FILED
July 07, 2014
INDIANA UTILITY
REGULATORY COMMISSION

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

IN THE MATTER OF THE COMMISSION'S INVESTIGATION, PURSUANT TO IC § 8-1-2-58, INTO THE EFFECTIVENESS OF DEMAND SIDE MANAGEMENT ("DSM") PROGRAMS CURRENTLY UTILIZED IN THE STATE OF INDIANA, INCLUDING AN EXAMINATION OF ISSUES THAT COULD IMPROVE THE EFFECTIVENESS OF DEMAND SIDE MANAGEMENT PROGRAMS IN THE STATE, INCLUDING CONSIDERATION OF THE ESTABLISHMENT OF AN INDEPENDENT DSM ADMINISTRATOR MODEL ON A STATE-WIDE BASIS	)	CAUSE NO. 42693-S1
RESPONDENTS: ALL JURISDICTIONAL ELECTRIC AND GAS UTILITIES IN THE STATE OF INDIANA	)	

COMPLIANCE FILING – FINAL EVALUATION REPORT

At the April 17, 2014 Technical Conference held in this Cause, the Indiana Utility Regulatory Commission ("Commission") requested that the Demand Side Management Coordination Committee ("DSMCC") file the most recent draft version of the evaluation of the statewide core programs for Program Year 2. A copy of the 2013 Energizing Indiana Draft Evaluation Report was filed on April 21, 2014.

In its April 21, 2014 filing, the DSMCC indicated that the final Evaluation Report, inclusive of the cost benefit test information and any changes made to the other chapters as part of the development of the benefit cost test information, as well as the public report would both be filed with the Commission upon approval by the DSMCC.

Attached please find (1) the final 2013 Energizing Indiana Evaluation Report dated June 19, 2014 and (2) the public report, both of which have been approved by the DSMCC. Also attached is a redline showing changes to the report following the DSMCC's April 21, 2014 filing.

Respectfully submitted on behalf of the Demand Side Management Coordination Committee,

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2013 Energizing Indiana

Evaluation Report

June 19, 2014

2013 Energizing Indiana Evaluation Report

June 19, 2014

An Evaluation of the Statewide Core Second Year Energy Efficiency Programs

Prepared for

The Indiana Demand Side Management Coordination Committee

Submitted by

The Indiana Statewide Core Program Evaluation Team:

TecMarket Works, Cadmus, Opinion Dynamics Corporation, Integral Analytics, and Building Metrics

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1. EXECUTIVE SUMMARY

This report presents an assessment of the program year (PY2) *ex-ante,* audited, verified, *ex-post* gross, and net energy savings, achieved by the Energizing Indiana statewide Core programs. The report also provides a benefit cost assessment of the Core programs over the combined two-year (PY1 & PY2) period ending on December 31, 2013. In summary, the portfolio continues to be cost effective over the two year period with Core program energy efficiency resources being acquired at $0.03 cents per kWh. Table 1 defines the types of energy savings presented in this report.

Table 1: Savings Type Definitions

Savings Type	Definitions
Ex-Ante	Energy savings from program tracking system as reported by the third-party administrator (TPA).
Audited	*Ex-ante* savings after deemed calculations and project/measure counts have been confirmed by the evaluation administrator.
Verified	Savings estimated following confirmation of the installation and use of a sample of project/measure installations.
Ex-Post Gross	Evaluated savings resulting from the installation and use of all program-incented or provided technologies.
Net Energy Savings	Evaluated savings resulting from the installation and use of incented or provided technologies directly attributable to the program.

Energy savings presented in this report derive from three types of savings conditions:

1. Savings from measures distributed during the first year, but not installed or used until the second year.
2. Continued use and savings from measures installed during the first program year.
3. Savings from measure installations and actions during the second program year.

Savings reported in this report's impact sections are limited to those occurring during the second year. The report includes process evaluation findings. These assessments document program operations for use in enhancing or improving future delivery.

The TecMarket Works Energizing Indiana Core Program Evaluation Team (Evaluation Team) completed this report. The Evaluation Team includes representatives from: TecMarket Works (the Evaluation Administrator), Cadmus, Opinion Dynamics, Integral Analytics, and Building Metrics.

Energizing Indiana consists of five Core energy-efficiency programs serving low-income, residential, and commercial and industrial customers as well as schools. Specifically, these programs include the following:

1. The Residential Home Energy Assessment (HEA) program.
2. The Residential Low-Income Weatherization (LIW) program (also known as the Income-Qualified Weatherization program).

3. The Energy Efficient Schools (EES) Education and Schools Audit and Direct Install (SADI) programs.
4. The Residential Lighting (Lighting) program.
5. The Commercial and Industrial (C&I) Prescriptive Rebates program.

Six utility companies participate in the Core program effort:

- Duke Energy
- Indianapolis Power & Light Company (IPL)
- Indiana Michigan Power Company (I&M)
- Northern Indiana Public Service Company (NIPSCO)
- Indiana Municipal Power Agency (IMPA)
- Vectren

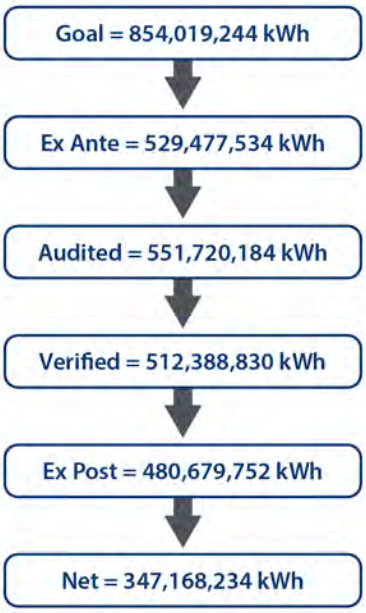
While IMPA discontinued its third-year programmatic efforts (2014), this agency served as part of the Core Programs for the complete 2013 calendar year. The programs are administered by a third-party administrator: GoodCents, hired through a competitive bid process in 2011.

This evaluation efforts seek to achieve the industry's highest reliability standards, conforming to definitions and requirements established by the Indiana Evaluation Framework (the Framework). The Framework requires reliable studies, with a 90% confidence level and a precision level within 10% over the standard three-year program cycle, at both the utility and program levels. As this includes five programs, sponsored by six utility companies, the evaluation presents 30 individual program-impact assessments. The report then rolls up utility-specific, energy-impact assessment results to provide program-level energy impacts, achieving greater than 90% confidence levels and ±10% precision levels for each program and for the portfolio level results.

While savings reported in this PY2 evaluation can be considered reliable at the program level, the highest level of utility-specific reliability will be reported at the end of the program cycle, once all three years' of program sampling and evaluation analysis efforts have been completed and rolled up into the final program-cycle evaluation report (to be delivered in Spring 2015). This report's language and terminology conforms to the Demand-Side Management (DSM) Impact Steps outlined in the Framework.

Across the portfolio, the programs achieved savings levels lower than set goals. Figure 1 shows the savings progress for portfolio-level savings.

Figure 1 Portfolio Level Savings



Overall, at a high level, this evaluation determined verified savings slightly lower than *ex-ante* gross savings reported by the TPA. Savings reported and realization rates achieved varied by program and utility. Residential program performance continued to meet targets or improve. The C&I program performed well, relative to savings claims, but fell short of savings goals.

1. School Education: the program achieved expected verified savings, with installation rates for the kit measures consistent with the previous year and with *ex-ante* assumptions.
2. School Audit and Direct Install: The program achieved the verified savings generally expected; vending machine sensors, however, achieved lower verified savings, as some schools reported removing them, as advised by the vending machine vendors.
3. The Residential Lighting program performed well in PY2. Overall *ex-ante* savings represented 110% of the program goal. Verified savings reached 96% of reported *ex-ante* energy savings and 72% of *ex-ante* demand savings at the statewide level. *Ex-ante* savings calculations generally were accurate and in compliance with the agreed-upon assumptions.
4. Although missing its participation goals, the Residential Home Energy Assessment program performed well in 2013. The program achieved PY2-verified savings very close to *ex-ante* savings (97%), including canvassing measures. The largest contributing factor to this was the TPA installing more measures in each home than assumed in the per-home energy savings value used to calculate *ex-ante* energy savings.
5. The Residential Low Income Weatherization program achieved 101% of its participation goals for 2013. Although the program achieved 105% of its goals at the audited level, it produced verified savings 10% lower than *ex-ante* savings. This partly resulted from a compact fluorescent lamp (CFL) verification rate of 79% and an energy-efficient showerhead verification rate of 76%.
6. The C&I Prescriptive program realized 96% of its energy claim and 81% of its coincident peak demand claim. The program, however, only achieved verified energy and demand savings of 60% and 37%, respectively, for PY2 program goals.

The PY2 portfolio moved from a start-up to more efficient, established operation for residential programs. Almost every program improved its design, marketing, and operations, leading to increased or steady energy savings and improved cost-effectiveness.

The Energizing Indiana programs' designs anticipated the TPA would meet very aggressive energy-savings objectives, requiring high participation levels immediately upon launch. The programs did not achieve these aggressive objectives in the first year (see the PY1 report). However, the TPA significantly improved energy-savings performance for all residential programs, increasing their energy savings by 41% compared to PY1 achievements. Given the savings shortcomings relative to goals set for the C&I program, it appears unlikely that the TPA can continue achieving savings at a rate sufficient to overcome PY1 levels, unless the process of acquiring participants and the completion of new energy projects can be substantially improved.

The process evaluation identified the following potential improvements to program operations for increasing savings.

1. Consider tactics to improve student survey response rates for the School Education Program.
2. Consider providing financing mechanisms to implement capital projects for schools participating in the School Audit and Direct Install Program.
3. Prioritize installing occupancy sensors in locations that yield the greatest savings (such as gymnasiums and cafeterias) in schools participating in the School Audit and Direct Install Program.
4. Limit the fluctuating availability of program discounts for the Residential Lighting program. Though a tactic originally adopted to stay within budget, sales data can better inform stable incentive offerings as the program has operated for two years.
5. Actively seek methods to increase participation in the Residential HEA program and meet annual (and three-year) goals. To increase participation in PY3, the TPA could increase staffing resources, continue to identify key geographic areas, and expand the targeted customer base.
6. Increase savings per home for the Residential HEA and LIW programs by targeting: high-usage sockets; and homes using electric water heat. Emphasis on installing bulbs in high-usage sockets should continue. Specifically, based on past research in Indiana, CFLs should be installed in rooms experiencing the highest hours-of-use (HOU). This will require a minor adjustment to the Optimizer tool (Optimizer), allowing inclusion of dining rooms in the list of possible room types.
7. The program should continue to reach homes with electric water heating to realize greater savings from faucet aerators and showerheads.

If the TPA continues to focus significant efforts on increasing *ex-ante* gross savings accomplishments, and can improve C&I program performance, a strong probability exists that the following conditions can be achieved:

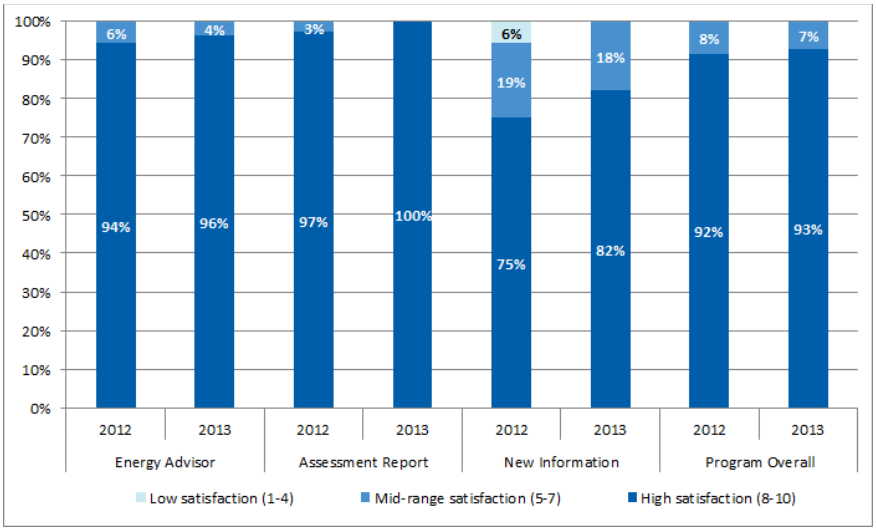
1. The residential portfolio may reach its energy-savings goal for combined PY1 and PY2 during PY3.
2. The C&I program may increase its energy savings performance in PY3, but likely will not increase its savings to a level near its goals, unless significant uptake based on the last two years of planning takes place or capital becomes available to companies implementing large projects.

3. If the Core programs increase their coordination and degree of channeling success, Core and Core Plus programs may see increased energy savings.

The Evaluation Team highlights many positive outcomes below and throughout this report. Notably, the following highlights indicate PY1 start-up issues and the speed of energy-saving achievements largely have been solved for the residential programs. These findings suggest PY3 will be delivered upon a fairly solid base, built in PY1 and refined in PY2. Positives outcomes include the following:

1. Satisfaction remains high and, in some cases, has improved.
   a. Residential Lighting program: Interviews with participating manufacturers revealed high satisfaction levels with the program design and implementation process. To ensure timely service of participating retail locations, the program hired two additional staff field service representatives.
   b. The Schools Audit and Direct Install Program experienced improved satisfaction levels in each category (facility staff satisfaction).

Figure 2. Satisfaction with the Schools Program

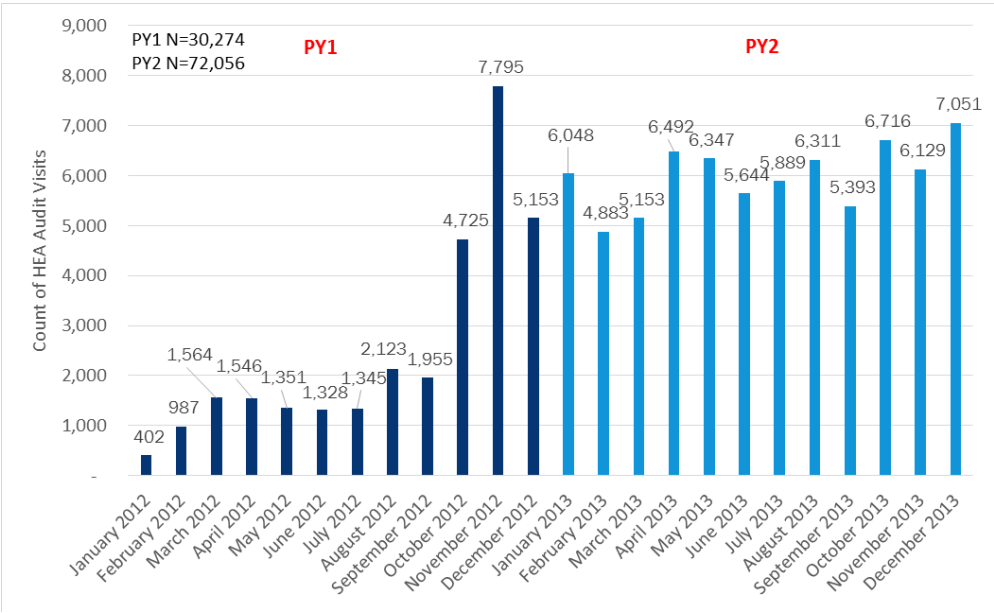


Using a 1-10 Scale, 1 is Extremely Dissatisfied and 10 as Extremely Satisfied, (2012 n=36, 2013 n = 28)

2. Participation rates have improved.
   a. The School Education Program: Participation remains high as the program achieved its goals each year. In 2012, 72,695 kits were distributed; in 2013, the total rose to 83,222 kits.
   b. Residential Lighting program: Consistent with the increase in program goals and budgets, sales of lighting products increased by about 30% from PY1.
3. The level and quality of marketing and outreach efforts have increased participant interest and enrollments. The LIW program exceeded (101%) its participation PY2 goals
4. Coordination between the statewide Core Programs and the individual utility programs has improved, benefitting both portfolios, and helping customers' access energy services.
5. HEA satisfaction remains high, with customers reporting an 8.9 mean satisfaction score on a scale of 1 to 10: a slight improvement over the previous year's mean satisfaction score (8.8).

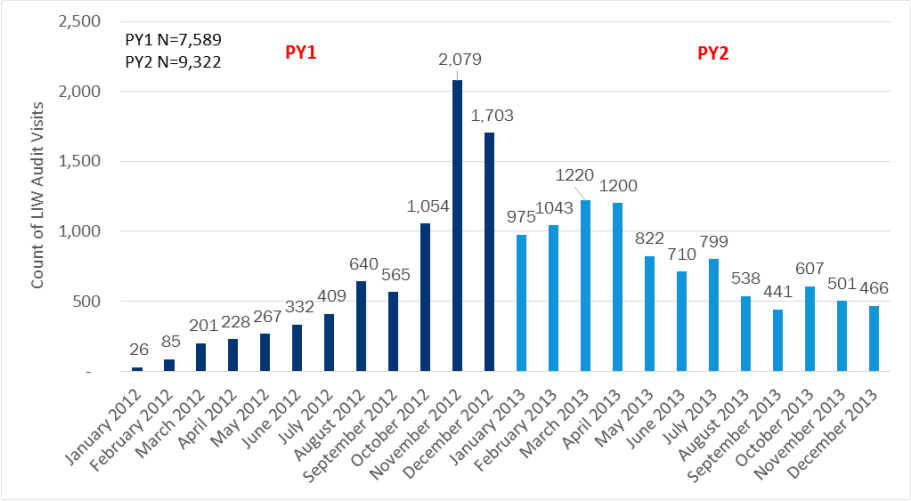
6. HEA participation rates improved. Figure 3 shows the number of audits completed by month since introduction of the HEA program. A clear ramp-up period can be observed in the first half of PY1, with the program reaching a steady state in the fourth quarter of PY1 and remaining relatively consistent throughout PY2.

Figure 3: HEA Audits Completed per Month Since Program Inception



7. After a significant increase in audits at the end of PY1 the Residential LIW program reduced the number of audits completed monthly as auditors shifted from LIW to HEA when it became apparent the LIW program remained on track to achieve its targeted number of audits.

Figure 4: LIW Audits Completed per Month Since Program Inception



1.1 PROGRAM DESCRIPTIONS

The Indiana Office of Utility Consumer Counselor (OUCC), participating utilities, and consumer organizations describe Energizing Indiana as "a united effort" to offer comprehensive energy-efficiency programs that bring savings to communities across the state. The program consists of five offerings, delivered by an independent TPA (GoodCents). PY2 represented the second year of a three-year program cycle for Energizing Indiana. The programs address homes, schools, and commercial facilities. Table 2 provides a program-by-program summary of Energizing Indiana offerings.

Table 2: Core Programs

Programs	Brief Program Description
Home Energy Assessment (HEA)	This program provides a free walk-through energy audit that: analyzes participant energy use; recommends efficiency measures or upgrades; and facilitates direct installation of low-cost, energy-saving measures, including low-flow showerheads, CFL bulbs, hot water pipe wrap, and sink aerators.
Low Income Weatherization (LIW)	This program provides a free walk-through home energy assessment that includes all Home Energy Assessment elements, plus full diagnostic testing (blower-door) for the home. Auditors recommend weatherization measures or upgrades that facilitate direct installation of low-cost, energy-saving measures, including energy-efficient showerheads, CFL bulbs, sink aerators, pipe wrap, water heater tank wrap and air sealing. In addition, eligible homes may receive attic insulation through the program.
Residential Lighting (Lighting)	This program provides upstream discounts on a variety of lighting products (CFLs, light-emitting diodes [LEDs], and lighting fixtures). The program works with retailers and manufacturers across the state to offer reduced prices at the point-of-sale.
Energy Efficient Schools (Schools)	This program has two components: • The first works with fifth-grade students, teaching them about energy efficiency and how they can make an impact at school and home. Participating schools receive classroom curriculum and Energizing Indiana take-home efficiency kits. • The second, the School Audit and Direct Install Program, works with schools to assess all energy systems to determine if they operate efficiently. Assessment results guide schools to install appropriate upgrades and rebates available through the C&I program. The schools also receive a bundle of direct-install measures at no cost.
Commercial and Industrial (C&I)	Addressing the use of commercial customers, this program provides prescriptive rebates to facilities, based on the installation of energy-efficiency equipment and system improvements. Additional tracks targeted to small businesses include: the Opt-in Direct Install program and targeted relationships with Trade Allies. Rebates address: lighting, variable frequency drives (VFDs), Heating, Ventilation, Air Conditioning (HVAC), and efficient ENERGY STAR® commercial kitchen appliances. In addition, the program began offering direct-mail CFLs kits, starting in Fall 2012.

1.2 BUDGET AND EXPENDITURES

Overall, the TPA spent 80% of the total 2013 implementation budget for all programs evaluated in this report. Table 3 shows budgets and reported expenditures by program at the statewide level, and Table 4 shows the budgets by utility. The budget by program is slightly lower than the utility-based budget total as it does not include the portfolio costs of $344,778 for branding.

Table 3: Budget and Expenditures by Program and Statewide

Program	2013 Budget(1)	2013 Reported Expenditures(1)	% of Budget Goals
Home Energy Assessment	$ 27,915,723	$ 25,174,399	90%
Low Income Weatherization	$ 7,133,314	$ 7,222,297	101%
Lighting	$ 7,712,844	$ 7,763,131	101%
Energy Efficient Schools	$8,179,321	$8,283,575	101%
Commercial and Industrial	$ 56,377,283	$ 37,328,403	66%
Total	**$ 107,318,485**	**$ 85,771,805**	**80%**

(1) Provided by the TPA via e-mail. Ben Becht, GoodCents, February 15, 2014.

Table 4: Budget and Expenditures by Utility and Statewide

Utility	2013 Budget Goals(1)	2013 Reported Expenditures(1)	% of Budget Goals
Duke	$ 42,380,071	$ 23,620,535	56%
I&M	$ 11,610,122	$ 21,295,504	183%
IPL	$ 23,547,703	$ 18,413,785	78%
IMPA	$ 4,551,585	$ 4,697,226	103%
NIPSCO	$ 17,450,502	$ 12,147,125	70%
Vectren	$ 8,123,282	$ 5,942,407	73%
Total	**$ 107,663,263**	**$ 86,116,582**	**80%**

(1) Provided by the TPA via e-mail. Ben Becht, GoodCents, February 15, 2014.

1.3 GOALS AND EX-ANTE SAVINGS SUMMARY

The TPA provides goal and *ex-ante* savings. Figure 5 demonstrates the distribution of electric savings among programs planned to be achieved by the portfolio in 2013.

Figure 5: Percent, by Program, Toward kWh Goal

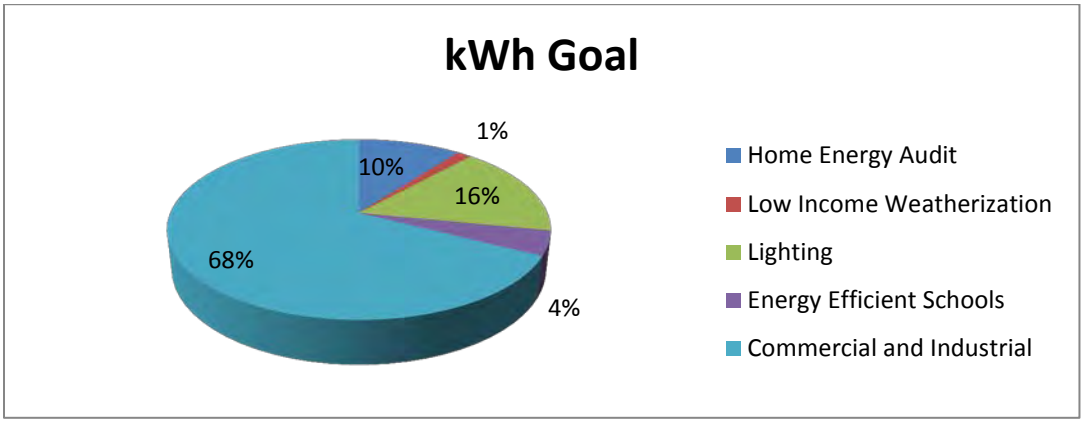


Table 5 summarizes the TPA's *ex-ante* savings, compared to planned savings for 2013. These savings do not include adjustments from the Evaluation Team; rather, they show goal and reported savings in 2013.

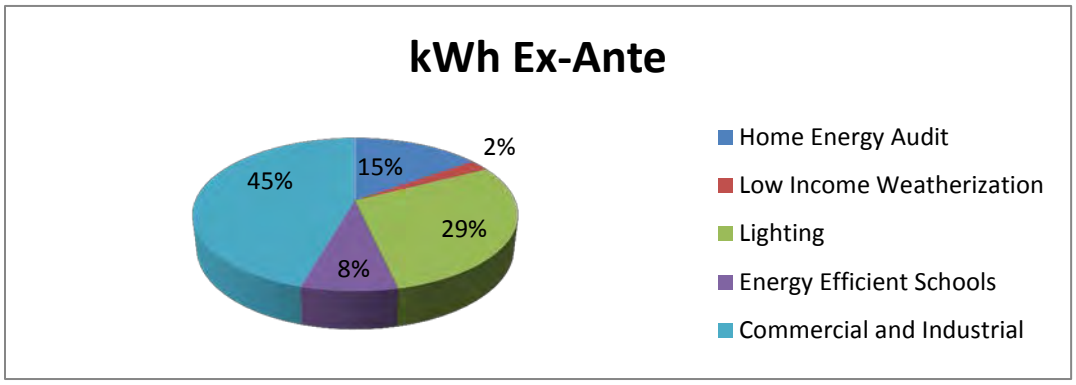
Table 5: Statewide *Ex-Ante* Savings by Program for PY2[1]

Program	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goal
Home Energy Assessment	88,556,244	80,063,597[3]	90%	39,458	36,766[3]	93%
Low Income Weatherization	11,992,888	12,141,544	101%	5,177	5,242	101%
Lighting	139,542,000	153,171,798	110%	22,302	24,480	110%
Energy Efficient Schools Audit	1,571,360	5,087,159	324%	n/a	286	n/a
Energy Efficient Schools Education	35,683,132	37,519,814	105%	n/a	n/a	n/a
Commercial and Industrial[2]	576,673,620	241,493,622	42%	165,038	39,627	24%
Statewide Total	**854,019,244**	**529,477,534**	**62%**	**231,975**	**106,401**	**46%**

(1) Source: From GoodCents Portal, yearend savings statement, pulled January 24, 2014.
(2) Data updated on February 13, 2014 based on data moved for I&M. Complete updated information was received on February 19, 2014.
(3) Includes Canvassing Measures

Figure 6 demonstrates the distribution of electric savings among programs reported as achieved (*ex-ante)* by the portfolio in 2013.

Figure 6: Percent (by Program) Toward *Ex-Ante* kWh Savings



1.4 *AUDITED SAVINGS SUMMARY*

Following guidance from the Indiana Framework, the Evaluation Team audited the Energizing Indiana savings, reviewing the programs' tracking databases and the portal provided by the TPA. This included reviewing claimed *ex-ante* savings. Revisions included:

1. Adjusting for tracking errors of measures installed.
2. Ensuring program *ex-ante* savings applied correctly to a sampling of measures.

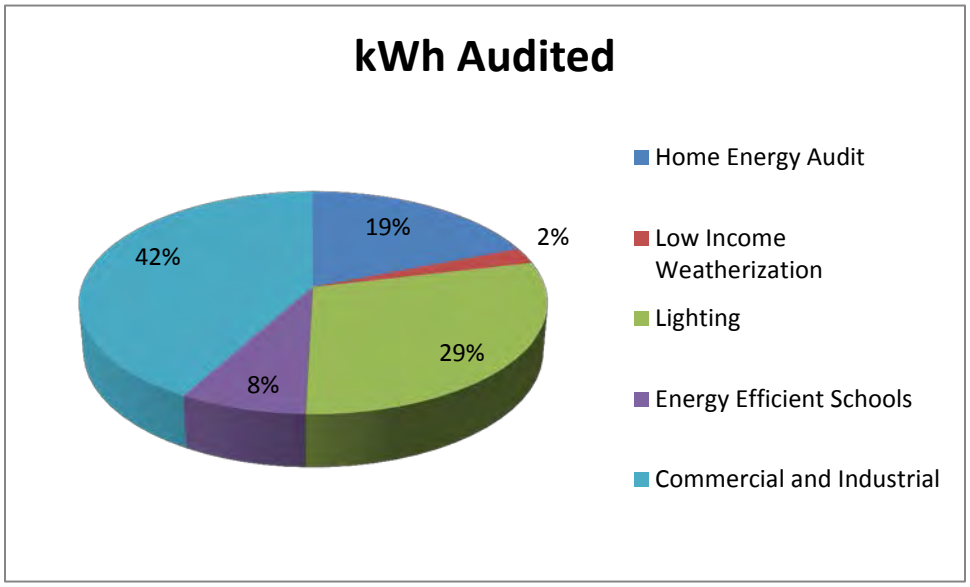
Adjustments corrected for errors or omissions (as identified above). This allowed recalculation of program savings, based on the adjusted audited number of measures. Table 6 compares total PY2 audited savings by program against *ex-ante* savings reported by the TPA.

Table 6: Statewide Audited Savings by Program

Program	2013 kWh *Ex-Ante*	2013 kWh Audited	2013 kW Ex-Ante	2013 kW Audited
Home Energy Assessment	80,063,597	104,891,194	36,766	24,476
Low Income Weatherization	12,141,544	12,720,318	5,242	3,851
Lighting	153,171,798	160,564,910	24,480	19,205
Energy Efficient Schools	42,606,973	42,606,973	286	286
Commercial and Industrial	241,493,622	230,936,789	39,627	47,841
Statewide Total	**529,477,534**	**551,720,184**	**106,401**	**95,659**

Figure 7 demonstrates the distribution of electric savings among programs audited in the portfolio in 2013.

Figure 7: Percent (by Program) Toward kWh Audited Savings



1.5 *Verified Savings Summary*

Verified savings calculations occurred after confirming measures had been installed and remained in operation. This process leveraged savings values claimed by the TPA.

Verification typically employs detailed analysis of a stratified random sample of installations. Typical methods for collecting necessary data include telephone surveys and/or site visits. For this step, the Evaluation Team adjusted total savings to address issues such as the following:

- Measures rebated/distributed but never installed;
- Measures not meeting program qualifications;

- Measures installed but later removed; or
- Measures improperly installed.

Table 7 presents savings credited for PY2 in a way differentiating the two time periods, which correspond to the actions taken that produce savings. The program-specific sections of the report present more detailed savings, depending on the measure and time of installation. The following table summarizes kWh savings for the portfolio reported for each program. The two time periods included are: *Incremental kWh Savings (PY1)* and *Cumulative kWh Savings (PY1 and PY2).*

The cumulative kWh savings equaled total savings from three sources:

1. Incremental savings from the PY1 actions that continued to save energy in PY2.
2. PY2 savings from measures acquired by participants during PY1, but not installed and used until PY2.
3. Savings from actions taken and measures implemented in PY2.

Table 7: Verified Year-Two (2013) Cumulative Savings from PY1 and PY2 Installations[(1)]

	Program	kWh Savings from Measures Installed in PY1 that Continue to Save Energy in PY2	kWh Savings from Measures Acquired by Participants in PY1, but not Installed Until PY2	kWh Savings from Measures Installed in PY2	Total kWh Savings in PY2
Year 2	Home Energy Assessment	17,190,585	1,192,244	77,642,156	96,024,985
	Low Income Weatherization	4,118,006	174,494	10,461,359	14,753,859
	Lighting	92,944,601	28,649,881	147,563,636	269,158,118
	Energy Efficient Schools	28,718,896	4,210,963	41,573,927	74,503,786
	Commercial and Industrial	152,014,384	117,437,757	230,936,789	500,388,930
	Statewide Total	**294,986,473**	**151,665,339**	**508,177,867**	**954,829,678**
	(1) kWh for measures distributed in PY1 but not installed until PY2 are *ex-post* gross.				

Figure 8: Percent (by Program) Toward kWh Verified Savings

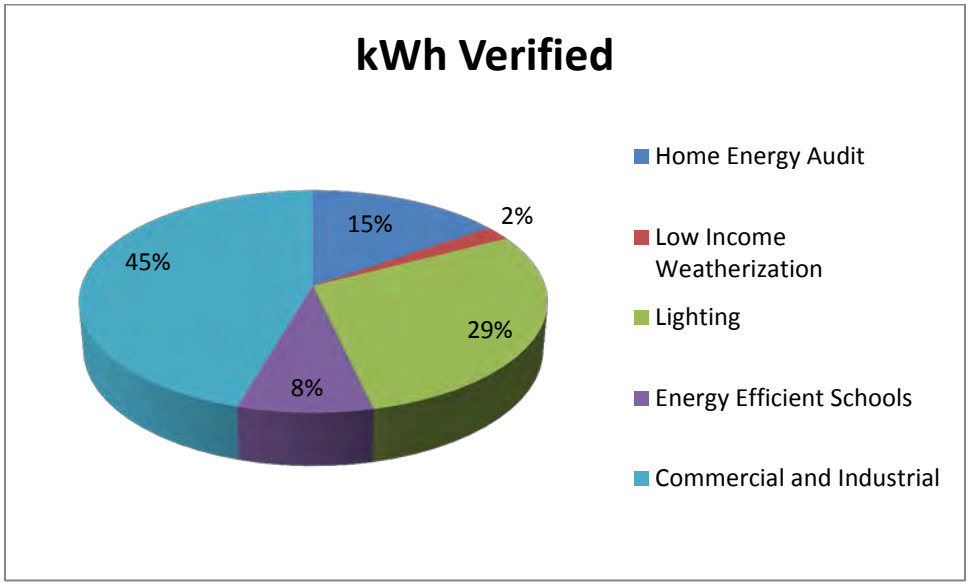


Table 8 compares *ex-ante* savings to verified savings by program, and Table 9 compares *ex-ante* savings to verified savings by utility per program. Details have been included in the report's program sections.

Table 8: Statewide *Ex-Ante* and Verified Savings by Program for PY2

Program	2013 kWh *Ex-Ante*	2013 kWh Verified	kWh Realization Rate	% of kWh Goal	2013 kW *Ex-Ante*	2013 kW Verified	kW Realization Rate	% of kW Goal
Home Energy Assessment	80,063,597	77,642,156	97%	89%	36,766	17,314	47%	44%
Low Income Weatherization	12,141,544	10,461,359	90%	91%	5,242	3,155	61%	62%
Lighting	153,171,798	147,563,636	96%	123%	24,480	17,650	72%	79%
Energy Efficient Schools	42,606,973	45,784,890	107%	123%	286	281	98%	N/A
Commercial and Industrial	241,493,622	230,936,789	96%	40%	39,627	47,841	121%	29%
Statewide Total	**529,477,534**	**512,388,830**	**97%**	**60%**	**106,401**	**86,241**	**81%**	**37%**

Table 9: Statewide *Ex-Ante* and Verified Savings by Program by Utility

Program	2013 kWh *Ex-Ante*	2013 kWh Verified	kWh Realization Rate	% of kWh Goal	2013 kW *Ex-Ante*	2013 kW Verified	kW Realization Rate	% of kW Goal
DUKE								
Home Energy Assessment	20,195,052	19,308,195	96%	87%	9,345	4,371	47%	44%
Low Income Weatherization	3,912,000	3,105,102	82%	84%	1,689	1,017	61%	62%
Lighting	56,461,616	54,693,532	97%	100%	9,024	6,542	72%	75%
Energy Efficient Schools	21,576,001	23,379,141	108%	116%	80	79	98%	N/A
Commercial and Industrial	62,550,987	60,058,328	96%	24%	9,910	12,054	122%	17%
Total DUKE	**164,695,656**	**160,544,298**	**97%**	**45%**	**30,048**	**24,063**	**80%**	**27%**
I&M								
Home Energy Assessment	6,321,156	6,329,546	100%	103%	2,805	1,382	49%	50%
Low Income Weatherization	2,115,088	1,748,559	87%	87%	913	558	62%	62%
Lighting	19,861,198	21,487,684	108%	132%	3,174	2,570	81%	99%
Energy Efficient Schools	3,968,064	4,124,736	104%	180%	23	22	98%	N/A
Commercial and Industrial	90,000,457	86,378,457	96%	132%	15,585	18,956	122%	85%
Total I&M	**122,265,963**	**120,068,982**	**98%**	**130%**	**22,500**	**23,488**	**104%**	**83%**
IPL								
Home Energy Assessment	26,977,410	24,950,485	92%	73%	12,318	5,097	41%	33%
Low Income Weatherization	1,305,304	1,154,136	92%	93%	564	371	67%	68%
Lighting	31,416,251	28,250,432	90%	109%	5,021	3,379	67%	82%
Energy Efficient Schools	6,539,046	6,863,624	105%	121%	90	89	98%	N/A

Commercial and Industrial	38,087,107	36,600,707	96%	43%	5,651	6,876	122%	29%
Total IPL	**104,325,118**	**97,819,384**	**94%**	**64%**	**23,644**	**15,812**	**67%**	**36%**
IMPA								
Home Energy Assessment	5,143,792	5,148,417	100%	92%	2,365	1,109	47%	45%
Low Income Weatherization	395,112	326,832	86%	87%	171	108	64%	65%
Lighting	7,296,511	6,452,898	88%	90%	1,166	772	66%	67%
Energy Efficient Schools	1,360,048	1,442,426	106%	127%	12	12	98%	N/A
Commercial and Industrial	17,642,220	16,931,899	96%	33%	2,627	3,195	122%	22%
Total IMPA	**31,837,683**	**30,302,472**	**95%**	**46%**	**6,341**	**5,196**	**82%**	**28%**
NIPSCO								
Home Energy Assessment	14,109,132	15,162,352	107%	104%	6,606	3,547	54%	55%
Low Income Weatherization	2,789,256	2,595,228	97%	98%	1,204	672	57%	57%
Lighting	23,555,640	22,341,169	95%	103%	3,765	2,672	71%	77%
Energy Efficient Schools	6,774,683	7,355,211	109%	114%	30	30	98%	N/A
Commercial and Industrial	22,685,196	21,779,651	96%	25%	4,239	5,155	122%	22%
Total NIPSCO	**69,913,907**	**69,233,611**	**99%**	**52%**	**15,844**	**12,076**	**76%**	**35%**
Vectren								
Home Energy Assessment	7,317,055	6,743,161	92%	118%	3,326	1,807	54%	71%
Low Income Weatherization	1,624,784	1,531,593	98%	98%	702	429	62%	62%
Lighting	14,580,582	14,337,920	98%	104%	2,330	1,715	74%	77%
Energy Efficient Schools	2,389,131	2,619,753	110%	168%	50	49	98%	N/A
Commercial and Industrial	10,527,655	9,187,747	87%	23%	1,614	1,604	99%	14%
Total Vectren	**36,439,207**	**34,420,174**	**94%**	**54%**	**8,022**	**5,604**	**70%**	**34%**

1.6 *EX-POST AND NET SAVINGS SUMMARY*

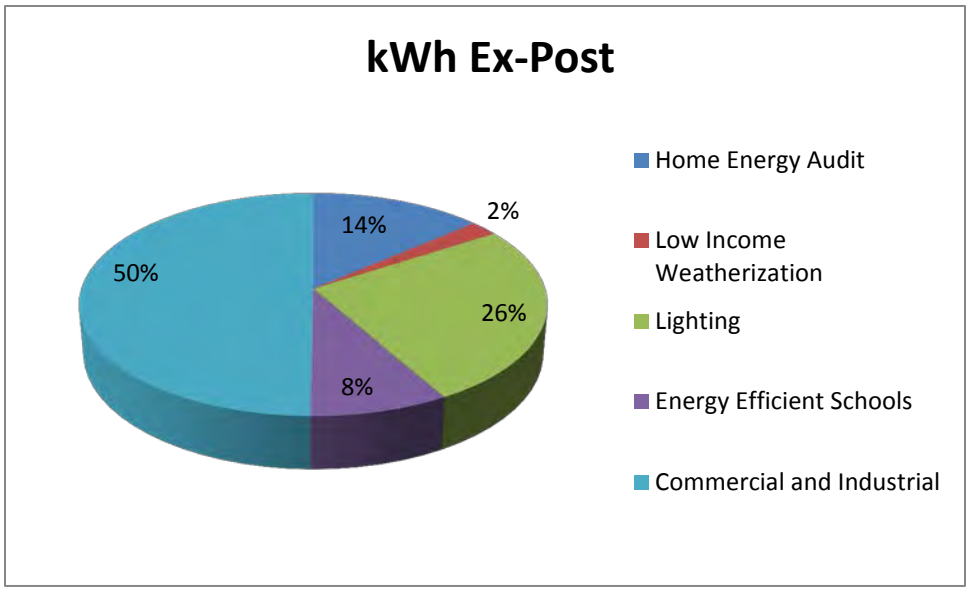
The Evaluation Team determined *ex-post* gross evaluated savings for the Energizing Indiana PY2 programs through: engineering analysis; building simulation modeling; billing analysis; metering analysis; or other accepted impact evaluation methods.

Verified savings adjustments could include changes to the following:

1. Baseline assumptions.
2. Weather.
3. Occupancy levels.
4. Hours-of-use (HOU).
5. Decreased or increased production levels.
6. Other assumptions resulting from the impact analysis research.

Net savings reflect *ex-post* savings, with the net-to-gross (NTG) ratio applied to evaluated savings estimates. These NTG ratios account for freeridership and short-term[1] spillover effects[2], which ultimately contribute to the programs' cost-effectiveness calculations. Table 10 shows the statewide *ex-post* and net savings by program attributable to PY2 program actions only.

Figure 9: Percent (by Program) Toward kWh *Ex-Post* Savings



[1] Short-term means between the period of participation and the evaluation contact made to confirm savings, typically between 3 to 12 months.

[2] The only program to not have annual spillover savings applied is the Residential Lighting program which will receive market effects savings at the end of the cycle.

Table 10: Statewide *Ex-Post* and Net Savings by Program

Program	2013 kWh *Ex-Post*	2013 kWh NTG Ratio	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG Ratio	2013 kW Net
Home Energy Assessment	65,551,258	88%	58,008,705	9,888	91%	8,955
Low Income Weatherization	10,648,224	100%	10,648,224	1,674	100%	1,674
Lighting	124,361,368	49%	60,937,070	17,057	49%	8,358
Energy Efficient Schools: Education Program	38,847,964	97%	37,802,826	5,266	102%	5,363
Energy Efficient Schools: School Audit and Direct Install Program	1,690,987	366%	6,187,292	97	100%	97
Commercial and Industrial(1)	239,579,951	80%	173,584,117	57,296	80%	45,837
Statewide Total	**480,679,752**		**347,168,234**	**91,278**		**70,284**

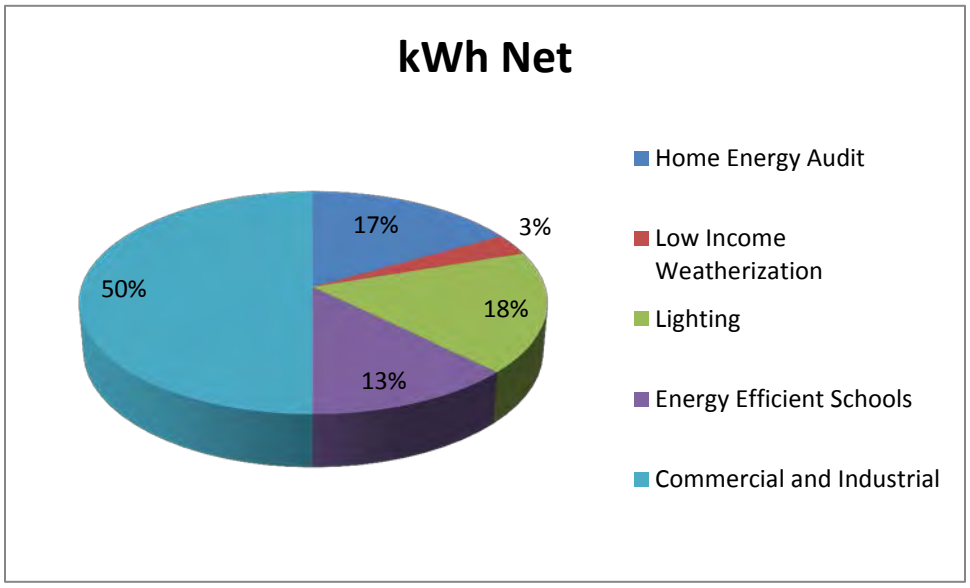
(1) C&I totals are for Portal Savings only. These savings do not include Bulb Drop or Opt-in offerings.

Some measures, such as CFLs, contain carryover savings. Carryover savings refers to the installation of a measure after the year it was distributed. For example, if a CFL was purchased or given to a participant in 2012, but not installed until 2013, the savings from that measure would not be applied until the actual installation date. This is based off of in-service rate (ISR) research, also discussed in subsequent chapters, that indicates CFLs in storage will go into use within 3 years from the date of receiving or purchasing them. Within program chapters and provided in Table 12, utilities can see additional savings applied based on the savings accrued from measures that continue to be installed, even if they were not distributed and counted in the current year's *ex-ante* savings.

Table 11 and Table 12 provide the program-level *ex-post* gross and net savings and the utility-level, *ex-post* gross and net savings. Table 11 includes savings achieved from measures distributed during PY1, but not installed until PY2. Given the TPA did not identify these savings in the goals or *ex-ante* savings they are represented as *ex-post* and net savings for the statewide achievements.

The program sections provide details on *ex-post* savings and NTG ratios by program and utility.

Figure 10: Percent (by Program) Toward kWh Net Savings



Carryover savings, shown in Table 11, maintain the NTG values from the year they were acquired by the participant. Table 12 includes carryover savings and the NTG values reflect the additional savings metrics.

Table 11: Statewide *Ex-Post* and Net Savings by Program from PY1 Achieved in PY2

Program	2013 kWh *Ex-Post*	2013 kWh NTG Ratio	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG Ratio	2013 kW Net
Home Energy Assessment	1,192,244	88%	1,049,175	447	91%	407
Low Income Weatherization	174,494	100%	174,494	95	100%	95
Lighting	9,510,574	57%	5,421,027	1,131	57%	644
Energy Efficient Schools	3,078,301	94%	2,889,538	388	94%	364
Commercial and Industrial(1)	117,437,757	107%	125,658,400	30,960	107%	33,127
Statewide Total	**131,393,370**		**135,192,634**	**33,021**		**34,637**

(1) Bulb drop installations carryover from PY1 to PY2

Table 12: Statewide *Ex-Post* and Net Savings by Program by Utility

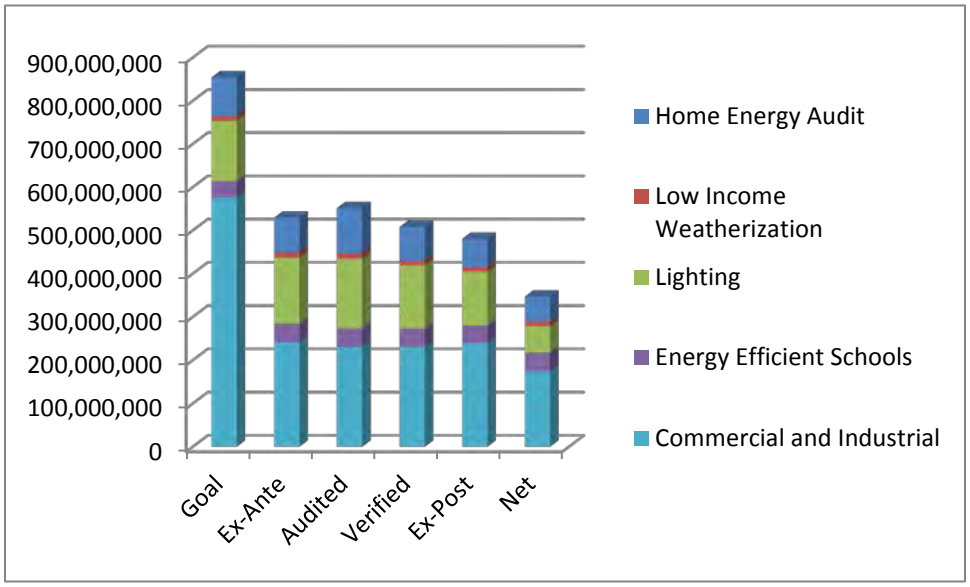
Program	2013 kWh *Ex-Post*	2013 kWh NTG	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG	2013 kW Net
Duke						
Home Energy Assessment	16,384,640	89%	14,609,486	2,693	91%	2,463
Low Income Weatherization	2,721,484	100%	2,721,484	323	100%	323
Lighting	49,764,026	50%	24,667,160	6,758	49%	3,345
Energy Efficient Schools	24,462,618	104%	25,515,284	3,121	101%	3,168
Commercial and Industrial	105,864,570	91%	96,517,442	25,986	92%	23,906
Total Duke	**199,197,338**		**164,030,856**	**38,881**		**33,205**

Program	2013 kWh *Ex-Post*	2013 kWh NTG	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG	2013 kW Net
I&M						
Home Energy Assessment	5,050,190	87%	4,409,967	682	91%	623
Low Income Weatherization	1,718,316	100%	1,718,316	176	100%	176
Lighting	19,541,520	50%	9,711,922	2,663	50%	1,321
Energy Efficient Schools	3,999,228	109%	4,345,424	527	101%	535
Commercial and Industrial	108,523,427	85%	92,003,529	27,784	85%	23,594
Total I&M	**138,832,681**		**112,189,158**	**31,832**		**26,248**
IPL						
Home Energy Assessment	22,060,426	88%	19,489,529	2,949	89%	2,621
Low Income Weatherization	1,411,323	100%	1,411,323	205	100%	205
Lighting	25,472,793	50%	12,615,011	3,462	49%	1,712
Energy Efficient Schools	6,307,013	81%	7,457,106	822	101%	830
Commercial and Industrial	52,830,889	88%	46,329,582	12,193	89%	10,826
Total IPL	**108,082,444**		**87,302,551**	**19,631**		**16,195**
IMPA						
Home Energy Assessment	4,213,502	88%	3,725,032	561	89%	499
Low Income Weatherization	346,928	100%	346,928	40	100%	40
Lighting	5,834,316	50%	2,895,237	792	49%	392
Energy Efficient Schools	1,535,482	107%	1,640,842	192	101%	195
Commercial and Industrial	29,179,850	91%	26,494,969	6,906	92%	6,356
Total IMPA	**41,110,078**		**35,103,008**	**8,492**		**7,482**
NIPSCO						
Home Energy Assessment	11,906,901	88%	10,523,118	1,529	89%	1,363
Low Income Weatherization	2,654,471	100%	2,654,471	418	100%	418
Lighting	20,160,172	50%	9,990,522	2,721	50%	1,347
Energy Efficient Schools	5,510,464	101%	5,547,929	854	101%	862
Commercial and Industrial	43,219,738	93%	40,168,931	11,634	93%	10,781
Total NIPSCO	**83,451,746**		**68,884,971**	**17,156**		**14,771**
Vectren						
Home Energy Assessment	5,935,598	88%	5,251,573	1,474	94%	1,386
Low Income Weatherization	1,795,702	100%	1,795,702	512	100%	512
Lighting	13,099,116	49%	6,478,246	1,793	49%	885
Energy Efficient Schools	1,802,446	132%	2,373,071	234	101%	235
Commercial and Industrial	17,520,480	91%	15,929,154	3,782	93%	3,530
Total Vectren	**40,153,342**		**31,827,746**	**7,795**		**6,548**

Figure 11 provides a high-level summary of EM&V findings, with the impact evaluation steps and overall Energizing Indiana results are summarized as follows:

- ***The overall portfolio goal for 2013 was set at 854 GWh.*** This corresponds to the 2013 portion of the TPA's three-year goal, as stated in its contract scope of work. With respect to savings goals, the largest proportion was expected from the C&I program (68%). Energy goals for the remaining residential programs ranged from 1% for the Low Income Weatherization Program to 16% for the Lighting Program. The goal was based on summation of per-measure *ex-ante* gross savings, projected to be achieved from the installation and use of program-induced actions taken by program participants.
- ***The TPA's ex-ante claimed savings for 2013 was approximately 529 GWh,*** with the majority of claimed savings occurring through the Residential Lighting (29%) and the C&I (45%) programs. Only one residential program (HEA) fell just below its goal. The other residential programs compensated for this small shortfall by achieving from 101% (LIW) to over 300% (Schools—Audit) of their goals. The C&I Program achieved 42% of the program-specific goal; the program primarily did not reach its goal due to lower-than-projected participation rates.
- ***The evaluation audit actually increased the total ex-ante saving achievement to 551 GWh,*** primarily due to additional savings credited to the HEA and Residential Lighting programs. This recalculation of ex-ante claimed savings, based on detailed examination of the program tracking data, found the two programs accounted for more measures installed than claimed in the ex-ante totals from the portal.
- ***The verification step reduced portfolio savings to 512 GWh***. This resulted from the Evaluation Team's efforts to confirm that measures reported were installed and in use. To verify this, the Evaluation Team conducted a series of on-site visual confirmation examinations and telephone verification efforts. Verified savings served as the basis of measurement of compliance against goals.
- ***The Evaluation step resulted ex-post savings of 481 GWh****. Ex-post* savings are the outcome of conducting as assessment of factors such as baseline assumptions. This is the value to be used for future cycle program design.
- ***Application of NTG ratios resulted in net savings estimates at 347 GWh.*** This equals the amount of savings that can be directly attributed to the programs' efforts. This energy-saving estimate is used for the cost-effectiveness analysis for the Energizing Indiana portfolio and to calculate lost revenues by the utilities.

Figure 11: Savings by Program in Each Savings Category



1.7 CORE PROGRAMS HIGH-LEVEL INSIGHT AND FINDINGS

Each program provides a unique offering to target all Indiana customers. The broad range of program designs has effectively reached residential customers and facilitated high-priority energy-saving actions. Not only have immediate energy-efficiency improvements been made to qualifying homes, but the schools program has educated young people. This program's use of education elements can help shape habit-forming behaviors and attitudes toward energy-efficiency for generations to come. Overall, uptake across all residential programs exceeds the goals set for the TPA.

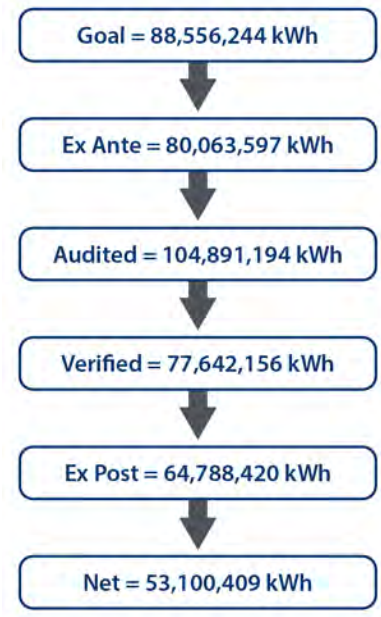
With a robust measure list, the C&I program can assist an array of customers, from small business to large industrial process plants. Enhancements made to the C&I program helped market services offered by Energizing Indiana. The improvements—including direct installation of CFLs, mailings, Trade Ally networks—build relationships with businesses and inform decision makers, aiding them in planning upcoming energy-efficiency improvements.

Each program uses its own methods for gauging success, based on the population targeted. Program-specific findings are highlighted below, with each program-specific section containing greater detail on the methods used for capturing data and additional recommendations based on these findings.

1.7.1 HOME ENERGY ASSESSMENT

The Home Energy Assessment Program offers walk-through audits and direct-installations of energy-efficiency measures. In 2013, the program achieved 88% of its verified energy-savings goals and 44% of its verified demand-savings goals, while using 90% of its budget. Figure 12 presents an overview of its savings achievements.

Figure 12: HEA Overview of Savings



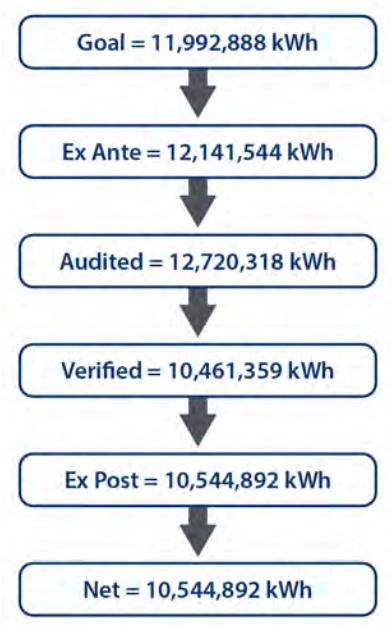
Key evaluation findings include the following:

- HEA significantly increased participation in PY2 compared to PY1 (by 229%), maintaining participation at an approximate average of 5,900 homes per month over the course of the year. Despite this, the HEA program did not reach its PY2 participation goals, meeting 84% of its goals.
- The program installed more measures in homes than in PY1, yielding higher savings per home. This resulted from programmatic changes, allowing installation of more measures, improved auditor training, and an enhanced QA/QC process.
- In PY2 the TPA made a number of enhancements to the database, allowing it to more accurately capture the auditors' activities.
- Customers remained satisfied with the program, rating it an 8.9 mean satisfaction score on a scale of 1 to 10.

1.7.2 LOW INCOME WEATHERIZATION

The LIW program offers walk-through audits and direct installations of energy-efficiency measures. Similarly to the HEA program, the program includes air sealing and, in some cases, attic insulation. In 2013, the program achieved 91% of its energy-savings goals and 62% of its demand-savings goals, while using 101% of its budget. Figure 13 presents an overview of the savings achievements.

Figure 13: LIW Overview of Savings



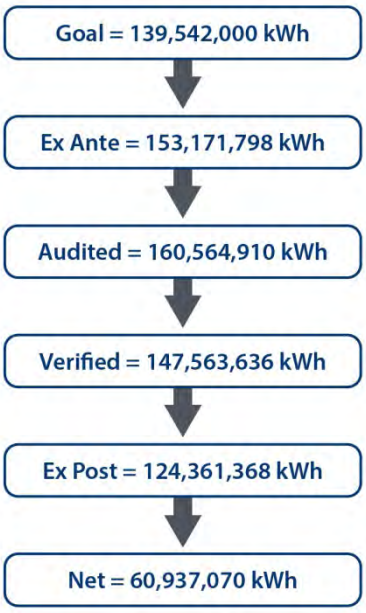
Key evaluation findings include the following:

- The program performed well in 2013, meeting its participation goals, despite shifting staffing resources to the HEA program to boost the number of HEA audits completed.
- The TPA actively worked to increase savings per home in PY2 by increasing the number of bulbs per home and ensuring (in the second part of the year) that measures provided to homes were installed before leaving the sites.
- The TPA revised its planning assumptions between PY1 and PY2, ensuring the program met its energy-savings targets. Several changes occurred mid-year and increased the accuracy of planning assumptions, compared to data from the tracking database.

1.7.3 RESIDENTIAL LIGHTING

The Residential Lighting program performed well in 2013 and exceeded its *ex-ante* goals. Agreed-upon gross savings calculations were generally applied accurately and consistently. The program continued to offer discounts on a variety of lighting products and increased its footprint by adding new participating retail locations. The program operated smoothly, resulting in high levels of manufacturer satisfaction. Figure 14 presents an overview of program savings achievements.

Figure 14: Lighting Overview of Savings



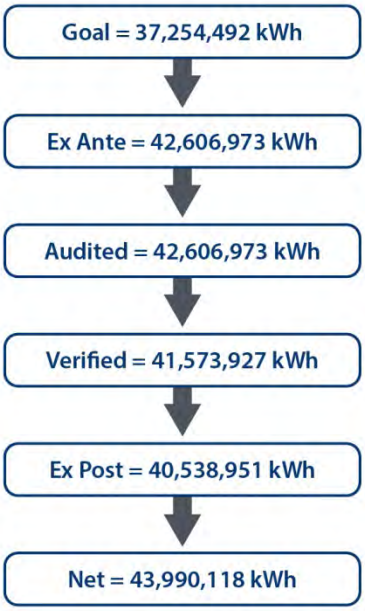
Key evaluation findings include the following:

- Despite the smooth operations, some interviewed manufacturers expressed concerns regarding information that program incentives could be turned on and off unexpectedly, and cited the inconvenience of retailers having to remove program signage and marketing and of making adjustments to their point-of-sale data systems. Consequently, manufacturers thought retailers might be hesitant to participate in the program in the future.
- In-store lighting demonstrations offered a powerful and highly effective tool to increase customer awareness of program discounts and sales of energy-efficient lighting products over less-efficient options. Moreover, the events encouraged customers, who would not have purchased CFLs (at full price), to buy program-discounted bulbs.
- In PY2, close to 90% of all bulbs sold through the program were standard CFLs, according to in-store intercept survey results. Sales of efficient specialty bulbs lagged behind standard CFLs. In-store customer intercept surveys suggested customer dissatisfaction with specialty CFLs and a lack of awareness regarding specialty CFL bulbs serving as a barrier to specialty CFL purchases.

1.7.4 ENERGY EFFICIENT SCHOOLS

The Energy Efficient Schools program offers energy-efficiency kits to students and energy assessments of school buildings, coupled with installing low-cost, energy-saving measures. In 2013, the program achieved 114% of its energy-savings goals and 101% of its participation goals, while using 101% of its budget. Figure 15 presents an overview of the savings achievements.

Figure 15: Schools Overview of Savings



Key evaluation findings include the following:

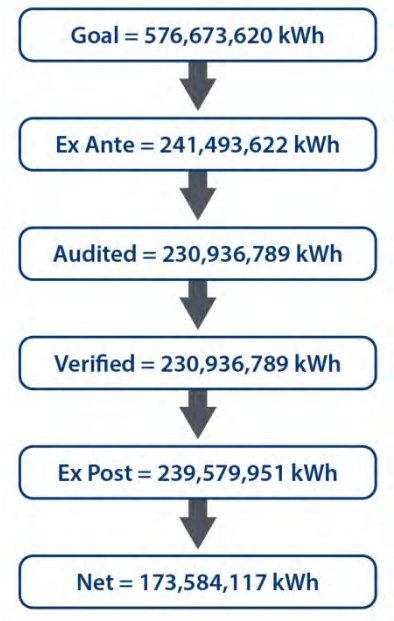
- Satisfaction ran high among participating teachers and facility staff. Almost all surveyed teachers (89%) reported they would be highly likely to recommend the program to other teachers. Ninety-three percent of facility staff reported high satisfaction levels with the School Audit and Direct Install program.
- The TPA received 41% of completed student surveys. While exceeding its goal of 37.5%, this response rate decreased substantially from 50% in 2012. Similar school kit programs have successfully implemented a tiered incentive approach, encouraging teachers to return as many surveys as they receive from students (and experience response rates between 66% and 75%).
- Teachers continued to report that program lesson plans aligned better with fourth-grade students than fifth-grade students. The program's lessons would prove more effective if better aligned with the curricula targeted for the fifth-grade.
- As in PY1, a lack of funding presented a major participation barrier for the program's audit portion. Providing a financing mechanism or a list of available financing options could help schools procure funds to implement recommendations.
- Several School Audit and Direct Install program measures experienced significantly negative *ex-post* adjustments. These occurred due to: the reported location of measure installations, such as occupancy sensors, did not maximize potential savings; and a lack of data exists regarding the circumstances in which measures were installed.

1.7.5 COMMERCIAL AND INDUSTRIAL

The C&I Prescriptive Rebates program seeks to achieve long-term, cost-effective savings. This program relies on a prescriptive rebate structure that offers participants monetary incentives, based on their installation of energy-efficiency equipment upgrades. Upgrades include: lighting, VFDs, HVAC, and

ENERGY STAR kitchen equipment. The C&I program fell just short of meeting savings targets set for PY2. The TPA addressed lessons learned through PY1 implementation and added seven new tracks to the program to enhance its program customer reach. In 2013, the program achieved 42% of its energy-savings goals and 24% of its demand savings goals, while using 66% of its budget. Figure 16 presents an overview of the program's savings achievements.

Figure 16: C&I Overview of Savings



Key evaluation findings include the following:

- Trade allies serve as a key driver and marketing channel for reaching C&I customers. Overall, customers and Trade Allies expressed satisfaction with the program as well as with its individual components.
- While the Evaluation Team received reliable data to work from, some conflicting numbers appeared when comparing the portal reported savings to other reporting sources, such as the Year-end Scorecard supplied by the TPA. This can be attributed to some new marketing channels lead by the TPA, which yielded some savings and were tracked in a separate database.
- To assist in participant uptake in commercial and industrial sectors, providing financing mechanisms, such as a loan program, should be considered.
- Enhanced marketing efforts have helped potential C&I participants become aware of the program. Nonparticipants learned of the program primarily from printed advertisements, such as mailings or newspapers, or from their contractors. Continuing to target these marketing channels will help the program grow and better achieve its savings goals.

1.7.6 BENEFIT COST ASSESSMENT

The energy efficiency program portfolios for each of the utilities as well as the aggregation to the state of Indiana continue to be cost-effective for the combined 2012 and 2013 program years under the PCT, UCT, and TRC tests. Most of the individual programs were also found to be cost-effective; however, the Low Income Weatherization did not pass cost-effectiveness for most of the program portfolios. In addition, there has been a decline in the level of cost-effectiveness for the School Building Assessments program for all the utilities that deserves further investigation.

The cost-effectiveness analysis of the portfolio, providing new energy resources to the State of Indiana, indicates that the levelized cost for new energy efficiency supplied electric resources acquired via the Statewide Core programs was $0.03 dollars per kWh for the two-year period of program implementation.

2. EM&V METHODOLOGY OVERVIEW

Overall, this evaluation sought to quantify each program's energy and demand savings (via the impact evaluation) and to understand and help improve the Indiana Core Programs' performance (via the process evaluation).

Process Evaluation: The process evaluation included documenting program efforts and improving program design and delivery, involving the following key efforts: a review of program materials; in-depth interviews with third-party administrator program staff and program implementer staff; participant surveys; and participant/nonparticipant contractor in-depth interviews. The process evaluations sought to answer the following overall questions:

- Does the program, as designed and implemented, meet its goals?
- Can improvements be made in the program design and implementation processes, including marketing and database tracking efforts?
- What specific customer/contractor insights could improve the program and increase satisfaction levels?

Impact Evaluation: The impact evaluation sought to accurately quantify energy savings and to provide information leading to more accurate energy savings, including demand reduction, and estimates in future program years. Data were gathered from various sources, including: the tracking database, management interviews, independent operational observation, and participant surveys. Data analysis included conducting an audit of the tracking system, analysis of participant survey data, conducting statistical and engineering analysis of *ex-ante* savings, and other efforts. A description of the evaluation approach and its application follows in the section below.

2.1 *IMPACT ANALYSIS APPROACH*

This section describes the typical steps taken in conducting impact evaluations of Indiana-based demand-side management (DSM), using steps consistent with the approaches described in the Indiana Evaluation Framework (the Framework).[3] These steps guided the Evaluation Team's evaluation approaches.

In addition to outlining the evaluation approaches, this section provides summary descriptions of actions taken to determine savings estimations for the overall Energizing Indiana portfolio and for program- and utility-specific energy and demand savings. Figure 17 illustrates steps used in the impact evaluation approach. Table 13 elaborates on the actions taken within each of these steps. The methods employed varied by program, accurately representing the program designs and target populations.

[3] Indiana Evaluation Framework. TecMarket Works. September 25, 2013.

Figure 17: DSM Impact Evaluation Steps

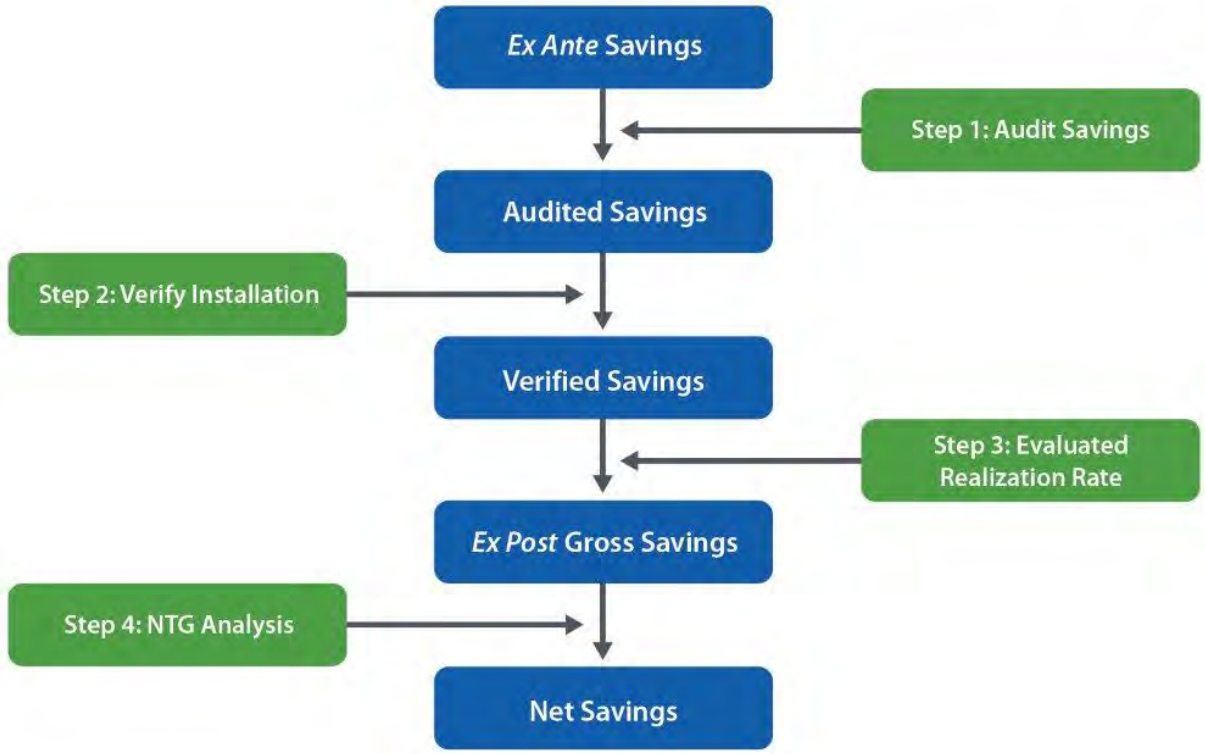


Table 13 provides summary descriptions of impact analysis steps:

Table 13: EM&V Impact Analysis Steps

Savings Categories	Definition, Sources, and Activities
Ex-Ante Savings	Reported savings values provided by the third-party administrator (TPA), as shown in its portal. Savings resulted from the TPA's Energizing Indiana activities, using savings values and assumptions provided in its scope of work.
Audited Savings	Once the following activities have been conducted through the "audit savings" step, audited savings are produced: • Reviewing the program tracking databases. • Reviewing hardcopy program applications from a sample to verify consistency with data recorded in the program tracking databases. • Checking *ex-ante* savings estimates and calculations to make sure the implementer/utility applied the agreed-upon values appropriately/correctly. • Adjusting program tracking data as necessary to correct errors or identified omissions. • Recalculating program savings, based on the adjusted, audited number of measures and on any errors found in the program tracking data.

Savings Categories	Definition, Sources, and Activities
Verified Savings	Verified savings can be computed after confirming measures have been installed and remain operational. This step typically employs a stratified random sample of installations, selected for detailed analysis. Typical methods for collecting necessary data include telephone surveys and/or site visits. This step may result in adjustments in *total* savings to address issues such as the following: • Measures rebated but never installed, or not installed in the correct program year; • Measures not meeting program qualifications; • Measures installed but later removed; or • Measures improperly installed. This step does not alter the per-unit, energy-saving values.
Ex-Post Gross Evaluated Savings	*Ex-post* gross evaluated savings can be determined using: engineering analysis, building simulation modeling, billing analysis, metering analysis, or other accepted impact evaluation methods. Adjustments to the verified savings may include: changes to the baseline assumption; adjustments for weather; adjustments for occupancy levels; adjustments for decreased or increased production levels; and other adjustments following from the impact analysis approach.
Net Savings	Determined by adjusting the *ex-post* evaluated gross savings estimates to account for a variety of circumstances related to program attribution, including savings weighted freerider and spillover effects. *Total Net Savings* involves extrapolation of sample-based *ex-post* net savings to the population of Energizing Indiana participants (*ex-ante* tracking data), using appropriate weights corresponding to sampling rates for the adjustment factor research activities. This incorporates adjustments for freeridership, participant spillover, and market effects (applied at the end of the current program cycle): *Net-to-Gross Ratio = (1- freerider adjustment + participant spillover adjustment + market effects adjustment)*

Table 14 shows the origins and different uses for energy-savings estimates in the Core Programs.

Table 14: Uses of Various Saving Estimates

Savings Estimate	Purpose
Ex-Ante Savings	Goal setting.
Audited Savings	Reconciling the program tracking database with the portal.
Verified Savings	Determine if utilities, portfolio, and programs have achieved their statutory goals. A realization rate, provided at this point, equals: verified savings divided by the program *ex-ante* savings claimed.
Ex-Post Gross Evaluated Savings	Use for program planning purposes and future target setting.
Net Savings	Program design improvements, planning future programs, cost-effectiveness analysis, and calculations of lost revenues.

2.1.1 FREERIDER ASSESSMENT

Assigning energy-savings credits to customers who would have opted for more efficient choices without the program's influence overstates its net savings. For technologies with a minimum, normally available efficiency level used as the energy-savings baseline, a portion of these participants can be expected to take more energy-efficient actions in the program's absence. When a minimum efficiency technology

normally available in the market is used as the baseline, analysis includes a set of participant questions that ask what they would have done in the program's absence.

For the percentage of participants saying they would have made a more energy-efficient choice without the program, savings would be adjusted by the difference in energy use of the program-provided technology and the efficiency of the technology they would have installed without the program. This approach adjusted out savings associated with participants who would have made the energy-efficient choice without the program.

In some cases, energy impact analysis need not be adjusted for freeriders as an energy-savings baseline can be selected already net of freeriders. By setting baselines at the mean efficiency those participants already include freeridership within the adopted efficiency levels. These savings approaches produce net savings directly without identifying gross savings.

In some cases, however, one applies the baseline decision at the participant level; so each participant receives a baseline appropriate for their conditions. For example, with commercial compact fluorescent lamps (CFLs), if participants use the CFL to replace an incandescent bulb in their business and have no history of buying and installing CFLs, the baseline would be the minimum standard efficiency of an incandescent bulb, at the wattage of the replaced bulb, with no additional freeridership adjustments made for the participant.

Similarly, if a participant replaces a CFL with a program-provided CFL, the participant's standard market practice for that socket would be a CFL, and the baseline would be set at the CFL level for that socket, thus requiring no other freeridership adjustments. Savings for that socket would already be net (zero savings). The evaluation effort selected the baseline approach at the same time it defined the freeridership approach due to linkages between these two conditions. The individual program chapters report each approach used in the Energizing Indiana program evaluations.

Residential CFLs, installed as part of one of the three kit-based programs,[4] required a different approach, described below.

2.1.2 RESIDENTIAL FREERIDERSHIP FOR CFLS DIFFUSION OF INNOVATION APPROACH

As homes present a limited number of sockets that can use CFLs, and because light bulbs are repetitive-purchase consumables, the Evaluation Team used a standard diffusion of innovation adoption curve approach to estimate freeridership, provided customer survey information proved available that provided insights into how many bulbs customers installed in their homes prior to the program.

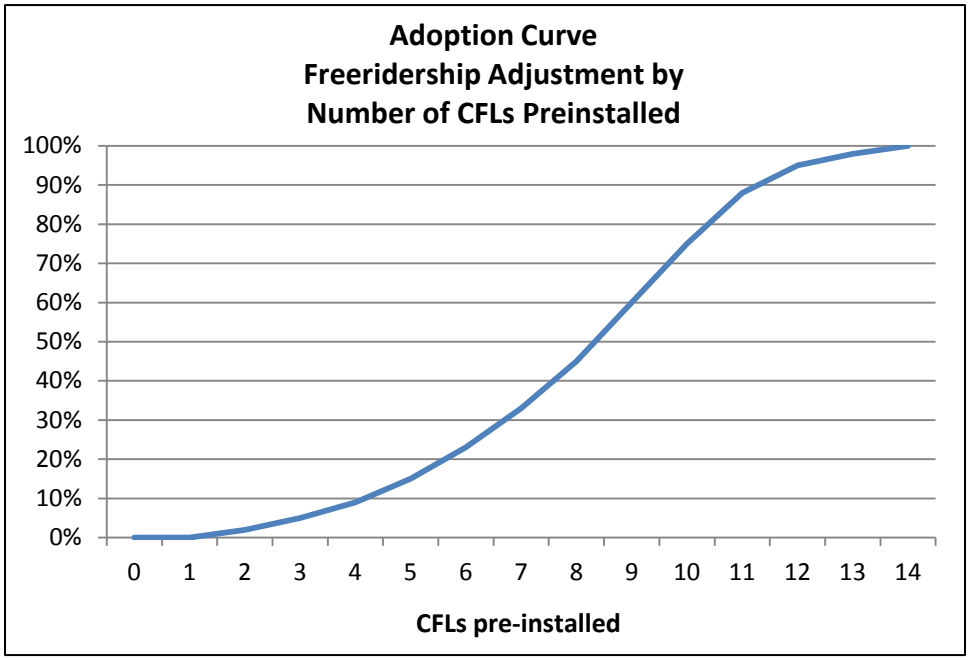
Basically, this approach followed a standard, S-shaped adoption curve, associated with market adoption literature addressing how and why customers buy products. Essentially, the more known about whether or not a homeowner previously used CFLs and already had them installed in their homes, the more likely they would adopt additional CFLs without the program. This approach based freeridership ratios on

[4] This includes HEA, LIW, and EES. An alternative approach was used for Residential Lighting, as described in detail in that program's section.

participant[5] survey responses, with each response assigned a freeridership ratio using a market adoption curve. A response of 0 preinstalled CFLs corresponded to a 0% freeridership level as no history of CFL adoption and use existed. On the other end of the S-curve, a score of 14 or more CFLs corresponded to a 100% freeridership level as it documented strong, consistent use in their homes. The remaining responses, between 0 and 14, were scored as a function of their placement on a standard, consumable-product adoption curve.

The adoption curve in Figure 18 shows corresponding freeridership levels by CFL count, as presented in Table 15. This freeridership estimation approach remained consistent with the product adoption research field and represented a standard approach.

Figure 18: Adoption Curve



[5] For the Indiana programs, this only applied where participant survey data informed the results. The approach was not used in Residential Lighting because these participants were not surveyed.

Table 15: CFL Freeridership Adjustment Determined by S Curve

Number of Preinstalled CFLs	Freeridership Preinstallation Adjustment Factor
0	0%
1	0%
2	2%
3	5%
4	9%
5	15%
6	23%
7	33%
8	45%
9	60%
10	75%
11	88%
12	95%
13	98%
14 or more	100%

2.1.3 SPILLOVER ASSESSMENT

Spillover savings must be added to program-induced net savings when a participant replicates actions that save energy in their facilities, and they attribute that non-program-incented or provided action to the program. Spillover savings in the Energizing Indiana PY1 evaluation report only included short-term participant spillover savings, representing but a portion of the spillover savings typically achieved by programs.

That is, more spillover savings typically occur than those identified in the evaluation efforts. Spillover savings are based on short-term spillover, which include actions taken between program participation, identified by the evaluation's survey with participants.

Longer-term spillover savings also occur in the future, after completion of an evaluation effort, as a portion of the participant population retake actions caused by the program. Nonparticipants also take spillover actions if directly or indirectly influenced by a program, and, typically, remain unaware of that influence.

Savings from groups of unaware nonparticipants, taking actions due to a program's influence but not perceiving that influence, more traditionally are termed "market effects savings." In this report, the Evaluation Team only included participant spillover.

To assess spillover, surveys asked participants if they took additional actions to save energy in their facilities or homes.[6] If they reported taking additional actions, follow-ups asked them to describe that action in sufficient detail to allow estimation of savings achieved. An attribution question then indicated whether the program influenced or caused the action.

[6] For the HEA program, responses to audit recommendations were not included in spillover; rather, they were included as direct program impacts. For the LIW program, captured spillover was identified as Audit Recommendations.

If respondents reported actions influenced by the program, surveys asked them to rate that influence level on a 1 to 10 scale, allowing the percent of influence to be attributed, based on the score provided. Using a 1 to 10 scale, cause could be attributed using a direct linear conversion of their score to a percentage (2=20% / 5=50% / 8=80%). As an attribution score differs from an adoption curve, a direct assignment approach proved more appropriate than an S-curve approach (more typical of an adoption approach). To estimate spillover, engineering or modeling approaches allowed savings from reported actions to be multiplied by the degree of influence score. That level of energy savings would then be added to the direct program-induced energy savings to estimate the net savings addition from spillover and to set the program's net-to-gross (NTG) ratio.

2.1.4 EISA BASELINE ADJUSTMENT APPROACH

In 2007 the United States passed the Energy Independence and Security Act (EISA), which restricts sales of standard incandescent light bulbs (standard bulbs), but allows bulbs in the supply chain to be sold via retail sales. Upon exhausting the supply of standard bulbs, new incandescent bulbs could not be manufactured, distributed, or sold in the United States. If standard bulbs no longer proved available, savings from standard bulbs could not be used to estimate program savings. Rather, the energy saving baseline must reflect the market and products available for sale.

As this law affects bulbs sold in Indiana stores and therefore affects the energy-savings baselines used to estimate program impacts, the Evaluation Team conducted research in two waves across Indiana, focusing on the availability of incandescent bulbs addressed by EISA.

The research used a mystery shopper approach, which called retail stores to inquire if a store offered 100- and 75-watt bulbs for sale, how many they carried, and other questions regarding future availability.

The first wave, conducted in January 2013, was used for the PY1 CFL impact calculations. This research indicated that EISA-impacted incandescent bulbs remained readily available in 2012, and the baseline did not require adjustment.

In January 2014, the second phase of the EISA impact study began. This study indicated the availability of 100- and 75-watt incandescent bulbs eroded due to EISA's effects. The mystery shopper survey results indicated that, while EISA considerably affected the availability of 100- and 75-watt incandescent light bulbs, a sizable number of Indiana stores still carried those bulbs.

In addition, and perhaps more importantly, the removal rate of EISA noncompliant bulbs from the market appeared to slow (rather than increase), regarding the rate at which bulbs were stocked and sold. As the second wave study indicated the market supply of 100- and 75-watt bulbs eroded the baseline from which CFL energy savings are estimated, adjustments were made for the PY2 savings analysis. Calibration of energy-savings estimates of CFL savings used the baselines shown in Table 16 for 2013 (PY2).

The table presents best estimates of baselines to be used for PY3, based on the second-wave research. Baselines presented in the table for 2014 were not applied to the PY2 impact estimates and should be considered placeholders for PY3. If the decrease in market-available of 100-, 75-, and 60-watt bulbs continues to slow into PY3, baseline estimates for these years will require adjustment.

Table 16. Lighting Baseline Wattage with EISA

100-watt			75-watt			60-watt			40-watt		
Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)
2012	0%	100	2012	0%	75	2012	0%	60	2012	0%	40
2013	55%	85	2013	0%	75	2013	0%	60	2013	0%	40
2014	60%	83	2014	60%	62	2014	0%	60	2014	0%	40
2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD
2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD
2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD

2.2 PROCESS EVALUATION APPROACH

Although the process evaluation efforts differ somewhat for each program, to an extent, these studies follow a similar theme and approach. The process evaluation consists of program-specific efforts, designed to address each program's researchable issues, and generally include the following methodologies:

- Reviewing program materials and operation methods;
- Conducting interviews with program managers and implementers;
- Designing interview and survey instruments;
- Conducting interviews with Trade Allies and partners;
- Conducting surveys with participants and/or nonparticipants;
- Reviewing marketing materials;
- Analyzing process evaluation data; and
- Developing process evaluation reports.

The PY2 process efforts focused on identifying key researchable issues most relevant for a program in its second year of implementation. This included exploring researchable issues such as the following:

- *Reviews of the Key Performance Indicators (KPIs)*: During PY1 process efforts, the Evaluation Team focused on development of KPIs that served as a "road map" for the evaluation efforts. PY2 process efforts continued assessments of program operations in comparison with those indicators.
- *Verification of robust program tracking databases:* In PY2, the Evaluation Team continued working with the TPA to ensure program tracking systems remained robust and collected the correct information for accurately reporting savings at the end of each program cycle.
- *Assessment of marketing efforts:* PY2 efforts also focused on understanding operations of the program's marketing and outreach efforts, ensuring marketing effectively raised program awareness among the targeted customers.
- *Assessment of participation processes:* Continued assessment of the participation process and the sharing of insights to: streamline program processes, increase customer satisfaction, and increase overall program savings levels.

- *Assessment of market actor interactions/processes:* Continued assessment of communication lines between program implementers and Trade Allies, along with training and marketing opportunities for these market actors.
- *Analysis of program design:* Qualitative and quantitative efforts in PY2 explored issues regarding the participant service development and interaction process, and the participant's experiences relative to expectations and satisfaction.
- *Verification of program processes:* Continued to assure quality assurance/quality control (QA/QC) procedures remained in place during PY2, this included verifying the achievement of administrative responsibilities and performance expectations (per the statement of work) and that on-site QA/QC occurred.

2.3 UNCERTAINTY

Program evaluations seek to reliably determine energy and demand savings, along with some reasonable accuracy level. Whenever selecting a population *sample* to represent a population—whether of appliances, individuals, households, premises, or organizations—some amount of *sampling error* occurs. Sampling error arises as only a portion of actual values can be measured (e.g., metering energy consumption over one week, metering 5% of the affected equipment). Different samples lead to different estimates of energy and demand savings.

If randomly drawing a sample from the population, the sampling error should be random and provide an unbiased estimate of true savings. The Evaluation Team uses *precision* to characterize sampling error, defined as the degree that additional measures would produce the same or similar results. Convenient measures such as confidence intervals and statistical significance tests provide quantitative estimates of the uncertainty introduced through sampling.

Each program, across each utility, will achieve a level of 90% confidence with a 10% precision rate across the three-year program cycle. Consequently, each sample was designed to limit uncertainty and to maintain a high level of accuracy within the evaluation. Survey findings in their program-specific sections include the number (n=) of participants sampled throughout PY2.

2.4 SAMPLING DESIGN

The evaluation included on-site surveys and field EM&V work for a sample of participating sites. The Evaluation Team developed a sampling plan for each project, outlining: the sampling design, the population, and the sample sizes needed to meet the evaluation's overall precision requirements. This report's program sections provide the sampling detail for each program. Samples generally derived from the participant tracking data, per the sampling plan.

The sampling design depended on: the analysis' data quality objectives; development of the sample frame; and potential uses of the data. These designs included the following:

- Simple random sampling;
- Stratified random sampling;
- Two-stage or cluster sampling;

- Nested sampling (time-of-use meters used within a smaller sample of interval meters); and
- Systematic sampling.

The PY2 efforts' overall data quality resulted in a margin of error of ±10% with 90% confidence at the program or subprogram level (subprogram as a specific effort nested within a program). Several factors affected the required samples' size, including the number of participants in the population, and the variance of measures.

Table 17: EM&V Activities by Program

Core Program	Process Evaluation Approach	Impact Evaluation Approach	Market Effects Evaluation Approach
Residential Programs			
Residential Lighting Lead: Kessie Avseikova, Opinion Dynamics	Program manager and implementer interviews; in-store customer intercept survey; manufacturer interviews.	Upstream supply-side data review; engineering review of savings estimates, in-store customer intercept survey; sales data modeling (used PY1 results).	Review of market-based data (e.g., Indiana sales trends, ENERGY STAR® awareness and/or penetration rates, and planning documents). Interviews with customers. On-sites.
Home Energy Assessment Lead: Erinn Monroe, Opinion Dynamics	Program manager and implementer interviews. Auditor ride-alongs. Partial "null" survey. Participant survey covering, at a minimum: actions taken as a result of audit, freeridership, satisfaction with the audit.	Participant surveys; engineering review; database review; peak demand savings analysis.	
Low Income Weatherization Lead: Erinn Monroe, Opinion Dynamics	Program manager and implementer interviews. Auditor ride-alongs. Partial "null" survey. Participant survey covering, at a minimum: actions taken as a result of the audit, freeridership, satisfaction with the audit.	Participant and nonparticipant surveys; engineering review, supplemented by simulations, as required for measure-specific savings; peak demand savings analysis.	
Energy Efficient Schools Lead: Sarah Brooks, Cadmus	Program manager interviews; other interviews to understand the value of education-based efforts. Recommendations for additional information needed to encourage action.	Participating school surveys; engineering reviews, with an emphasis on savings values claimed by program; assessing indirect impacts (e.g., spillover).	

Core Program	Process Evaluation Approach	Impact Evaluation Approach	Market Effects Evaluation Approach
Nonresidential Program			
Commercial and Industrial Lead: Vanessa Frambes, Cadmus	Program manager and implementer interviews. Interviews with C&I participants to understand satisfaction with program processes (e.g., application process), use of equipment, operational changes, freeridership and spillover. Nonparticipant surveys.	Participant surveys; nonparticipant surveys; engineering modeling and energy and demand savings review; peak demand savings analysis; on-site metering evaluations.	Review of market-based data (e.g., Indiana technical resource manual [TRM], penetration rates, and planning documents). Interviews with C&I customers and account reps. Nonparticipant surveys.

The following sections describe the program-specific evaluation efforts conducted.

3. HOME ENERGY ASSESSMENT

3.1 PROGRAM DESIGN AND IMPLEMENTATION

The HEA program offers a walk-through audit and direct installation of energy-efficiency measures: the Direct Install program is available for all single-family homes. Additionally, the TPA canvassed neighborhoods, soliciting energy savings pledges and encouraging residents to participate in the HEA program.

Energy auditors conduct a walk-through audit of participating customers' homes to assess the homes' energy performance. While on-site, auditors install energy-efficiency measures such as CFLs and energy-efficient faucet aerators. In addition, the customer receives a report about their homes' energy use, suggesting further actions to reduce customers' energy consumption.

The HEA program delivery model shifted in the middle of PY2. Figure 19 provides an overview of the key program delivery changes implemented from PY1 to PY2. Interviews with the program implementers indicated that, as of July 1, 2013, the program moved from a model of providing an energy "kit" and leaving uninstalled measures with the customer (to install later on their own) to a revised model where auditors were instructed to install as many measures as possible in homes (without leaving any measures behind) and recording all of the installed measures in the program tracking database. Besides the model shifts, the program increased the number of CFLs installed and removed water heater tank wrap and Smart Strips.

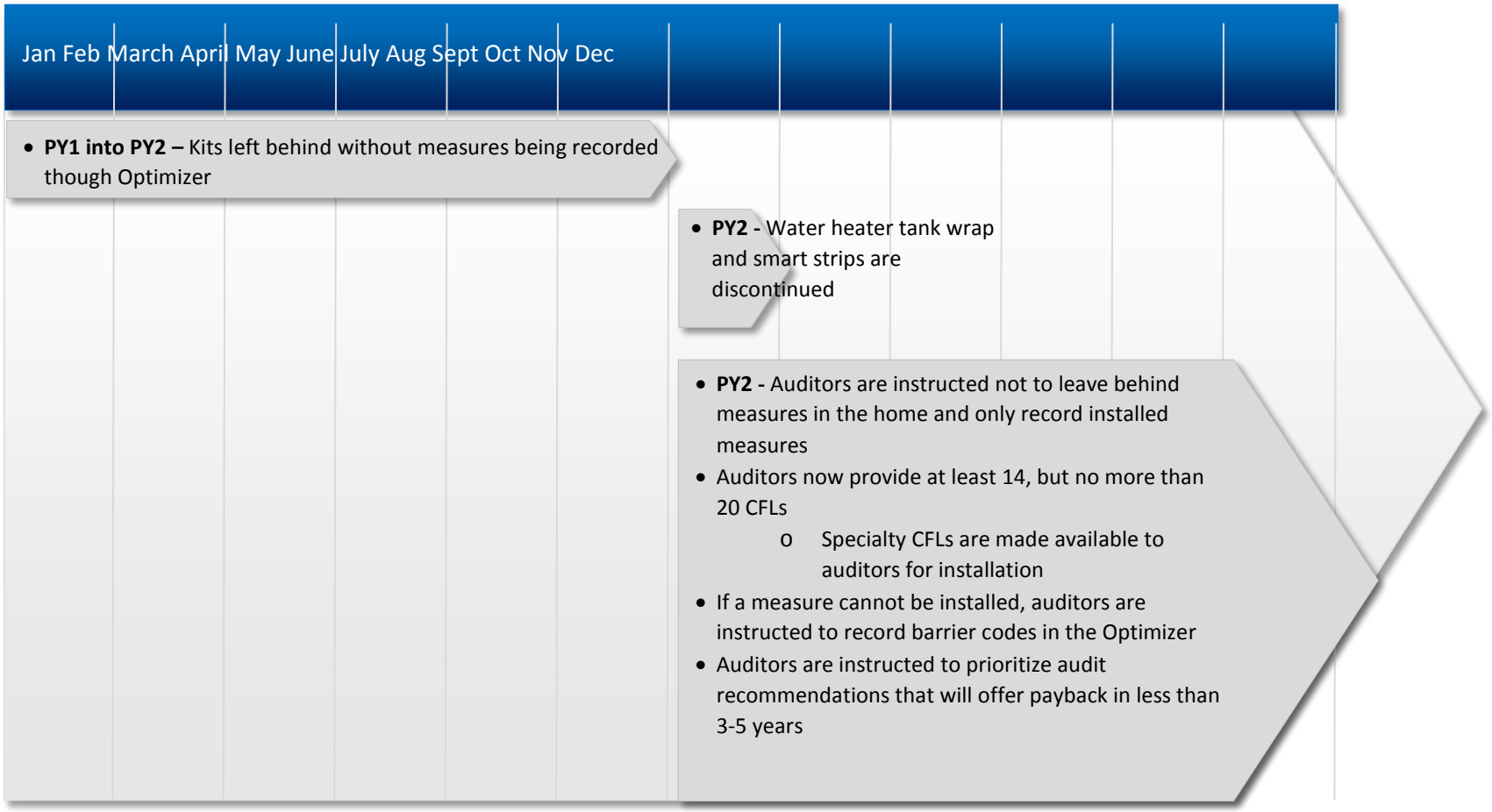
As of July 1, 2013, auditors could install up to 20 CFLs in a participant's home—a change supported by the program's need for increased electric savings. Alternatively, the program removed water heater tank wrap and Smart Strips, which did not greatly impact the program savings and offerings. Generally, few customers received water heater tank wrap due to safety issues, and Smart Strip savings in the Indiana TRM proved much lower than assumed by the TPA.

The program served about twice as many homes in PY2 than in PY1. Part of this can be attributed to the significant ramp-up necessary upon the program's PY1 launch; in PY2, it appears the program operated at a steady state in terms of participation, while continuing to implement operational improvements, including the following:

- Providing additional training to auditors;
- Improving data collection and tracking;
- Enhancing the rigor of the QA/QC process; and
- Installing more measures while in the homes.

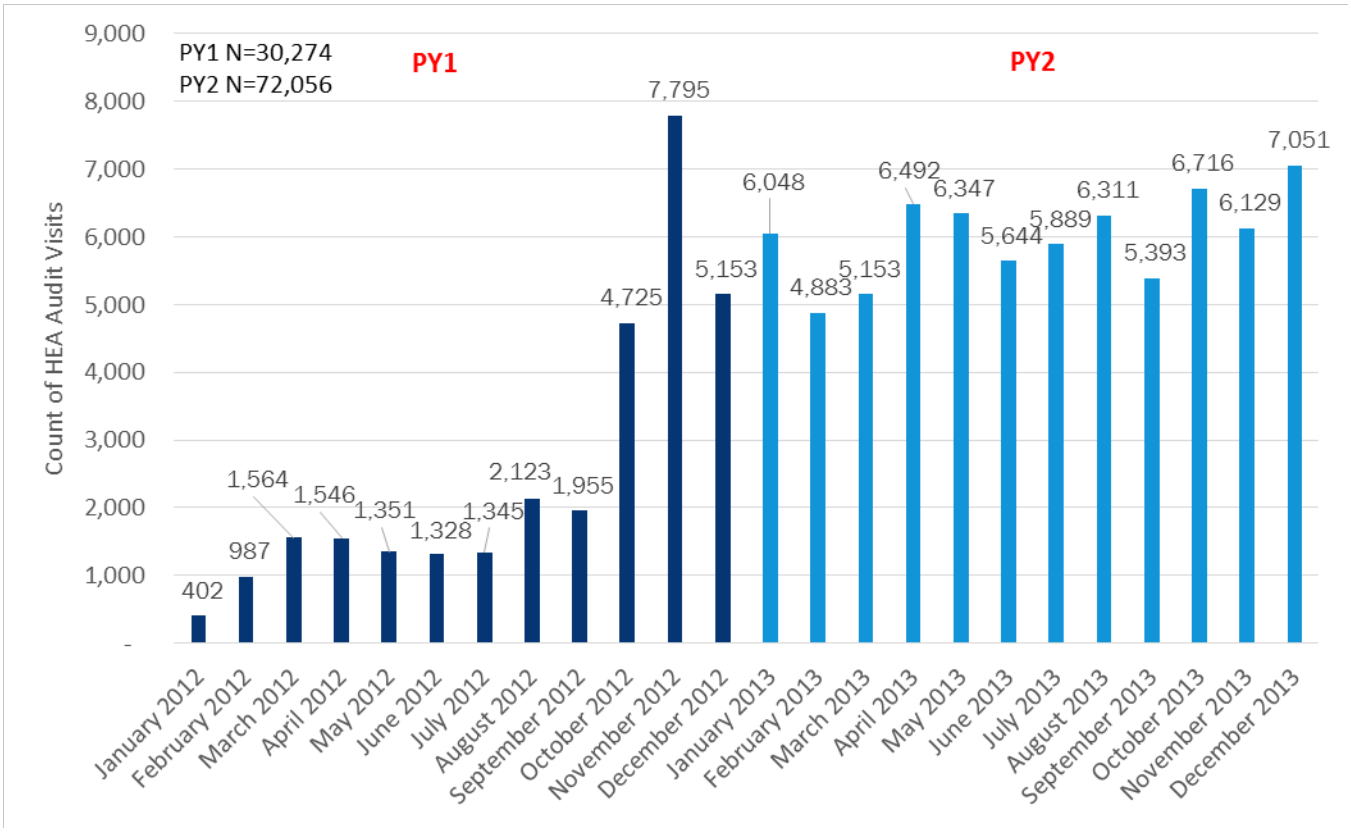
These activities resulted in a number of positive outcomes for the program, including: increasing the number of homes served in the state; increasing the savings captured within each home; and improving the quality of program tracking data.

Figure 19: Program Changes in PY2



Since the initial ramp up of audit visits in late PY1, the TPA has maintained the number of HEA visits completed each month, over the course of PY2. Visits averaged about 5,900 per month, with the highest number conducted in December 2013. Figure 20 shows the number of audits completed in each month during PY1 and PY2. A rapid increase in completed audits clearly can be seen in the fourth quarter of PY1, followed by a steady rate in PY2.

Figure 20: HEA Audits Completed by Month in PY1 and PY2



Note: This represents the number of homes as they appear in the program database. Differences may occur from the report's (*ex-ante*) number of completions.

3.2 EM&V METHODOLOGY

The evaluation of the Direct Install Home Energy Assessment program incorporated impact and process elements. Table 18 provides an overview of tasks used for evaluating this program.

Table 18: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• Interviewed Implementation manager.
Auditor Surveys	• Conducted a survey of program auditors. • Conducted ride-along observations and in-depth interviews with program auditors.
Program Database Review/ Verification	• Reviewed the participant data tracking database.
Program Materials Review	• Reviewed materials to assess marketing and outreach efforts.
Participant Interviews	• Conducted telephone survey with 230 program participants. • Conducted follow-up survey with 100 PY1 program participants to revisit energy kit receipt and installation.
Impact Analysis	• Audited the measure installations reported in the program database. • Verified the reported measure installations using participant interviews. • Performed engineering calculations of installed measures. • Estimated NTG (freeridership and spillover), based on self-reported data from participant interviews.

For the PY2 evaluation, the Evaluation Team moved to a measure-level approach, rather than a "per home" approach. Several factors lead to that decision.

First, the TPA is moving to a measure-level savings approach for PY3. By shifting the evaluation approach, the Evaluation Team could better make year-over-year comparisons and provide detailed recommendations to help inform future program design.

Second, midway through PY2, the TPA changed the program delivery model from "kit-based," whereby all participants received the same kit of measures, to one where auditors could install up to 20 CFLs in a home and not leave measures behind for participants to install later. This program delivery change meant savings achieved in each home varied, depending on measures installed in that home, making the "per home" value less relevant (although the TPA was contractually bound to using the per-home value in tracking for PY2).

Finally, measure-level savings streamlined inclusion of measures distributed during the canvassing activities conducted by the TPA. Previously, canvassing measures were calculated separately from savings achieved through the audit activities, and combined with energy savings occurring due to the audits.

3.2.1 SAMPLING DESIGN

The Evaluation Team developed a sampling plan to produce telephone survey findings within agreed bounds of 90% confidence level and 10% precision. The Evaluation Team conducted interviews with program participants in two waves during PY2, acknowledging changes in program delivery. The first wave of the participant survey occurred in September 2013 and included customers receiving audit visits between January and June 2013. The second wave of the survey occurred in January 2014 and included customers receiving audit visits between July and November 2013.

In October 2013, as a part of the HEA program's PY2 evaluation, the Evaluation Team interviewed auditors attempting to achieve a census of auditors working in the HEA program through use of an online survey that collected their feedback on the program's process and design.

Table 19 provides the sample frame, response, and cooperation rates for each survey effort.

Table 19: Auditor and Participant Survey Sample Design

Action	Population	Completions	Response Rate	Cooperation Rate
Online Auditor Surveys	45	20	45%	N/A
Telephone Participant Interviews	61,842	230	5%	42%

3.3 PROGRAM PERFORMANCE

Table 20 shows how reported program performance compared to goals established in program planning. *Ex-ante* savings reported by the program (and shown below) did not reflect adjustments made due to the evaluation. The TPA reported the program met 84% of the participation (home), kWh, and kW goals.

Table 20: *Ex-Ante* Statewide Results

	kWh			kW			Therms		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	22,078,196	20,195,052	91%	9,838	9,345	95%	347,857	315,364	91%
I&M	6,161,092	6,321,156	103%	2,745	2,805	102%	-	-	NA
IPL	34,413,848	26,977,410	78%	15,334	12,318	80%	-	-	0%
IMPA	5,580,932	5,143,792	92%	2,487	2,365	95%	-	-	0%
NIPSCO	14,591,024	14,109,132	97%	6,501	6,606	102%	389,404	347,524	89%
Vectren	5,731,152	7,317,055	128%	2,554	3,326	130%	153,236	180,244	118%
Statewide	**88,556,244**	**80,063,597**	**90%**	**39,458**	**36,766**	**93%**	**890,497**	**843,132**	**95%**

The program achieved 84% of its participation goals in terms of homes served, as shown in Table 21.

Table 21: Number of Homes Served by the HEA Program

	Number of Homes		
	Goal	Reported	% Achieved
Duke	21,311	18,121	85%
I&M	5,947	5,906	99%
IPL	33,218	24,222	73%
IMPA	5,387	4,643	86%
NIPSCO	14,084	12,546	89%
Vectren	5,532	6,507	118%
Statewide	**85,479**	**71,945**	**84%**

3.4 PROGRAM BUDGET AND EXPENDITURES

Table 22 shows PY2 program budgets and expenditures reported at the conclusion of 2013. The program spent 90% of its allotted budget; however, utility-specific budget expenditures varied from 78% to 128%.

Table 22: Program-Level Budget and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$7,042,945	$6,441,388	91%
I&M	$1,901,929	$1,951,277	103%
IPL	$10,867,893	$8,472,645	78%
IMPA	$1,766,923	$1,627,523	92%
NIPSCO	$4,526,136	$4,371,326	97%
Vectren(1)	$1,809,898	$2,310,239	128%
Statewide	$27,915,723	$25,174,399	90%

(1) The TPA indicated that, at the end of PY1, Vectren asked for the number of visits completed in their territory to be increased beyond the set program goals over the course of PY2. The overage reported here results from the program goals not aligning with this requested change.

3.5 *Ex-Ante Energy Savings*

Ex-ante savings are those reported by the program, compared to goals set forth in program planning. While measure-specific estimates changed mid-year, per an agreement between the TPA and the DSMCC, all parties maintained the same per-home savings estimate throughout 2013 as this value was negotiated within the program contract.[7] The savings value of 1,036 kWh per home was used to obtain the *ex-ante* savings estimates shown in the total *ex-ante* savings in Table 23 (which provides *ex-ante* savings for the HEA program).

Table 23: *Ex-Ante* Savings from Audits By Utility and Statewide

	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goal	2013 Therm *Ex-Ante*	% of Therm Goals
Duke	22,078,196	18,773,356	85%	9,837	8,365	85%	347,857	315,364	91%
I&M	6,161,092	6,118,616	99%	2,745	2,726	99%	-	-	NA
IPL	34,413,848	25,093,992	73%	15,334	11,181	73%	-	-	NA
IMPA	5,580,932	4,810,148	86%	2,487	2,143	86%	-	-	NA
NIPSCO	14,591,024	12,997,656	89%	6,501	5,791	89%	389,404	347,524	89%
Vectren	5,731,152	6,741,252	118%	2,554	3,004	118%	153,236	180,244	118%
Statewide	**88,556,244**	**74,535,020**	**84%**	**39,458**	**33,210**	**84%**	**890,497**	**843,132**	**NA**

Table 24 provides utility level *ex-ante* savings for audits and canvassing measures. In addition to installing measures in homes as a part of the program audits, the TPA distributed CFLs and Smart Strips to potential customers as a part of recruitment and enrollment, although the program dropped Smart Strips in June 2013. *Ex-ante* savings from these "canvassing measures" were then added to ex-ante savings from the audits, also shown in Table 24.

[7] Per-unit values were used for planning purposes, trying to ensure they achieved savings in the homes.

Table 24: *Ex-Ante* Savings from Audits and Canvassing Measures Combined

	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goals	2013 *Ex-Ante* Therms	% of Therm Goals
Duke	22,078,196	20,195,052	91%	9,837	9,345	95%	347,857	315,364	91%
I&M	6,161,092	6,321,156	103%	2,745	2,805	102%	0	0	NA
IPL	34,413,848	26,977,410	78%	15,334	12,318	80%	0	0	NA
IMPA	5,580,932	5,143,792	92%	2,487	2,365	95%	0	0	NA
NIPSCO	14,591,024	14,109,132	97%	6,501	6,606	102%	389,404	347,524	89%
Vectren	5,731,152	7,317,055	128%	2,554	3,326	130%	153,236	180,244	118%
Statewide	**88,556,244**	**80,063,597**	**90%**	**39,458**	**36,766**	**93%**	**890,497**	**843,132**	**NA**

3.6 *IMPACT ANALYSIS*

This evaluation included a database review of: quantities of measures installed in each home; a survey of participating customers to determine behavioral elements related to the energy savings (such as removal of measures or installation of measures outside of the program); and an engineering analysis of *ex-post* savings.

3.6.1 AUDITED SAVINGS

The impact evaluation process began by reviewing the program database and totaling the number of reported measures installed in homes. In addition, audited savings included savings from canvassing measures distributed through customer recruitment. As noted, the PY2 evaluation approach drew upon the actual number of measures installed, as opposed to applying a uniform, per-home value across all treated homes. Table 25 shows measures the program installed in participant homes.

Table 25: Audited Measure Quantities

		Measures in Database						
	Measure	**Duke**	**I&M**	**IPL**	**IMPA**	**NIPSCO**	**Vectren**	**Statewide**
CFLs	Bulb	225,744	72,443	311,462	57,681	164,029	71,749	**903,108**
Pipe Wrap	Home	6,321	3,270	9,882	1,804	6,668	1,728	**29,673**
Energy Efficient Showerhead	Shower-head	10,210	3,196	13,315	2,706	6,497	3,328	**39,252**
Faucet Aerators	Aerator	25,039	8,751	35,000	7,482	17,616	9,429	**103,317**
Tank Wrap	Wrap	15	17	33	5	13	9	**92**
Audit Recommendations	Home	18,163	5,918	24,260	4,644	12,560	6,511	**72,056**

The program most frequently installed CFLs in homes. As noted, the program eliminated tank wrap in the middle of 2013; hence, that measure seldom appears in the database.

In addition to measures installed in homes, the TPA distributed CFLs and Smart Strips while conducting neighborhood canvassing activities as a part of customer recruitment. Table 26 shows measures distributed through canvassing, as they appear in the program database.

Table 26: Audited Canvassing Measure Quantities

	Canvassing Measures						
	Duke	I&M	IPL	IMPA	NIPSCO	Vectren	Statewide
CFLs	18,020	3	17,079	3,895	16,134	4,164	**59,295**
Smart Strips	6,470	1,741	10,727	1,499	4,224	3,207	**27,868**

HEA design and agreed-upon *ex-ante* savings values changed mid-year based on the PY1 evaluation results. Specifically, the TPA, at the request of the DSMCC, changed *ex-ante* savings estimates from a "per-home" value of 1,036 kWh and 0.462 kW, to using "per-unit" *ex-ante* for each measure installed in the home. This change produced more accurate energy and demand savings estimates as the measures installed in homes can vary.

To calculate savings after this program change, the Evaluation Team also changed the impact evaluation approach. The Evaluation Team multiplied the agreed upon *ex-ante* savings per unit by the quantity of measures installed—both the canvassing efforts and the measures installed in participating homes (e.g., number of CFLs * *ex-ante* savings per CFL)—to arrive at the program's total audited energy savings (see Table 27).

After calculating the energy savings from the canvassing measures, it was discovered that the files the evaluation team received documenting program measure counts were incomplete. As a result, some Smart Strips (representing less than a tenth of one percent of the HEA program's savings) were left out of the analysis. The savings associated with this portion of the Smart Strips installations will be included in the PY3 analysis and reported savings.

Table 27: Audited Energy Savings from Direct Install and Canvassing Measures Combined

	Audited kWh	Audited kW Savings	Audited Therms
Duke	25,770,855	6,119	798,970
I&M	8,490,851	1,974	260,811
IPL	35,708,023	8,089	1,104,731
IMPA	6,945,424	1,563	211,840
NIPSCO	18,925,653	4,147	629,890
Vectren	9,050,387	2,584	220,448
Statewide	**104,891,194**	**24,476**	**3,226,689**

This method resulted in significantly higher audited kWh savings than the *ex-ante* kWh savings (74,535,020 kWh) reported on the portal. The actual number of measures installed per home exceeded estimates used to develop the original "per-home" value. For example, the "per-home" value assumed nine CFLs would be installed in each participating home, and the tracking database indicated 12 CFLs were installed.

3.6.2 VERIFIED SAVINGS

After determining the audited savings, the Evaluation Team compared the database results with those customers reported during the participant surveys. Adjustments to the audited savings included changes to the numbers of installed measures as well as changes for customers removing measures after the audits. These adjustments were made at a statewide level rather than at the utility level, given the sample size of survey participants for each utility was required to be significant at the statewide level for the first and second years and at the utility level over the course of the three-year evaluation effort. Table 28 shows adjustments for installation rates and measure removals.

Table 28: Statewide Verification Adjustments

	Statewide Installation Rate	Statewide Persistence
CFLs	70%	99%
Pipe Wrap	100%	100%
Energy Efficient Showerhead	55%	93%
Faucet Aerators	66%	98%
Tank Wrap	100%	100%
Audit Recommendations	100%	100%
Canvassing CFLs	79%	99%
Canvassing Smart Strips	100%	100%

Note: The Evaluation Team did not receive primary data on installation rates for canvassing CFLs. The CFL installation rate within the direct-install audit for HEA did not prove appropriate. Thus, the Evaluation Team applied the installation rate from the residential lighting program as the best estimate of how customers installed bulbs received through this outreach effort.

Installation rates indicated that customers confirmed the majority of measures reported were installed during the audit. Additionally, statewide persistence rates indicated that, once measures were installed in the home, customers tended to leave them in place. Installation rates for CFLs distributed through the canvassing activities aligned with the installation rate for CFLs purchased through the residential lighting program. While the installation rate for Smart Strips distributed through canvassing measures may not equal 100%, very little research has been done on installation rates for Smart Strips, and the Evaluation Team did not conduct primary research on this measure, as it did not contribute greatly to energy savings (and had been dropped by the program). Consequently, no basis existed on which to make an adjustment.

Verification adjustments were then applied to audited savings to calculate verified energy savings shown in Table 29.

Table 29: Audited and Verified Savings from Audits and Canvassing Activities

	Audited kWh	Verified kWh	Audited kW	Verified kW	Audited Therms	Verified Therms
Duke	25,770,855	19,308,195	6,119	4,371	798,970	751,094
I&M	8,490,851	6,329,546	1,974	1,382	260,811	243,474
IPL	35,708,023	24,950,485	8,089	5,097	1,104,731	1,033,075
IMPA	6,945,424	5,148,417	1,563	1,109	211,840	197,133
NIPSCO	18,925,653	15,162,352	4,147	3,547	629,890	594,716
Vectren	9,050,387	6,743,161	2,584	1,807	220,448	202,273
Statewide	**104,891,194**	**77,642,156**	**24,476**	**17,314**	**3,226,689**	**3,021,765**

The realization rate equaled the percentage of *ex-ante* savings verified through this evaluation step. Table 30 shows verified savings and utility-specific realization rates. As noted, the agreed-upon, per-unit savings values changed in PY2. When new per unit values applied to measures in the database, a decline occurred in verified kW achieved by the program. This resulted from kW values, used to build the original “per home” value, considered too high and subsequently lowered in PY2.

Table 30: Verified Realization Rates from Audit and Canvassing Activities

	Verified kWh	*Ex-Ante* kWh	Reali-zation Rate	Verified kW	*Ex-Ante* kW	Reali-zation Rate	Verified Therm	*Ex-Ante* Therm	Reali-zation Rate
Duke	19,308,195	20,195,052	96%	4,371	9,345	47%	751,094	315,364	238%
I&M	6,329,546	6,321,156	100%	1,382	2,805	49%	243,474	-	NA
IPL	24,950,485	26,977,410	92%	5,097	12,318	41%	1,033,075	-	NA
IMPA	5,148,417	5,143,792	100%	1,109	2,365	47%	197,133	-	NA
NIPSCO	15,162,352	14,109,132	107%	3,547	6,606	54%	594,716	347,524	171%
Vectren	6,743,161	7,317,055	92%	1,807	3,326	54%	202,273	180,244	112%
Statewide	77,642,156	80,063,597	**97%**	17,314	36,766	**47%**	3,021,765	843,132	NA

Additionally, some activities the TPA conducted in PY1 could not be included in the PY1 energy savings, but could be included in the PY2 savings. For the residential HEA program, these savings occurred due to CFLs left behind in homes and not installed by the PY1 audits. Several studies indicated up to 99% of stored bulbs became installed within a few years of purchase, causing savings to occur several years after initial purchases. This suggests the program should receive additional credit for bulbs left behind with customers for future installation.

To calculate these "PY1 Carryover" savings, the Evaluation Team followed the approach used in other programs where this occurred (such as the Schools Program). Specifically, the Evaluation Team calculated measures left behind in homes by subtracting the PY1 utility-specific incidence rates from the quantity of CFLs included in the kits (nine) to arrive at the number of CFLs left behind in homes. This was then multiplied by the number of homes served by the program in PY1. To determine the portion of CFLs left behind that likely remained installed in PY2, the Evaluation Team used the Uniform Methods Project (UMP)[8] recommended method. The UMP explains most bulbs placed into storage (99%) become installed within two years and recommends calculating the installation rate for the two years after the bulb purchase, as follows:

$$ISR_{Y2} = ISR_{Y3} = \frac{99\% - ISR_{Y1}}{2}$$

Where:

ISR	=	In-service rate
Y1	=	Year 1, the year the bulb was purchased
Y2, Y3	=	Years 2 and 3, the two years following the bulb's purchase date
99%	=	Percentage of program bulbs installed within three years, including the program year

The Evaluation Team applied a 55% installation rate for the PY1 left-behind CFLs installed in PY2, and will apply a 44% installation rate for installations of PY1 left-behind CFLs in PY3. Table 31 summarizes additional carryover savings from bulbs distributed in PY1 but installed in PY2.

[8] The UMP is a framework and set of protocols established by the U.S. Department of Energy for determining energy savings from energy-efficiency measures and programs. More details are available online: https://www1.eere.energy.gov/office_eere/de_ump_protocols.html.

Table 31: Verified PY1 Carryover Savings from CFLs Left Behind in Homes (Savings Added to PY2)

	Quantity Left in Homes in PY1	Installation Rate	Verified Quantity	Verified Carryover kWh	Verified Carryover kW
Duke	9,212	55%	5,067	272,300	100
I&M	3,718	55%	2,045	111,669	47
IPL	16,391	55%	9,015	483,550	174
IMPA	2,232	55%	1,228	66,024	24
NIPSCO	5,731	55%	3,152	166,987	53
Vectren	2,957	55%	1,626	91,714	48
Statewide	**40,241**	**55%**	**22,133**	**1,192,244**	**447**

Verified energy savings, including both the PY2 measures installed as well as PY1 carryover savings, appear in the following tables.

Table 32: Verified PY2 and PY1 Carryover Savings (kWh)

	PY2 Verified kWh	PY1 Carryover kWh	Total Verified
Duke	19,308,195	272,300	19,580,495
I&M	6,329,546	111,669	6,441,215
IPL	24,950,485	483,550	25,434,035
IMPA	5,148,417	66,024	5,214,441
NIPSCO	15,162,352	166,987	15,329,339
Vectren	6,743,161	91,714	6,834,875
Statewide	**77,642,156**	**1,192,244**	**78,834,400**

Table 33: Verified PY2 and PY1 Carrover (kW)

	PY2 Verified kW	PY1 Carryover kW	Total Verified kW
Duke	4,371	100	4,471
I&M	1,382	47	1,429
IPL	5,097	174	5,272
IMPA	1,109	24	1,134
NIPSCO	3,547	53	3,601
Vectren	1,807	48	1,855
Statewide	**17,314**	**447**	**17,761**

Table 34: Verified PY2 and PY1 Carryover (Therms)

	PY2 Verified Therms	PY1 Carryover Therms	Total Verified Therms
Duke	751,094	0	751,094
I&M	243,474	0	243,474
IPL	1,033,075	0	1,033,075
IMPA	197,133	0	197,133
NIPSCO	594,716	0	594,716
Vectren	202,273	0	202,273
Statewide	**3,021,765**	**0**	**3,021,765**

3.6.3 *Ex-Post* Savings

Ex-post savings reflect engineering adjustments made to *ex-ante* measure savings claimed by the program. Discussions follow of engineering analyses for each measure included in the HEA program,

with details included in the engineering appendix for HEA and LIW. Explanations of high-level differences between PY1 and PY2 within the engineering analyses follow.

CFLs

Unlike in PY1, the Evaluation Team estimated *ex-post* savings based on more detailed information drawn from the program tracking database. Specifically, the analysis included the wattage of actual bulbs removed and bulbs installed, along with the bulb location. The program tracking database also included information on the presence of central air conditioners and fuel types for space heating. This information proved critical to the correct application of the waste heat factors (WHFs). If the space heat type could not be determined and central air conditioning was present, weighted average values applied. Application of the various wattages and HOU resulted in *ex-post* per-bulb savings, about 70% of PY1 per-bulb energy estimates, and 84% of PY1 per-bulb demand savings.

Showerheads

Energy-efficient showerhead savings varied, depending on the number of people using the shower and the length of the showers they took. Similar to the CFL calculations, savings calculations included more detailed information about each home with a measure installed. Specifically, algorithms included the number of people within each household. Additionally, since the previous evaluation, Michigan funded a large research effort that gathered information on how people used their showers and faucets.[9] Decreasing three parameters (minutes per day of a shower, showers per day per person, and mixed water temperature) caused expected savings to fall by about 28%, while increasing the household number brought average savings up by about 10%. In PY1, savings ranged from 441 to 516, while they ranged from 303 to 416 in PY2.

Faucet Aerators

As with showerheads, the Evaluation Team included information from the recent Michigan water study, data from the Indiana TRM, the Indiana Residential Market Baseline 2012, and the Domestic Hot Water Event Scheduler Generator (developed by the National Renewable Efficiency Laboratory (NREL)) for faucet aerators. Using these additional sources, four parameters changed between PY1 and PY2. Differing from showerheads, the Evaluation Team increased three parameters for faucet aerators (minutes per day per person for kitchen faucets, mixed water temperature, and the number of occupants per home) and caused the expected kitchen savings to increase substantially (by around 270%). Increasing the mixed water temperature and the number of occupants while decreasing the minutes per day per bathroom faucet produced an increase in average bathroom savings, but also resulted in a smaller increase (about 115%). Per-unit kWh savings in PY1 ranged from 68.1 to 97.8, an average reflecting the number of different kitchen and bathroom aerators installed in homes. PY2 per-unit savings ranged from 155 to 255 kWh, a change that reflected the substantial estimated per-unit savings for kitchen faucets.

[9] Findings from this research, while publicly available, are not available online. If stakeholders wish to obtain this research, the Evaluation Team can provide materials on request.

Water Heater Tank Wrap

The TPA discontinued inclusion of tank wrap measures in PY2, but, simply because of timing, PY2 estimates included a few of these measures (n=149). The Evaluation Team spent little time on this measure due to its low incidence and very low savings. The same algorithm and inputs applied as in PY1.

For PY1, the Evaluation Team reviewed algorithms and assumptions for hot water tank wrap from various references, including: the 2010 Ohio TRM; the Indiana TRM; and the Mid-Atlantic TRM. The program did not install water heater tank wrap blankets for participants with gas water heaters due to combustion safety. Savings were calculated for electric water heaters only. The same per-unit value applied for all utilities, as the savings calculations drew upon an increase in efficiency resulting from the added tank wrap insulation.

Smart Strip Algorithms

Little empirical research exists regarding actual savings from Smart Strips, though the Indiana TRM references some of the latest data available. The Northeast Energy Efficiency Partnership (NEEP) reported on a deemed methodology for advanced power strips (i.e., Smart Strips) that references multiple documents.[10] Within that document, NEEP estimated these devices can save 31 kWh per year for television entertainment centers and 75.1 kWh per year for items such as home computers and printers. However, the Evaluation Team chose to use the values within the Indiana TRM for two reasons: the lack of industry knowledge about how the average consumer actually uses these devices to achieve possible savings; and the conservative savings applied in the Indiana TRM.

For PY2, Indiana Core programs *ex-post* savings for a Smart Strip measure are: 22.6 kWh/year, 0.00178 kW/year, and -0.41 Therms/year. The TPA moved this value to in the second half of the year. However, all Smart Strips were installed before July 2013, with an *ex-ante* estimate of 102.8 kWh. For this measure, therefore, the *ex-post* per-unit energy savings value equals 22% of the *ex-ante* value.

Ex-Post Savings

Table 35 shows total *ex-post* savings by TPA and statewide.

Table 35. HEA *Ex-Post* Savings by Utility and Statewide

	Ex-Post kWh	*Ex-Post* KW	*Ex-Post* Therms
Duke	16,384,640	2,693	1,427,151
I&M	5,050,190	682	467,037
IPL	22,060,426	2,949	1,923,779
IMPA	4,213,502	561	371,184
NIPSCO	11,906,901	1,529	998,558
Vectren	5,935,598	1,474	533,878
Statewide	**65,551,258**	**9,888**	**5,721,586**

[10] Northeast Energy Efficiency Partnership. "Advanced Power Strips Deemed Savings Methodology." January 2012. http://www.neep.org/Assets/uploads/files/market-strategies/NEEP-APS-Deemed-Savings-Report-4-30-12.pdf

3.6.4 NET SAVINGS

Net savings reflect the application of the program NTG ratio to *ex-post* energy savings. As identified in the Core Evaluation Plan,[11] NTG analysis refers to: "the analytical process associated with isolating the savings that are caused by a program's efforts from the savings that are caused by other market forces."

In PY1, the freeridership approach drew upon participant responses to survey questions regarding the timing, quantity, and prior usage of the measure in question. In PY2, an update to the freeridership approach for CFLs accounted for light-emitting diode (LED) ownership via a series of questions gauging interest and intent to purchase. Other changes to the PY2 freeridership approach included minor updates to NTG measure batteries, based on fielding the PY1 participant survey.

Table 36: Measure-Level NTG Ratios (Includes PY1 Carryover)

Measure	NTG
CFLs	82%
Pipe Wrap	85%
Low-Flow Showerhead	84%
Faucet Aerators	85%
Tank Wrap	100%
Audit Recommendations	100%
PY1 Carryover CFLs	100%

Applying the NTG ratios to *ex-post* savings from measures installed through the program resulted in the following net savings.

Table 37: Net Savings

	Net kWh	Net kW	Net Therms
Duke	14,609,486	2,463	1,391,458
I&M	4,409,967	623	506,675
IPL	19,489,529	2,621	1,873,279
IMPA	3,725,032	499	361,085
NIPSCO	10,523,118	1,363	972,035
Vectren	5,251,573	1,386	517,572
Statewide	**58,008,705**	**8,955**	**5,622,104**

3.6.5 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy savings claimed by the program. Table 38 shows energy (kWh) savings, and Table 39 shows demand (kW) savings. The PY1 carryover savings appear in the *ex-post* gross and net savings.

[11] Submitted to the DSMCC on November 14, 2012.

Table 38: Energy Savings Adjustments (kWh)

	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* Gross kWh	Net kWh
Duke	22,078,196	20,195,052	25,770,855	19,308,195	96%	16,384,640	14,609,486
I&M	6,161,092	6,321,156	8,490,851	6,329,546	100%	5,050,190	4,409,967
IPL	34,413,848	26,977,410	35,708,023	24,950,485	92%	22,060,426	19,489,529
IMPA	5,580,932	5,143,792	6,945,424	5,148,417	100%	4,213,502	3,725,032
NIPSCO	14,591,024	14,109,132	18,925,653	15,162,352	107%	11,906,901	10,523,118
Vectren	5,731,152	7,317,055	9,050,387	6,743,161	92%	5,935,598	5,251,573
Statewide	**88,556,244**	**80,063,597**	**104,891,194**	**77,642,156**	97%	**65,551,258**	**58,008,705**

Table 39: Demand Savings Adjustments (kW)

	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* Gross kW	Net kW
Duke	9,837	9,345	6,119	4,371	47%	2,693	2,463
I&M	2,745	2,805	1,974	1,382	49%	682	623
IPL	15,334	12,318	8,089	5,097	41%	2,949	2,621
IMPA	2,487	2,365	1,563	1,109	47%	561	499
NIPSCO	6,501	6,606	4,147	3,547	54%	1,529	1,363
Vectren	2,554	3,326	2,584	1,807	54%	1,474	1,386
Statewide	**39,458**	**36,766**	**24,476**	**17,314**	**47%**	**9,888**	**8,955**

Table 40. Therm Savings Adjustments (therms)

	Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Gross Therms	Net Therms
Duke	347,857	315,364	798,970	751,094	216%	1,427,151	1,391,458
I&M	0	0	260,811	243,474	NA	467,037	506,675
IPL	0	0	1,104,731	1,033,075	NA	1,923,779	1,873,279
IMPA	0	0	211,840	197,133	NA	371,184	361,085
NIPSCO	389,404	347,524	629,890	594,716	153%	998,558	972,035
Vectren	153,236	180,244	220,448	202,273	132%	533,878	517,572
Statewide	**890,497**	**843,132**	**3,226,689**	**3,021,765**	**NA**	**5,721,586**	**5,622,104**

Table 41: Lifetime Savings Achieved

Utility	Lifetime *Ex-Post* kWh
Duke	150,458,734
I&M	48,368,009
IPL	204,177,936
IMPA	39,049,297
NIPSCO	106,173,539
Vectren	54,617,374
Statewide	**602,844,889**

Overall, verified kWh savings were slightly lower than *ex-ante* kWh savings reported by the program. While savings underwent key changes during the verified savings step, with some changes increasing savings and some decreasing savings, the verified savings ended up close to the planned values. For example, measure-by-measure analysis, which more accurately reflected measures installed in the homes, increased savings; however, the application of installation and persistence rates then reduced

this, bringing savings per home down to around the planned numbers. Ultimately, verified savings were 97% of *ex-ante* reported savings.

The *ex-post* evaluation then reduced verified savings, primarily due to reductions of per-unit savings for CFLs and showerheads. Ultimately, *ex-post* savings were 82% of *ex-ante* reported savings.

Differing from kWh savings, kW savings averaged much lower than *ex-ante* kW savings reported by the program. The same key changes to savings made during this step impacted the kW savings, plus planned assumptions were too high. These included: decreases in savings resulting from measure-by-measure analysis, which more accurately reflected measures installed in the homes; and another reduction from the application of installation and persistence rates. Ultimately, verified savings equaled 57% of *ex-ante* reported savings.

The *ex-post* evaluation then reduced verified savings, primarily due to reductions of per-unit savings for CFLs and showerheads. *Ex-post* savings equaled 27% of *ex-ante* reported savings.

3.7 PROCESS ANALYSIS

The PY2 process analysis for the HEA program drew upon on data collected from the following sources:

- A participant survey (administered in two waves—Fall 2013 and January 2014);
- An online survey of program auditors;
- Ride-along observations of auditors working in the field;
- Interviews with the TPA; and
- The Evaluation Team's review of the program database.

Participant surveys included questions related to:

- How participants learned of the program;
- Awareness of ways to save energy;
- Program satisfaction levels; and
- The program's participation processes.

Auditor interviews and ride-along observations explored:

- Areas of program training;
- The audit process;
- Participant perceptions; and
- Health and safety issues.

The Evaluation Team also interviewed the TPA to discuss the program's goals, changes from PY1, operations, strengths, and challenges.

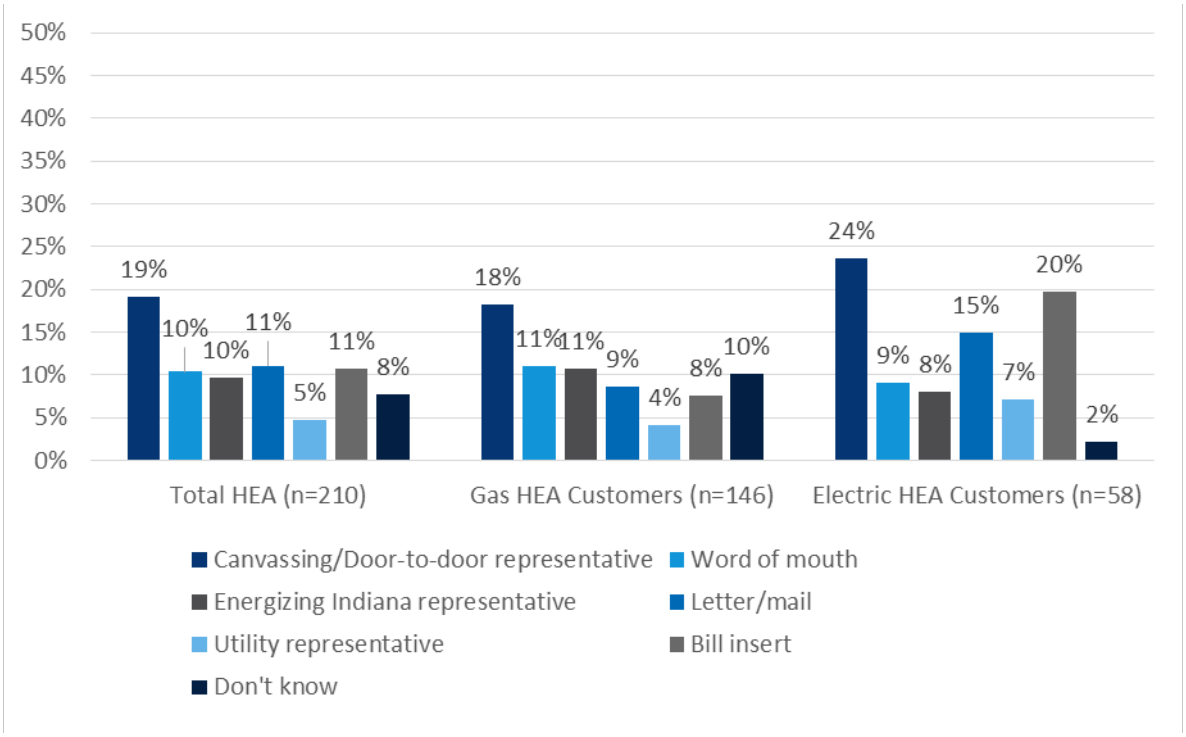
Program administration staff reported making significant changes to the program's design and implementation in July 2013. Implementation during the first half of PY2 remained consistent with PY1

practices, with auditors leaving a "kit" of measures behind for program participants. In July 2013, the program model changed, allowing auditors to install up to 20 CFLs in each home (with an average goal of 14 CFLs per home) and to no longer leave uninstalled measures with customers. Additionally, the program dropped the water heater tank wrap measure from its slate of offerings. As a result, the participant survey took place in two waves: one in Fall 2013 to capture feedback from the first half of the year; and one in January 2014 to capture customer feedback from the second half of the year.

3.7.1 PROGRAM MARKETING

The program targets all single-family homes, 10 years or older, within a participating utility territory and with a specific focus on electric-only homes. The TPA employs a number of tactics to draw customers into the program, including: the Internet, mailings, community action agencies, and neighborhood canvassing. In 2013, the TPA partnered with several utilities to send bill inserts to target ZIP codes, identified as having lower saturation rates. The participant survey asked customers how they learned of the program, and some differences emerged between electric and gas customers. Electric customers primarily learned of the program through canvassing, bill inserts, and letters/direct mail, while natural gas participants primarily learned about the program through canvassing, word-of-mouth, and Energizing Indiana representatives. Figure 21 shows how participants learned of the program.

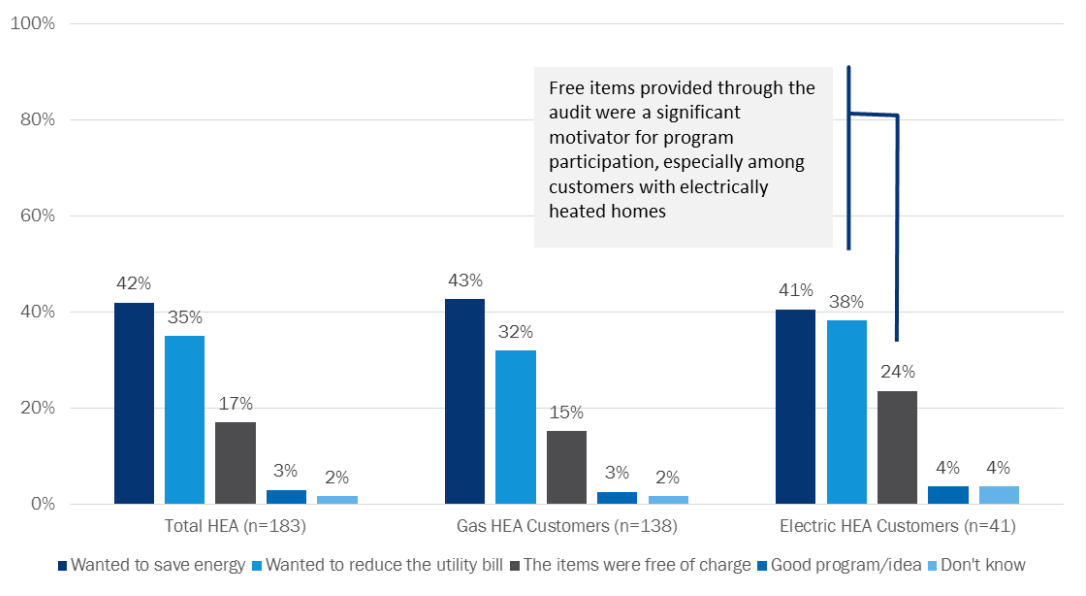
Figure 21: How Participants Learned of the HEA Program (Multiple Responses)



Note: Analysis excluded responses under 4%.

Respondents cited saving energy and reducing energy bills as their primary reasons for program participation. The availability of free measures also motivated some customers. Though the report presents overall findings as well as findings by electric and gas homes to reveal trends, samples sizes proved insufficient to detect significant differences.

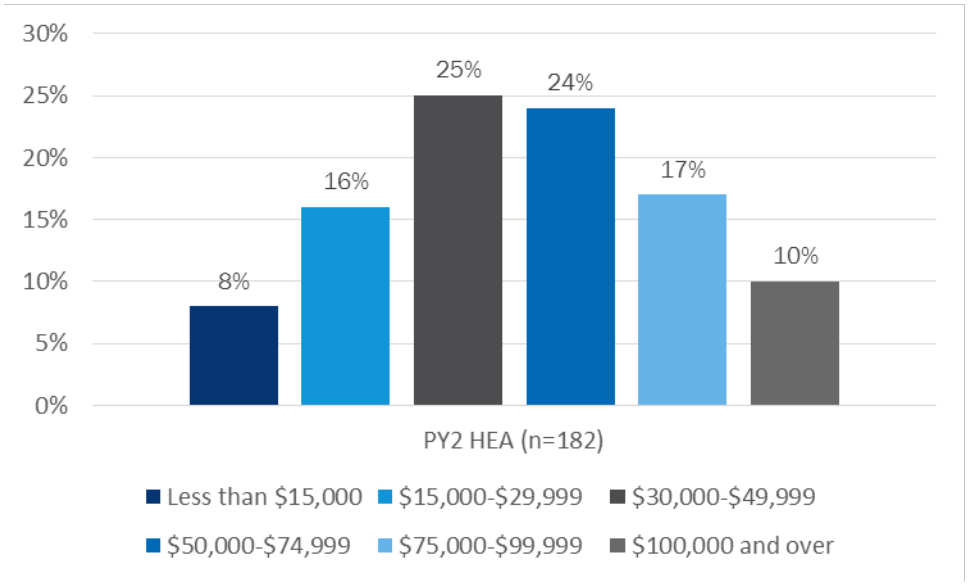
Figure 22: Reason for Participating in the HEA Program (Multiple Responses)



Note: Analysis excluded responses under 4%.

The Evaluation Team also collected basic demographic information from survey participants. For an individual, 200% of the 2013 federal poverty level (FPL [also known as the federal poverty guidelines]) equaled $22,980; for a family of four, it equaled $47,100. As shown in Figure 23, a number of participants receiving HEA audits still could have qualified for the LIW program, though this number was quite a bit lower than in PY1.

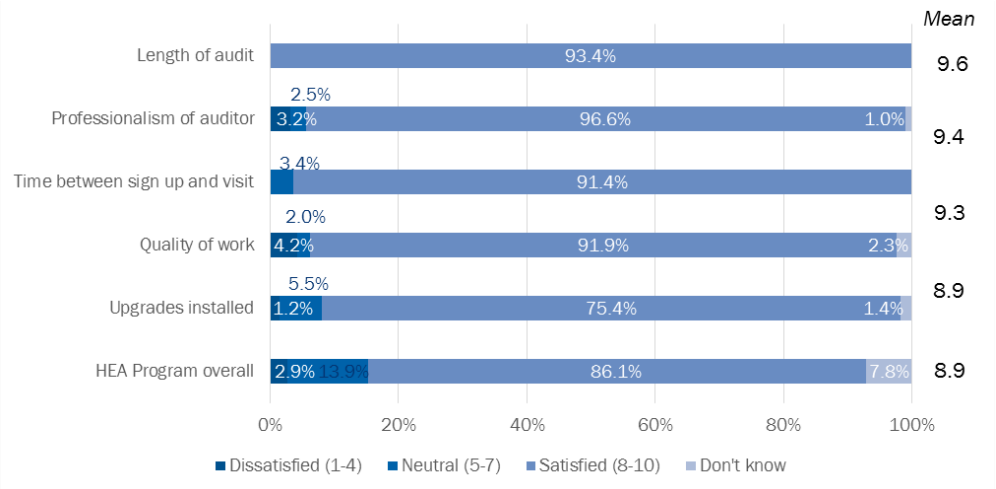
Figure 23: HEA Participant Reported Income Levels



3.7.2 CUSTOMER SATISFACTION

The program continued to produce high customer satisfaction levels. As shown in Figure 24, participants expressed the greatest satisfaction with the auditors' professionalism and the time required to complete the audit. Participants expressed the lowest satisfaction with measures provided through the program, though that program aspect still received a mean score of 8.9 on a 1 to 10 scale, indicating high satisfaction levels.

Figure 24: Satisfaction with Program Elements



Note: Questions only addressed respondents in the second survey wave.

Over 70% of HEA program participants reported nothing could be done to improve the program or they did not know of things to improve the program.

3.7.3 PROGRAM OPERATIONS

Auditor Training

Auditors completed a two-week training and then spent five to 10 days in the field with more experienced auditors. Training focused on: job requirements; company policies; audit procedures; tablet operations; and training on technical equipment used during the audits. In addition, supervisors held trainings for their teams and could select the topics they thought would most benefit their field staff. In PY2, auditor training emphasized the importance of installing as many measures as possible in the home at the time of the audit (not leaving measures behind uninstalled) and accurately capturing all installed measures in the tracking database.

The TPA reported expanding training efforts and adding enhancements to the Optimizer Tool (Optimizer) to provide feedback for auditors regarding energy savings achieved in each home, as evidenced by higher PY2 incidence rates. According to the auditor survey data, 82% of HEA auditors reported completing an audit in one to two hours, compared to 55% reporting this in PY1. Process improvements reduced the overall time, increasing the program's ability to serve more homes.

QA/QC Process

The TPA implemented several QA/QC mechanisms, including: on-site verifications of measure installations; review of Optimizer files; and compliance reporting requirements for field staff. Key indices reviewed in the quality processes included: field staff production (the number of homes served); and installation rates (the number of measures installed). Additionally, the TPA changed the interface, allowing auditors to determine the amount of energy savings that could be achieved within each home; thus, they could adjust their practices to meet measure installation targets.

Customer Participation Process

As in the previous past year, once a participant enrolled in the program, an appointment was scheduled for an auditor to visit the participant's home. While at the home, the auditor conducted a one- to two-hour audit and installed the prescribed measures. The homeowner received a report, including recommendations for additional steps they could take to improve their home's efficiency. Figure 25 provides an example of the audit report provided to customers during audit visits. A total of 98% of participants reported the program participation had been clearly explained to them.

Figure 25: Example of Audit Reports Provided to Customers

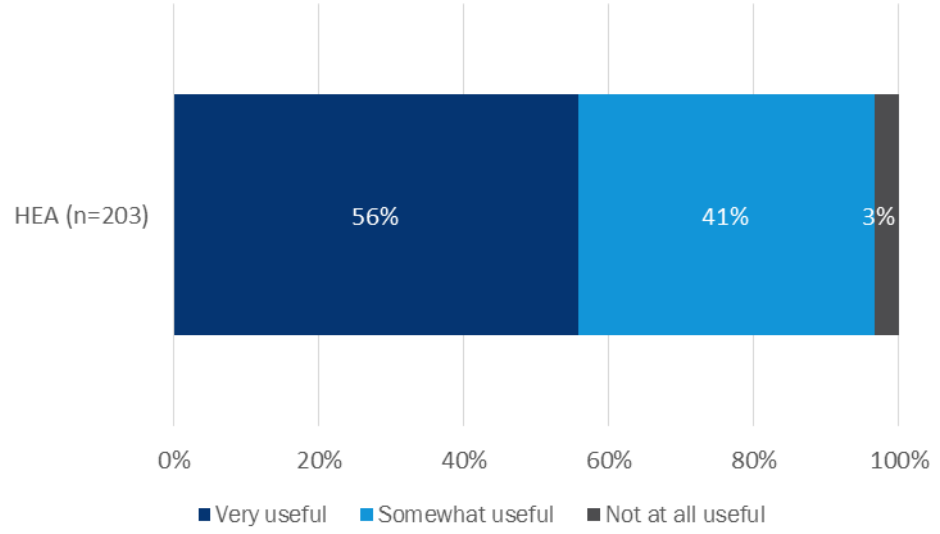
The Evaluation Team also conducted observations of audits where it appeared that auditors led visits in

a consistent manner with minor deviations, based on ease and preference that would not affect program outcomes and savings.

During observation visits and in survey data, auditors cited the large geographic area as a barrier to completing more program audits. The program, however, appeared to provide adequate statewide coverage.

Ninety-three percent of customers reported receiving an audit as a part of their program participation. Among this group, significant differences occurred between homeowners and renters.[12] Renters (83%) found information provided during the audit useful, compared to only 52% of homeowners. Although direct-install programs often target homeowners, renters also benefit from audit information and tips to reduce energy usage. Figure 26 shows how useful participants found the information provided during the audit.

Figure 26: Usefulness of the Information Provided During Audit



3.7.4 DATA AND TRACKING SYSTEMS

Database tracking improved over the course of PY2. The TPA initiated more thorough QA/QC procedures for data collection, which markedly reduced data quality issues over the course of 2013. Applied QA/QC procedures included: the introduction of regular field observations, with auditors shadowed during visits by supervisors; and the addition of post-audit visits, where a field supervisor returned to a home to confirm installation of measures recorded through the program-tracking software (the Optimizer). The TPA also reported increasing auditor training on use of the Optimizer through weekly check-in meetings, designed to address issues occurring in the field and to provide opportunities to streamline the program delivery process.

[12] Per the 2012 American Community Survey One-year Estimates, Indiana has 69.4% owner-occupied housing units and 30.6% renter-occupied housing units.

Program delivery changes also affected data collection. Prior to July 2013, the TPA noted the program-tracking software only allowed documentation of measures installed at the time of the audit, although some measures were left for future on-site installation by customers. Given this data collection approach, the Evaluation Team could not rely on program databases to accurately represent measures installed within homes between January and June 2013. From July 2013 forward, auditors did not leave uninstalled measures with the customer. All measures recorded in the Optimizer currently represent those received by the customer and installed during the audit visit, as confirmed through data gathered from the two surveys. Table 42 shows large increases in installations between Wave 1 and Wave 2, signifying that the quality of program track data improved due to the TPA not leaving measures behind and increased accuracy within the database.

Table 42. HEA Installation Rates by Waves

	Installation Rate by Waves		
HEA	CFL	Faucet Aerator	Showerhead
Wave 1	19%	39%	36%
Wave 2	93%	93%	85%

3.8 *INSIGHTS AND RECOMMENDATIONS*

For HEA, the Evaluation Team provides the following recommendations to increase participation and to target high-usage sockets to increase savings per home.

Conclusion 1: The HEA program significantly increased participation in PY2 compared to PY1 (more than a 200% increase), maintaining participation at an average of approximately 5,900 homes per month over the course of the year. Despite this, the HEA program did not reach its PY2 participation goals, reaching 84% of its goals while spending 90% of its budget.

Recommendation 1: Actively seek methods for increasing participation to meet annual (and three-year) goals. To increase participation in PY3, the TPA could undertake the following actions:

- ***Continue to increase HEA staffing resources*:** The TPA shifted staffing resources to the HEA program from the LIW program when it became clear that LIW would reach its participation goals. The TPA should consider: continuing to assign auditors to the HEA program (as the LIW program remains on track to meet its goals); and/or find other ways to increase the number of auditors in the field, thus reaching even more homes.
- ***Continue to seek geographic pockets to target*:** HEA reached more than 71,000 homes in PY2, and over 100,000 homes over the program's two years. Mapping PY1 and PY2 participants shows distributions of participating homes across the state, with deeper participation in urban areas. While the TPA uses ZIP codes to determine program saturation rates across the state, it could continue to analyze participation in the state, seeking potentially underserved areas. These findings, however, may reflect rural areas, which prove more difficult and costly to reach. Given these costs, it may prove more cost-effective to identify and target pockets of homes

within urban areas. (Notably, many auditors cited "windshield time" as a challenge faced in completing audits. Geo-targeting underserved areas also would reduce driving times.)[13]

- ***Target messaging and expand target*:** This program actively targets customers with electric water heating (as these customers achieve savings from aerators and showerheads). While the program has targeted such homes, it still achieves significant savings from homes with gas water heating/gas heated homes, primarily due to increases in the number of CFLs installed in PY2 and a more favorable WHF adjustment for these homes (i.e., gas-heated homes achieve more savings from CFLs). Homes with electric water heating should continue to be targeted, but, given the need for increased participation, broadening the target may increase overall participation. Customers reported learning of the program in three primary ways: canvassing, bill inserts, and letters/direct mail. These methods appeared even more effective among electrically heated homes (which tended to have electric water heating).

Conclusion 2: The TPA actively worked to increase savings per home in PY2 by increasing the number of bulbs per home and by ensuring (during the second part of the year) installations of measures provided to homes before leaving. Through this process, the TPA provided data related to room types in which CFLs were installed. These data were used to apply an HOU factor in the savings calculations. Continuing to increase savings per home can help meet overall savings goals.

Recommendation 2: Work to increase savings per home by targeting high-usage sockets and homes with electric water heat. The program should continue to target high-usage sockets while installing bulbs. Specifically, based on past research in Indiana, CFLs should be installed in dining rooms (3.08 hours per day), kitchens (2.95 hours), and living spaces (2.60 hours). This would require a small adjustment to the Optimizer, allowing for inclusion of dining rooms in the list of possible room types. Continuing to reach homes with electric water heating, thus allowing the program to realize more savings from faucet aerators and showerheads, would increase electric savings per home.

Conclusion 3. The TPA revised its planning assumptions between PY1 and PY2 to ensure meeting program targets. Several changes made mid-year increased the accuracy of the planning assumptions. In addition, expected CFL installation rates (using program tracking data) rose from 20% in the first half of the year to 93% in the later part of the year due to program model changes. While planning assumptions will never exactly match in-field conditions, analysis of energy-savings planning assumptions indicated overall assumptions proved valid, when taken together.[14] Moreover, the Evaluation Team anticipates that average CFL installation rates in PY3 will match higher rates in the second half of PY2 due to requirements that auditors install as many measures as possible and not leave measures behind uninstalled.

Recommendation 3. Continue use of existing planning assumptions, but revisit assumptions (particularly kW assumptions) prior to setting 2015 values. The Evaluation Team does not recommend changes to HEA planning assumptions for PY3, as per-unit savings values may shift around as program

[13] Note that the Evaluation Team could help the Program Administrator with this area in PY3, though this would require coordinating closely with the Administrator and allocating resources to an early feedback process memo to aid the Administrator with targeting.

[14] *Ex-post*, per-unit savings for CFLs were lower than the planning assumptions, but *ex-post,* per-unit savings for showerheads and faucet aerators were higher, tending to cancel each other in providing similar per-home savings when using the measure-specific planning assumptions.

implementation adjusts to changes. For Indiana, where Energizing Indiana enters only its third year, the Evaluation Team believes it may be prudent to wait until the end of the program year before making changes. If possible, a 2014 mid-year partial evaluation of the HEA measures should be performed, using the latest program tracking data. This would clarify whether differences seen in this year's *ex-post,* per-unit savings continue. If so, choices could be made to prospectively apply any updated values at the beginning of 2015. This would require shifting dollars between programs, as the current HEA evaluation budget does not address this.

4. LOW INCOME WEATHERIZATION

4.1 PROGRAM DESIGN AND IMPLEMENTATION

The LIW program provides walk-through audits and direct installations of energy-efficiency measures to single-family homeowners or renters with a total household income of up to 200% of the FPL. Specific target neighborhoods were identified using 2010 U.S. Census block data. All residents, regardless of income, within a qualified census block are eligible for the LIW program. Income-qualified homeowners or renters outside of the targeted census blocks also may participate by referral through a Community Action Program (CAP) agency. Though all single-family homes could take advantage of the Direct Install program, the program primarily targets high-usage customers with electric power. Customers are recruited for LIW participation through door-to-door canvassing, outreach through community action agencies, and various marketing strategies that rely on word-of-mouth connections.

The LIW energy auditors conduct a walk-through audit of participating customer homes to assess the home's energy performance. While on-site, auditors install energy-efficiency measures, conduct carbon monoxide and gas leak tests, and perform blower-door guided air sealing. Attic insulation may also be upgraded to R-48 after the initial walk-through assessment, if the home's existing attic insulation level falls below R-19. In addition, the customer receives a report about their home's energy use that suggests further actions to reduce the customer's energy consumption.

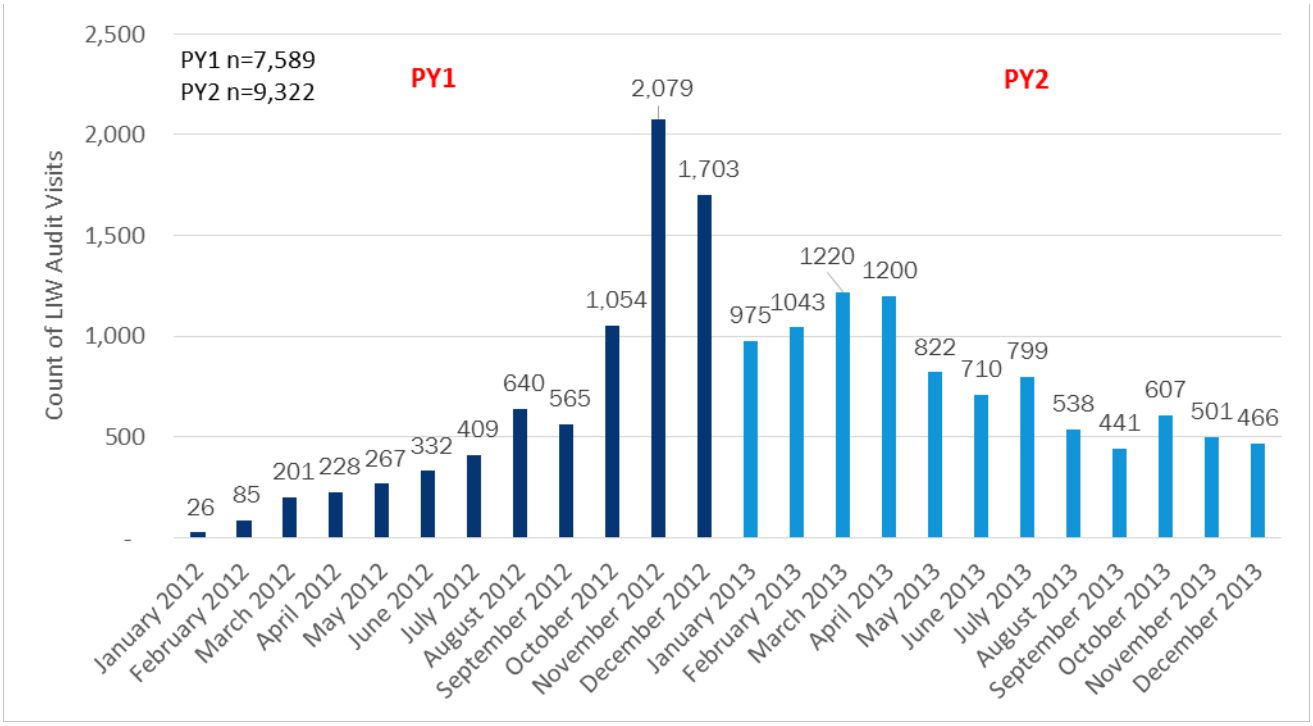
LIW program changes mirrored those in the HEA program. These included shifting the program delivery model in the middle of PY2. Interviews with program implementers indicated that, as of July 1, 2013, the program shifted from a model that provided an energy "kit" and left measures behind for the customers to install independently at a later date. The revised model requires the installation of as many measures as applicable and does not allow measures to be left behind uninstalled .

Besides the program model shifts, various measures were added or removed from each program's slate of offerings. As of July 1, 2013, auditors could install up to 20 CFLs in a participant's home, which was a change supported by the program's need for increased electric savings. Alternatively, water heater tank wrap and Smart Strips were removed from the program. Few customers received water heater tank wrap, and Smart Strip savings, based on the Indiana TRM, proved much lower than previously assumed by the TPA.

Over the course of PY2, database tracking significantly improved, with more measures and details regarding measure installation recorded in the database. Prior to July 1, 2013, the TPA noted the program database only documented measures installed at the time of the audit; yet some measures were left at the site for later installation by customers. To close this data gap, program delivery in the second half of PY2 changed to prevent leaving measures behind; so the database would reflect the measures actually installed at the time of the audit.

Since the initial ramp up of audit visits in late PY1, the TPA has maintained the number of LIW visits completed each month over the course of PY2. Figure 27 shows the number of LIW audits completed in each month during PY1 and PY2. In the second half of PY2, auditors shifted from the LIW program to the HEA program as the LIW program safely remained on track to meet its goals, and the HEA program required increased audit activity.

Figure 27: LIW Audits Completed by Month



Note: The figure represents the number of homes appearing in the program database. Differences may occur from the reported (*ex-ante*) number of completions.

4.2 EM&V METHODOLOGY

Evaluation of the Direct Install Low Income Weatherization program included impact and process elements. Table 43 provides an overview of tasks used for evaluating the program.

Table 43: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• Interviewed Implementation manager.
Auditor Surveys	• Conducted a survey of program auditors. • Conducted ride-along observations and in-depth interviews with program auditors.
Program Database Review/ Verification	• Reviewed the participant data tracking database.
Program Materials Review	• Reviewed materials to assess marketing and outreach efforts.
Participant Interviews	• Conducted telephone surveys with 189 program participants. • Conducted follow-up surveys with 100 PY1 program participants to revisit energy kit receipt and installation.
Impact Analysis	• Verified reported measure installations in the program database. • Calculated installation and persistence rates through participant interviews. • Performed engineering calculations for installed measures. • Estimated NTG (freeridership and spillover) based on self-reported data from participant interviews.

As with HEA, for the PY2 evaluation of the LIW program, the Evaluation Team moved to a measure-level approach, as opposed to a "per home" approach. Several factors guided that decision:

- First, due to the TPA's move toward a measure-level savings approach for PY3, shifting the evaluation approach allowed the Evaluation Team to make better year-over-year comparisons.
- Second, midway through PY2, the TPA changed the program delivery model from a "kit-based" model, whereby all participants received the same kit of measures, to a model where auditors could install up to 20 CFLs in a home and did not leave measures behind for participants to install later. This change to program delivery meant savings achieved in each home would vary, depending on whether measures installed in the home made the "per home" value obsolete.

4.2.1 SAMPLING DESIGN

The Evaluation Team developed a sampling plan, designed to produce telephone survey findings at a precision level of ±10% and 90% confidence. Interviews with program participants were conducted in two waves over the course of PY2 to acknowledge changes in program delivery. The Evaluation Team conducted the first wave of the participant survey in September 2013, and included customers receiving audit visits between January and June 2013. The second wave of the survey was conducted in January 2014 and included customers receiving audit visits between July and November 2013.

As a part of the LIW program evaluation, the Evaluation Team attempted to conduct a census among LIW auditors through use of an online survey addressing the program's process and design.

Table 44 presents the sample frame, response, and cooperation rates for each survey effort.

Table 44: Auditor and Participant Survey Sample Design

Action	Population	Completions	Response Rate	Cooperation Rate
On-line Auditor Surveys	42	16	41%	N/A
Telephone Participant Interviews	8,479	189	9%	41%

4.3 *PROGRAM PERFORMANCE*

Table 45 shows how reported program performance compared to goals established in program planning. Savings reported by the program do not reflect adjustments made due to the evaluation.

Table 45: *Ex-Ante* Results by Utility and Statewide

	kWh			kW			Therms		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	3,819,416	3,912,000	102%	1,649	1,689	102%	211,176	109,610	52%
I&M	2,115,088	2,115,088	100%	913	913	100%	0	0	NA
IPL	1,284,440	1,305,304	102%	555	564	102%	0	0	NA
IMPA	391,200	395,112	101%	169	171	101%	0	0	NA
NIPSCO	2,773,608	2,789,256	101%	1,197	1,204	101%	267,364	268,872	101%
Vectren	1,609,136	1,624,784	101%	695	702	101%	155,114	156,622	101%
Statewide	**11,992,888**	**12,141,544**	**101%**	**5,177**	**5,242**	**101%**	**633,654**	**535,104**	**84%**

As shown in Table 46, the program met its participation goals in terms of numbers of homes served.

Table 46: Number of Homes Served by the LIW Program

	Number of Homes		
	Goal	Reported	% Achieved
Duke	2,929	3,000	102%
I&M	1,622	1,622	100%
IPL	985	1,001	102%
IMPA	300	303	101%
NIPSCO	2,127	2,139	101%
Vectren	1,234	1,246	101%
Statewide	**9,197**	**9,311**	**101%**

4.4 PROGRAM BUDGET AND EXPENDITURES

Table 47 shows PY2 program budgets and expenditures reported at the conclusion of 2013. The program slightly exceeded its allotted budget. Utility-specific budget expenditures ranged from 100% to 102% of the goal.

Table 47: Program-Level Budget and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$2,289,358	$2,344,853	102%
I&M	$1,240,711	$1,240,711	100%
IPL	$770,664	$783,182	102%
IMPA	$235,346	$237,699	101%
NIPSCO	$1,626,444	$1,635,620	101%
Vectren	$970,792	$980,232	101%
Statewide	$7,133,314	$7,222,297	101%

4.5 EX-ANTE ENERGY SAVINGS

Ex-ante savings equaled savings reported by the program, compared to goals set forth in program planning. Table 48 provides statewide *ex-ante* savings for the LIW program, and Table 49 provides utility-level *ex-ante* savings.

Table 48: LIW *Ex-Ante* Savings Statewide

2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goal	2013 Therm *Ex-Ante*	% of Therm Goals
11,992,888	12,141,544	101%	5,177	5,242	101%	633,654	535,104	NA

Table 49: LIW *Ex-Ante* Savings By Utility

Utility	2013 kWh Goal[1]	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal[1]	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goal	2013 Therm *Ex-Ante*	% of Therm Goal
Duke	3,819,416	3,912,000	102%	1,649	1,689	102%	211,176	109,610	52%
I&M	2,115,088	2,115,088	100%	913	913	100%	0	0	NA
IPL	1,284,440	1,305,304	102%	555	564	102%	0	0	NA
IMPA	391,200	395,112	101%	169	171	101%	0	0	NA
NIPSCO	2,773,608	2,789,256	101%	1,197	1,204	101%	267,364	268,872	101%
Vectren	1,609,136	1,624,784	101%	695	702	101%	155,114	156,622	101%

4.6 *IMPACT ANALYSIS*

This evaluation effort included an engineering analysis of: *ex-ante* energy savings claimed; a database review of measure quantities installed in each home; and a survey of participating customers to determine if behavioral elements related to the energy savings (such as the removal of measures or the installation of measures outside of the program).

4.6.1 AUDITED SAVINGS

The impact evaluation process first reviewed the program database and the total number of reported measures installed during audits and through canvassing activities. As noted, the PY2 evaluation approach drew upon the actual number of measures installed, as opposed to applying a uniform, per-home value across all treated homes. Table 50 shows measures installed by the program in participant homes, as they appeared in the program database.

Table 50: Audited Measure Quantities

	Measures in Database						
	Duke	I&M	IPL	IMPA	NIPSCO	Vectren	Statewide
CFLs	31,505	16,504	10,787	2,866	26,264	14,978	102,904
Pipe Wrap	1,637	1,160	751	217	1,808	1,009	6,582
Energy-Efficient Showerhead	2,057	1,139	634	158	1,599	705	6,292
Faucet Aerators	3,657	2,664	1,409	470	3,875	1,992	14,067
Tank Wrap	14	5	36	-	1	1	57
Infiltration Reduction	871	458	723	146	1,027	878	4,103
Attic Insulation	475	31	169	7	371	366	1,419
Audit Recommendations	3,015	1,625	1,003	289	2,142	1,248	9,322

CFLs were the measures most frequently installed in homes. As noted, the program eliminated tank wrap, thus the database includes few incidences of that measure. The measure quantity installed in homes was multiplied by *ex-ante* (unevaluated) savings claimed per unit to arrive at the program's audited energy savings, as shown in Table 51.

Table 51: Audited Energy Savings from Direct-Install Measures

	Audited kWh	Audited KW	Audited Therms
Duke	4,037,478	1,270	224,688
I&M	2,079,052	691	110,799
IPL	1,352,993	447	144,498
IMPA	381,077	133	24,264
NIPSCO	3,082,239	806	286,188
Vectren	1,787,478	504	207,970
Statewide	**12,720,318**	**3,851**	**998,405**

4.6.2 VERIFIED SAVINGS

After determining audited savings, the Evaluation Team compared database results to results customers reported during the participant survey. Adjustments to audited savings included changes to the numbers of installed measures and changes for customers removing measures after the audits. These adjustments took place at a statewide level, as opposed to a utility level, as the sample size of survey participants had to be significant at the statewide level for the first year and at the utility level over the course of the three-year evaluation effort. Table 52 shows adjustments for installation rates and measure removals.

Table 52: Statewide Verification Adjustments

	Statewide Installation Rate	Statewide Persistence
CFLs	79%	99%
Pipe Wrap	100%	100%
Low-Flow Showerhead	80%	95%
Faucet Aerators	91%	99%
Tank Wrap	100%	100%
Air Sealing	100%	100%
Attic Insulation	100%	100%
Audit Recommendations	100%	100%

The installation rates indicated customers confirmed the majority of measures reported installed during audits had actually installed. Additionally, persistence rates indicated that, once measures had been installed in the home, customers tended to leave them in place.

Table 53 shows utility and statewide verified energy savings.

Table 53: Audited and Verified Savings

	Audited kWh	Verified kWh	Audited kW	Verified kW	Audited Therms	Verified Therms
Duke	4,037,478	3,105,012	1,270	1,017	224,688	92,634
I&M	2,079,052	1,748,559	691	558	110,799	61,325
IPL	1,352,993	1,154,136	447	371	144,498	142,973
IMPA	381,077	326,832	133	108	24,264	23,871
NIPSCO	3,082,239	2,595,228	806	672	286,188	282,307
Vectren	1,787,478	1,531,593	504	429	207,970	206,226
Statewide	**12,720,318**	**10,461,359**	**3,851**	**3,155**	**998,405**	**809,337**

The realization rate equals the percentage of *ex-ante* savings verified through this evaluation step. Table 54 shows verified savings and utility-specific realization rates.

Table 54: Verified Realization Rates

	Verified kWh	*Ex-Ante* kWh	Realization Rate	Verified kW	*Ex-Ante* kW	Realization Rate	Verified Therms	*Ex-Ante* Therms	Realization Rate
Duke	3,105,012	3,912,000	79%	1,017	1,689	60%	92,634	109,610	85%
I&M	1,748,559	2,115,088	83%	558	913	61%	61,325	0	NA
IPL	1,154,136	1,305,304	88%	371	564	66%	142,973	0	NA
IMPA	326,832	395,112	83%	108	171	63%	23,871	0	NA
NIPSCO	2,595,228	2,789,256	93%	672	1,204	56%	282,307	268,872	105%
Vectren	1,531,593	1,624,784	94%	429	702	61%	206,226	156,622	132%
Statewide	10,461,359	12,141,544	86%	3,155	5,242	**60%**	**809,337**	**535,104**	**NA**

Additionally, the TPA conducted activities in PY1 that could not be included in the PY1 energy savings, but could be included in PY2 savings. For the residential LIW program, these savings occurred for CFLs left behind in homes and not installed at the time of PY1 audits. As mentioned in the HEA section, several studies have shown up to 99% of stored bulbs are installed within a few years of purchase, causing savings to take place several years after the initial purchase. This indicates the program should realize additional credits for light bulbs left behind with customers for future installation.

To calculate "PY1 Carryover" savings, the Evaluation Team calculated measures left behind in homes by subtracting the PY1 utility-specific incidence rates from the quantity of CFLs included in the kits (nine). The resulting number of CFLs left behind in homes could then be multiplied by the number of homes served by the program in PY1.

To determine the portion of CFLs left behind that would likely be installed in PY2, the Evaluation Team used the UMP-recommended method, which notes most bulbs placed into storage (99%) subsequently become installed within two years. The Evaluation Team applied a 55% installation rate for PY1 left-behind CFLs installed in PY2, and will apply a 44% installation rate for the installation of PY1 left-behind CFLs in PY3. Table 55 summarizes additional carryover savings from bulbs purchased in PY1 but installed in PY2.

Table 55: Verified PY1 Carryover Savings from CFLs Left Behind in Homes

	Quantity	Installation Rate	Verified Quantity	Verified Carryover kWh	Verified Carryover KW
Duke	2,900	55%	1,595	91,137	51
I&M	512	55%	282	16,257	10
IPL	1,052	55%	579	32,739	17
IMPA	329	55%	181	10,615	7
NIPSCO	329	55%	181	9,788	4
Vectren	469	55%	258	13,957	5
Statewide	**5,591**		**3,075**	**174,494**	**95**

Table 56 and Table 57 show verified energy savings, including PY2 measures installed and PY1 carryover savings.

Table 56: Verified PY2 and PY1 Carryover Savings (kWh)

	PY2 Verified kWh	PY1 Carryover kWh	Total Verified
Duke	3,105,012	91,137	3,196,149
I&M	1,748,559	16,257	1,764,816
IPL	1,154,136	32,739	1,186,875
IMPA	326,832	10,615	337,447
NIPSCO	2,595,228	9,788	2,605,016
Vectren	1,531,593	13,957	1,545,550
Statewide	**10,461,359**	**174,494**	**10,635,852**

Table 57: Verified PY2 and PY1 Carrover (kW)

	PY2 Verified kW	PY1 Carryover kW	Total Verified kW
Duke	1,017	51	1,069
I&M	558	10	568
IPL	371	17	388
IMPA	108	7	115
NIPSCO	672	4	676
Vectren	429	5	434
Statewide	**3,155**	**95**	**3,250**

4.6.3 *Ex-Post* Savings

Ex-post savings reflect engineering adjustments made to *ex-ante* measure savings claimed by the program. Discussions of the engineering analyses for each measure included in the HEA program follow.

CFLs

Unlike in PY1, the Evaluation Team estimated *ex-post* savings based on more detailed information from the program tracking database. Specifically, analysis included the wattage of the actual bulb removed and the bulb installed, along with the location of the bulb. The program tracking database also included information on the presence of a central air conditioner and the fuel type for space heating. This information proved critical to correctly applying the WHF. If the space heat type could not be determined and if a central air conditioning was present, weighted average values applied. Applications of the various wattages and HOU resulted in *ex-post*, per-unit savings lower than assumed within the *ex-ante* estimate.

Showerheads

Savings from low-flow showerheads varied, depending on the number of people using the shower and the length of showers taken. Similarly to CFL calculations, determination of savings this year included more detailed information about each home, with the measures installed. Specifically, the Evaluation Team included the number of people within each household in the algorithm used. Additionally, since the last evaluation, Michigan has funded a large research effort to gather information on how people use their showers and faucets.[15] Decreasing three parameters (e.g., minutes per day of a shower,

[15] Findings from this research, while publicly available, are not available online. If stakeholders wish to obtain this research, the Evaluation Team can provide the documentation.

showers per day per person, and mixed water temperature) caused expected savings to fall by about 28%, while increasing the household numbers led to a rise of about 10% of average savings. PY1 savings ranged from 441 to 516, while PY2 savings ranged from 303 to 416.

Faucet Aerators

As with showerheads, the Evaluation Team included information from the recent Michigan water study, data from the Indiana TRM, Indiana Residential Market Baseline 2012, and the Domestic Hot Water Event Scheduler Generator (published by NREL) to develop savings for faucet aerators. The Evaluation Team changed four parameters between PY1 and PY2. Increasing three parameters (e.g., minutes per day per person for kitchen faucets, mixed water temperature, and number of occupants per home) caused the expected kitchen savings to increase substantially (by around 270%). Increasing the mixed water temperature and number of occupants, while decreasing the minutes per day per bathroom faucet, increased average bathroom savings, though by a smaller amount (about 115%). Per-unit kWh savings in PY1 ranged from 68.1 to 97.8, an average reflecting the number of different kitchen and bathroom aerators installed in homes in PY1. PY2 per-unit savings ranged from 155 to 255 kWh.

Water Heater Tank Wrap

The TPA discontinued inclusion of tank wrap measures in PY2, but, simply due to timing, PY2 estimates include a few measures. The Evaluation Team did not spend time on this measure, given the low incidence and very low savings, but applied the same algorithm and inputs as in PY1.

In PY1, the Evaluation Team reviewed algorithms and assumptions for hot water tank wrap from various references, including the 2010 Ohio TRM, the Indiana TRM, and the Mid-Atlantic TRM. The program did not install water heater tank wrap blankets for participants with gas water heaters because of combustion safety concerns. Savings only were calculated for electric water heaters. The same per-unit value applied for all utilities, as the savings calculations derived from an increase in efficiency resulting from the added tank wrap insulation.

Infiltration Reduction

The Evaluation Team used the same algorithms and data inputs for calculating infiltration reduction savings for PY1 and PY2. Specifically, these included data from the program tracking database and engineering algorithms to determine *ex-post* savings from infiltration reduction. The *ex-post*, per-home estimates did not compare well to the TPA per-home estimates, simply due to the method used to categorize each savings estimate. The TPA tracked per-home savings from these measures, based on the space heat type and whether the home had a central air conditioner. This also matched methods for estimating savings. *Ex-ante* estimates, however, appeared low. For PY2, evaluation savings from insulation achieved 208% of the *ex-ante* estimate[16] (i.e., a 368 kWh home for the *ex-post* estimate compared to 177 kWh per home for the *ex-ante* estimate).

[16] Based on the location of the insulation and the home's HVAC configuration.

Attic Insulation

As with infiltration reduction, the Evaluation Team used the same algorithms and data inputs for calculating attic insulation savings in PY1 and PY2. Specifically, calculations used data from the program tracking database and engineering algorithms to determine *ex-post* savings from attic insulation. For the first half of the year, the TPA per-home savings from insulation included infiltration reduction, while, in the second half of the year, the TPA included all attic insulation with its own per-home estimate. For PY2, evaluation savings from infiltration reduction were 95% of the *ex-ante* estimate, using per-home estimates across the entire year (i.e., 470 kWh home for the *ex-post* estimate, compared to the 497 kWh per home *ex-ante* estimate). The *ex-ante*, per-unit savings value for insulation in the second half the year (438.6 kWh per home) fell slightly below the Evaluation Team's estimate.

Table 58: PY2 *Ex-Post* Savings (Includes PY1 Carryover)

	Ex-Post kWh	*Ex-Post* kW	*Ex-Post* Therms
Duke	2,721,484	323	186,860
I&M	1,718,316	176	117,695
IPL	1,411,323	205	149,033
IMPA	346,928	40	24,376
NIPSCO	2,654,471	418	250,052
Vectren	1,795,702	512	182,639
Statewide	**10,648,224**	**1,674**	**910,654**

4.6.4 NET SAVINGS

Net savings reflect the application of the program NTG ratio to *ex-post* energy savings. As identified in the Core Evaluation Plan,[17] NTG analysis refers to: "the analytical process associated with isolating the savings that are caused by a program's efforts from the savings that are caused by other market forces." Evaluations of low-income programs typically assume very few, if any, energy-efficiency improvements would be made in the program's absence. This assumes low-income customers generally would not have the discretionary income (and thus have difficulty in securing a loan) to install these measures on their own. Per the evaluation plan developed in December 2011, the Evaluation Team assigned a 1.0 (100%) NTG ratio to all program measures and did not ask freeridership or spillover questions in the participant survey.

Table 59: LIW PY2 Net Energy Savings (Includes PY1 Carryover)

	Net kWh	Net kW	Net Therms
Duke	2,721,484	323	186,860
I&M	1,718,316	176	117,695
IPL	1,411,323	205	149,033
IMPA	346,928	40	24,376
NIPSCO	2,654,471	418	250,052
Vectren	1,795,702	512	182,639
Statewide	**10,648,224**	**1,674**	**910,654**

[17] Submitted to the DSMCC on November 14, 2012.

4.6.5 SUMMARY OF IMPACT ADJUSTMENTS

Table 60 shows all adjustments made to energy savings claimed by the programs. *Ex-post* and Net savings include PY1 carryover.

Table 60: Energy Savings Adjustments (kWh)

	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh(1)	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	3,819,416	3,912,000	4,037,478	3,105,012	79%	2,721,484	2,721,484
I&M	2,115,088	2,115,088	2,079,052	1,748,559	83%	1,718,316	1,718,316
IPL	1,284,440	1,305,304	1,352,993	1,154,136	88%	1,411,323	1,411,323
IMPA	391,200	395,112	381,077	326,832	83%	346,928	346,928
NIPSCO	2,773,608	2,789,256	3,082,239	2,595,228	93%	2,654,471	2,654,471
Vectren	1,609,136	1,624,784	1,787,478	1,531,593	94%	1,795,702	1,795,702
Statewide	**11,992,888**	**12,141,544**	**12,720,318**	**10,461,359**	**86%**	**10,648,224**	**10,648,224**

(1) Verified savings do not include PY1 carryover.

Table 61: Demand Savings Adjustments (kW)

	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	1,649	1,689	1,270	1,017	60%	323	323
I&M	913	913	691	558	61%	176	176
IPL	555	564	447	371	66%	205	205
IMPA	169	171	133	108	63%	40	40
NIPSCO	1,197	1,204	806	672	56%	418	418
Vectren	695	702	504	429	61%	512	512
Statewide	**5,177**	**5,242**	**3,851**	**3,155**	**60%**	**1,674**	**1,674**

Table 62: Therm Savings

	Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Therms	Net Therms
Duke	211,176	109,610	224,688	92,634	85%	186,860	186,860
I&M	0	0	110,799	61,325	NA	117,695	117,695
IPL	0	0	144,498	142,973	NA	149,033	149,033
IMPA	0	0	24,264	23,871	NA	24,376	24,376
NIPSCO	267,364	268,872	286,188	282,307	105%	250,052	250,052
Vectren	155,114	156,622	207,970	206,226	132%	182,639	182,639
Statewide	**633,654**	**535,104**	**998,405**	**809,337**	**NA**	**910,654**	**910,654**

Table 63: Lifetime Savings Achieved

Utility	Lifetime *Ex-Post* kWh
Duke	32,892,744
I&M	18,306,585
IPL	15,656,523
IMPA	4,039,140
NIPSCO	23,315,360
Vectren	20,072,673
Statewide	114,283,026

Overall, verified kWh savings were slightly lower than *ex-ante* kWh savings reported by the program. Key changes were made to savings made during this step, including increases in savings due to the measure-by-measure analysis, which more accurately reflected measures installed in the homes. This, however, was reduced by the application of the installation and persistence rates. Additionally, in PY2, the TPA reduced infiltration in electrically space-heated homes for 5% of homes touched by the program, when the original plan anticipated reaching 13%. This reduced savings somewhat. Ultimately, verified savings were 86% of *ex-ante* reported savings.

These verified savings were then reduced during the *ex-post* evaluation, largely due to the reduction of per-unit savings for CFLs and showerheads. Ultimately, *ex-post* net kWh savings were 87% of *ex-ante* reported savings.

Unlike kWh savings, kW savings were much lower than *ex-ante* kW savings reported by the program. Differences in the savings values included: decreases in savings due to the measure-by-measure analysis, which more accurately reflected the measures installed in the homes; and another reduction from the application of the installation and persistence rates. Ultimately, verified kW savings were 60% of *ex-ante* reported savings.

These verified savings were then reduced during the *ex-post* evaluation, primarily due to the reduction of per-unit savings for CFLs and showerheads. Ultimately, *ex-post* kW savings were 32% of *ex-ante* reported savings.

4.7 PROCESS ANALYSIS

The PY2 process analysis for the LIW program drew upon data from: a participant survey (administered in two waves); an online survey of program auditors; ride-alongs with auditors; interviews with the TPA; and a review of program databases. Participant surveys asked questions regarding: how participants learned of the program; awareness of ways to save energy; program satisfaction levels; and the program's participation processes. Auditor interviews and ride-alongs explored: areas of program training; the audit process; participant perceptions; and health and safety issues. The Evaluation Team also interviewed the TPA to discuss program goals, changes from PY1, operations, strengths, and challenges.

4.7.1 PROGRAM MARKETING

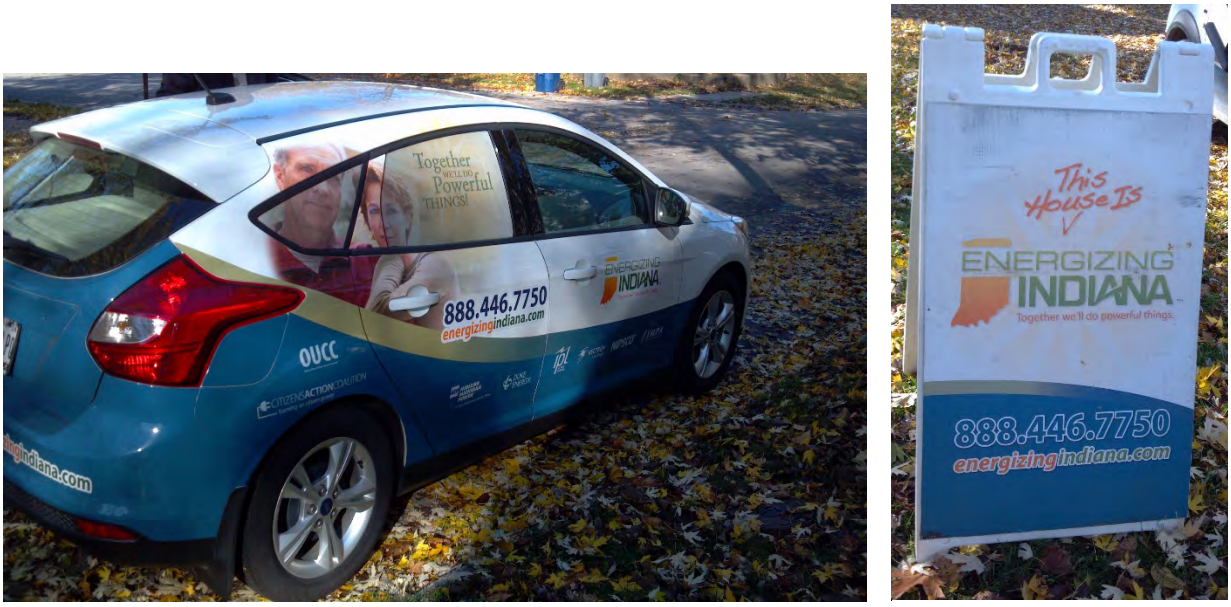
The LIW program targets single-family homeowners or renters with a total household income of up to 200% of the FPL ($47,100 for a family of four), with specific target neighborhoods identified using 2010 U.S. Census block data. All residents, regardless of income, within a qualified census block are eligible for the LIW program. Income qualified homeowners or renters outside of the targeted census blocks may also participate by referral through a CAP agency.

The TPA marketed the program through a number of CAP Agencies, community, and non-profit organizations, with community partners awarded $25 dollars for each recruited participant,[18] and through neighborhood canvassing, bill inserts, and the Internet. The LIW program also utilized street marketing during audit visits: auditors drove program-branded vehicles and placed program-branded

[18] Organizations may receive up to $25,000 per program year.

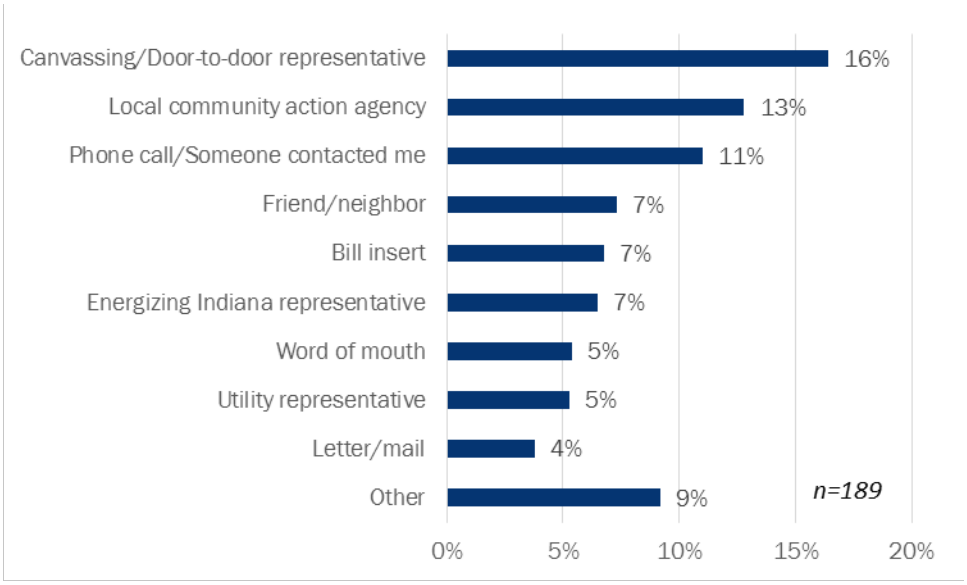
sandwich boards in front of homes receiving a program audit. Figure 28 shows on-site branding employed by the LIW program.

Figure 28: Energizing Indiana Branding Used During LIW Audits



LIW participants most often learned of the program through canvassing/door-to-door representatives, local community action agencies, and other contacts from program representatives. Figure 29 shows how survey respondents reported learning of the program.

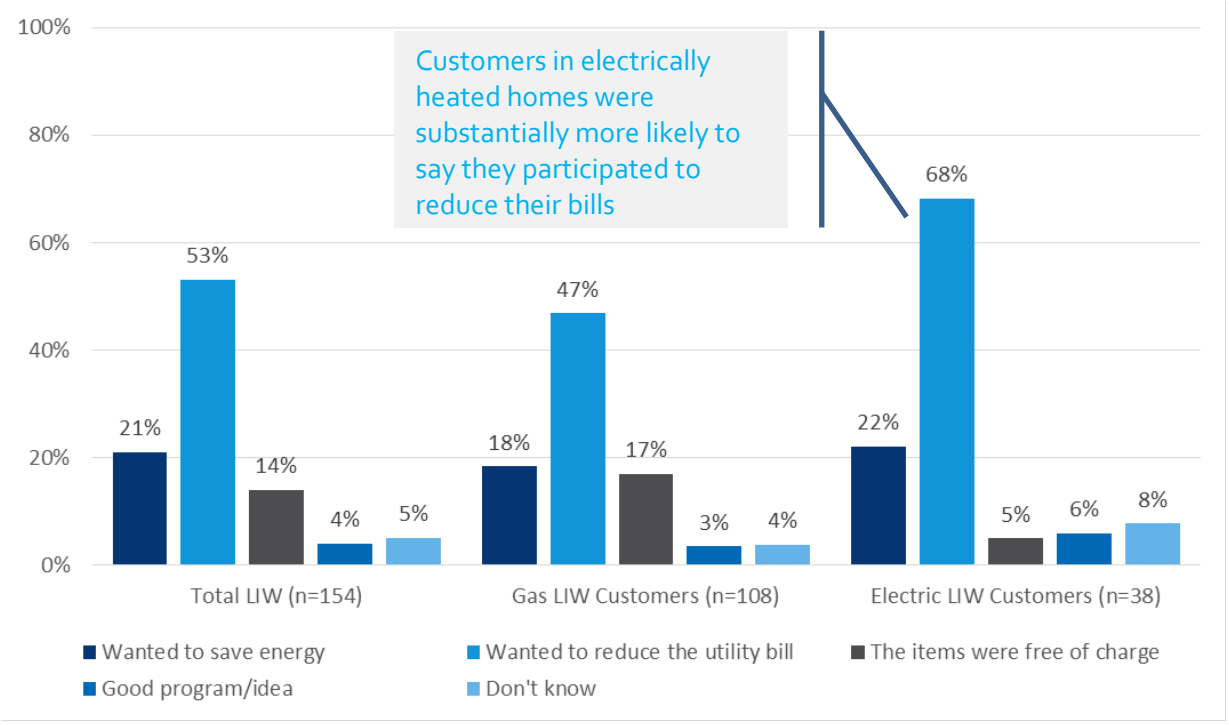
Figure 29: How Customers Heard about the LIW Program (Multiple Responses)



Participants primarily reported participating in the LIW program to reduce utility bills. Participants in the second half of PY2 also reported wanting to save energy and to receive free items as their top reasons for participating (as shown in Figure 30). Customers with electrically-heated homes appeared to be

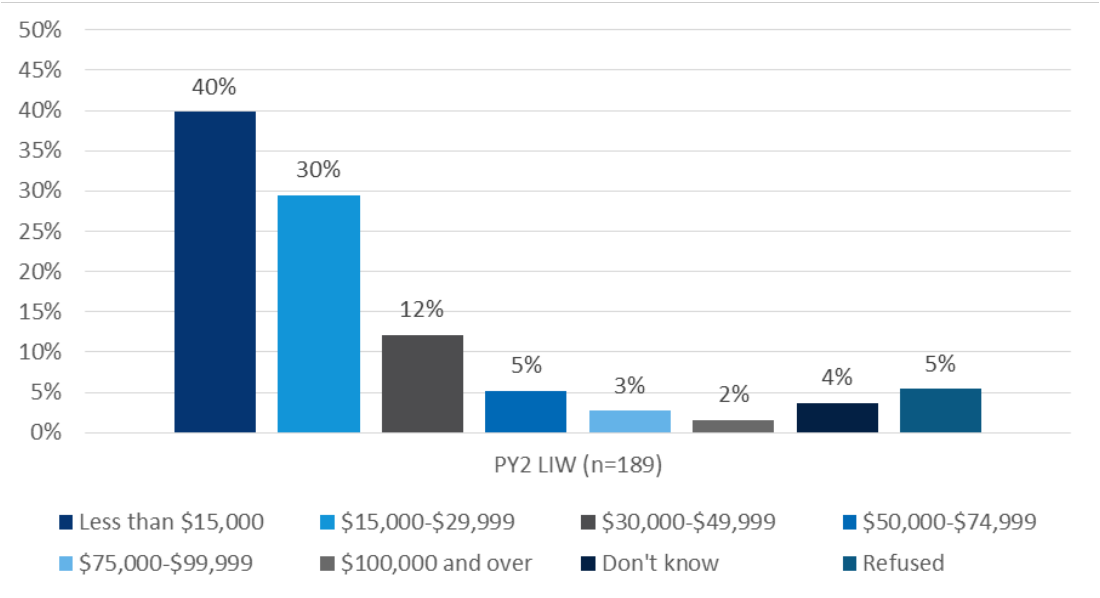
more motivated to participate by reducing their energy bills than those with gas-heated homes, though the sample size was not large enough to detect a statistically significant difference.

Figure 30 : Reasons for Participating in the LIW Program (Multiple Responses)



The Evaluation Team also collected basic demographic information from survey participants. As shown in Figure 31, some participants receiving LIW audits likely fell outside of the income groups intended for the program, a finding consistent with the planned delivery approach of targeting by community. These percentages were slightly higher in PY2 than in PY1, but remained fairly low overall, indicating the program reached its target audience.

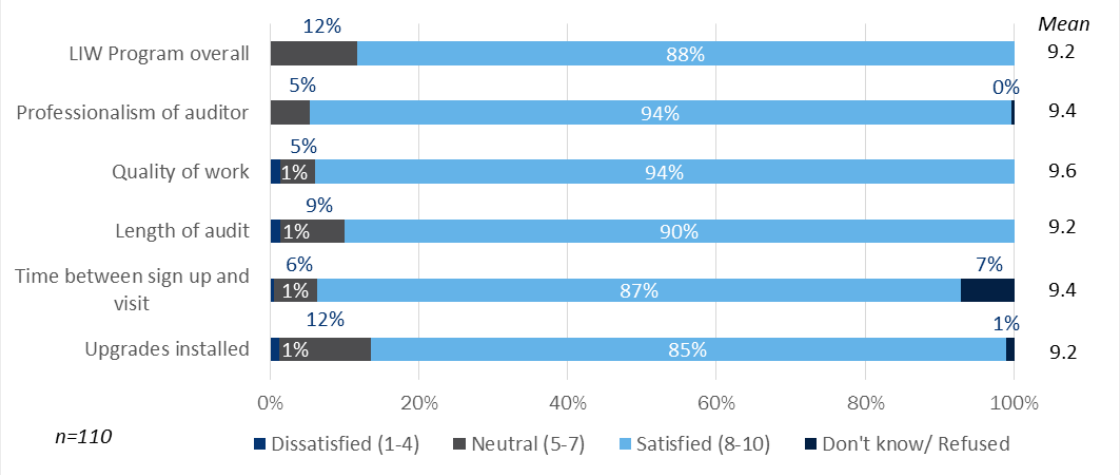
Figure 31: LIW Participant Reported Income Levels



4.7.2 CUSTOMER SATISFACTION

LIW program participants reported very high satisfaction levels, rating the program a 9.2 mean satisfaction score on a scale of 1 to 10. Figure 32 shows participant satisfaction with various program elements. Participants expressed the greatest satisfaction with the auditor's professionalism and the least with measures installed through the audit (although all program elements scored at least a 9.2 mean).

Figure 32: Satisfaction with LIW Program Elements



Note: Questions only asked of respondents during the survey's second wave.

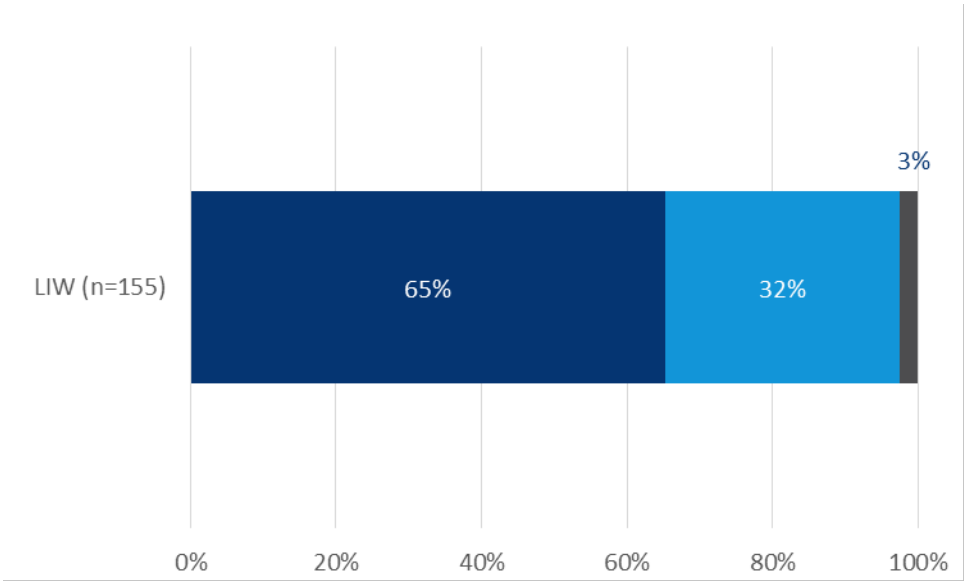
4.7.3 PROGRAM OPERATIONS

As with the HEA program, actual program operations changed little over the course of PY2. LIW audits clearly resembled those conducted for the HEA, except they included a blower door test, air sealing, and, in some cases, attic insulation. If attic insulation was included, following the audit, the auditor scheduled measure installations with the homeowner and a contractor working on the program's behalf. Auditors reported audits took three to four hours to complete, depending on a home's condition. Across the board, LIW auditors reported that inaccessible parts of a home presented the principal barrier in installing measures and completing air-sealing.

Additionally, program staff reported a key challenge in the rate of audit deferrals, which occurred when an audit could not be completed until remediation of a health or safety issue. For example, as the LIW program involved air sealing, auditors deferred this action if a home had high carbon monoxide levels. Gas leaks also often resulted in LIW audit deferrals.

As noted, participants generally expressed strong satisfaction with the program, with 97% of participants reporting the participation clearly explained. Approximately 93% of interviewed LIW participants reported the auditor discussed the assessment findings with them. Figure 33 shows LIW participants generally found the information provided to them during the assessment useful.

Figure 33: Usefulness of Information Provided During Audit



4.7.4 DATA AND TRACKING SYSTEMS

Over the course of PY2, database tracking improved. The TPA initiated more thorough QA/QC procedures for data collection, which markedly reduced data quality issues over the course of 2013. Applied QA/QC procedures included the introduction of regular field observations, where supervisors shadowed auditors during visits, and the addition of post-audit visits, where a field supervisor returned to a home to confirm installation of measures recorded through the Optimizer program-tracking software. The TPA also reported increasing auditor training on use of the Optimizer through weekly check-in meetings, designed to address issues encountered in the field and opportunities for streamlining the program delivery process.

Program delivery changes also affected data collection. The TPA noted that, before July 2013, the program tracking software only required documentation of measures installed at the time of the audit; yet it was confirmed that some measures were left at sites for future installation by customers. From July 2013 forward, auditors received instructions to only install program measures and not to leave them uninstalled with the customer. In this case, measures recorded in the Optimizer represented both those received by the customer and installed during the audit visit.

4.8 INSIGHTS AND RECOMMENDATIONS

The LIW program met its participation and energy savings goals and appears to operate well. The TPA made many improvements in PY2, including enhanced QA/QC processes and improved data tracking. The Evaluation Team found little that the program could improve upon. The following suggestions may prove helpful but not imperative to the program's continued success.

Conclusion 1: The TPA actively worked to increase savings per home in PY2 by increasing the number of bulbs per home and by ensuring (in the second part of the year) installation of measures provided to homes before leaving the site. Through this process, the TPA provided data related to room types in which CFLs were installed, and applied these data to the HOU factor in the savings calculations. Continuing to increase savings per home can help meet overall savings goals.

Recommendation 1: Work to increase savings per home by targeting high usage sockets and homes with electric water heat. The program should continue to target high-usage sockets when installing bulbs. Specifically, based on past research in Indiana, CFLs should be installed in dining rooms (3.08 hours per day), kitchens (2.95 hours), and living spaces (2.60 hours). This would require a small adjustment to the Optimizer to allow inclusion of dining rooms in the list of possible room types. Continuing to reach homes with electric water heating, aiding the program in realizing greater savings from faucet aerators and showerheads, would increase electric savings per home.

Recommendation 2: Continue use of existing planning assumptions, but revisit assumptions (particularly for kW), prior to setting 2015 values. The Evaluation Team does do not recommend changing LIW planning assumptions for PY3. From experience, per-unit savings values may fluctuate as program implementation adjusts to needed changes. For Indiana, where Energizing Indiana is just entering its third year, it may be prudent to wait for the end of the program cycle before making changes. The Evaluation Team recommends, if possible, performing a 2014 mid-year partial evaluation of the LIW measures using the latest program tracking data. This would inform whether differences seen in this year's *ex-post* per-unit savings remain steady. If so, choices could be made to prospectively apply updated values at the beginning of 2015. This would require shifting dollars between programs, as it does not fall within the current LIW evaluation budget.

5. Residential Lighting

5.1 Program Design and Implementation

Now in its second year of implementation, the Energizing Indiana Residential Lighting program works with retailers and manufacturers to offer CFLs, LEDs, and ENERGY STAR-qualified fixtures at reduced prices. Discounted pricing includes standard and specialty bulbs, across a range of wattages. In PY2, the program addressed residential customers across Indiana.

GoodCents (the TPA) administers the program and Ecova (the Program Implementer) implements it. In PY2, the Implementer worked with 16 retailers across 865 storefronts throughout the state in marketing and delivering the program. Participating retailers included: do-it-yourself (DIY) stores, hardware stores, club stores, and general retailers. The program's marketing and promotional activities included in-store signage, point-of-purchase materials, store events, buy-one-get-one (BOGO) lighting promotions, and customer bill inserts.

5.2 EM&V Methodology

The PY2 evaluation of the Residential Lighting program included impact and process elements. Table 64 provides an overview of tasks used for evaluating the program.

Table 64: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• Interviewed Administrator and Implementation managers.
Manufacturer Interviews	• Conducted 11 telephone interviews with staff from eight energy-efficient lighting manufacturers participating in the program. The manufacturers served nine out of 16 participating retailers.
Program Database Review/ Verification	• Reviewed the program tracking database.
In-Store Customer Intercept Interviews	• Conducted in-store interviews with 393 customers across 11 retailers in Indiana to support the net impact and process evaluations.
Retailer Mystery Shopper Survey	• Completed a mystery shopper survey with 100 retailers, assessing the availability of 100-watt and 75-watt standard incandescent light bulbs.
Impact Analysis	• Reviewed savings estimates provided by the Implementer. • Verified the reported measure installations in the program database. • Estimated freeridership, based on self-reported data from in-store customer intercept interviews, combined with sales data modeling.

5.3 Program Performance

Table 65 compares reported program performance with goals established in program planning. The program's reported savings do not reflect adjustments made due to the evaluation. As shown, the program achieved 110% of its *ex-ante* goals at the statewide level. All utilities achieved over 100% of their planning goals, with I&M and IPL achieving 122% of their planned goals (both kWh and kW). Over the course of PY2, the program sold nearly 3.5 million lighting products in Indiana.

Table 65: *Ex-Ante* Results by Utility and Statewide

	Number of Bulbs			kWh Savings			kW Savings		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	1,248,719	1,289,078	103%	54,694,000	56,461,616	103%	8,741	9,024	103%
I&M	371,002	453,452	122%	16,250,000	19,861,198	122%	2,598	3,174	122%
IPL	589,814	717,266	122%	25,834,000	31,416,251	122%	4,129	5,021	122%
IMPA	164,062	166,587	102%	7,186,000	7,296,511	102%	1,148	1,166	102%
NIPSCO	496,002	537,800	108%	21,725,000	23,555,640	108%	3,472	3,765	108%
Vectren	316,277	332,890	105%	13,853,000	14,580,582	105%	2,214	2,330	105%
Statewide	**3,185,876**	**3,497,073**	**110%**	**139,542,000**	**153,171,798**	**110%**	**22,302**	**24,480**	**110%**

5.4 *Program Budget and Expenditures*

Table 66 shows the original program budgets and expenditures reported at the conclusion of 2013. Overall, the program largely stayed on budget in PY2, expending 101% of its allotted funds.

Table 66: Program-Level Budgets and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$2,860,496	$2,877,187	101%
I&M	$965,770	$968,586	100%
IPL	$1,605,222	$1,606,556	100%
IMPA	$375,109	$382,472	102%
NIPSCO	$1,180,350	$1,183,680	100%
Vectren	$725,897	$744,650	103%
Statewide	**$7,712,844**	**$7,763,131**	**101%**

5.5 *Ex-Ante Energy Savings*

The *ex-ante* savings equaled savings reported by the program, compared to goals set forth in program planning. Table 67 shows the program's statewide and utility-specific *ex-ante* savings.

Table 67: *Ex-Ante* Savings By Utility and Statewide

	2013 kWh Savings Goal	2013 kWh *Ex-Ante* Savings	% of kWh Savings Goals	2013 kW Savings Goal	2013 kW *Ex-Ante* Savings	% of kW Savings Goal
Duke	54,694,000	56,461,616	103%	8,741	9,024	103%
I&M	16,250,000	19,861,198	122%	2,598	3,174	122%
IPL	25,834,000	31,416,251	122%	4,129	5,021	122%
IMPA	7,186,000	7,296,511	102%	1,148	1,166	102%
NIPSCO	21,725,000	23,555,640	108%	3,472	3,765	108%
Vectren	13,853,000	14,580,582	105%	2,214	2,330	105%
Total	**139,542,000**	**153,171,798**	**110%**	**22,302**	**24,480**	**110%**

Table 68 presents per-unit *ex-ante* kWh savings for the program in PY2.

Table 68: *Ex-Ante* Per-Unit Energy (kWh) Savings

	Ex-Ante kWh Savings	Total Number of Bulbs	Per Unit kWh Savings
Lighting	153,171,798	3,497,073	43.80

5.6 IMPACT ANALYSIS

This evaluation included: a quantitative analysis of the program tracking databases; engineering analysis of the tracked savings; application of an in-service rate (ISR), established through the PY1 evaluation; and an in-store survey with customers, combined with sales data modeling from PY1 to estimate freeridership.

5.6.1 AUDITED SAVINGS

In developing audited savings estimates, the Evaluation Team reviewed the program tracking databases and checked savings estimates and calculations against agreed-upon *ex-ante* values (i.e., those from the 2010 Ohio TRM) to confirm accurate application of savings assumptions.[19] Following the review, the Evaluation Team recalculated the savings estimates to account for errors, omissions, and inconsistencies identified in the program tracking data.

At the beginning of the review, the Evaluation Team compared total bulb counts and savings—energy and demand—from the program tracking data files[20] to *ex-ante* values tracked and reported by the TPA. The tracking data contained more bulbs than reported (by 329,258 bulbs), greater kWh savings (11,091,575 more kWh than reported), and less kW savings (3,838 less kW than reported).

After investigating the source for these discrepancies, the Evaluation Team concluded the 2013 tracking data contained bulbs sales occurring in 2012, but invoiced by retailers in 2013. As the 2012 evaluation of bulb counts and savings did not account for such sales, the evaluation included them as part of the 2013 program impacts.

The Evaluation Team audited bulb quantities by comparing the "bulb description data field" to data fields with the "number of packs" and "number of units" to confirm consistency. The evaluation also included validating bulb quantities through analysis of rebate and buy-down dollar amounts. As quantity data appeared to be reported consistently, data adjustments were not necessary. Table 69 summarizes audited bulb counts by bulb type (statewide) and by utility.

Table 69: Audited Bulb Counts by Product Type and Utility

	Total Statewide Audited Number of Bulbs	Total Audited Number of Bulbs by Utility					
		Duke	I&M	IPL	IMPA	NIPSCO	Vectren
Standard CFLs	3,376,325	1,222,734	498,063	650,670	149,518	521,875	333,465
Specialty CFLs	442,359	187,923	57,890	80,900	16,068	60,739	38,839
LEDs	5,762	1,721	846	1,191	231	865	908
Lighting Fixtures(1)	1,885	605	279	429	86	300	186
Total	**3,826,331**	**1,412,983**	**557,078**	**733,190**	**165,903**	**583,779**	**373,398**

(1) This represents the count of bulbs and not the lighting fixtures (a lighting fixture can have multiple bulbs)

[19] *Ex-ante* savings for 2013 were estimated using the most recent version of the Ohio TRM. In 2014, e*x-ante* savings will be estimated using the Indiana TRM.

[20] Program tracking data, obtained from the Administrator, represented detailed sales data by retailer, bulb type, and date.

The Evaluation Team then thoroughly investigated energy and demand savings assumptions, and corrected errors or omissions. *Ex-ante* savings assumptions aligned with those set forth in the 2010 Ohio TRM. The energy and demand savings audit identified several issues with program tracking data requiring correction. Table 70 provides an overview of the issues the Evaluation Team encountered and steps taken to address them. As shown, none of these affected more than 14% of all bulbs.

Table 70: Issues Identified During the Savings Auditing Process

Issue Type	Issue Description	Total % of Light Bulbs Affected	Steps Taken
Actual Wattage Mismatch	Reported wattages did not match across data fields for the same product type.	0.1%	Corrected wattage information obtained by looking up accurate wattage values.
Delta Watts Multiplier	Incorrect delta watts multipliers were applied in CFL energy savings calculations.(1)	5%	Corrected delta watts multipliers to align with TRM-prescribed values.
	In calculating demand savings, delta watts multipliers were applied without wattage consideration	14%	
	For fixtures, delta watts multipliers were based on the sum of wattages of all CFLs comprising the fixture and not each individual CFL.	<0.1%	

(1) To account for EISA, the Indiana TRM prescribes different delta watts multipliers by year. The 2012 delta watts multipliers were used to calculate savings (rather than those for 2013).

Table 71 and Table 72 show audited energy and demand savings. Comparing Table 67 (*ex-ante* savings) to Table 71 and Table 72, audited energy savings did not fall by more than 5% and, in some cases, increased up to 18%. Overall, audited energy savings were 5% higher than *ex-ante* savings. Audited demand savings, in turn, fell from 12% to 28%, compared to *ex-ante* savings.

Table 71: Audited Energy Savings (kWh) by Utility and Statewide

	Number of Bulbs in Database	Total Audited kWh Savings
Duke	1,412,983	59,516,162
I&M	557,078	23,380,245
IPL	733,190	30,737,626
IMPA	165,903	7,021,406
NIPSCO	583,779	24,309,190
Vectren	373,398	15,600,281
Statewide	**3,826,331**	**160,564,910**

Table 72: Audited Demand Savings (kW) by Utility and Statewide

	Number of Bulbs in Database	Total Audited kW Savings
Duke	1,412,983	7,119
I&M	557,078	2,796
IPL	733,190	3,676
IMPA	165,903	840
NIPSCO	583,779	2,908
Vectren	373,398	1,866
Statewide	**3,826,331**	**19,205**

5.6.2 VERIFIED SAVINGS

Verified savings for the Residential Lighting program were computed by applying an installation rate to the audited savings, as calculated above. Many programs determine installation rates through primary research with program participants. Given Residential Lighting's structure as an upstream program, the Evaluation Team could not easily contact participants one year after bulb purchases to determine how many bulbs they installed during that time. As such, much like the PY1 evaluation, the evaluation relied on data from the Residential Baseline, performed in 2012, to determine first-year CFL installation rates and the Indiana TRM to determine installation rates for lighting fixtures and LEDs. The following installation rates applied:

- CFLs: 79% (per CFL installation rates found in the Residential Baseline)[21] [22]
- Fixtures: 100% (per the ISR for lighting fixtures outlined in the Indiana TRM)
- LEDs: 100% (per the ISR for LEDs outlined in the Indiana TRM)

The Evaluation Team applied these rates to audited bulb counts and savings to determine verified bulb counts and savings. As the audited savings already factored in an 86% ISR (per the 2010 Ohio TRM), the 79% rate required appropriate adjustment as to not double-discount program savings.

Table 73: Statewide Verified Savings (kW and kWh) by Product Type

	Statewide Verified Number of Bulbs	Statewide Verified kWh Savings	Statewide Verified kW Savings
Standard CFLs	2,667,297	129,848,506	15,531
Specialty CFLs	349,464	17,391,497	2,080
LEDs	5,762	225,949	27
Lighting Fixtures(1)	1,885	97,685	12
Total	**3,024,407**	**147,563,636**	**17,650**

(1) This represents counts of bulbs and not lighting fixtures (as lighting fixtures can use multiple bulbs).

Table 74 shows utility and statewide verified energy savings. After completing an audit of *ex-ante* savings values and applying the installation rate to establish verified savings, the program experienced realization rates of 96% for energy savings and 72% for demand savings at the statewide level. Utility-specific energy savings realization rates varied between 88% and 108%, while demand savings realization rates varied between 66% and 81%.

[21] Opinion Dynamics. *Residential Baseline Report*. November 2, 2012.

[22] During in-store intercept surveys performed in 2013, the Evaluation Team sought to validate the 79% installation rate, asking customers purchasing program-rebated CFLs how many of those CFLs they planned to install within the next week (and not asking customers to predict beyond a week, as most people do not know when they will next replace a light bulb). Customers planned to install 61% of purchased bulbs within the next week. The 79% first-year ISR for CFLs appeared reasonable, given in-store intercept survey question only asked about installation during the narrow time period.

Table 74: Verified Energy Savings (kWh) by Utility and Statewide

	Ex-Ante kWh Savings	Verified kWh Savings	Realization Rate
Duke	56,461,616	54,693,532	97%
I&M	19,861,198	21,487,684	108%
IPL	31,416,251	28,250,432	90%
IMPA	7,296,511	6,452,898	88%
NIPSCO	23,555,640	22,341,169	95%
Vectren	14,580,582	14,337,920	98%
Statewide	**153,171,798**	**147,563,636**	**96%**

Table 75: Verified Demand Savings (kW) by Utility and Statewide

	Ex-Ante kW Savings	Verified kW Savings	Realization Rate
Duke	9,024	6,542	72%
I&M	3,174	2,570	81%
IPL	5,021	3,379	67%
IMPA	1,166	772	66%
NIPSCO	3,765	2,672	71%
Vectren	2,330	1,715	74%
Statewide	**24,480**	**17,650**	**72%**

In PY1 (and for CFLs specifically), the Evaluation Team applied a first-year installation rate of 79%. However, several studies indicate installations of up to 99% of stored bulbs within a few years of purchase, causing savings to occur several years after an initial purchase. The research suggests the program should receive additional credit for bulbs purchased in PY1 but installed in PY2. To determine this portion of savings, the Evaluation Team used the UMP-recommended method.

The evaluation determined that in PY2, the program earned an additional 10% of sales (and subsequently savings) occurring in PY1 ((99%-79%)/2). Table 76 summarizes additional carryover savings from bulbs purchased in PY1, but installed in PY2. As shown, the program received over 28 GWh in energy savings and over 4 MW in demand savings for PY2.

Table 76: Carryover Verified Energy (kWh) and Demand (kW) Savings from PY1

	Carryover Verified PY1 kWh Savings	Carryover Verified PY1 kW Savings
Duke	10,644,166	1,705
I&M	5,130,742	822
IPL	5,011,913	803
IMPA	1,375,122	220
NIPSCO	4,241,582	679
Vectren	2,246,356	360
Statewide	**28,649,881**	**4,589**

5.6.3 *Ex-Post* Savings

Similarly to PY1, the Evaluation Team determined the Residential Lighting program's *ex-post* gross evaluated savings in PY2 through engineering analysis. Adjustments reflected engineering adjustments made to *ex-ante* measure savings claimed by the program.

CFL, LED, and fixtures savings derived from calculating delta watts for each bulb (i.e., the difference between the wattage used by the baseline light bulb [incandescent light bulbs] and the wattage used by the replacement efficient bulb). The evaluation then applied HOU estimates, WHFs, a coincidence factor (for demand savings), and an installation rate to these delta watts.

The Evaluation Team determined equivalent baseline light bulb wattages using the lumen output values, further adjusted for baseline conditions due to EISA legislation, which effectively phases out the manufacturing and import of traditional incandescent light bulbs over a three-year period, beginning in January 2012. The legislation first affected 100-watt incandescent technology (in January 2012), followed by 75-watt incandescents (January 2013), and 60- and 40-watt incandescents (January 2014). Please refer to the EISA section of this report.

The Evaluation Team used a dynamic approach to the baseline adjustment, supported by market data collected through the mystery shopper survey of retailers in Indiana. The mystery shopper study found that, while EISA legislation considerably affected the availability of 100-watt incandescent light bulbs, a sizeable number of stores in Indiana (39%) still carried those bulbs. Given the findings, discounting the baseline wattage for *all* 100-watt CFL equivalents from 100-watts to 72-watts (the halogen equivalent of a 100-watt incandescent) did not prove warranted. As such, the Evaluation Team developed baseline wattages using market data obtained through the survey, adjusting the baseline wattage for 100-watt CFL equivalents to 85-watts.

The Evaluation Team used CFL-specific HOU estimates derived through the 2012–2013 lighting logger study, which measured lighting usage for over 400 sockets containing CFLs in a representative sample of 68 homes across Indiana. The study resulted in a CFL HOU estimate of 2.47 hours a day—a number lower than prescribed in the Indiana TRM (2.85). The number, however, was similar to that used in other jurisdictions. The study report[23] presents a detailed methodology and study results, along with HOU estimates used in other areas of the United States. This evaluation applied the HOU estimate across all lighting products.

CFLs and LEDs emit less heat than incandescents, resulting in increased heating loads (given more energy is needed to supplement heat emitted by incandescent light bulbs). Still, this also decreases the cooling load (as less energy is needed to compensate for heat given off by incandescents). To account for these changes, the Evaluation Team applied the WHF, prescribed in the Indiana TRM (WHF values vary
by utility).

To calculate demand savings, the Evaluation Team applied summer peak coincidence factor of 0.11 (as prescribed by the Indiana TRM).

Finally, the evaluation applied a 79% first-year installation rate to CFL-generated energy savings. As discussed in this report's Verified Savings section, this installation rate derived from the 2012 Baseline Study results. LEDs and fixtures received a 100% installation rate.

Table 77 and Table 78 summarize *ex-post* energy and demand savings per utility and statewide. The engineering analysis resulted in 16% lower *ex-post* kWh savings, compared to the verified savings, and 3% lower *ex-post* kW savings, compared to the verified savings. As compared to *ex-ante* savings, *ex-post*

[23] Opinion Dynamics. *Indiana Hours or Use Study*. The Indiana Statewide Core Program Evaluation Team. July 2013.

gross energy savings were 19% lower, and *ex-post* demand savings were 30% lower. Lower *ex-post* savings values largely resulted from lower HOU (2.47 vs. 2.85) and different electric waste heat factor (WHFe) assumptions than those used to calculate *ex-ante* savings.

Table 77: *Ex-Post* Energy (kWh) Savings per Utility and Statewide

	Verified kWh Savings	*Ex-Post* kWh Savings	*Ex-Post* Therm Savings
Duke	54,693,532	46,229,184	-886,182
I&M	21,487,684	17,834,305	-369,120
IPL	28,250,432	23,806,018	-456,345
IMPA	6,452,898	5,379,034	-103,112
NIPSCO	22,341,169	18,759,698	-383,263
Vectren	14,337,920	12,353,128	-217,395
Statewide	**147,563,636**	**124,361,368**	**-2,415,417**

Table 78: *Ex-Post* Demand (kW) Savings per Utility and Statewide

	Verified kW Savings	*Ex-Post* kW Savings
Duke	6,542	6,337
I&M	2,570	2,460
IPL	3,379	3,263
IMPA	772	737
NIPSCO	2,672	2,555
Vectren	1,715	1,704
Statewide	**17,650**	**17,057**

Consistent with the verified savings approach, the Evaluation Team calculated carryover energy and demand savings from PY1 that the program could claim in PY2. As shown in Table 79, the program received over 9 GWh in energy savings and over 1 MW in demand savings. The Evaluation Team used the savings assumptions for the installation year to calculate carryover savings: in this case, using PY2 savings assumptions to calculate savings from PY1 purchases carried over to PY2.

Table 79: Carryover *Ex-Post* Energy (kWh) and Demand (kW) Savings from PY1

	Carryover *Ex-Post* PY1 kWh Savings	Carryover *Ex-Post* PY1 kW Savings	Carryover *Ex-Post* PY1 Therm Savings
Duke	3,534,841	420	-67,569
I&M	1,707,214	203	-32,634
IPL	1,666,775	198	-31,861
IMPA	455,282	54	-8,703
NIPSCO	1,400,474	166	-26,770
Vectren	745,988	89	-14,260
Statewide	**9,510,574**	**1,131**	**-181,795**

5.6.4 NET SAVINGS

Net savings reflect the application of the program NTG ratio to the e*x-post* energy savings. NTG is generally comprised of freeridership, spillover, and market effects. Freeridership represents the portion of savings that would have occurred absent the program. Spillover and market effects represent savings from purchases of additional non-discounted lighting products induced by program activity in the market.

This year's evaluation of the Residential Lighting program's net savings only estimated freeridership. Estimations of spillover and market effects will be captured in 2015, when the Evaluation Team completes the second market baseline study.

Upstream lighting programs such as Energizing Indiana's are designed as market transformation programs that change manufacturer and retailer stocking and sales practices of lighting products. As such, the Evaluation Team expects these programs will have a considerable effect on the market, which in turn will translate into considerable energy savings. Consequently, net impacts presented in this report are likely biased downward.

Estimating lighting program freeridership proved extremely challenging due to the upstream program delivery method, which did not collect information on customers purchasing program-discounted bulbs. Existing evaluation methods are expensive and produce unpredictable results, containing great uncertainty as to their validity. Use of multiple methods can help alleviate some of this uncertainty. Therefore, to calculate PY2 net impact savings, the Evaluation Team relied on the average of the NTG ratios from two sources:

- Sales data modeling results from PY1; and
- In-store customer intercepts performed in PY2.

In PY1, the Evaluation Team used program and non-program pricing as well as program sales data to estimate what program sales would have been at regular retail pricing, absent the program (in essence what preprogram baseline sales would have been). The model operates on the premise that retailers only would participate in a utility-sponsored lighting program if their gross revenues did not fall (i.e., remained at least neutral or increased) due to participation. The PY1 evaluation report provided detailed descriptions of the method and results, which resulted in a 0.57 NTG estimate.

In PY2, the Evaluation Team planned to repeat the sales modeling effort, update the freeridership estimate and perform customer in-store intercept surveys to develop an independent estimate of freeridership, based on customer self-reports. Due to data availability and quality issues, however, the Evaluation Team did not utilize the sales modeling method in PY2, rather relying on PY1 NTG values, as results did not appear to drastically change over the course of the year.[24]

PY1 sales data modeling process was labor intensive and resulted in a match of 74% of all units sold. As part of the PY1 evaluation report, the Evaluation Team outlined data issues and provided recommendations for improvements. The Evaluation Team also completed a follow-up call with the implementation team to discuss data format and quality. As the initial review of the PY2 allocation data files by the Evaluation Team revealed that data quality continued to be an issue, PY2 data were not anticipated to provide more accurate information than that already available from the PY1 analysis. Therefore, the Evaluation Team chose to not expend evaluation resources on repeating the modeling, but rather relied on the PY1 modeling results. To facilitate sales modeling analysis in the future, providing a single allocation data table per utility would prove most advantageous, as would developing a unique identifier to allow the Evaluation Team to link stock keeping units (SKUs) in the allocation and sales data files.

[24] The Evaluation Team plans to work with the implementation team to obtain the necessary data, in the format required to facilitate analysis in PY3.

Regarding the in-store intercept surveys, the Evaluation Team completed over 170 interviews with customers purchasing program-discounted CFLs across 11 stores in Indiana.[25] Part of the surveys asked customers about factors influencing their purchasing decisions, and included counterfactual questions about what purchase they would have made in the program's absence. The freeridership score included the influence that the program discount and program marketing had on customer purchasing decisions. The program also received credit for influencing the quantity of light bulbs purchases and for discouraging customers from purchasing less-efficient light bulbs.

While NTG values across the two program years differed, more likely a result from the method rather than actual changes in customers' purchases, absent the program. As such, the Evaluation Team equally weighted both values and simply averaged them. *Ex-post* savings received a final NTG of 0.49.

Table 80: NTG Ratio

	NTG Ratio
Sales data modeling (PY1)	0.57
In-store customer intercept survey (PY2)	0.40
Final NTG	**0.49**

Note: the Residential Lighting Program Freeridership Algorithm section of Appendix A contains greater detail on how the NTG ratios using both methods were estimated.

The 0.49 NTG ratio resembles that of programs in other regions of the country: Table 81 compares NTG ratios for residential lighting programs in other jurisdictions.

Table 81: NTG Ratios in Other Jurisdictions

	NTG Ratio
Delaware (2010-2011)	0.49
Midwestern Utility (2013)	0.48
Massachusetts ENERGY STAR (2009-2010)	0.45

The Evaluation Team applied a 0.49 NTG ratio across all products;[26] applying the NTG ratios to installed measures produced the net savings shown in Table 82.

[25] Stores included: DIY, big box, and club stores, representing 13% of all program bulbs sold in the state. The Evaluation Team completed over 400 interviews. To support the process evaluation, in addition to over 170 customers purchasing program-discounted CFLs, the Evaluation Team completed interviews with customers purchasing other lighting products, such as incandescent, halogen, and LED light bulbs.

[26] NTG may differ for standard versus specialty CFLs and LEDs. However, sample sizes for estimating separate NTG ratios for specialty CFLs and LEDs using in-store intercepts would be very costly. Consequently, the Evaluation Team applied overall estimates from the PY2 customer intercepts and PY1 sales modeling to all bulb types. Future applications of the sales data modeling method will explore estimating separate NTG ratios by bulb type.

Table 82: Lighting Program Net Energy (kWh) Savings by Utility and Statewide

	Ex-Post kWh Savings	*Ex-Post* Therm Savings	NTG	Net kWh Savings	Net Therm Savings
Duke	46,229,184	-886,182	0.49	22,652,300	-434,229
I&M	17,834,305	-369,120	0.49	8,738,810	-180,869
IPL	23,806,018	-456,345	0.49	11,664,949	-223,609
IMPA	5,379,034	-103,112	0.49	2,635,727	-50,525
NIPSCO	18,759,698	-383,263	0.49	9,192,252	-187,799
Vectren	12,353,128	-217,395	0.49	6,053,033	-106,523
Statewide	124,361,368	-2,415,417	0.49	60,937,070	-1,183,554

Table 83: Net Demand (kW) Savings by Utility and Statewide

	Ex-Post kW Savings	NTG	Net kW Savings
Duke	6,337	0.49	3,105
I&M	2,460	0.49	1,206
IPL	3,263	0.49	1,599
IMPA	737	0.49	361
NIPSCO	2,555	0.49	1,252
Vectren	1,704	0.49	835
Statewide	17,057	0.49	8,358

When developing net PY1 carryover savings, the Evaluation Team applied the NTG ratio from PY1. Table 84 provides net energy and demand carryover savings by utility and statewide.

Table 84: Carryover Net Energy (kWh) and Demand (kW) Savings by Utility and Statewide

	Carryover *Ex-Post* kWh Savings	Carryover *Ex-Post* kW Savings	Carryover *Ex-Post* Therm Savings	NTG	Carryover Net kWh Savings	Carryover Net kW Savings	Carryover Net Therm Savings
Duke	3,534,841	420	-67,569	0.57	2,014,860	240	-38,514
I&M	1,707,214	203	-32,634	0.57	973,112	116	-18,601
IPL	1,666,775	198	-31,861	0.57	950,062	113	-18,160
IMPA	455,282	54	-8,703	0.57	259,511	31	-4,961
NIPSCO	1,400,474	166	-26,770	0.57	798,270	95	-15,259
Vectren	745,988	89	-14,260	0.57	425,213	51	-8,128
Statewide	**9,510,574**	**1,131**	**-181,795**	**0.57**	**5,421,027**	**644**	**-103,623**

5.6.5 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy and demand savings claimed by the programs.

Table 85: PY2 Achieved Energy (kWh) Savings Summary

Utility	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* Gross kWh	Net kWh
Duke	54,694,000	56,461,616	59,516,162	54,693,532	97%	46,229,184	22,652,300
I&M	16,250,000	19,861,198	23,380,245	21,487,684	108%	17,834,305	8,738,810
IPL	25,834,000	31,416,251	30,737,626	28,250,432	90%	23,806,018	11,664,949
IMPA	7,186,000	7,296,511	7,021,406	6,452,898	88%	5,379,034	2,635,727
NIPSCO	21,725,000	23,555,640	24,309,190	22,341,169	95%	18,759,698	9,192,252
Vectren	13,853,000	14,580,582	15,600,281	14,337,920	98%	12,353,128	6,053,033
Statewide	**139,542,000**	**153,171,798**	**160,564,910**	**147,563,636**	**96%**	**124,361,368**	**60,937,070**

Table 86: PY2 Achieved Energy (kWh) Savings Summary with Carryover Installations from PY1

Utility	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	54,694,000	56,461,616	59,516,162	65,337,698	116%	49,764,026	24,667,160
I&M	16,250,000	19,861,198	23,380,245	26,618,426	134%	19,541,520	9,711,922
IPL	25,834,000	31,416,251	30,737,626	33,262,345	106%	25,472,793	12,615,011
IMPA	7,186,000	7,296,511	7,021,406	7,828,020	107%	5,834,316	2,895,237
NIPSCO	21,725,000	23,555,640	24,309,190	26,582,751	113%	20,160,172	9,990,522
Vectren	13,853,000	14,580,582	15,600,281	16,584,277	114%	13,099,116	6,478,246
Statewide	**139,542,000**	**153,171,798**	**160,564,910**	**176,213,517**	**115%**	**133,871,942**	**66,358,097**

Table 87: PY2 Achieved Demand (kW) Savings Summary

Utility	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	8,741	9,024	7,119	6,542	72%	6,337	3,105
I&M	2,598	3,174	2,796	2,570	81%	2,460	1,206
IPL	4,129	5,021	3,676	3,379	67%	3,263	1,599
IMPA	1,148	1,166	840	772	66%	737	361
NIPSCO	3,472	3,765	2,908	2,672	71%	2,555	1,252
Vectren	2,214	2,330	1,866	1,715	74%	1,704	835
Statewide	**22,302**	**24,480**	**19,205**	**17,650**	**72%**	**17,057**	**8,358**

Table 88: PY2 Achieved Demand (kW) Savings Summary with Carryover Installations from PY1

Utility	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	8,741	9,024	7,119	8,247	91%	6,758	3,345
I&M	2,598	3,174	2,796	3,392	107%	2,663	1,321
IPL	4,129	5,021	3,676	4,182	83%	3,462	1,712
IMPA	1,148	1,166	840	992	85%	792	392
NIPSCO	3,472	3,765	2,908	3,352	89%	2,721	1,347
Vectren	2,214	2,330	1,866	2,075	89%	1,793	885
Statewide	**22,302**	**24,480**	**19,205**	**22,239**	**91%**	**18,188**	**9,002**

Table 89: Lifetime Savings Achieved

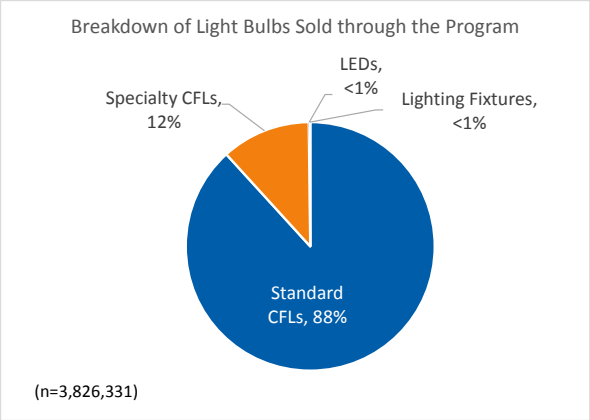
Utility	Lifetime *Ex-Post* kWh
Duke	220,570,660
I&M	86,546,260
IPL	112,869,659
IMPA	25,702,116
NIPSCO	88,896,020
Vectren	58,034,703
Statewide	**592,619,418**

5.7 *PROCESS ANALYSIS*

5.7.1 PROGRAM OPERATIONS

The Residential Lighting program's PY2 design did not change from PY1: the program worked with retailers and manufacturers to offer discounted prices on CFLs, LEDs, bulbs for ceiling fans, and ENERGY STAR-qualified fixtures. PY2 continued the same product mix discounted through the program, with standard CFLs representing the largest share of discounted products (88%), followed by specialty CFLs (12%). LEDs and lighting fixtures represented less than 1% of program bulb sales. In comparison, 76% of all bulbs sold in PY1 were standard CFLs and 23% were specialty CFLs.

Figure 34: Breakdown of Light Bulbs Sold through the Program[(1)(2)]



(1) Base size represents the total number of light bulbs.
(2) These data represent bulb counts reported by the TPA.

To increase the program's footprint in the state over the course of the year, program implementation contractors added Dollar General to the mix of participating stores. The program also added new locations of already participating retailers. Consequently, the total number of participating storefronts across the state increased from 753 in PY1 to 865 in PY2. Table 90 lists participating retailers.

Table 90: PY2 Participating Retailers

Participating Retailers	
Ace Hardware	Meijer
Big Lots	Menards
Costco	Outreach
Dollar General	Sam's Club
Dollar Tree	TechniArt.com
Goodwill	Home Depot
Habitat ReStore	Walgreens
Lowe's	Walmart

Program staff did not identify challenges or issues in servicing participating retail locations, making certain store signage was present and the store staff were trained on the program. In PY2, the program added two field service representatives to ensure timely service of participating retailers.

5.7.2 PROGRAM SATISFACTION

Based on interviews with the program implementation staff, the Lighting program ran fairly smoothly in PY2. Participating manufacturers interviewed as part of the evaluation effort generally expressed satisfaction with the program overall. When asked to rate the program on a 10-point scale, where 1 as very dissatisfied and 10 as very satisfied, the majority of manufacturers (five out of eight) interviewed rated the program either an 8, 9, or 10. The lowest satisfaction rating was 6, provided by only one manufacturer. The average satisfaction rating was 8.4.

Interviews with manufacturers also generally revealed high satisfaction levels with the range of products incented. One recommendation manufacturers voiced for the program moving forward involved incenting more LED bulbs and fixtures. Most manufacturers felt LEDs would rapidly fall in price and the program would see more "bang for the buck" by increasing the rebate amounts on LED products, and expanding the number and types of LEDs incented.

Implementers expressed some concerns regarding program consistency over the course of the year. The Residential Lighting program works toward specific goals, by utility. Program implementers proactively forecast and kept close track of light bulb sales to not exceed the program budget for each utility. This caused the program to slow or even close discounts at stores in utility service territories with goals close to being met.

Though altering promotions was necessary from a budgetary perspective, interviews with participating manufacturers revealed concerns about the levels and consistency of program promotions. Manufacturers expressed dissatisfaction in that program funding could be cut quite suddenly, requiring retail partners to change their signage, marketing, and point-of-sale data systems quickly. With certain retailers (specifically those franchise-owned), communicating and coordinating these changes proved time and labor intensive, and could dissuade certain stores from participating in future years. Manufacturers suggested either making certain funding could be maintained for the entire year, or limiting discounts only to certain times of the year, such as around Earth Day or during the holiday sales period.

5.7.3 PROGRAM INCENTIVES

In PY2, the program discounted a variety of product types and wattages. Product discounts varied from: $0.50 to $3.25 per bulb for standard CFLs; $1.00 to $3.25 per bulb for specialty CFLs; $12 per fixture; and $5.00 or $10.00 per bulb for LEDs. The manufacturer interviews asked respondents to discuss their preferences for the program either offering: (a) a smaller per-unit discount on a broad range of product types (e.g., twist and specialty CFLs, A-line and parabolic aluminized reflector (PAR) LEDs, efficient fixtures and ceiling fans); or (b) fewer types of products (e.g., only twist CFLs) at a higher per-unit discount.

Manufacturer responses varied. Generally, those advocating for option (a) suggested the program would more effectively move efficient lighting into sockets that traditionally have been hard to reach for programs such as this. These manufacturers generally felt that, by providing broader discounts on more product types, programs would appeal to a wider range of potential customers.

Manufacturers supporting option (b) considered the justification in bringing down the price of otherwise expensive bulbs, especially LEDs. Several LED manufacturers cited the $10 price point as particularly important, and, if a program could bring down LED prices below that threshold, LED sales would increase dramatically. This would serve as a feedback loop, increasing orders of LEDs in general, which would make costs fall due to bulk manufacturing effects.

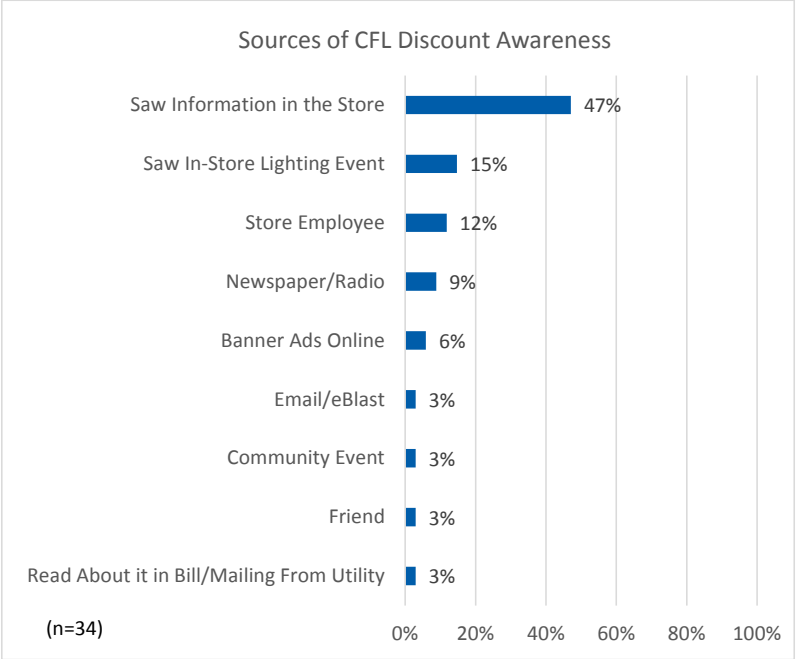
5.7.4 PROGRAM MARKETING AND OUTREACH

In PY2, Residential Lighting program promotion primarily utilized point-of-purchase materials and events at participating stores, including impromptu BOGO events, which targeted high-performing locations on high-traffic days (e.g., Saturdays) to increase lighting sales. The program held two BOGO events in Spring 2013. Some utilities sent bill inserts to promote the program throughout the year. Overall, program staff felt marketing and outreach efforts undertaken in PY2 generally succeeded in educating customers about high-efficiency lighting products and discounts offered through the program, while building the Energizing Indiana brand.[27]

As part of the PY2 evaluation efforts, the Evaluation Team conducted in-store intercept interviews with customers at participating retail stores across Indiana. Only one in five customers purchasing program-discounted bulbs knew of the bulb discounts (18%).[28] Customers aware of the discount reported learning of it in ways consistent with program marketing and outreach. As shown in Figure 35, almost three-quarters (74%) learned of the discounts from a source in the store. Nearly one-half of customers (47%) first learned of the discount from seeing in-store information and displays, while 15% of customers saw an in-store lighting event. A little over one-quarter of customers (27%) first learned of Energizing Indiana's discounts from non-store sources, such as newspapers, radio, and online banner advertisements.

[27] The Evaluation Team plans to examine this area further as part of the Residential Market Study for 2015.
[28] Results should only be used to assess customer awareness of marketing materials and not the impact of discounts on purchasing behavior. Customers not aware of the discount still might not pay full price for the bulbs.

Figure 35: Sources of CFL Discount Awareness



Note: the small sample size possibly introduces uncertainty/high variability in the results.

The customer in-store intercept survey also explored the influence of in-store marketing materials and information on a customer's decision to purchase CFLs. Close to one-half of the customers (42%) purchasing program-discounted CFLs and seeing information in the store reported being highly influenced by the information they saw.[29]

Program staff felt in-store events offered the best way to promote the program and to educate customers. During events, program representatives at the store interacted with customers, educating them about energy-efficient lighting, available lighting options, and program discounts. The Evaluation Team performed interviews during times when in-store events were underway and during non-event times. Comparisons of survey results during these two times indicated in-store events offered a very effective method for promoting energy-efficient lighting sales. The events increased customer awareness of the program and drove purchasing behaviors. While one-quarter of all respondents saw information about CFLs at the store, respondents were more likely to see information during in-store events than periods without events (as shown in Table 91). Furthermore, awareness of sponsorships of the in-store marketing and information ran much higher during in-store events.

[29] Using a scale of 1 to 5, where 1 meant not at all influential and 5 meant extremely influential, respondents were asked how influential the in-store information sponsored by Energizing Indiana was in their decision to buy CFLs. Highly influenced respondents awarded the program a 4 or 5 on that scale.

Table 91: Awareness of In-Store Information about CFLs and Sponsor of the Information

	Total (n=392)	Event (n=66)	No Event (n=326)
Saw Information about CFLs In-Store	26%	70%	17%
	Among Those Who Saw Information about CFLs In-Store		
	Total (n=100)	Event (n=46)	No Event (n=54)
Aware Energizing Indiana is the Sponsor of the In-Store Marketing	32%	59%	9%

Customers purchasing program-discounted CFLs during lighting events also were more likely to know they purchased discounted CFLs (64% compared to 37%), as shown in Table 92. Of those aware of the discount, more customers during an event (63%) knew Energizing Indiana provided the discount than when no event occurred (31%). Overall, slightly less than one-half of customers purchasing discounted CFLs (43%) knew the CFLs were discounted, and, of those, 42% knew Energizing Indiana provided the discount.

Table 92: Awareness of the Lighting Discount

	Total (n=187)	Event (n=42)	No Event (n=145)
Aware that They are Purchasing Discounted CFLs	43%	64%	37%
	Among Those Aware of the Discount		
	Total (n=81)	Event (n=27)*	No Event (n=54)
Aware Energizing Indiana is the Discount Sponsor	42%	63%	31%

Note: Only respondents purchasing program-discounted CFLs were asked this question.
*The small sample sizes introduced possible uncertainty/high variability to the results.

To gain information about barriers to efficient-lighting purchases, the Evaluation Team interviewed customers purchasing all types of lighting and not just program-discounted CFLs. Customers purchasing light bulbs during the event more likely purchased efficient lighting than customers purchasing lighting outside of the event. As shown in Table 93, approximately two-thirds of customers (68%) purchased CFLs during the in-store event, while one-half (49%) purchased CFLs when no event was underway. LEDs also experienced higher sales higher during in-store events (14% of customers compared to 9%).[30] Between CFLs and LEDs, 81% of customers purchased energy-efficient light bulbs (LEDs or CFLs) during events, compared to 58% purchasing efficient bulbs in the absence of events.

[30] As this difference is not statistically significant at 90% percent confidence interval, it should be treated as directional.

Table 93: Types of Bulbs Purchased by Customers

Efficiency	Bulb Type	% of Customers		
		Total (n=393)	Event (n=66)	No Event (n=327)
Higher	LEDs	10%	14%	9%
	CFLs	52%	68%	49%
	Halogen	12%	5%	13%
Lower	Incandescent	33%	15%	36%
Total CFL/LED		**62%**	**81%**	**58%**

Note: Presents the number of customers purchasing at least one bulb of each type. Percentages are greater than 100% as some customers purchased more than one bulb type.

Furthermore, a slightly higher average number of CFLs were purchased during the events than during non-event periods. CFLs customers purchased an average of 6.6 CFLs during an event, compared to 5.5 CFLs during non-event periods.

Table 94: Average Number of Light Bulbs Purchased by Customers

Efficiency	Bulb Type	Average Number of Light Bulbs		
		Total	Event	No Event
Higher	LEDs	3.1 (n=38)*	2.0 (n=9)*	3.5 (n=29)
	CFLs	5.8 (n=206)	6.6 (n=45)	5.5 (n=161)
	Halogen	4.8 (n=46)	14.3 (n=3)*	4.1 (n=43)
Lower	Incandescent	6.2 (n=129)	6.6 (n=10)*	6.2 (n=119)

*Note: the small sample sizes introduced possible uncertainty/high variability to the results.

Finally, customers purchasing program-discounted CFLs during in-store events proved much less likely to purchase those bulbs had a discount not been offered than those purchasing program-discounted CFLs during non-event periods. As shown in Table 95, customers purchasing program-discounted CFLs during program events were more likely to say they would not have purchased CFLs in the rebate's absence.[31]

Table 95: Amount of Program-Discounted CFLs Customers Would Have Purchased Without Discount

	Total (n=176)	Event (n=38)*	No Event (n=138)
All	63%	53%	66%
Some	7%	8%	7%
None	30%	39%	27%

Note: The small sample size possibly introduces uncertainty/high variability to the results.

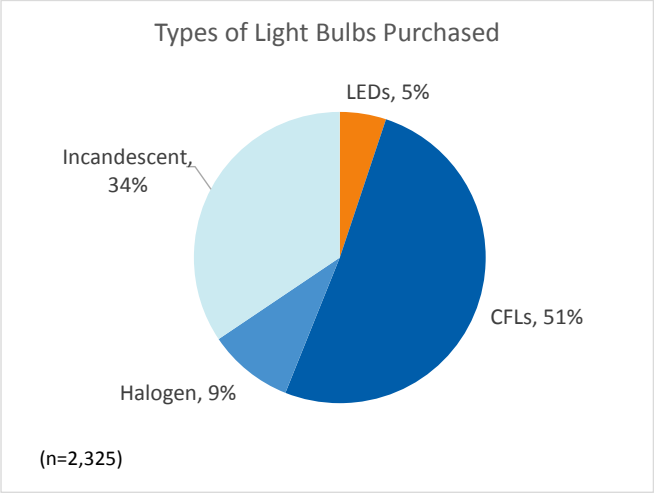
[31] This difference is not statistically significant at 90% percent confidence interval, and therefore should be treated as directional.

Combined, these findings suggest continuing the in-store events, and potentially even increasing their number throughout the year, could effectively increase CFL sales among customers who otherwise would not purchase CFLs without program support.

5.7.5 CUSTOMER LIGHTING PURCHASE BEHAVIORS

The customer in-store intercept survey results indicate customers bought less-efficient light bulbs despite the presence of program-discounted CFLs. Only one-half of all bulbs purchased at participating retailers by survey respondents were CFLs (51%), while one-third of all bulbs purchased were incandescents (34%), as shown in Figure 36. Furthermore, mystery shopper surveys of retailers revealed that incandescent products remained widely available at retail locations. More specifically, the survey found 39% of retailers stocked 100-watt and/or 75-watt incandescent light bulbs, banned from manufacturing due to EISA since January 2012. Consequently, respondents had less-efficient lighting options still available to them for these wattages.

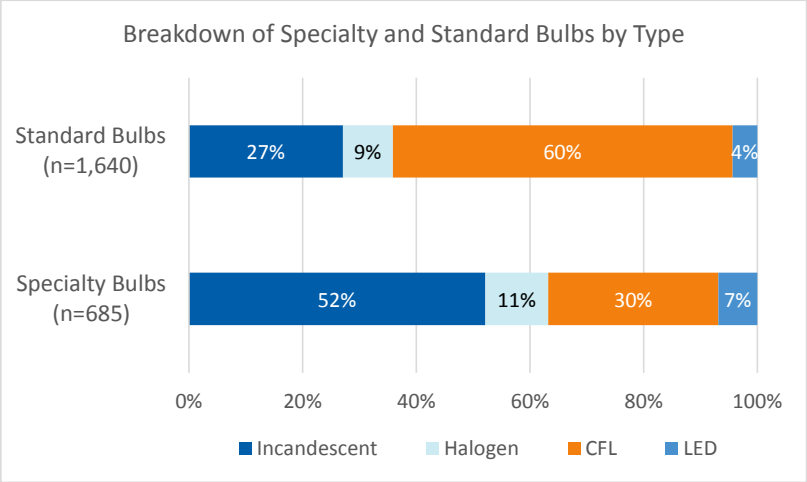
Figure 36. Types of Light Bulbs Purchased[1]



(1) Base size represents the total number of light bulbs.

Less-efficient lighting purchases dominate the specialty bulb category. While, overall, less than one-third (29%) of all bulbs purchased were specialty bulbs, the majority of specialty bulbs purchased (52%) were incandescents. As shown in Figure 37, customers generally bought CFLs for their standard bulb needs and incandescents for their specialty bulb needs. In fact, LEDs show some promise as an efficient specialty bulb alternative to CFLs. This finding suggests opportunity exists to shift the share of program discounted bulb sales into the specialty category, which remains dominated by less-efficient lighting.

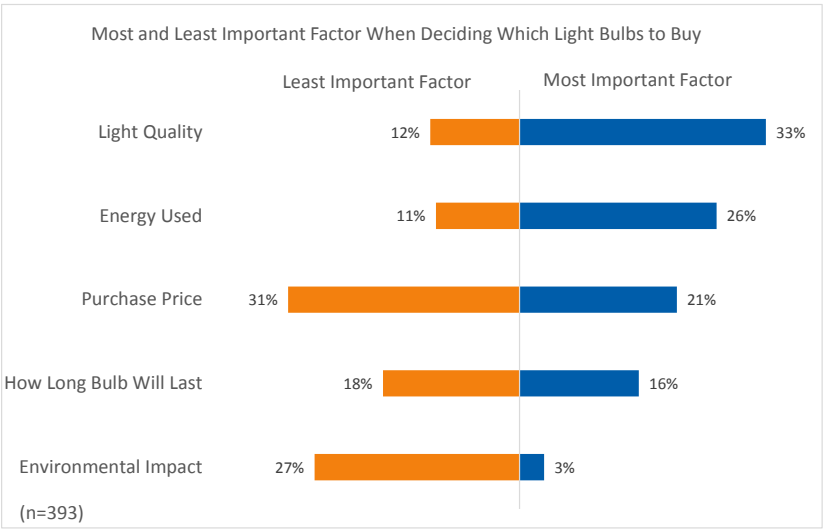
Figure 37: Breakdown of Specialty and Standard Bulbs Purchased by Type



Note: Base sizes represent the total number of bulbs purchased by customers. CFL and LED bulb counts include both those discounted and not discounted by the program.

As shown above, despite Energizing Indiana's CFL discounts, a considerable number of customers still purchased less-efficient lighting options. The Evaluation Team asked respondents what the most-important and least-important factors were when purchasing light bulbs. As shown in Figure 38, the primary drivers were light quality, energy use, and price. One-third rated light quality as the most important factor (33%). This sentiment proved particularly true among customers purchasing less-efficient lighting, where nearly one-half (49%) rated light quality as the most important factor. This finding suggests expanding LED program offerings may offer an effective light quality alternative to incandescents at a more affordable price, thus motivating customers to switch to high-efficiency lighting technologies.

Figure 38: Most and Least Important Factor When Deciding Which Light Bulbs to Buy

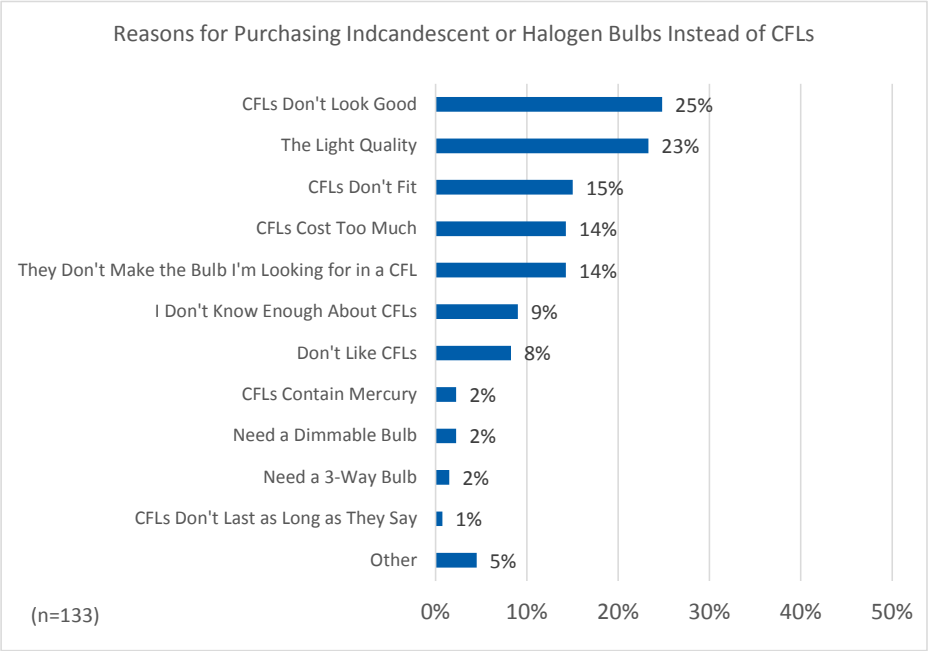


The reasons customers gave for not purchasing CFLs further supported the premise that light quality and cost served as core barriers to CFL sales. The Evaluation Team asked respondents purchasing

incandescents and halogens why they chose those bulbs rather than of CFLs. As shown in Figure 39, 25% of respondents cited light quality and 14% cited cost. The look of CFLs, however, presented a barrier to the technology's adoption among one-quarter of respondents. These customers may not know that, in many cases, a specialty CFL exists, works, and looks attractive in light sockets. For customers stating CFLs do not look good, survey questions followed up by asking if they knew about the availability of covered CFLs (which look more like a traditional light bulb). Two-thirds (69%) said they did not know covered CFLs existed.

These findings suggest increased marketing of specialty CFLs through educating customers about availability of the various specialty CFL alternatives might prove beneficial. Even with increased awareness, some customers will not adopt the bulbs, simply because they do not like them. LEDs may offer a potential solution to this barrier as they continue to drop in price.

Figure 39: Reasons for Purchasing Incandescents or Halogen Bulbs Instead of CFLs



Note: Multiple response question. Percentages sum to more than 100%.

As for other lighting purchase behaviors, on average, customers purchased the same number of CFLs as incandescents and halogens, but purchased fewer LEDs. The high cost of LED technology and few sold in multipacks likely discouraged customers from purchasing greater quantities.

Table 96: Average and Maximum Number of Bulbs Purchased Per Person Buying Each Bulb Type

Bulb Type	Average Number of Bulbs Purchased	Maximum Number of Bulbs Purchased
LEDs	3.1 (n=38)	13 (n=38)
CFLs	5.8 (n=206)	20 (n=206)
Halogen	4.8 (n=46)	29 (n=46)
Incandescent	6.2 (n=129)	64 (n=129)

When purchasing light bulbs, customers generally only purchased one type of bulb, whether incandescents, LEDs, halogens, or CFLs: only 6% of customers purchased multiple types of light bulbs.

Only 5% of all customers purchased an energy-efficient option (CFLs and LEDs) along with a less-efficient option (incandescents and halogens).

Most customers were not first-time buyers of CFLs; the large majority of customers buying CFLs reported already having CFLs installed in their homes (86%).

Customers also did not buy light bulbs on a whim—purchasers were planned decisions. Approximately three-quarters (76%) of customers buying light bulbs already planned on purchasing bulbs when entering the store. The percentage of customers planning on buying light bulbs did not vary significantly during events and non-event periods. Customers generally purchased the same bulb type (e.g., incandescent, CFL, LED) as they planned to do before entering the store, with only 5% of customers purchasing a different bulb type than planned. This suggests the program faces challenges in primarily changing customer purchasing behaviors in the stores.

5.7.6 Program Impacts on CFL Sales, Revenues, and Advancing Technology and Innovation

The Evaluation Team used interviews with lighting manufacturers to explore the program's influence on the stocking and sales of efficient lighting and technological innovation.

Nearly all manufacturers said the program increased their sales of CFLs or LEDs. Only five out of 11 manufacturers, however, could provide point estimates of the increase. Responses varied from 15% to 75% for the lift in high-efficiency bulb sales due to the program, though one manufacturer said a particular LED SKUs at Costco had seen a sales lift of nearly 250% since introduction of the program in Indiana.

The study also asked manufacturers about the influence of incentive programs (such as Energizing Indiana), EISA, and state regulations on the development of new lighting products. Only five of 11 manufacturers felt they were sufficiently familiar with EISA and other regulations to answer this question. Most said incentive programs, along with state and national regulations, had a positive impact on driving innovation. Further, most manufacturers attributed at least some of the rise in the wide variety of available efficient lighting to the combined national impact of rebate and incentive programs, such as Energizing Indiana's. Manufacturers noted, however, that the impact resulted from the presence of these programs in many regions across the country and not just a single program.

Manufacturers generally did not offer strong opinions regarding the impact of EISA-compliant halogens on the lighting market. Most manufacturers interviewed did not manufacture the halogens. They largely stated, however, that compliant halogens would take the place of traditional incandescents as the baseline bulb, especially for consumers particularly sensitive to initial price points. Those offering an opinion on the topic thought compliant halogen bulbs would continue to grow as a share of the market during the phase out of traditional incandescents and the clearance of retailer stock, though they also thought CFLs and LEDs remained well placed to compete with these bulbs for the immediate future.

5.8 *Insights and Recommendations*

This section presents conclusions and recommendations from the research evaluation efforts.

Conclusion 1: Based on interviews with program staff, the Residential Lighting program ran smoothly in PY2. The program offered incentives for a wide range of energy-efficient lighting products at a variety of

retailers across the state. Manufacturers interviewed through the evaluation generally expressed satisfaction with the program design and implementation. Some, however, voiced concerns regarding program incentives turning on and off quite unexpectedly, citing the difficulties associated with having retailers remove program signage and marketing, and making adjustments to their point-of-sale data systems. Consequently, manufacturers thought retailers might be reluctant to participate in the program in the future.

Recommendation 1: Limit turning off and on program discounts. The program's success and the need to stay within the utility-specific program budgets may require turning program discounts on and off across Indiana, and avoiding this situation may not be possible. However, now that the program has acquired two years of experience and sales data, program implementers may be able to use this information to adjust incentive levels, so the program can run an entire year. If the program cannot be conducted without disruption, it should work closely with retailers, alerting them of program changes, to maintain high satisfaction levels and prevent retailer attrition.

Conclusion 2: In-store lighting demonstrations offer a powerful, highly effective tool to increase customer awareness of program discounts and sales of energy-efficient lighting products over less-efficient options. Moreover, events encourage customers who would not have purchased CFLs at full price to buy program-discounted bulbs.

Recommendation 2: Increase the number of in-store lighting demonstrations. While the relative effectiveness of other marketing strategies (such as bill inserts) could not be assessed as part of this evaluation, in-store customer interviews suggest increasing the number of in-store lighting events could help attract customers who otherwise would not purchase high-efficiency lighting. Therefore, the implementation team should consider increasing the number of in-store events, potentially at the cost of other marketing strategies used by the program.

Conclusion 3: In both PY1 and PY2, the Residential Lighting program emphasized standard CFLs. In PY2, close to 90% of all bulbs sold through the program were standard CFLs. Per the in-store intercept survey results, customers most frequently purchase CFLs as standard bulb types (60% of all standard bulbs purchased are CFLs and 4% are LEDs). Sales of efficient specialty bulbs lag behind (30% are CFLs and 7% are LEDs). In-store customer intercept survey results suggest customer dissatisfaction with specialty CFLs and lack of awareness regarding specialty CFL bulbs present barriers to specialty CFL purchases.

Recommendation 3: Increasingly emphasize specialty bulbs. The program has very successfully promoted purchases of standard CFLs, but the market for efficient lighting for specialty sockets remains largely untouched. The program should consider increasing incentives on specialty CFLs and LEDs to attract more customers and to begin filling these sockets with efficient bulbs. Specialty LEDs hold particular promise for reaching customers dissatisfied with specialty CFLs. To increase incentives on specialty products, the program would likely have to reduce incentives on standard bulbs. Given the program's success in promoting standard CFLs, however, and that many customers purchasing discounted standard CFLs say they would pay full price for them, a shift in program focus may be warranted. In addition, the program should consider additional educational and marketing efforts to make customers aware that efficient lighting options exist for their specialty lighting needs.

6. ENERGY EFFICIENT SCHOOLS

6.1 *PROGRAM DESIGN AND IMPLEMENTATION*

The Energy Efficient Schools (EES) program launched in January 2012, seeking to produce cost-effective electricity savings by influencing school staff, students, and their families to focus on conservation and the efficient use of electricity and gas. The program design helps schools and students identify opportunities to manage their energy consumption by providing zero- or low-cost improvements and tips as well as knowledge and support from conducting larger efficiency projects.

The program consists of two subprograms: the Education program, which targets students and their families through distributions of energy-savings kits; and the School Audit and Direct Install program, which targets school district facility staff by conducting audits, installing free direct-install measures for instant savings, and providing recommendations and rebate options for energy-efficient building improvements to schools.

The TPA manages implementation of both subprograms by tracking overall performance and working with the two subprogram implementers: CLEAResult (the program implementer); and Resource Action Programs (RAP; the implementing subcontractor).

6.1.1 EDUCATION PROGRAM

Program eligibility requirements changed slightly in 2013, primarily targeting teachers with fifth-grade classes (in 2012, both fifth- and sixth-grade teachers were targeted for participation) located within an Energizing Indiana participating utility territory. During 2013, sixth-grade teachers only qualified for participating if their school had not participated in 2012. Once teachers signed up for the program, the implementing subcontractor distributed all kits and curriculum materials to the teachers, who provided each student with a kit containing the following items:

- Three 13-watt CFLs
- Three 23-watt CFLs
- Kitchen Faucet Aerator
- Energy-efficient Showerhead
- LED Night Light
- FilterTone® Alarm
- Flow Rate Test Bag
- Digital Thermometer
- Reminder Sticker and Magnet Pack
- Parent/Guardian Comment Card

Student materials include:

- Student Workbook
- Student Guide
- Scantron Form

Teacher materials include a Teachers Materials Folder, which contains:

- Additional Activities
- Scantron/Letter Postage Paid Return Envelope
- Wristband Flyer
- Teacher Incentive Flyer
- State Education Standards Program Correlation
- Teacher Program Evaluation Survey
- Water Poster
- Energy Poster
- Natural Gas Poster
- Teacher Book

6.1.2 SADI PROGRAM

The Schools Audit and Direct Install (SADI) program makes up the second component of EES. The program seeks to educate school officials and facility staff about the benefits of energy efficiency and the savings associated with installation of recommended energy-saving measures and operational improvements to their schools as well as providing instant savings through direct installations of free energy-saving equipment.

The SADI program provides free walk-through energy audits for K-12 schools more than 10 years old. After the implementation contractor performs the walk-through, an energy specialist presents schools with: a detailed assessment report, outlining a variety of options to increase the school's energy efficiency; and information about available rebates for financial support. The implementation contractor encourages school officials to take advantage of the C&I Prescriptive program or other Core Plus programs that they may qualify for.

In 2013, the program implementer added a direct-install component to the SADI program, requiring participating schools to install a set of direct-install measures within 30 days of the walk-through audit. The set bundle of direct-install measures include:

- Two Vending Machine Timers
- 10 Commercial Smart Strip with Occupancy Sensor
- 10 18-watt CFLs

- 15 Room Occupancy Sensors
- LED Exit Signs (optional)

After receiving the set bundle of measures, schools may opt to choose additional measures to install (up to the value of $4,700). The SADI program reports all savings resulting from direct-install measures and no savings are reported as a direct result of the assessment.

6.2 EM&V METHODOLOGY

The EES program evaluation utilized impact and process elements. Table 97 provides an overview of tasks used for evaluating this program.

Table 97: Program Evaluation Overall Tasks

Action	Details	Education Program	Assessment Program
Implementer Interviews	Interviewed representatives from GoodCents, CLEAResult, and RAP for program progress, successes, and barriers for the 2013 program year.	X	X
Auditor Interviews	Interviewed energy specialists and engineers at CLEAResult to gain knowledge on the assessments and the assessment reports.		X
Student Participant Surveys	Questionnaire distributed in the kits helped determine measures families installed and the persistent of the resulting savings.	X	
Teacher Surveys	Interviewed a sample of teachers to determine their assessment of the program's effectiveness.	X	
Parent/Guardian Survey	Surveyed a sample of parents of students receiving kits to determine freeridership and spillover from the kit measures.	X	
School Facility Staff Participant Surveys	Surveyed a sample of facility staff from a school receiving direct install-measures, and assessed the audit's effectiveness, and the status of energy-efficiency improvements.		X
Program Database Review	Ensured appropriate data were collected to inform the evaluation.	X	X
Ex-Ante Savings Review	Reviewed assumptions and calculations used in the program's *ex-ante* savings assumptions for student kits and school direct-install measures.	X	X

6.2.1 SAMPLE DESIGN AND DATA COLLECTION METHODS

The Evaluation Team developed samples, seeking to achieve precision of ±10% at the 90% confidence level per utility by the end of the three-year evaluation period. Table 98 shows the final sample disposition for various data-collection activities.

Table 98: Sample Disposition for Various Data-Collection Activities

Action	Population(1)	Targeted	Achieved
Implementer Interviews	N/A	2	2
Auditor Interviews	N/A	1	1
Student Participant Surveys(2)	83,222	31,208	34,426
Teacher Surveys	2,554	200	199
Parent/Guardian Survey	398	160	106
School Facility Staff Participant Surveys	93	35	28

(1) All populations listed were available at the time of the survey.
(2) Surveys included in the kits, conducted by GoodCents, with a survey response goal of 37.5%.

The Evaluation Team drew data collection samples using simple or stratified random sampling.[32] The utility-specific Technical Volumes provided achieved surveys per utility.

6.3 PROGRAM PERFORMANCE

Table 99 and Table 100 show reported program performance, compared to statewide and utility-level goals. Reported program savings do not reflect adjustments made for the evaluation.

Table 99: EES *Ex-Ante* Savings (kWh and kW) By Utility

Utility	kWh			kW		
	Goal	*Ex-Ante*	% Goals	Goal	*Ex-Ante*	% Goals
Duke	20,125,953	21,576,001	107%	N/A	80	N/A
I&M	2,293,216	3,968,064	173%	N/A	23	N/A
IPL	5,681,025	6,539,046	115%	N/A	90	N/A
IMPA	1,135,766	1,360,048	120%	N/A	12	N/A
NIPSCO	6,458,237	6,774,683	105%	N/A	30	N/A
Vectren	1,560,295	2,389,131	153%	N/A	50	N/A
Statewide	**37,254,492**	**42,606,973**	**114%**	**N/A**	**286**	**N/A**

Table 100: EES *Ex-Ante* Savings (Therms) By Utility

Utility	Therms		
	Goal	*Ex-Ante*	% Goals
Duke	235,420	252,003	107%
I&M	0	0	N/A
IPL	0	0	N/A
IMPA	0	0	N/A
NIPSCO	152,525	149,450	98%
Vectren	33,289	33,733	101%
Statewide	**421,234**	**435,186**	**103%**

[32] Simple random samples were drawn from the entire population, while stratified random samples were drawn randomly from subpopulations (strata), and then weighted to extrapolate to the greater population.

6.3.1 EDUCATION PROGRAM

Table 101 shows the number of reported kits distributed compared with 2013 program goals per each utility for the Education program.

Table 101: Education Program Participation by Utility and Statewide

Utility	Kits		
	Goal	Reported	% Achieved
Duke	44,402	44,426	100%
I&M	7,928	7,939	100%
IPL	11,592	11,611	100%
IMPA	2,723	2,743	101%
NIPSCO	13,445	13,464	100%
Vectren	2,646	3,039	115%
Statewide	**82,736**	**83,222**	**101%**

Table 102 shows, at the utility level, how reported program performance compared to goals established in program planning. The Education program achieved 105% of its *ex-ante* energy savings goals for electricity and 103% for gas. Savings reported by the program do not reflect adjustments made due to the evaluation.

Table 102: Education Program *Ex-Ante* Savings by Utility and Statewide[1]

Utility	kWh			Therms		
	Goal	*Ex-Ante*	% of Goal	Goal	*Ex-Ante*	% of Goal
Duke	20,103,153	20,114,852	100%	235,420	252,003	107%
I&M	2,054,976	3,521,333	171%	0	0	N/A
IPL	5,037,777	5,047,167	100%	0	0	N/A
IMPA	1,016,646	1,164,761	115%	0	0	N/A
NIPSCO	6,219,997	6,229,158	100%	152,525	149,450	98%
Vectren	1,250,583	1,442,543	115%	33,289	33,733	101%
Statewide	**35,683,132**	**37,519,814**	**105%**	**421,234**	**435,186**	**103%**

(1) The Education program did not report demand savings.

6.3.2 SADI PROGRAM

Tracking SADI program performance included the number of completed audits and closeout meetings performed in each utility's territory as well as savings achieved through the installation of direct-install measures. Table 103 shows how the number of reported assessments compared with 2013 program goals for each utility; Table 104 shows savings goals for direct-install measures and *ex-ante* values achieved.

Table 103: SADI Program Participation by Utility and Statewide

Utility	Audits		
	Goal	Reported	% Achieved
Duke	30	30	100%
I&M	10	10	100%
IPL	27	27	100%
IMPA	3	3	100%
NIPSCO	10	10	100%
Vectren	13	13	100%
Statewide	**93**	**93**	**100%**

Table 104: SADI Program *Ex-Ante* Results by Utility and Statewide[1]

Utility	kWh			kW		
	Goal	*Ex-Ante*	% of Goal	Goal	*Ex-Ante*	% of Goal
Duke[2]	22,800	1,461,149	6409%	0	80	N/A
I&M	238,240	446,731	188%	0	23	N/A
IPL	643,248	1,491,879	232%	0	90	N/A
IMPA	119,120	195,287	164%	0	12	N/A
NIPSCO	238,240	545,525	229%	0	30	N/A
Vectren	309,712	946,588	306%	0	50	N/A
Statewide	**1,571,360**	**5,087,159**	**324%**	**0**	**286**	**N/A**

(1) The SADI program did not report gas savings.

(2) Of the five direct-install measures, Duke originally planned to attribute only savings from the 18-watt CFLs to this SADI program; however, mid-program year the utility decided to capture direct-install savings from all measures through this program. The goals were not updated to reflect this change.

6.4 *Program Budget and Expenditures*

Table 105 and Table 106 show original subprogram and program level budgets and expenditures reported at the conclusion of 2013. The TPA reported spending: 101% of the total EES program budget; 101% of the statewide Education program budget; and 105% of the statewide SADI program budget.

Table 105: Subprogram-Level Budget and Expenditures

Utility	Education Program			SADI Program		
	Budget	Reported Expenditures	% of Budget Used	Budget	Reported Expenditures	% of Budget Spent
Duke	$3,765,321	$3,767,512	100%	$391,080	$378,420	97%
I&M	$645,186	$646,165	100%	$130,360	$132,045	101%
IPL	$944,079	$945,839	100%	$351,972	$323,575	92%
IMPA	$216,563	$218,393	101%	$65,180	$38,415	59%
NIPSCO	$1,136,393	$1,138,067	100%	$130,360	$127,095	97%
Vectren	$233,359	$269,179	115%	$169,468	$298,870	176%
Statewide	**$6,940,901**	**$6,985,155**	**101%**	**$1,238,420**	**$1,298,420**	**105%**

Table 106: Program-Level Budget and Expenditures

Utility	EES Program		
	Budget	Reported Expenditures	% of Budget Spent
Duke	$4,156,401	$4,145,932	100%
I&M	$775,546	$778,210	100%
IPL	$1,296,051	$1,269,414	98%
IMPA	$281,743	$256,808	91%
NIPSCO	$1,266,753	$1,265,162	100%
Vectren	$402,827	$568,049	141%
Statewide	**$8,179,321**	**$8,283,575**	**101%**

6.5 *EX-ANTE ENERGY SAVINGS*

*Ex-ant*e savings equal savings reported by the program, compared to goals set forth in program planning.

6.5.1 EDUCATION PROGRAM

The Evaluation Team determined Education program savings by applying a "per-kit" energy savings value to the number of kits distributed through the program. In the spring semester, the TPA, sourcing the Ohio TRM and the initial proposal to Energizing Indiana, designated each kit would save 417 kWh and 11.1 therms annually. In the fall semester, the TPA, with approval by the DSMCC, updated *ex-ante* kit savings to 487 kWh annually, citing the 2012 Evaluation Report. Gas savings per kit remained at the originally designated 11.1 therms per kit. No demand savings were reported for the energy-savings kits.

Table 107 outlines assumptions dictating electricity savings for each measure provided in the energy-savings kit for the 2013 spring semester. The electricity savings per kit were predicated on assumptions about installation rates for each kit measure and saturations of electric- versus gas-sourced water heaters.

Table 107: Spring Semester Planned *Ex-Ante* Energy (kWh) Savings per Kit

Kit Measure	Base *Ex-Ante* kWh Savings (a)	Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total *Ex-Ante* kWh per Kit (a*b*c*d)
CFLs (13 Watt)	44	75%	100%	3	99
CFLs (23 Watt)	78	66%	100%	3	154
Low-Flow Showerhead	608	60%	20%	1	73
Faucet Aerator	158	60%	20%	1	19
LED Night Light	39	80%	100%	1	31
Filter Tone Alarm	90	45%	N/A	1	41
Total				**10**	**417**

Table 108 outlines assumptions dictating electricity savings for each kit measure for the 2013 fall semester. The 2012 EM&V Report adopted these assumptions for the fall semester kits.

Table 108: Fall Semester Planned *Ex-Ante* Energy (kWh) Savings per Kit

Kit Measure	Base *Ex-Ante* kWh Savings (a)	Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total *Ex-Ante* kWh per Kit (a*b*c*d)
CFLs (13 Watt)	57	71%	100%	3	121
CFLs (23 Watt)	58	65%	100%	3	113
Low-Flow Showerhead	603	50%	52%	1	157
Faucet Aerator	243	48%	52%	1	60
LED Night Light	17	88%	100%	1	15
Filter Tone Alarm	46	43%	N/A	1	20
Total				**10**	**487**

For both school semesters, gas savings derived from the ratio of electric savings between the HEA program and the Education program; as these were not determined on a per-measure basis, measure-level assumptions were unavailable.

6.5.2 SADI PROGRAM

Table 109 outlines the electricity and demand savings for each direct-install measure.

Table 109: *Ex-Ante* SADI Program Measure-Level Savings

Kit Measure	*Ex-Ante* kWh	*Ex-Ante* kW
18-watt CFL	76	0.0252
LED Exit Sign	83	0.0100
Occupancy Sensor	1,210	0.0788
Smart Strips	169	0.0000
Vending Machine Sensor	1,612	0.0000
Audit	0	0.0000

6.6 *IMPACT ANALYSIS*

The evaluation effort included multiple data-collection efforts and analysis tasks for each subprogram, and, given the programs' different nature of delivery and performance tracking, the Evaluation Team used unique evaluation methods to conduct the impact analysis for each program.

The Education program's impact analysis included the following:

- A database review of the number of kits distributed;
- An engineering analysis of *ex-ante* energy savings per kit;
- An installation rate analysis (student Scantron survey and parent/guardian survey); and
- NTG analysis (parent/guardian survey).

The SADI program impact analysis included the following:

- A database review of the number of assessments and closeout meetings completed as well as the number of direct-install measures distributed;
- An engineering analysis of *ex-ante* energy savings for the direct-install equipment; and
- Savings attribution analysis (participant facility staff survey and assessment reports).

6.6.1 AUDITED SAVINGS

The impact evaluation process first reviewed the program database to confirm the number of kits distributed and the assessments conducted through the program, and to verify tracking and accurate reporting of program savings.

Education Program

Table 110 presents audited kit quantities, and energy and gas savings.

Table 110: Audited Education Program Demand Savings (kW) by Utility and Statewide

Utility	Number of Reported Kits	Number of Kits in Database	Total *Ex-Ante* kWh Savings	Total Audited kWh Savings	Total *Ex-Ante* Therm Savings	Total *Ex-Ante* Audited Savings
Duke	44,426	44,426	20,114,852	20,114,852	252,003	252,003
I&M	7,939	7,939	3,521,333	3,521,333	0	0
IPL	2,743	2,743	1,164,761	1,164,761	0	0
IMPA	11,611	11,611	5,047,167	5,047,167	0	0
NIPSCO	13,464	13,464	6,229,158	6,229,158	149,450	149,450
Vectren	3,039	3,039	1,442,543	1,442,543	33,733	33,733
Statewide	**83,222**	**83,222**	**37,519,814**	**37,519,814**	**435,186**	**435,186**

As shown, adjustments were not made to the audited number of kits distributed, as the database matched reported kits-per-utility exactly. The Evaluation Team also found correct tracking of the application of electric savings per kit and did not make savings adjustments.

SADI Program

Table 111 and Table 112 show audited measure and audit quantities as well as energy and demand savings. The Evaluation Team reviewed the tracking database for the SADI program's participating schools and did not adjust reported savings per measure or total savings and quantities reported on the TPA's portal.

Table 111: Audited SADI Program Measure-Level Savings and Quantity

Kit Measure	*Ex-Ante* kWh	Audited kWh	*Ex-Ante* kW	Audited kW	*Ex-Ante* Quantity of Measures	Audited Quantity of Measures
18-watt CFL	76	76	0.0252	0.0252	N/A	195
LED Exit Sign	83	83	0.0100	0.0100	N/A	34
Occupancy Sensor	1,210	1210	0.0788	0.0788	N/A	980
Smart Strips	169	169	0.0000	0.0000	N/A	548
Vending Machine Sensor	1,612	1,612	0.0000	0.0000	N/A	121
Audit	0	0	0.0000	0.0000	30	30

Table 112: Audited SADI Program Savings (kWh and kW) by Utility and Statewide

Utility	Total *Ex-Ante* kWh Savings	Total Audited kWh Savings	Total *Ex-Ante* kW Savings	Total Audited kW Savings
Duke	1,461,149	1,461,149	80	80
I&M	446,731	446,731	23	23
IPL	1,491,879	1,491,879	90	90
IMPA	195,287	195,287	12	12
NIPSCO	545,525	545,525	30	30
Vectren	946,588	946,588	50	50
Statewide	**5,087,159**	**5,087,159**	**286**	**286**

6.6.2 VERIFIED SAVINGS

Along with auditing the database, the Evaluation Team used survey data to generate installation and participation rates to verify audited savings for both subprograms.

Education Program

The Evaluation Team used survey data from the student Scantrons and the parent/guardian survey to adjust installation rates of each measure in the kit. The Evaluation Team used the same methods as the 2011 Vectren Core Plus Schools Evaluation, with the addition of the independent data-collection effort with parents and guardians of children receiving kits. Given this extra survey was deployed months after families received the kits, the Evaluation Team could survey families that had significant time to install kit measures and to compare the findings.

Similarly to 2012 findings, the parent/guardian survey produced higher installation rates than the student survey (see Table 113). This finding likely resulted from two factors:

1. Families had the kits for a longer period of time and could install more measures.
2. Parents in the sample likely installed more measures than other parents, as they had to complete the form from the kit and mail it back to the TPA for the Evaluation Team to include their contact information in the sample, thus indicating a “more involved parent,” more likely to engage in their children’s schoolwork.

As often happens (and is extremely difficult to avoid with survey research), student data likely contained biases.

First, students completed the Scantron survey shortly after receiving the kit, which did not allow families sufficient time to install every measure that they would want or plan to, likely causing underreported installation rates.

Some non-response bias also occurred, as 41.4% of Scantron surveys were returned, and installation rates could not be determined for the remaining 58.6%. This non-response bias could indicate an over-reported installation rate (as one cannot know if students not returning surveys installed any measures).

However, results from the participating teacher survey indicated 59% of teachers receiving less than 80% of surveys did not return all surveys received from students. Consequently, the Evaluation Team followed the same methodology in treating student data as that used in the Vectren Core Plus 2011 Evaluation, due to unknowns regarding numbers of surveys completed but not returned.

As no mechanism exists to measure the severity of the various biases, the Evaluation Team considered a straight average of the two survey results as the most appropriate method.

Table 113: Education Program Statewide Verification Adjustments

	Student Data Installation Rate	Parent Data Installation Rate	Statewide Installation Rate
CFLs (13 Watt)	51.4%	87.0%	**69.2%**
CFLs (23 Watt)	40.3%	83.2%	**61.7%**
Low-Flow Showerhead	44.3%	66.0%	**55.2%**
Faucet Aerators	42.8%	50.9%	**46.9%**
LED Night Light	79.3%	88.5%	**83.9%**
Filter Tone Alarm	32.2%	55.8%	**44.0%**

The Evaluation Team compared these results to installation rates reported by similar energy-education kit programs across the Midwest. As shown in Table 114, the Education Program's statewide installation rates aligned with measure installation rates reported by similar school education programs.[33] Two programs included in the comparison (Midwest Utilities A and C) strictly relied on student survey data to determine installation rates.

The remaining program (Midwest Utility B) adjusted reported installation rates, based on a non-response assumption. This program assumed students not responding to the student survey installed kit measures at 50% of those installed by respondents. In other words, the program assumed one-half of non-respondents did not install the measures, and the other half of non-respondents installed the measures at a rate equal to that of respondents.

Table 114. Comparison of Measure Installation Rates

	Energizing Indiana (2013)	Energizing Indiana (2012)	Midwest Utility A (2011)	Midwest Utility B (2011)	Midwest Utility C (2011)
CFLs (13 Watt)	69%	71%	70%	65%	79%
CFLs (23 Watt)	62%	65%	N/A	70%	N/A
Low-Flow Showerhead	55%	50%	52%	32%	53%
Faucet Aerators	47%	48%	54%	N/A	61%
LED Night Light	84%	88%	N/A	N/A	81%

[33] The methodologies used in calculating these installation rates varied by program.

Table 115 and Table 116 show adjustments for installation rates and the effect on audited per-measure savings for the spring and fall semesters.

Table 115: Spring Semester Education Program Statewide Verification Adjustments

Kit Measure	Base *Ex-Ante* Savings (a)	Evaluated Statewide Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total Verified kWh Savings (a*b*c*d)	Total Verified Therm Savings(1)
CFLs (13-watt)	44	69%	100%	3	91	N/A
CFLs (23-watt)	78	62%	100%	3	144	N/A
Low-Flow Showerhead	608	55%	20%	1	67	N/A
Faucet Aerators	158	47%	20%	1	15	N/A
LED Night Light	39	84%	100%	1	33	N/A
Filter Tone Alarm	90	44%	N/A	1	39	N/A
Statewide Total				**10**	**390**	**10.38**

(1) As *ex-ante* savings for gas were generated from a program electric savings ratio to HEA, measure-level verified savings were unavailable.

Table 116: Fall Semester Education Program Statewide Verification Adjustments

Kit Measure	Base *Ex-Ante* Savings (a)	Evaluated Statewide Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total Verified kWh Savings (a*b*c*d)	Total Verified Therm Savings(1)
CFLs (13-watt)	57	69%	100%	3	118	N/A
CFLs (23-watt)	58	62%	100%	3	107	N/A
Low-Flow Showerhead	603	55%	52%	1	174	N/A
Faucet Aerators	243	47%	52%	1	60	N/A
LED Night Light	17	84%	100%	1	15	N/A
Filter Tone Alarm	46	44%	N/A	1	20	N/A
Statewide Total				**10**	**494**	**11.25**

(1) As *ex-ante* savings for gas were generated from a program electric savings ratio to HEA, measure-level verified savings were unavailable.

These adjustments occurred at a statewide level rather than at the utility level, as the sample size of survey participants for each utility had to be significant at the statewide level for the first year and at the utility level over the course of the three-year evaluation effort. While data from the student surveys proved statistically significant across the utilities, data from the parent/guardian survey did not.

Table 117 summarizes *ex-ante* and verified energy savings per kit for each semester.

Table 117: Statewide Verified Energy Savings per Kit by Semester

Semester	*Ex-Ante* kWh Savings Per Kit	Verified kWh Savings Per Kit	*Ex-Ante* kW Savings Per Kit	Verified kW Savings Per Kit	*Ex-Ante* Therm Savings Per Kit	Verified Therm Savings Per Kit
Spring	417	390	N/A	N/A	11.10	10.4
Fall	487	494	N/A	N/A	11.10	11.2

Table 118 and Table 119 show utility and statewide verified energy savings for the Education program, including additional electric savings from the 2012 CFLs installed in 2013.

Table 118: Verified Energy Savings (kWh) by Utility and Statewide

Utility	*Ex-Ante* kWh Savings	Verified kWh Savings	Realization Rate (kWh)
Duke	20,114,852	19,676,328	98%
I&M	3,521,333	3,407,782	97%
IPL	5,047,167	4,831,662	96%
IMPA	1,164,761	1,100,593	94%
NIPSCO	6,229,158	6,160,182	99%
Vectren	1,442,543	1,444,533	100%
Statewide	**37,519,814**	**36,621,079**	**98%**

Table 119: Verified Gas Savings (Therms) by Utility and Statewide

Utility	*Ex-Ante* Therm Savings	Verified Therm Savings	Realization Rate (Therms)
Duke	252,003	255,229	101%
I&M	0	0	N/A
IPL	0	0	N/A
IMPA	0	0	N/A
NIPSCO	149,450	147,241	99%
Vectren	33,733	33,694	100%
Statewide	**435,186**	**436,165**	**100%**

CFL Storage to Installation

In addition to adjusting the installation rate for the kits, the Evaluation Team examined verified savings generated from bulbs not installed in 2012, but likely installed in 2013.

For the 2012 evaluation, the Evaluation Team calculated first-year savings from installed 13- and 23-watt bulbs, and did not credit verified savings for any bulb discarded or stored. Several studies, however, have shown that up to 99% of stored bulbs move into sockets within a few years, causing savings to occur several years after the initial purchase. The Evaluation Team calculated the verified savings impacts for the 2012 bulbs installed in 2013, as shown in Table 120.

Table 120. Electric (kWh) Savings from Y1 13- and 23-watt Bulbs Installed in Y2

Utility	Quantity of Bulbs Distributed in Y1	Quantity of Bulbs Installed in Y1	Quantity of Bulbs Installed in Y2	Second Year Savings (kWh)
Duke	236,700	161,389	36,472	2,285,198
I&M	29,616	20,193	4,563	285,925
IPL	59,388	40,493	9,151	573,356
IMPA	15,600	10,637	2,404	150,609
NIPSCO	69,192	47,177	10,661	668,008
Vectren	25,674	17,505	3,956	247,867
Statewide	**436,170**	**297,394**	**67,207**	**4,210,963**

The Evaluation Team used the UMP-recommended method to calculate savings from bulbs initially stored and later installed.

To generate these additional savings, the Evaluation Team applied the 2012 base *ex-ante* per bulb savings to the quantity of bulbs installed in 2013.[34] The Evaluation Team could not account for these additional bulbs in terms of gas savings, given the bundled way gas savings apply to kits and demand savings (as the TPA did not report demand savings for CFLs in 2013). The Summary of Impact Adjustments section, below, captures these additional verified (as well as *ex-post* gross and net) savings.

SADI Program

The Evaluation Team used data from the facility staff surveys to verify the installation and persistence rates of the direct-install measures. For each direct-install measure, surveyed facility members were asked: if all the recorded measures were installed; and if they remained installed at the time of the survey (i.e., if measures had been removed). Responses to the questions produced individual installation and persistent rates for the five direct-install measures. Table 121 shows these rates as applied to *ex-ante* savings to generate verified savings.

Table 121: SADI Program Statewide Verification Adjustments

Measure	Verified Installation Rate	Verified Persistence Rate
18-watt CFL	96.4%	100.0%
LED Exit Sign	87.5%	100.0%
Occupancy Sensor	100.0%	98.4%
Smart Strips	99.3%	99.8%
Vending Machine Sensor	100%	87.9%

Several measures received installation and persistence rates below 100% for the following reasons:

- One facility staff member reported receiving 10 CFLs and only installed four.
- One facility staff member reported receiving 28 LED exit signs and installed only 20.
- One facility staff member reported installing 101 occupancy sensors and removed 16.
- One facility staff member reported receiving 10 Smart Strips and only installed six.
- One facility staff member reported installing 12 Smart Strips and removing one.

[34] Base *ex-ante* savings in 2012 of 44kWh for 13-watt CFLs and 78 kWh for 23-watt CFLs.

- Two facility staff members reported installing all vending machine sensors, but removed some due to technical issues or because the machine vendor requested their removal.

Table 122 shows utility and statewide verified energy savings for the SADI program. Overall, SADI realized 97% of electricity and 98% of demand savings.

Table 122: Verified Energy Savings (kWh and kW) by Utility and Statewide

Utility	*Ex-Ante* kWh Savings	Verified kWh Savings	Realization Rate (kWh)	*Ex-Ante* kW Savings	Verified kW Savings	Realization Rate (kW)
Duke	1,461,149	1,417,615	97%	80	79	98%
I&M	446,731	431,029	96%	23	22	98%
IPL	1,491,879	1,458,606	98%	90	89	98%
IMPA	195,287	191,224	98%	12	12	98%
NIPSCO	545,525	527,021	97%	30	30	98%
Vectren	946,588	927,353	98%	50	49	98%
Statewide	**5,087,159**	**4,952,848**	**97%**	**286**	**281**	**98%**

6.7 *Ex-Post Savings*

Ex-Post savings reflect engineering adjustments made to *ex-ante* measure savings claimed by the program. Due to the varying nature of program delivery between the subprograms, the Evaluation Team conducted *ex-post* reviews separately, using methodologies tailored to each subprogram.

6.7.1 Education Program

The Evaluation Team calculated *ex-post* electric energy, demand, and gas savings for each kit measure using engineering reviews and survey results, and evaluated a statewide per-kit savings value of 466.80 kWh, 0.063 kW, and 13.37 therms.

The evaluated *ex-post* savings shown in Table 123 represent statewide average savings for each measure across all utilities. This statewide average was determined by weighting the calculated, utility-specific savings of each measure by the total number of school kits distributed.

Table 123: Summary Table of Statewide Engineering Review Findings by Measure

Kit Measure	*Ex-Post* Savings Per Measure (kWh)	*Ex-Post* Savings Per Measure (kW)	*Ex-Post* Savings Per Measure (Therms)
3 CFLs (13-watt)	97.28	0.012	(1.49)
3CFLs (23-watt)	83.42	0.011	(1.28)
Low-Flow Showerhead	116.53	0.006	5.20
Faucet Aerator	142.77	0.003	6.36
LED Night Light	6.83	0.000	0.00
Filter Tone Alarm	19.98	0.032	4.58
Kit Total	**466.80**	**0.063**	**13.37**

The engineering team applied the same methodologies to determine school kit savings as in the previous year's evaluation. Student and parent surveys were used to calculate utility-specific inputs, such as: the number of people per home, shower flow rates, and hot water heater fuel saturations. The

Evaluation Team applied these inputs, along with other inputs from the Indiana TRM, to determine savings for each utility for each measure.

Overall, inputs did not change significantly year over year, resulting in similar findings from the previous evaluation. Two water measures in the school kits, however, proved to be notable exceptions: kitchen faucet aerators and showerheads. For these measures, the Evaluation Team adopted inputs from the 2012 Cadmus Michigan water metering study to replace several Indiana TRM inputs, while retaining the same Indiana TRM algorithms. Updated inputs included: length of use, baseline flow rates, point-of-use water temperature, and numbers of shower per day. These updated inputs drove down the *ex-post* base savings for the showerhead measure by approximately 210 kWh per unit and drove up kitchen aerator savings by approximately 350 kWh per unit year-over-year.

Also of note, the Evaluation Team updated the CFL HOUs to be consistent with the Indiana metering study. The Evaluation Team adjusted the metering study HOU to account for the presence of children in the home, which increased the HOU value slightly.

Table 124 and Table 125 provide summary findings for the *ex-post* kit savings review, by utility.

Table 124: *Ex-Post* Education Program Energy (kWh) Savings per Utility and Statewide

Utility	Verified kWh Savings	*Ex-Post* kWh Savings	Verified kW Savings	*Ex-Post* Savings
Duke	19,676,328	22,347,370	N/A	2,884
I&M	3,407,782	3,608,527	N/A	493
IPL	4,831,662	5,430,233	N/A	738
IMPA	1,100,593	1,363,803	N/A	175
NIPSCO	6,160,182	4,768,039	N/A	783
Vectren	1,444,533	1,329,992	N/A	193
Statewide	**36,621,079**	**38,847,964**	**N/A**	**5,266**

Table 125: *Ex-Post* Education Program Gas (Therms) Savings per Utility and Statewide

Utility	Verified Therm Savings	*Ex-Post* Therm Savings
Duke	255,406	706,508
I&M	0	87,824
IPL	0	163,715
IMPA	0	41,067
NIPSCO	147,393	79,563
Vectren	33,723	34,071
Statewide	**436,522**	**1,112,748**

6.7.2 SADI PROGRAM

The Evaluation Team calculated *ex-post* electric energy, demand, and gas savings for each direct-install measure through engineering reviews and survey results.

Evaluated *ex-post* savings shown in Table 126 and Table 127 represent the statewide average savings for each measure across all utilities. This statewide average was determined by weighting the calculated, utility-specific savings of each measure by the total number of measures distributed.

Table 126: Statewide *Ex-Post* Savings (kWh and kW) by Measure

Direct Install Measure	Verified Savings Per Measure (kWh)	Base *Ex-Post* Savings Per Measure (kWh)	Verified Savings Per Measure (kW)	Base *Ex-Post* Savings Per Measure (kW)
18-watt CFL	73	100	0.024	0.033
LED Exit Sign	73	95	0.009	0.012
Occupancy Sensor	1,191	316	0.078	0.022
Smart Strips	168	45	0.000	0.000
Vending Machine Sensor	1,417	1,612	0.000	0.000

Table 127: Statewide *Ex-Post* Savings (Therms) by Measure

Direct Install Measure	Verified Savings Per Measure (Therms)	Base *Ex-Post* Savings Per Measure (Therms)
18-watt CFL	N/A	(0.32)
LED Exit Sign	N/A	(0.32)
Occupancy Sensor	N/A	(1.02)
Smart Strips	N/A	0.00
Vending Machine Sensor	N/A	0.00

The Evaluation Team applied algorithms and inputs from the Indiana TRM to determine evaluated savings. Inputs were refined using primary data sources, such as the facility staff survey and assessment reports when possible and appropriate.

Evaluated savings for three measures resulted in savings very similar to the *ex-ante* savings. These measures included: 18-watt CFLs, LED exit signs, and vending machine sensors. Evaluated savings for the remaining two measures, lighting occupancy sensors and Smart Strips, resulted in reduced savings compared to *ex-ante* savings.

Evaluated savings for the lighting occupancy sensor measure were driven down when the Evaluation Team updated the "watts controlled" input. This input had an evaluated wattage of 434-watts compared to the *ex-ante* value of 1,600-watts. Survey data indicated lighting occupancy sensors overwhelmingly were installed in small rooms, such as closets, offices, and bathrooms. This installation location drove down the wattage amount the sensors controlled, reducing overall savings.

The Evaluation Team revised the occupancy Smart Strip savings, largely due to two findings: facility staff survey data indicated installation of Smart Strips almost entirely in school computer labs; and Smart Strip specifications suggested using devices with computer monitors. *Ex-ante* savings were based on the Indiana TRM calculation, which assumed the device would be used with a "laser printer" and a "multi-function device, laser (scanner, fax)"; Smart Strips product information warns against plugging both devices into Smart Strips.[35] The Evaluation Team's evaluated savings assumed Smart Strips were used with computer monitors and adjusted the HOUs to reflect those of a school.

[35] The specification sheet for occupancy power strip Isolé IDP-3050: "The IDP-3050 is ideal for controlling task lighting and computer monitors. Additional devices for the controlled outlets include space heaters, fans and other equipment that can be turned off during unoccupied periods. Devices such as CPUs and fax machines should be plugged into the uncontrolled outlets."

Table 128 and Table 129 provide summary findings for an *ex-post* savings review by utility. Savings per measure vary by utility as savings calculations use inputs specific to each utility's territory and the participating schools.

Table 128: *Ex-Post* Gross Energy (kWh and kW) Savings per Utility and Statewide

Utility	Verified kWh Savings	Total *Ex-Post* kWh Savings	Verified kW Savings	Total *Ex-Post* kW Savings
Duke	1,417,615	515,244	79	28
I&M	431,029	174,677	22	8
IPL	1,458,606	468,155	89	30
IMPA	191,224	58,578	12	3
NIPSCO	527,021	184,803	30	11
Vectren	927,353	289,530	49	17
Statewide	**4,952,848**	**1,690,987**	**281**	**97**

Table 129: *Ex-Post* Gross Energy (Therms) Savings per Utility and Statewide

Utility	Verified Therm Savings	Total *Ex-Post* Therm Savings
Duke	N/A	(1,033)
I&M	N/A	(354)
IPL	N/A	(1,195)
IMPA	N/A	(162)
NIPSCO	N/A	(340)
Vectren	N/A	(575)
Statewide	**N/A**	**(3,659)**

6.8 *NET SAVINGS*

Net savings reflect the application of the program NTG ratio to *ex-post* energy savings. Freeridership and spillover comprise the two NTG ratio components. Freeridership occurs when participants would have undertaken the same energy-efficient actions in the program's absence.

$$\text{NTG} = 1 - \text{Freeridership} + \text{Spillover}$$

6.8.1 EDUCATION PROGRAM

Table 130 summarizes freeridership, spillover, and NTG estimates for each measure included in the energy-efficiency kit. The overall statewide program NTG estimate derives from weighting each individual measure-level NTG estimate by the total energy savings of each respective measure. A 97% weighted, statewide, electric NTG estimate results for each kit. The subsequent section provides freeridership and spillover methods and results.

Table 130: Education Program Freeridership, Spillover, and NTG Summary[(1)]

Measure	Freeridership	Spillover	NTG
3 CFLs (13-watt)	39%	18%	78%
3CFLs (23-watt)	39%	18%	78%
Low-Flow Showerhead	10%	18%	107%
Faucet Aerator	7%	18%	110%
LED Night Light	18%	18%	100%
Filter Tone Alarm	1%	18%	117%

(1) NTG values were applied by measure and the net savings were rolled up into a kit-level estimate. Differences in the weighting between *ex-post* measure-level values for electricity, demand, and gas savings caused these variations in NTG values across savings type.

Applying measure-level NTG ratios to the utility-level savings per measure resulted in the net savings for the Education program shown in Table 131. NTG ratios varied by utility and by savings type due to different *ex-post* savings values per utility and measure. A detailed summary of the NTG approach and its establishment by measure can be found in Appendix C of the *2012 Energizing Indiana Programs EM&V Report*.

Table 131: Education Program Net Savings by Utility and Statewide

	NTG (kWh)	Net kWh Savings	NTG (kW)	Net kW Savings	NTG (Therms)	Net Therm Savings
Duke	99%	22,047,728	102%	2,944	116%	816,325
I&M	97%	3,484,496	102%	502	125%	109,582
IPL	98%	5,300,004	102%	750	116%	190,678
IMPA	98%	1,331,056	102%	178	116%	47,613
NIPSCO	91%	4,356,224	101%	794	139%	110,232
Vectren	96%	1,283,318	101%	195	117%	40,021
Statewide	**97%**	**37,802,826**	**102%**	**5,363**	**118%**	**1,314,451**

6.8.2 SADI PROGRAM

Due to significant program changes implemented in 2013, the Evaluation Team approached the net savings review differently than in the previous evaluation. As the program did not claim savings in 2012, the Evaluation Team assigned the SADI program a NTG of 100%. However, with the addition of direct-install measures to the program design and the program's growth in 2013, the Evaluation Team collected information from schools during the facility staff surveys to inform the NTG ratio, particularly to discover spillover from the audit recommendations.

Freeridership

As in 2012, the Evaluation Team assumed freeridership did not occur for the energy savings attributed to the SADI program. Since commercial building energy audits preformed on school facilities prove highly expensive and schools tend to have limited budgets, the Evaluation Team assumed the school would not have received an energy audit using its own funds outside of the program. The Evaluation Team also assumed schools would not have installed the direct-install measures without program assistance in 2013.

Spillover

The SADI program design's audit component seeks to funnel schools through other prescriptive programs, which capture savings for all measures implemented that qualify for rebates. However, many recommendations offered in the assessment reports either did not qualify for a rebate or depended on behavioral changes (e.g., thermostat set points) that could be tracked without verification or follow-up. Considering the potential savings accruing through these scenarios, the Evaluation Team conducted surveys with participating facility staff to understand recommendations adopted in 2013 that did not qualify for a rebate.

The Evaluation Team interviewed 28 representatives from participating schools and found, of the total number of recommendations implemented in the first year, 64% did not qualify for a rebate and were not attributed to or tracked by any efficiency program. Therefore, savings from these implemented recommendations could be directly attributable to the SADI program in the form of spillover.

The Evaluation Team used calculated savings values from each school's assessment report to assign spillover savings to any recommendation implemented and not receiving a rebate to calculate a savings-per-school value (discounting for partial implementation). Table 132 summarizes average spillover savings per recommendation type, per school.

Table 132: Spillover Energy (kWh and Therms) Savings by Measure per School

Recommendation Type	kWh Per School	Therms Per School
Lighting	789	-11
Occupancy sensors	2,057	0
Air temperature controls	3,000	201
Heating, Ventilation, Air Conditioning (HVAC)	81	182
Building re-commissioning	42,420	1,059
Grand Total	**48,347**	**1,432**

The Evaluation Team multiplied per-school values by the number of assessments conducted in each utility territory to arrive at the total spillover savings for the SADI program. Table 133 and Table 134 present net savings for the SADI program, including adjustments for freeridership and positive adjustments for spillover.

Table 133: SADI program Net Energy and Demand (kWh and kW) Savings by Utility and Statewide

Utility	*Ex-Post* kWh Savings (a)	Spillover Savings (kWh) (b)	Net kWh Savings (a+b)	*Ex-Post* kW Savings	Net kW Savings
Duke	515,244	1,450,421	1,965,665	28	28
I&M	174,677	483,474	658,151	8	8
IPL	468,155	1,305,379	1,773,534	30	30
IMPA	58,578	145,042	203,621	3	3
NIPSCO	184,803	483,474	668,276	11	11
Vectren	289,530	628,516	918,045	17	17
Statewide	**1,690,987**	**4,496,305**	**6,187,292**	**97**	**97**

Table 134: SADI program Net Gas (Therms) Savings by Utility and Statewide

Utility	*Ex-Post* Therm Savings (a)	Spillover Savings (Therms) (b)	Net Therm Savings (a+b)
Duke	(1,033)	42,961	41,928
I&M	(354)	14,320	13,966
IPL	(1,195)	38,665	37,469
IMPA	(162)	4,296	4,134
NIPSCO	(340)	14,320	13,980
Vectren	(575)	18,616	18,042
Statewide	**(3,659)**	**133,178**	**129,519**

6.9 *Summary of Impact Adjustments*

The following tables show all adjustments made to energy savings claimed by the programs in PY2.

Table 135: PY2 Achieved Savings Summary (kWh)

	Planned kWh	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	20,125,953	21,576,001	21,576,001	21,093,942	98%	22,862,613	24,013,393
I&M	2,293,216	3,968,064	3,968,064	3,838,811	97%	3,783,204	4,142,647
IPL	5,681,025	6,539,046	6,539,046	6,290,268	96%	5,898,388	7,073,538
IMPA	1,135,766	1,360,048	1,360,048	1,291,817	95%	1,422,382	1,534,677
NIPSCO	6,458,237	6,774,683	6,774,683	6,687,203	99%	4,952,841	5,024,500
Vectren	1,560,295	2,389,131	2,389,131	2,371,885	99%	1,619,522	2,201,364
Statewide	**37,254,492**	**42,606,973**	**42,606,973**	**41,573,927**	**98%**	**40,538,951**	**43,990,118**

Table 136: PY2 Achieved Savings Summary (kW)

	Planned kW	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	0	80	80	79	98%	2,912	2,972
I&M	0	23	23	22	98%	501	510
IPL	0	90	90	89	98%	768	780
IMPA	0	12	12	12	98%	179	182
NIPSCO	0	30	30	30	98%	794	805
Vectren	0	50	50	49	98%	210	213
Statewide	**0**	**286**	**286**	**281**	**98%**	**5,363**	**5,461**

Table 137: PY2 Achieved Savings Summary (Therms)

	Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Therms	Net kW Therms
Duke	235,420	252,003	252,003	255,406	101%	705,475	858,253
I&M	0	0	0	0	N/A	87,470	123,548
IPL	0	0	0	0	N/A	162,520	228,147
IMPA	0	0	0	0	N/A	40,905	51,747
NIPSCO	152,525	149,450	149,450	147,393	99%	79,223	124,213
Vectren	33,289	33,733	33,733	33,723	100%	33,497	58,063
Statewide	**421,234**	**435,186**	**435,186**	**436,522**	**100%**	**1,109,089**	**1,443,970**

The following tables show savings achieved in PY2, plus additional savings from delayed installations from PY1: savings generated from some CFLs distributed in kits in PY1 but not installed that year.

Table 138: PY2 Achieved Savings Summary (kWh)

	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	20,125,953	21,576,001	21,576,001	23,379,141	108%	24,462,618	25,515,284
I&M	2,293,216	3,968,064	3,968,064	4,124,736	104%	3,999,228	4,345,424
IPL	5,681,025	6,539,046	6,539,046	6,863,624	105%	6,307,013	7,457,106
IMPA	1,135,766	1,360,048	1,360,048	1,442,426	106%	1,535,482	1,640,842
NIPSCO	6,458,237	6,774,683	6,774,683	7,355,211	109%	5,510,464	5,547,929
Vectren	1,560,295	2,389,131	2,389,131	2,619,753	110%	1,802,446	2,373,071
Statewide	**37,254,492**	**42,606,973**	**42,606,973**	**45,784,890**	**107%**	**43,617,251**	**46,879,657**

Table 139: PY2 Achieved Savings Summary (kW)

	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	0	80	80	79	98%	3,121	3,168
I&M	0	23	23	22	98%	527	535
IPL	0	90	90	89	98%	822	830
IMPA	0	12	12	12	98%	192	195
NIPSCO	0	30	30	30	98%	854	862
Vectren	0	50	50	49	98%	234	235
Statewide	**0**	**286**	**286**	**281**	**98%**	**5,751**	**5,825**

Table 140: PY2 Achieved Savings Summary (Therms)

	Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Therms	Net kW Therms
Duke	235,420	252,003	252,003	255,406	101%	685,251	839,269
I&M	0	0	0	0	0%	82,297	118,692
IPL	0	0	0	0	0%	157,322	223,267
IMPA	0	0	0	0	0%	39,542	50,468
NIPSCO	152,525	149,450	149,450	147,393	99%	67,303	113,024
Vectren	33,289	33,733	33,733	33,723	100%	31,285	55,987
Statewide	**421,234**	**435,186**	**435,186**	**436,522**	**100%**	**1,063,000**	**1,400,707**

Table 141: Lifetime Savings Achieved by Schools

Utility	Lifetime *Ex-Post* kWh
Duke	162,359,282
I&M	25,917,264
IPL	41,213,557
IMPA	9,857,458
NIPSCO	32,945,470
Vectren	11,526,608
Statewide	**283,819,639**

6.10 *Process Analysis*

The Education program and the SADI program process analysis detailed in this chapter derived from the following evaluation activities:

- Program implementer interviews (n=2)
    - GoodCents staff
    - CLEAResult staff
- Parent comment cards (n=479)
- Student survey results (n= 34,426)
- Participant teacher surveys (n=199)
- Facility staff participant surveys (n=28)

6.10.1 PROGRAM MARKETING

Education Program

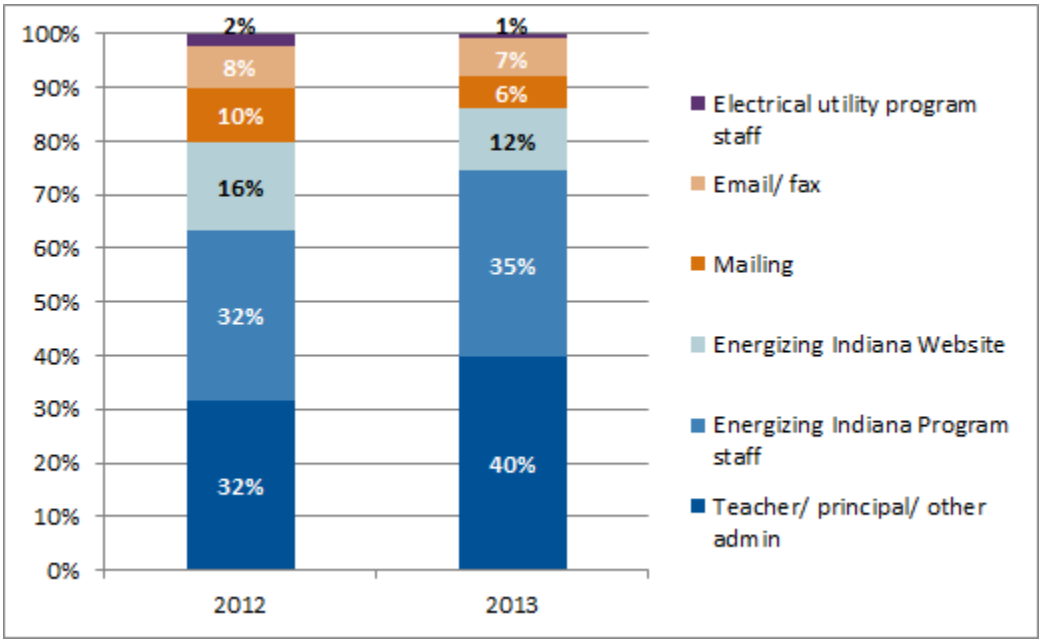
As in PY1, the EES program implementer, CLEAResult, subcontracted with Research Action Programs (the implementing subcontractor) to conduct day-to-day operations for the Education program. The implementing subcontractor managed all program outreach, teacher enrollment, and distributions of program materials.

Using a list of ZIP codes within each participating utility's service territory, the implementing subcontractor generated a potential list of participating teachers for the utilities to approve. Once approved, the implementing subcontractor conducted targeted outreach through a combination of e-mail, fax, and phone calls.

As shown in Figure 40, program awareness in the market increased: the number of participating teachers citing word-of-mouth from teacher/principal/other administrator rose from 32% in 2012 to 40% in 2013.[36] Word-of-mouth generated the greatest program awareness for the Education program in 2013, cited by 40% of surveyed teachers. Participants also cited direct outreach as a common source of program awareness, noted by 35% of teachers (an increase from 32% in 2012).[37]

[36] P-value = 0.00; this difference is statistically significant (α=0.1).
[37] P-value = 0.1; this difference is statistically significant (α=0.1).

Figure 40. How Did You First Learn about the Energizing Indiana Schools Education Program?



2012 n=441, 2013 n=199

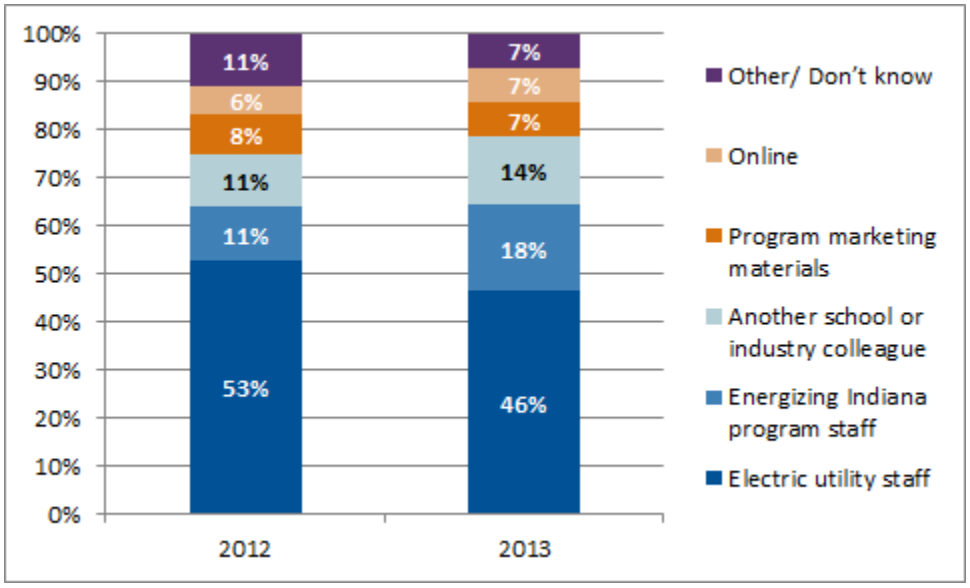
SADI Program

In 2012, the participating utilities primarily conducted their own outreach to schools for the SADI program, with only Duke Energy utilizing the program implementer for school recruitment. In 2013, the program implementer assumed responsibility for all direct outreach to schools. The program implementer reported that each utility provided a list of qualified schools, from which they recruited. The program implementer noted this change improved overall program delivery.

In addition, the TPA added a sign-up form to the Energizing Indiana website for interested schools to enroll in the SADI program. Due to the program's participation limits set by the utilities, the TPA reported schools signing up for the program through the website might not always be chosen to participate during a specific program year. However, all schools signing up through the website enter a wait list, which generates leads for the program implementer to recruit from in future program years.

Despite the outreach changes in 2013, participating facility staff reported similar sources of program awareness as cited in 2012 (see Figure 41). Similarly to 2012, roughly one-half (53% in 2012, compared to 46% in 2013) of participating facility staff reported they first learned about the SADI program through their electric utility. Direct outreach from Energizing Indiana program staff provided the second most common source of program awareness in 2013, cited by 18% of surveyed facility staff.

Figure 41. How Did You First Learn about the SADI Program?



(2012 n= 36, 2013 n=28)

6.10.2 PARTICIPANT SATISFACTION

Education Program

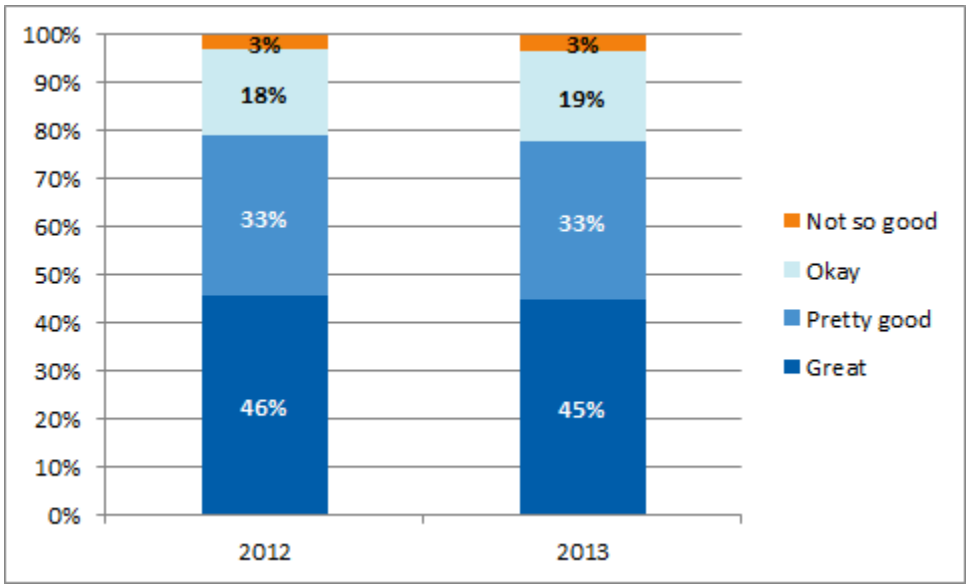
The TPA and program implementer reported high satisfaction levels with the Education program. Both parties reported communications among program stakeholders (e.g., the TPA, program implementer, and the implementing subcontractor) significantly improved in the program's second year. Also notable, funding for the Education program proved sufficient to fully support the program and to meet its goals.

The TPA reported the Education program participants consistently received the program well, specifically noting that students and their families appreciated that the kits provided an activity they could do together as a family. Participants—including students, parents, and teachers—expressed high satisfaction levels with their overall program experience.

Students rated the Education program as part of the student surveys returned by participating teachers. As shown in Figure 42, student satisfaction with the program consistently ran high. The majority of participating students rated the Education program as "great" (a slight decrease from 46% in 2012 to 45% in 2013)[38] or "pretty good" (33% in 2012 and 2013).

[38] P-value = 0.01; this difference is statistically significant (α=0.1).

Figure 42. How would you Rate the Energizing Indiana School Education Program?[1]



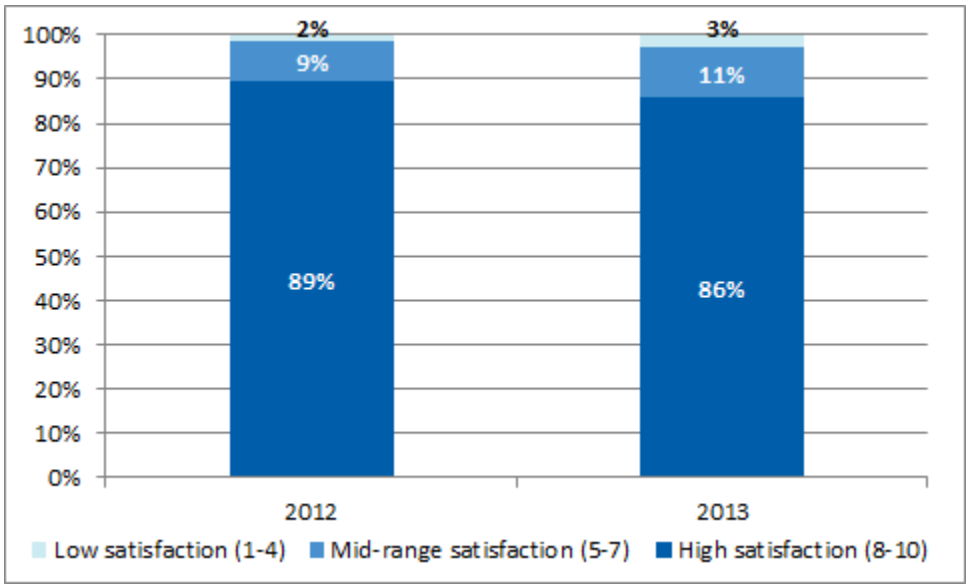
(1) Surveys without a response were removed from the population.
2012 N= 33,833, 2013 N= 32,100

Two-thirds (66%) of parents filling out and returning the parent comment card included in participating students' kits provided commentary on the Education program, with nearly all of it positive. Parents' comments regarding their satisfaction with their program experience included the following:

- *"Wonderful tool and easy instructions. We will definitely save energy and money."*
- *"Now my fifth-grader understands more about saving water when showering and doing dishes. Plus, I couldn't have went out and bought all [the kit equipment] at one time. Thanks again."*
- *"My child was very excited to be able to teach us about saving energy. I believe it is a good program. Thank you!"*
- *"We had a lot of fun setting up and testing. It was fun for the whole family. Plus, we all learned a lot about saving energy and money."*

Participating teacher satisfaction also remained consistently high in 2013. As shown in Figure 43, 86% of surveyed teachers in 2013 reported high satisfaction levels with the Education program overall, compared to 89% of teachers in 2012.

Figure 43. Overall, On a Scale of 1-10 How Satisfied Are You with the Energizing Indiana Schools Education Program?



2012 n= 441, 2013 n=199

Other indicators of teacher's high satisfaction included:

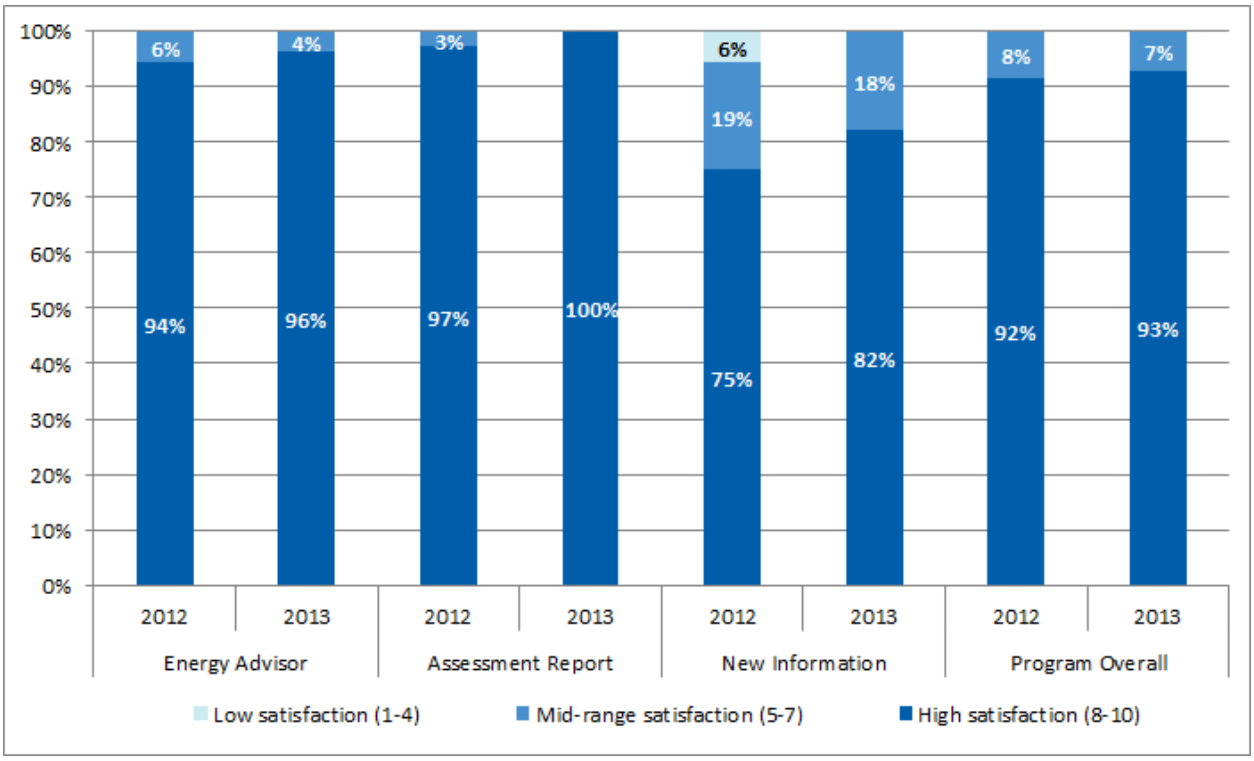
- More than three-quarters (79%) of participants rated the teaching materials they received through the program as highly effective (rated 8 to 10) on a scale of 1 to 10, where 1 is not at all effective and 10 is very effective.
- Nearly two-thirds (65%) of teachers reported the conservation tool kit as the most beneficial aspect of the program overall.
- Almost all (89%) surveyed teachers reported they would likely recommend the program to other teachers (rated 8 to 10) on a scale of 1 to 10, where 1 is not at all likely and 10 is very likely.
- The majority (68%) of teachers agreed (rated 8 to 10) with the statement: "my students understood the lessons/curriculum" on a scale of 1 to 10, where 1 is strongly disagree and 10 is strongly agree.
- Seventy percent of teachers agreed (rated 8 to 10) with the statement: "my students were engaged in the lessons" on a scale of 1 to 10, where 1 is strongly disagree and 10 is strongly agree.

SADI Program

The program implementer reported high satisfaction levels with the SADI program, stating the SADI program delivery ran smoothly during the 2013 program year, despite the addition of the direct-install component to the program offering.

Figure 44 illustrates participating facility staff's satisfaction with: the knowledge and professionalism of the energy advisor who conducted their energy assessment; the energy assessment report; the amount of new information they learned through participation; and their program experience overall. The vast majority of participants reported high satisfaction levels in all four categories, with results similar to those reported in the *2012 Energizing Indiana Programs EM&V Report*.

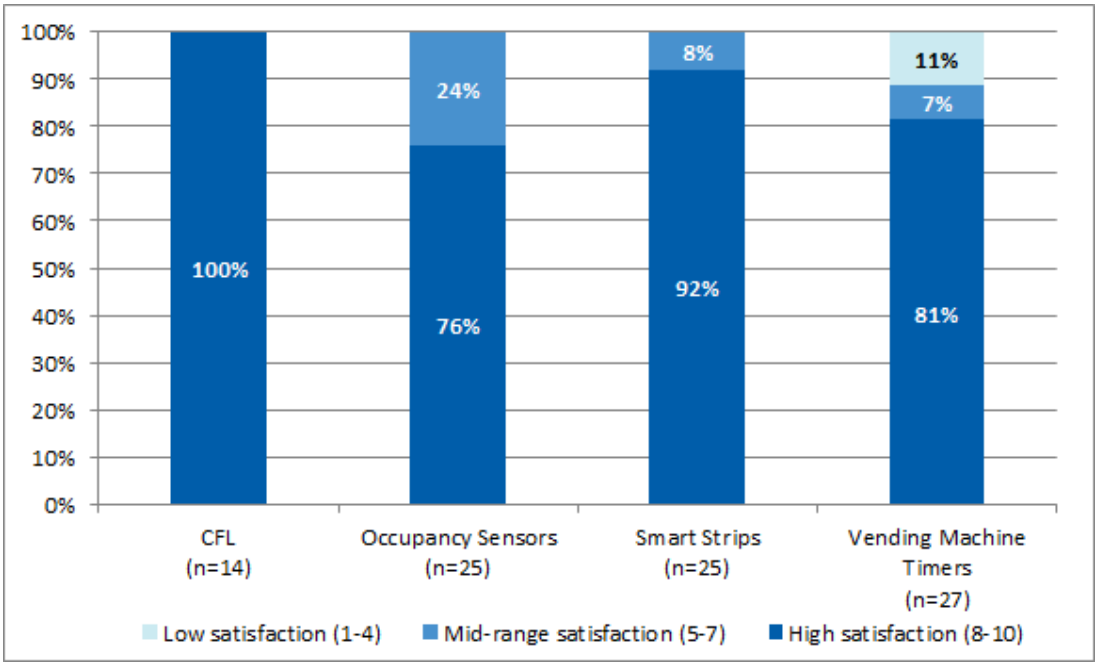
Figure 44. How Would You Rate Your Satisfaction with the…



1-10 Scale, with 1 Being Extremely Dissatisfied and 10 Being Extremely Satisfied.
2012 n=36, 2013 n = 28

As indicated in Figure 45, surveyed participants also remained highly satisfied with the SADI program's direct-install measures. More than 75% of participants reported high satisfaction (rated 8 to 10) with each of the four measures.

Figure 45. How Satisfied are You with the…



1-10 scale, with 1 being Extremely Dissatisfied and 10 Being Extremely Satisfied.

As shown above, the only measure receiving low satisfaction ratings (rated 1 to 4) was the vending machine timer. The most common complaint with this measure was the vending machine companies did not want the sensors installed on their machines (over 10% of vending machine sensors were removed after installation due to this issue). One participant specified a vending machine company complained that the quality of products decreased due to the sensors (i.e., customers complained that the beverages dispensed by the machines were not as cold as they preferred). Another teacher suggested the program implementer should contact the vending machine companies directly to discuss the program and the vending machine timers. This participant felt the program implementer may have realized more success implementing the measure using this approach.

The majority (71%) of participant facility staff reported no SADI program aspects that proved challenging. However, the most common (mentioned by four participants) program aspects that participants cited as challenging were: finding a time to schedule the assessment, direct-install, and close-out meeting that proved convenient for the program implementer and the school's staff. Two participants also found the direct-install component challenging, especially finding a time to install the occupancy sensors during school hours.[39]

[39] All direct-install measures installed by Energizing Indiana staff or a third-party vendor were installed during school hours.

6.10.3 PROGRAM OPERATIONS

Education Program

Once a teacher signed up for the Education program, the implementing subcontractor sent the teacher teaching materials and take-home kits for each student. The program's curriculum included several lesson topics (e.g., electricity and water conservation), which could be taught all at once or throughout the semester. The program curriculum aligned with Indiana state education requirements. Teachers had to distribute take-home kits to their students, and students were encouraged to install the measures at home with their families.

Once kit measures had been installed, students and their families completed an at-home student survey. Students completed a Scantron form with their survey answers and returned the form to their teacher. Once a participating teacher sent in at least 80% of their classroom's student survey data, he/she received a $50 stipend.

Delivery Challenges

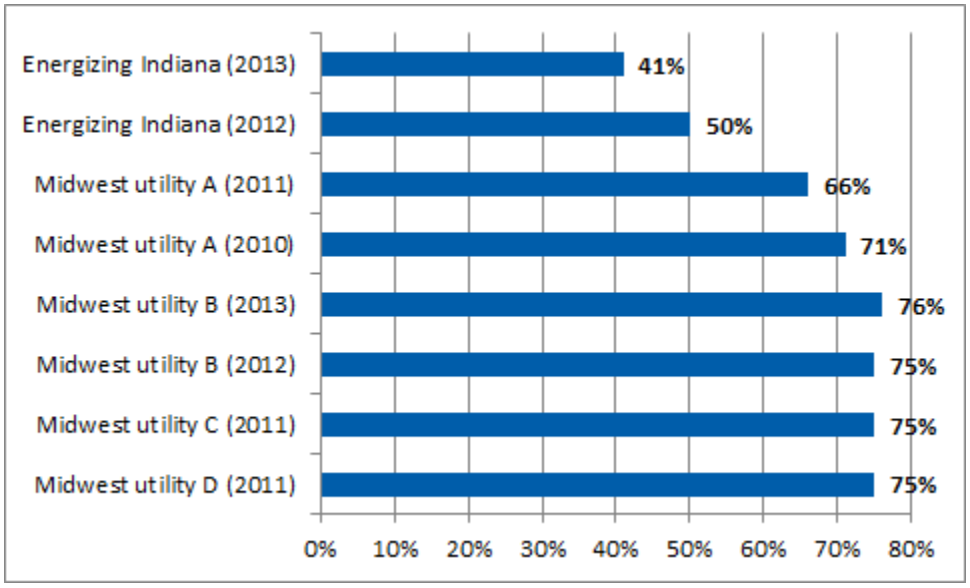
The Education program overcame many of the delivery challenges reported in the *2012 Energizing Indiana Programs EM&V Report*. However, although the TPA and program implementer reported high satisfaction with program delivery, a few challenges arose in 2013, including: student survey data collection, and grade-specific curriculum content.

Student Survey Data Collection

An important program component involved motivating participating teachers to collect student surveys and send them to the implementing subcontractor. Student survey data proved critical to the impact evaluation, as variables such as installation rate, water heater fuel type, and other household characteristics are were directly from these surveys to inform the electric and gas savings for each kit.

The TPA sought to receive 37.5% of overall student surveys from teachers, a goal achieved in 2013: data provided by the TPA indicated a 41% response rate for student surveys. The 2013 response rate, however, decreased in comparison to 2012, when participants returned 50% of the student surveys. The Evaluation Team compared these results to student survey response rates reported by similar energy-education kit programs across the Midwest. As shown in Figure 46, although the Education program exceeded the response goals in 2012 and 2013, it saw the lowest response rates of the other school programs. Student survey response rates among similar school programs ranged from 57% to 76%.

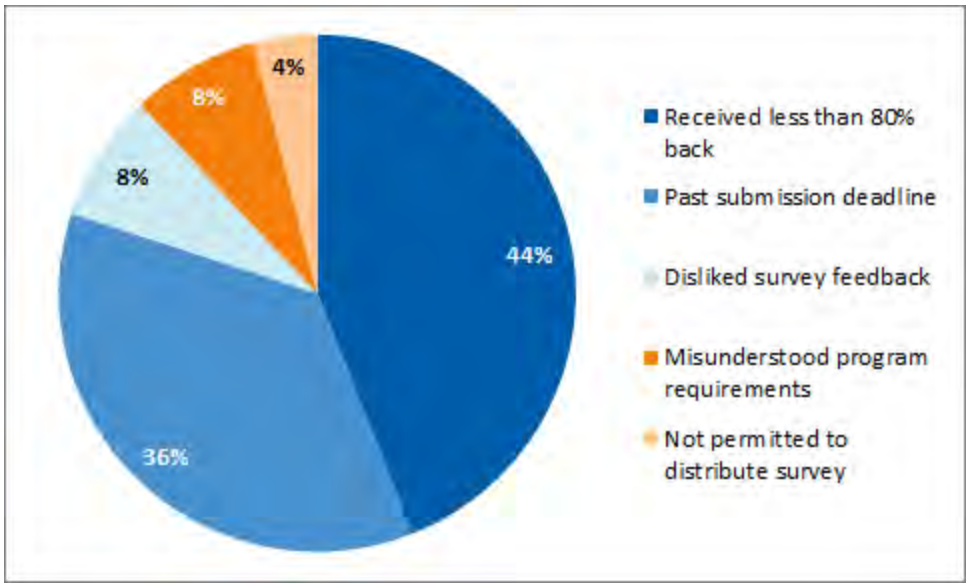
Figure 46. Comparison of Student Survey Response Rate



According to teacher survey results, more than three-quarters (78%) of teachers reported they received 80% or more of the student surveys from their class. Of these teachers, nearly all (95%) mailed all student surveys received. The remaining 5% of teachers reported they did not receive all surveys from their students prior to the submission deadline; so they did not submit the surveys.

Of teachers receiving less than 80% of the surveys from their students, the majority (59%) did not mail all surveys they received. Figure 47 illustrates the reasons teachers provided for not sending in surveys they received. Just under one-half (44%) of these teachers reported they did not send the surveys as they did not receive 80% of the class surveys and could not qualify for the $50 stipend. Nearly one-third (36%) reported they did not mail back the surveys as they received them after the submission deadline.

Figure 47. Why Did You Not Mail Back all of the Surveys You Received?

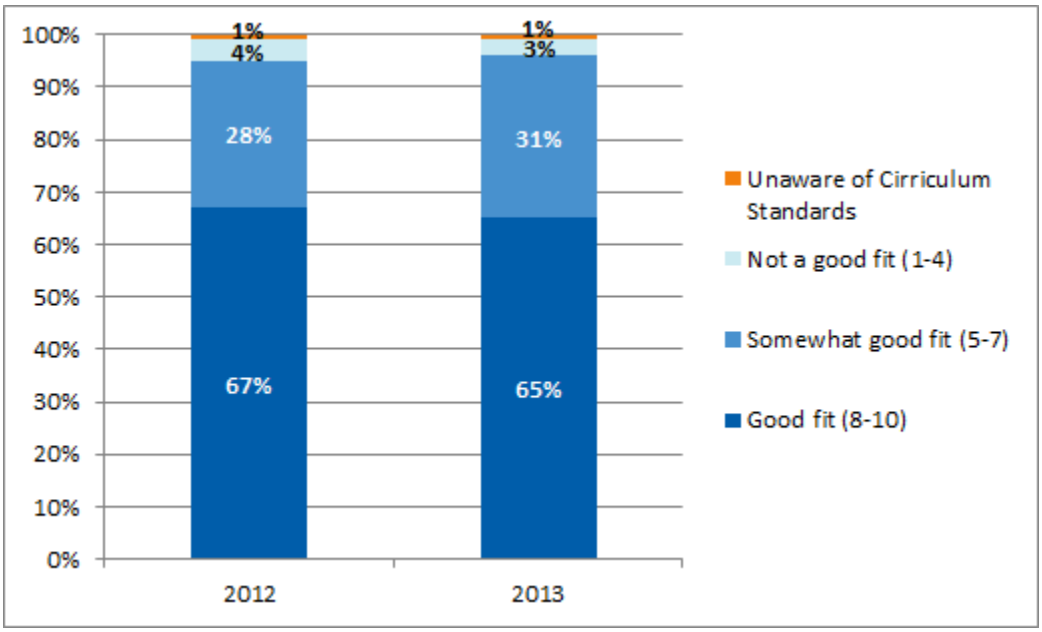


n=25

Grade-Specific Curriculum

The TPA reported slight updates to the Education program lesson plans in 2013, though they remained very similar to lessons included in the 2012 program. As in 2012, the majority of surveyed teachers (67% in 2012 compared to 65% in 2013) felt the program's lesson plans fit well with Indiana's Curriculum Standards (as shown in Figure 48).

Figure 48. How Well Do the Program's Lesson Plans Fit with Indiana's Curriculum Standards?



On a scale of 1-10. 2012 n= 441, 2013 n= 199

More than one-quarter (28%) of surveyed teachers who provided suggestions for improving the Education program reported the lesson plans could align better to fifth-grade students. Roughly one-half (10 of 18) of the teachers suggesting improvements to program lesson plans reported the material followed the fourth-grade curriculum more closely than fifth-grade standards. The other one-half (eight of 18) of the teachers with curriculum comments found the materials too advanced for their fifth-grade students, noting the workbook language and lesson topics proved challenging for their students to comprehend. The percentage of teachers suggesting the Education program curriculum should better align with the standards for fifth-graders increased from 16% in 2012 to 28% in 2013.[40]

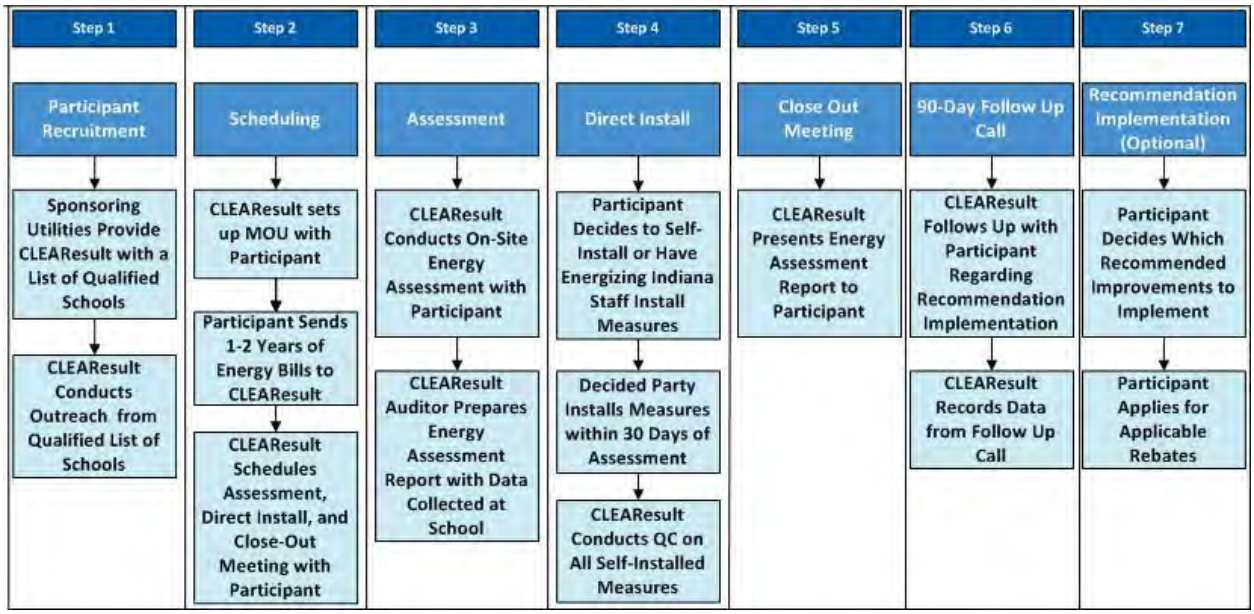
Only one-third (33%) of participating teachers reported including energy conservation content in their lesson plans before participating in the Education program.

[40] P-value = 0.04; this difference is statistically significant (α=0.1).

SADI Program

As discussed previously, the SADI program achieved 100% of its participation goal of 93 school audits statewide through participating utilities. Figure 49 illustrates program operations for the SADI program. As the process flow shows, CLEAResult implemented day-to-day program operations.

Figure 49. SADI Program Operations Process Flow



Participant Recruitment

Beginning in 2013, participant recruitment responsibility shifted from the utilities to the program implementer, which reported each utility took the first two months of the program year to compile a list of qualified schools from which the program implementer could recruit. After the two-month period, the program implementer received control of participant recruitment and conducted outreach from the list of qualified schools provided. The program implementer reported the new recruitment approach vastly improved program delivery, and they expressed satisfaction with the change.

The TPA also added a sign-up form to the Energizing Indiana website for interested schools to enroll in the SADI program. The TPA reported schools signing up for the program through the website either were contacted during the same program year or were placed on a wait list, which generates leads for the program implementer to recruit from in future program years.

The program implementer reported the SADI program's good reputation in the community aided recruitment in 2013. The program implementer could provide past participants as references for schools hesitant to participate.

Scheduling, Assessment, Direct Install, and Closeout Meeting

Upon school recruitment, participants had to submit a completed application and memorandum of understanding to the program implementer, which reviewed this paperwork and confirmed the school's eligibility for participation within two weeks from receipt of the application. Once a school received

confirmation for participation, the program implementer scheduled the assessment, direct-install, and close-out meeting with the participant. The program implementer had to schedule the direct-install and close-out meeting within 30 days of the assessment.

The program implementer had to conduct the on-site energy assessment within 10 days of receiving the participant's application. During the assessment, energy auditors conducted walk-through audits with a facility staff member from the participating school. Energy auditors identified areas for direct-install measures and, in consultations with facility staff members, discussed those most beneficial to the school. After the assessment, the energy auditor used all data collected from the audit as well as the school's utility data to prepare the energy assessment report.

The program implemented the provided direct-install measures at no cost to the participating school, and the measures had to be installed by Energizing Indiana staff (one of two electrical subcontractors hired by the program implementer), the participating school's facility staff, or a third-party vendor. If a school elected to self-install the measures, the program implementer reimbursed facility staff for their labor. The program implementer conducted quality control inspections on all measures self-installed by the participating school's staff. Quality control inspections had to be conducted within 30 days of the assessment.

During the close-out meeting, the program implementer's energy specialist presented an energy assessment report to participating facility staff. This report contained: information about the school's equipment and energy use; the assessment results; and an extensive list of recommended energy-saving building upgrades and behavioral changes. During the close-out meeting, the energy specialist walked the facility staff through the report and discussed all options for school improvements as well as the various rebates available to offset the improvement costs.

90-Day Follow-Up Call

The program implementer had to follow-up with participants 90 days after the closeout meeting. The follow-up call sought to assess whether the energy assessment report influenced the school's decision to implement building upgrades and to provide support regarding the assessment recommendations. The program implementer tracked the data collected during the follow-up call internally. These data were not reported to any other program stakeholders.

Recommendation Implementation

Upon receipt of the energy assessment report at the close-out meeting, participating schools decided which recommendations to implement.

Best Practices and Behavior Changes

The majority (61%) of surveyed facility staff reported their school adopted at least one of the best practice tips and recommendations for behavior changes included in their energy assessment reports. Table 142 lists best practices adopted by these facility staff. Adjusting HVAC equipment, based on the school's occupancy schedule (noted by 65% of facility staff making behavior changes in their schools), was the most commonly adopted best practice.

Table 142. Which Best Practice Tips has Your School Adopted?

Adopted Best Practice Tips	Adoption Rate
Perform routine reviews of occupancy schedules and adjust HVAC system operations accordingly.	65%
Install additional low-cost measures to save energy (e.g., programmable thermostat, LEDs, hot water tank insulation, exterior lighting controls).	53%
Turn off office equipment when not in use and enable standby or power saving features.	24%
Turn off lights located near windows on sunny days. Consider installing daylighting controls to automatically turn off or dim lights when enough natural daylight is present.	24%
Replace incandescent lamps with CFLs where possible on desks and in overhead lighting.	18%
Adjust window shades to help maintain occupant comfort.	18%
Remove personal plug loads such as refrigerators, space heaters, and personal printers.	18%
Take efforts to conserve water.	18%
Turn off lights when rooms remain unoccupied.	12%
Develop a delamping strategy. Remove or reduce the total number of light bulbs in fixtures throughout the building.	12%

n=17, Multiple Responses Allowed

Recommended Improvements

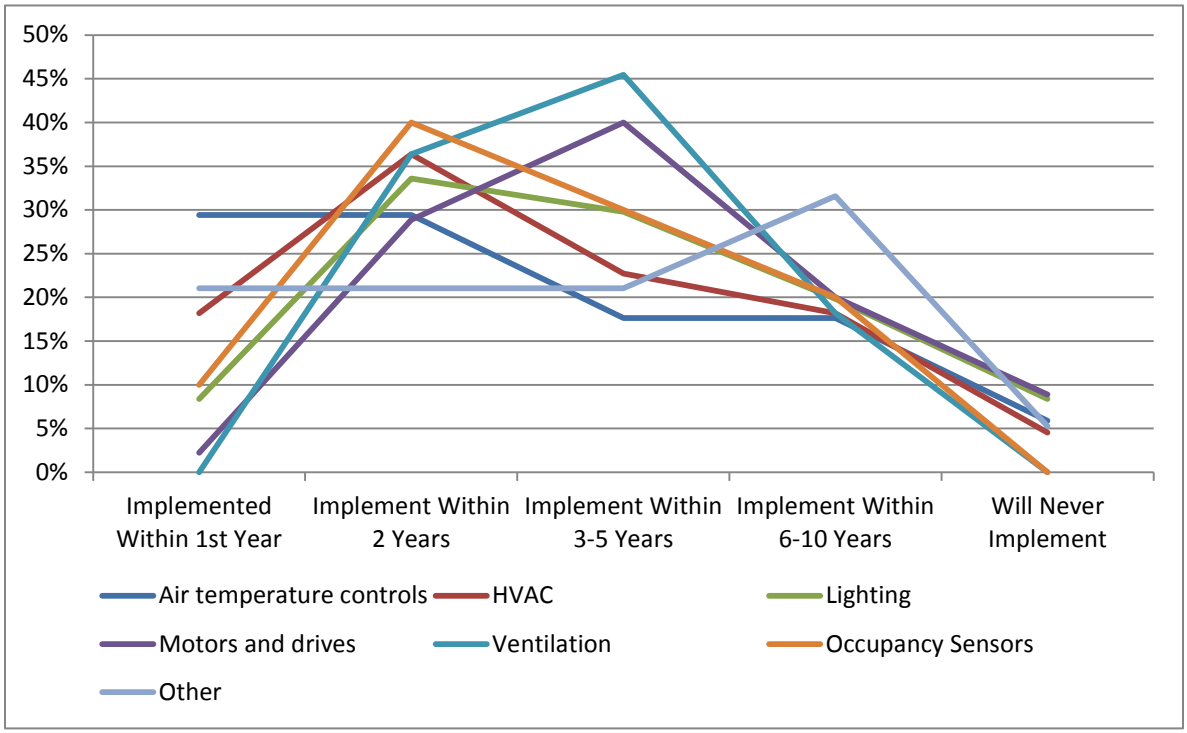
Just under one-half (43%) of surveyed facility staff reported their school installed at least one recommended measure due to participation in the SADI program, a decrease from 69% in 2012.[41] Lighting (42%), air temperature controls (19%), and HVAC (15%) were the recommendations most commonly reported installed in the first year. This mix of measures changed slightly from the 2012 program year, where occupancy sensors ranked in one of the top three most commonly adopted recommendations. Because the program currently offers occupancy sensors as part of the direct-install component, schools need not invest the capital towards those measures. Therefore, the number of recommendations to install occupancy sensors decreased dramatically.

One-half (50%) of surveyed facility staff reported the energy assessment report proved the most influential SADI program component in their school's decision to install recommended equipment. The close-out meeting was noted by 21% of surveyed facility staff as the most influential program component.

Figure 50 shows expected implementation timelines by recommendation type reported by participant facility staff. The surveyed facility staff indicated schools planned to implement over 93% of recommendations within 10 years.

[41] P-value = 0.02; this difference is statistically significant (α=0.1).

Figure 50. SADI Timeline of Recommendation Implementation



n=28

All 15 of the participating schools not implementing any recommendations reported lack of funding as their greatest barrier to implementation. Participant facility staff most frequently reported lighting and motors and drives upgrades as the recommended measures their schools never implemented.

6.10.4 PROGRAM IMPROVEMENTS

Education Program

Nearly one-third (32%) of surveyed teachers provided suggestions for improving the Education program. Respondents most commonly suggested (28% of respondents) the program curriculum should better align to serve fifth-grade students (an increase from 16% in 2012).[42]

Similarly to 2012, teachers offered the following suggested improvements:

- Providing videos, experiments, online workbooks, and more hands-on materials for teachers to use in their classrooms.
- Improving the program's timing, with some teachers preferring to teach the program during one semester over another.

[42] P-value = 0.04; this difference is statistically significant (α=0.1).

- Revamping the student workbooks to make them more "kid-friendly" (e.g., more color, pictures).

SADI program

Just over one-third (39%) of surveyed facility staff provided suggestions for improving the SADI program. Respondents most commonly suggested (six facility staff) providing more support to schools that implemented the recommended improvements. Such support included:

- Providing a more timely response to facility staff questions and concerns regarding the recommended improvements.
- Increasing follow-up with schools to check on the progress of implementation, even after the 90-day follow-up call.
- Adding support to assist with filling out required paperwork and rebate forms when moving forward with recommended improvements.

6.11 *INSIGHTS AND RECOMMENDATIONS*

The TPA changed the 2012 program design, improving overall EES program delivery in 2013. The following sections include the Evaluation Team's recommendations for continued program improvements.

6.11.1 EDUCATION PROGRAM

Conclusion 1: Although the TPA updated the 2012 curriculum in 2013, teachers continued to report that program lesson plans better aligned with a fourth-grade curriculum than fifth-grade standards. If the program's lessons better aligned with the curriculum targeted teachers must teach, they would be able to spend more time on the program topics.

Recommendation 1: Review the Indiana Curriculum Standards to ensure current program materials align with the standards established for the target market (e.g., fifth-grade students). If program stakeholders determine the program materials could better align with Indiana's fifth-grade standards, consider the costs and benefits of either redefining the target market (i.e., fourth-grade students) or revising the program's curriculum content to better suit fifth-grade students.

Conclusion 2: The student survey response rate dropped from 2012, falling below rates for similar programs. Impact analysis methodologies for similar programs in other states require evaluators to discount savings based on nonresponse, increasing the student survey response rate's importance in calculating the programs' evaluated savings.

Recommendation 2: Consider tactics to improve student survey response rates to ensure nonresponse minimally affects evaluated savings. Similar school kit programs have succeeded using a tiered incentive approach that encourages teachers to return as many surveys as they receive from students (e.g., a $20 stipend for returning any surveys).

6.11.2 SADI PROGRAM

Conclusion 1: As in 2012, upfront capital costs proved prohibitive to participants, even with rebates and expectations of energy cost savings over time.

Recommendation 1: Consider providing financing mechanisms to implement capital projects. Such a mechanism or a list of available financing options could help schools procure funds for implementing recommendations.

Conclusion 2: The Evaluation Team had to use survey data and information from the TPA to make certain assumptions regarding the location and use of measures installed in schools.

Recommendation 2: Collect and report specific information about the each direct-install measure; access to specific data collected about each direct-measure installed would greatly increase the precision surrounding the *ex-post* savings values. Table 143 lists data that the Evaluation Team recommends collecting for each direct-install measure.

Table 143: SADI Direct-Install Recommended Variables to Collect

Measure	Recommended Variables to Collect
18-watt CFL	Location (room-type), wattage replaced.
LED Exit Sign	Replaced light type (e.g., incandescent, fluorescent), wattage replaced.
Occupancy Sensor	Location (room-type), number of light fixtures connected to each occupancy sensor, type of lighting connected (e.g., lamp type, lamp quantity per fixture, lamp wattage).
Smart Strips	Location (room-type), description and quantity of appliances plugged into the controlled outlets.

Conclusion 3: During participant surveys, school facility staff reported the majority of occupancy sensors were installed in low-opportunity locations, such as utility closets and offices.

Recommendation 3: Prioritize installing occupancy sensors in locations yielding the greatest savings. Program Implementers can maximize savings by prioritizing measure installations in larger rooms (such as cafeterias and school gyms), where occupancy sensors can control more light fixtures.

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7. Commercial and Industrial

7.1 Program Design and Implementation

The C&I Prescriptive Rebates program seeks to help facility managers and building owners achieve long-term, cost-effective savings in the commercial and industrial market sector. This program primarily relies on a prescriptive rebate structure, which rewards participants with monetary incentives based on their installation of energy-efficiency equipment upgrades. Such upgrades include lighting, variable-frequency drives (VFDs), HVAC, and ENERGY STAR products

7.2 EM&V Methodology

The PY2 program evaluation incorporated impact and process elements. Table 144 provides an overview of tasks used in the evaluation.

Table 144: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• GoodCents staff (June 2013 and February 2014). • GoodCents marketing staff (January 2014).
Trade Ally Surveys	• 18 participating Trade Ally surveys, conducted by the Evaluation Team (December 2013). • Four nonparticipating Trade Ally surveys, conducted by Evaluation Team (December 2013).
Program Database Review/ Verification	• Program tracking data, reviewed and compared to reported values from the implementer portal/program scorecard.
Program Materials Review	• High-level program operations review (January 2014). • Review of messaging, promotions, and marketing materials (January 2014).
Participant Interviews	• 233 participating lighting customers (December 2013). • 49 participating non-lighting customers (December 2013). • 250 participating PY1 bulb drop customers (December 2013). • 101 nonparticipating customers (December 2013).
Impact Analysis	• Review of the savings estimate methodology. • 285 engineering reviews of program measures. • On-site inspection and analysis of 18 program chillers.

The process evaluation assessed customer awareness of (and satisfaction with) the C&I program, assessed factors influencing customers' decision making and purchasing patterns, and gathered data used to determine program freeridership.

The process evaluation assessed Trade Allies' awareness of the program and their satisfaction with the different program components, including program delivery, training, and support. The Evaluation Team also assessed Trade Allies' outreach efforts to customers. Table 145 shows key questions guiding the evaluation.

Table 145: Researchable Questions

Researchable Questions
Are necessary components in place to allow the program's success to be effectively measured and evaluated? (How accurately does the database reflect customer data?)
Is the program meeting its objectives for reducing energy consumption and demand in the C&I market sector?
How effective is the program implementation?
How effective is the marketing process?
Is the program designed effectively?
Is the program encouraging Trade Allies to actively promote and install energy-efficient technologies for their C&I customers?
Which factors influence a customer to install energy-efficient equipment?
How satisfied are customers with the program?
Are there additional barriers to customer participation and savings?

7.2.1 DATA COLLECTION ACTIVITIES

Data collection in PY2 focused on: surveys of participating and nonparticipating customers; and surveys of participating and nonparticipating Trade Allies. The Evaluation Team also interviewed Program Implementer staff.

Customer Surveys

The Evaluation Team stratified participating customers from all participating utilities, based on customer usage, and using a simple random sample. The Team did not receive nonparticipant population data from IMPA. Therefore, the nonparticipant survey did not include customers in IMPA's utility service territory.

Trade Ally Surveys

The TPA provided the Trade Ally database that the Evaluation Team used for conducting the surveys. For participating and nonparticipating surveys, the Evaluation Team used a simple random sample.

The evaluation made 72 attempts to contact nonparticipating Trade Allies throughout Indiana, resulting in four completed surveys. This 6% response rate primarily resulted from the high rate of participating Trade Allies on the nonparticipant call list. Out of four nonparticipating Trade Allies surveyed: two installed HVAC equipment; one manufactured and distributed HVAC controls; and one supplied industries with energy-efficient lighting solutions. Company sizes ranged from one to 37 full-time employees.

Chiller Study On-Sites

For on-site engineering activities, the Evaluation Team recruited customers installing chiller measures from the 2012 and early 2013 program populations. Site visits sought to achieve a better understanding of savings that resulted from these complex measures. Data collection activities targeted the following:

- Verification of measures' installation and current operating status (i.e. functioning properly).
- Changes in planned operating procedure (e.g., after decommissioning an existing chiller, the new program-incented chiller handles more load than originally planned).

- Nameplate data from the installed units and from any relevant existing equipment.
- System set points, including but not limited to:
    - System status (e.g., active or disabled).
    - Staging sequences (controlling criteria, if multiple chillers or compressors are present).
    - Chilled water supply temperature.
    - Chilled water flow (or gallons per minute [GPM]) and condenser water flow (or GPM).
    - Condenser Water Temperature (or condenser entering water temperature).
    - Enable points (e.g., the system is disabled when the outside air temperatures fall below 60 degrees Fahrenheit).
    - Resets (e.g., the chilled water supply temperature set point varies, based on outdoor air or chilled water return conditions).
    - System schedules (e.g., the system shuts off after hours, on weekends, or during warmer months).
- System performance data, including but not limited to:
    - True power demand at five-minute intervals, from a temporary meter installed by the engineering team.
    - Logged power demand from an energy management system (EMS) or existing power metering system.
    - System water temperatures and flows from an EMS or package controls system.
    - Local outdoor ambient conditions from a temporary meter installed by the engineering team.
    - Local outdoor ambient conditions from an EMS or an existing weather logging system.
    - Other relevant parameters affecting the system's loading or performance (e.g., occupancy schedule).

The Evaluation Team collected the above data where possible, and compared them with data from the Implementer tracking database and program application files.

7.3 PROGRAM PERFORMANCE

Table 146 shows how reported program performance compared to the goals established in program planning. Savings reported by the program do not reflect adjustments made as a result of the evaluation. Also, reported savings in Table 146 do not include those attributed to opt-in and bulb drop measures. The tracking database supplied by the Implementer included only ENERGY STAR products, VFD/HVAC and lighting measures; although the Evaluation Team could access other sources of reported savings, the implementer claimed the tracking database provided the most accurate source.

Table 146: *Ex-Ante* Results by Utility and Statewide

	Unit			kWh			kW		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	1,016,566	111,025	11%	248,465,099	62,529,961	25%	69,618	9,903	14%
I&M	320,530	164,758	51%	65,367,725	89,998,901	138%	22,172	15,585	70%
IPL	345,304	102,095	30%	85,540,216	38,050,097	44%	23,715	5,639	24%
IMPA	211,066	31,703	15%	51,363,415	17,642,220	34%	14,582	2,627	18%
NIPSCO	345,321	62,512	18%	85,778,214	22,670,350	26%	23,712	4,235	18%
Vectren	163,333	28,418	17%	40,158,951	10,509,259	26%	11,239	1,608	14%
Statewide	**2,402,120**	**500,511**	**21%**	**576,673,620**	**241,400,788**	**42%**	**165,038**	**39,597**	**24%**

7.4 PROGRAM BUDGET AND EXPENDITURES

Table 147 shows the original program budgets and the expenditures reported at the conclusion of 2013.

Table 147: Program-Level Budget and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$25,890,063	$7,670,367	30%
I&M	$6,700,192	$16,330,748	244%
IPL	$8,947,507	$6,221,621	70%
IMPA	$1,850,098	$2,150,358	116%
NIPSCO	$8,800,845	$3,641,363	41%
Vectren	$4,188,579	$1,313,947	31%
Statewide	$56,377,283	$37,328,403	66%

7.5 EX-ANTE SAVINGS

Ex-ante savings equal savings the program reported compared to goals set forth in program planning. Table 148 presents C&I statewide *ex-ante* savings, and Table 149 presents *ex-ante* savings by utility. The TPA's web portal tracking provided goal, kWh and kW, savings. *Ex-ante* savings represent year-to-date values, as of December 31, and resulted from querying the TPA's tracking database for total kWh and kW.

Table 148: *Ex-Ante* Savings Statewide

Program	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal[(1)]	2013 kW *Ex-Ante*	% of kW Goals
C&I	576,673,620	241,400,788	42%	165,038	39,597	24%

Table 149: *Ex-Ante* Savings By Utility

	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals
Duke	248,465,099	62,529,961	25%	69,618	9,903	14%
I&M	65,367,725	89,998,901	138%	22,172	15,585	70%
IPL	85,540,216	38,050,097	44%	23,715	5,639	24%
IMPA	51,363,415	17,642,220	34%	14,582	2,627	18%
NIPSCO	85,778,214	22,670,350	26%	23,712	4,235	18%
Vectren	40,158,951	10,509,259	26%	11,239	1,608	14%

In reviewing *ex-ante* savings, the Evaluation Team found three sources provided by the TPA (e.g., the TPA web portal, totals queried from the database, and the TPA report to the DSMCC) contained conflicting values. The TPA-maintained database totals supplied the most accurate measurement of *ex-ante* savings; the preceding tables reflect this clarification. However, since the tracking database did not contain the program's opt-in and bulb drop projects, C&I *ex-ante* savings in this report do not reflect savings attributed to these measures. Savings accrued from these alternative databases and savings sources will be rolled up at the end of the program cycle.

The evaluation included an engineering analysis of *ex-ante* energy savings, conducted through a database review of installed measures installed, and a survey of participating customers. Surveys sought to determine behavioral elements related to energy savings (such as removal of measures or installations of measures outside of the program).

7.6 IMPACT ANALYSIS

To determine gross program savings, the Evaluation Team reviewed the TPA tracking database and the web portal tracking totals summarized in Table 148 and Table 149. The database contained year-to-date, *ex-ante* savings records for each utility: a total of 10,675 C&I measures installed across 4,180 projects.

Figure 51: *Ex-Ante* Annual kWh Savings by Measure Type

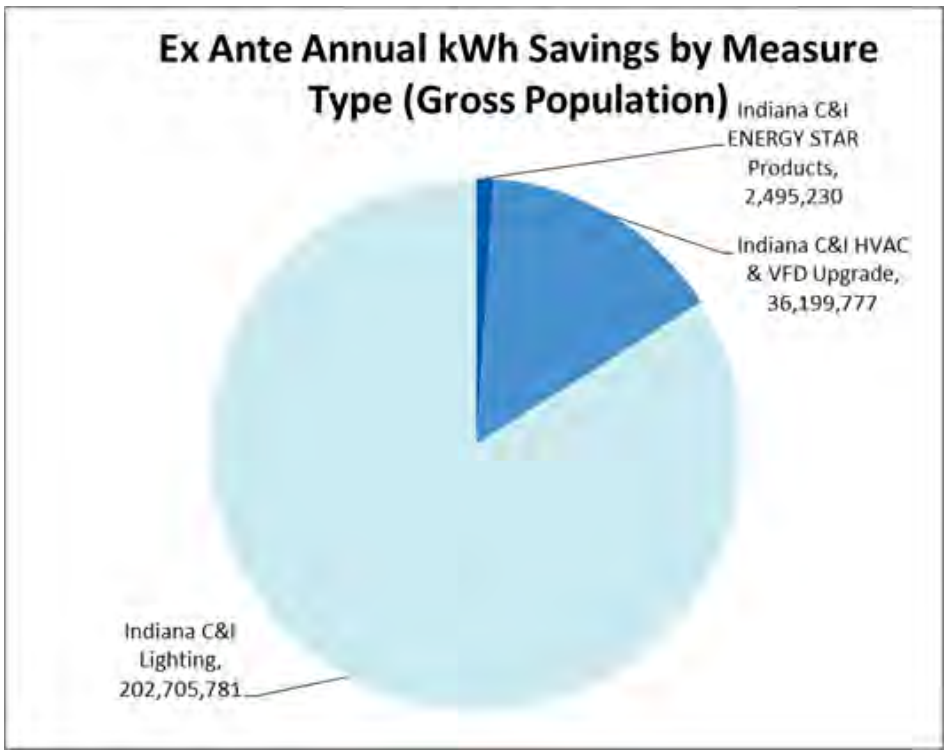


Figure 51 illustrates the distribution of *ex-ante* energy (kWh) savings contained in the database. This distribution occurs statewide and includes all participating utilities. Lighting measures represented 84% of all electric energy savings claimed by the program while HVAC/VFD upgrades and ENERGY STAR products represented 15% and 1%, respectively.

The Evaluation Team performed engineering file reviews on a sample of measures to determine the audited, verified, and *ex-post* savings of the program per utility and at the statewide level. The random sample of measures in the analysis targeted an 80% confidence interval at 10% precision (80/10) per utility to achieve a 90/10 target at the program level.

The Evaluation Team selected the sample of measures from each utility using a systematic approach to probability proportional to size (PPS) sampling. This method proves particularly useful when estimating population totals based on sampled projects. Ultimately, the Evaluation Team sought to calculate audited, verified, and *ex-post* gross savings from the sampled projects, and then use this to estimate the same gross savings in the population of measures. The total gross energy and demand savings were correlated with total reported savings, available in the program database. Therefore, the Evaluation Team sampled the measures using a systematic PPS sampling approach to include measures with greater savings with higher probabilities.

Table 150 compares the distribution, by utility, of the total measure count compared to the evaluation sample. The Evaluation Team oversampled measures for each utility to account for measure diversity and documentation constraints.

Table 150: Distribution of Total Measures vs. Sampled Measures

Utility	Database Measure Count	80/10 Measure Target	Sampled Measure Count
Duke	2,619	40	47
I&M	3,313	40	56
IPL	791	40	43
IMPA	1,828	39	44
NIPSCO	1,669	40	44
Vectren	455	40	51
Statewide	10,675	239	285

7.6.1 AUDITED SAVINGS

The impact evaluation process first required a review of the program database. The Evaluation Team examined the number of applications processed and the number of measures installed. Adjustments made in this evaluation step result from comparing data within the program applications with the claimed *ex-ante* savings at the measure level. The database review indicated all ENERGY STAR products and HVAC/VFD measures consisted of one installed unit; even though multiple measures could have been installed at a site, each of these measures was tracked as a separate line item. Lighting measures, on average, consisted of 80 installed units. Table 151 illustrates the distribution of measure quantities by measure type and the number of installed units for the population and the sample.

Table 151: Number of Installed Measures by Measure Category

Measure Category	Database Program Measure Quantity	Sampled Program Measure Quantity	Unit Quantity	Sampled Unit Quantity
Indiana C&I ENERGY STAR Products	3,068	7	3,068	7
Indiana C&I HVAC & VFD Upgrade	1,185	50	1,185	50
Indiana C&I Lighting	6,422	228	494,826	66,473

The Evaluation Team calculated audited savings for each of the 285 measures in the sample, developing estimates using the following process:

1. **Assess the applied TPA methodology used for energy (kWh)/demand (kW) savings calculations**.
    - Savings algorithms from the TPA's workpapers were examined. Using the applicable algorithm, wherever possible, the Evaluation Team recreated a measure's *ex-ante* savings as presented in the program tracking database. This helped determine assumptions, constants, or lookup values the TPA used in its applied methodology.
2. **Review the claimed TPA methodology for kWh/kW savings calculations.**
    - The Evaluation Team noted any differences between values used by the TPA in its applied methodology and the parameters and algorithms documented in the savings estimate workpapers.
3. **Compare tracking data with the project application file.**
    - Data present in both the database and the project application file often included installed quantity and pre/post equipment specifications. The Evaluation Team noted any discrepancies in values between these sources.
4. **Independently calculate annual energy savings and peak-coincident demand savings using the TPA's claimed methodology and with revised data found in the project application file.**
    - Information gathered from steps 2 and 3 contributed to audited savings calculations for the measure. Using the assumptions, constants, or lookup values outlined in the implementer's workpapers, the Evaluation Team calculated kWh and kW measure savings with data presented in the application file.

The WHF and peak coincidence demand factor (CF) assumptions for lighting measures presented the predominant inconsistencies between applied and claimed methodologies (database values and workpaper values, respectively). Regardless of the space type, the workpaper algorithms maintained a WHFe of 1.095 and a demand waste heat factor (WHFd) of 1.2 for all lighting measures. The Evaluation Team determined that the applied methodology assumed a WHFe and WHFd of 1.0 (i.e., the applied methodology did not account for space cooling savings associated with a lighting upgrade). Similarly, the workpaper algorithm referred to a lookup table to determine the CF based on space type, whereas the applied methodology assumed a CF of 0.68 for all lighting measures.

The Evaluation Team also found inconsistencies in the methodology for VFD measures. The TPA's original source for VFD savings derived from the 2008 Connecticut Program Savings Document, which required the VFD motor's brake horsepower (bhp) rating to calculate savings. The database only tracked the nameplate horsepower (hp) and did not include a motor loading assumption. The application also did not specify bhp. The Evaluation Team determined that the applied methodology for savings used the nameplate hp rather than the bhp, which would consistently overstate savings. The applied methodology also assumed 3,985 runtime hours for process pumps, even though the claimed methodology specified use of hours as listed in the program application.

Inconsistencies did not arise with ENERGY STAR product savings as the claimed and applied methodologies used the same deemed savings values. Unitary HVAC measures also used identical claimed and applied methodologies.

The Evaluation Team then calculated a realization rate of audited savings relative to *ex-ante* savings (audited/*ex-ante*). This number derived from the sample of 271 measures at the utility and statewide levels, which was then applied to the total program population. Table 152 presents these adjustment factors and the resulting total audited savings.

Table 152: Audited Energy Savings (kWh) and Demand (kW) by Utility and Statewide

Utility	Total Audited kWh Savings	kWh Adjustment Factor (Calculated from Sample)	Total Audited kW Savings	kW Adjustment Factor (Calculated from Sample)
Duke	60,012,345	79%	12,046	114%
I&M	86,375,315	97%	18,956	121%
IPL	36,518,103	109%	6,859	142%
IMPA	16,931,899	95%	3,195	106%
NIPSCO	21,747,449	100%	5,149	119%
Vectren	9,152,629	103%	1,596	123%
Statewide	**230,737,740**	**96%**	**47,801**	**122%**

The low adjustment factors for audited kWh savings in the Duke territory (79%) resulted from chiller measures sampled for this utility. Chiller measures accounted for 27% of the total *ex-ante* kWh savings in Duke, yet, in the Evaluation Team's audit analysis, achieved only 7% of chiller *ex-ante* savings.

The reasons for such a large discrepancy remain unclear as the Evaluation Team used implementer methodology and application data to calculate the audited savings. A difference in baselines provides one possible explanation. The Evaluation Team referenced the Indiana TRM assumptions for baseline integrated part load value (IPLV) values as the implementer workpapers or the application files did not outline these assumptions. These assumptions, however, provided reasonable values and did not account for such low adjustment factors. Ultimately, the Evaluation Team could not recreate the claimed savings values for these chiller measures using any combination of methods and factors from the implementer workpapers or the Indiana TRM.

The high adjustment factors for audited kW in all territories were attributed to the lighting measures sampled for both utilities. The engineering analysis discovered that the program applications in these territories were more consistent in listing accurate, ballasted, efficient fixture wattages than in other territories. This accuracy allowed for fewer wattage corrections, limiting the reductions in kW savings. The audit analysis for all utilities also applied a higher WHFd and CF to kW savings than the applied implementer methodology; so this approach served to increase audited demand savings across all utilities.

7.6.2 VERIFIED SAVINGS

The Evaluation Team utilized participant surveys for a sample of customers to assess the numbers of units actually installed, uninstalled, and placed in storage (and therefore not currently achieving savings), and the usage patterns for installed measures. Table 154 shows the utility and statewide verified energy savings and Table 155 shows the same for verified peak-coincident demand savings. This report's appendices provide utility-specific data. The calculation of verified savings resulted from multiplying the audited savings by the ISR. The participant survey data returned a 100% ISR, indicating no quantifiable measure withholding by program participants. The realization rates in the Table 154 and Table 155 provide the ratio of verified to *ex-ante* savings.

Table 153: Key Metrics from Participant Surveys

Metric	Description
Installation Rate	(Units installed)/(Total program-tracked units)
ISR	(Units remaining installed at time of evaluation)/(Total units installed)
HOU	Average number of hours per day a measure is in use

Table 154: Verified Energy Savings (kWh) by Utility and Statewide

	Ex-Ante kWh	Verified kWh Savings	Realization Rate
Duke	62,529,961	60,012,345	96%
I&M	89,998,901	86,375,315	96%
IPL	38,050,097	36,518,103	96%
IMPA	17,642,220	16,931,899	96%
NIPSCO	22,670,350	21,747,449	96%
Vectren	10,509,259	9,152,629	87%
Statewide	**241,400,788**	**230,737,740**	**96%**

Table 155: Verified Peak-Coincident Demand Savings (kW) by Utility and Statewide

	Ex-Ante kW	Verified kW Savings	Realization Rate
Duke	9,903	12,046	122%
I&M	15,585	18,956	122%
IPL	5,639	6,859	122%
IMPA	2,627	3,195	122%
NIPSCO	4,235	5,149	122%
Vectren	1,608	1,596	99%
Statewide	**39,597**	**47,801**	**121%**

7.6.3 *EX-POST* SAVINGS

Ex-post savings reflect all adjustments made to *ex-ante* measure savings claimed by the program. Additional adjustments beyond those discussed above derived from detailed engineering analyses that leveraged actual measurement data and secondary sources deemed most appropriate by the Evaluation Team. The Indiana TRM provided the majority of savings algorithms used in the analysis, with variable inputs relying on the most recent customer-specific data provided by the TPA. Much like the audited savings calculations, the Evaluation Team: determined *ex-post* savings for each of the 285 sampled measures; calculated an adjustment factor compared to the measures' *ex-ante* savings; and applied the rate to total *ex-ante* savings per utility. Table 156 and Table 157 summarize these values. This section discusses specific approaches used to assess ENERGY STAR appliances, HVAC measures, VFDs, lighting, and chillers.

Table 156: *Ex-Post* Energy (kWh) Savings per Utility and Statewide

	Ex-Ante kWh Savings	*Ex-Post* kWh Savings	Adjustment Factor
Duke	62,529,961	62,058,310	99%
I&M	89,998,901	89,320,058	99%
IPL	38,050,097	37,763,093	99%
IMPA	17,642,220	17,509,148	99%
NIPSCO	22,670,350	22,499,352	99%
Vectren	10,509,259	10,429,990	99%
Statewide	**241,400,788**	**239,579,951**	**99%**

Table 157: *Ex-Post* Demand (kW) Savings per Utility and Statewide

	Ex-Ante kW Savings	*Ex-Post* kW Savings	Adjustment Factor
Duke	9,903	14,438	146%
I&M	15,585	22,721	146%
IPL	5,639	8,222	146%
IMPA	2,627	3,830	146%
NIPSCO	4,235	6,172	146%
Vectren	1,608	1,913	119%
Statewide	**39,597**	**57,296**	**145%**

Any adjustments that the Evaluation Team made to TPA methodologies in calculating *ex-post* savings adopted the following hierarchy of sources:

1. Application file.
2. Tracking data.
3. Program-specific data (workpapers from the TPA).
4. Indiana TRM.
5. Secondary sources:
    a. Industry standards, codes, and references (e.g., ASHRAE 90.1).
    b. State- or region-specific studies and evaluations.
    c. Studies and evaluations from outside the area.

The Evaluation Team determined that lighting measures required a more detailed WHF estimation than that described in the workpapers. The claimed methodology in these implementer workpapers applied a WHFe of 1.095 and a WHFd of 1.2 to the savings, regardless of space type, for all measures. The Evaluation Team concluded that better estimates of WHF specific to each measure's space would better represent program savings. As the application file or tracking data did not provide WHF values, the Evaluation Team referred to the Indiana TRM for a better source of WHF.

The Indiana TRM presented a look-up table of variable WHFe estimates, dependent on space type, geographical region, and heating/cooling system type. The table matched the workpaper estimate of 1.2 for WHFd, regardless of space type or region. The Evaluation Team used the table to determine the WHFe for each sampled lighting measure, assuming the space type listed in the program application and a gas heat/electric cooling HVAC system. Using the Indiana TRM's WHF estimates in the *ex-post* calculations resulted in an across-the-board increase of energy and peak coincidence demand realization rates.

The Evaluation Team made one other primary adjustment when calculating *ex-post* savings: a case-by-case correction of baseline and/or efficient fixture wattages. During each measure's file review, the Evaluation Team flagged any instances where the nominal bulb wattage was recorded as a fixture wattage for an externally ballasted fixture. An example would be if the fixture wattage of a four lamp, 25-watt T8 (4LT8-25W) fixture was listed as 100-watts, which would account for the ballast factor adjustment. In such cases, the Evaluation Team referred to the application file for a specification sheet on the fixture's adjusted bulb and ballast configured wattage. If the application file did not include this information, the Evaluation Team examined the tracking database to see if it could provide better estimates.

In most cases, database values for fixture wattages were sourced from the application and proved identical. If so, the Evaluation Team referred to the Indiana TRM, which included tables for estimated fixture wattages for common baseline and efficient fixtures. This case-by-case adjustment did not produce an across-the-board effect, as the efficient and/or baseline wattage could be adjusted down or up depending on the fixture's ballast factor.

The Evaluation Team used its collective knowledge and experience to adjust the methodology for VFD *ex-post* savings. This included adjusting the Energy Savings Factor for three of the eight rebated VFD applications to include updates to the 2013 Connecticut (the 2008 Connecticut PSD 2008 provided the original source of implementer methodology) and to include process pump savings estimations from prior evaluation work. The Evaluation Team also determined that the assumed motor efficiency of 80% in the applied and claimed implementer methodology was incorrect and overstated the savings. The correction adjusted the motor efficiency case-by-case using the nameplate hp rating to determine the EPAct 2001 minimum efficiency level for the motor. Due to these adjustments, the realization rates for VFD measures generally were lower than for lighting measures.

Chiller Study

The Evaluation Team particularly focused on program chiller measures. These measures generally provide a good ratio of savings to incentive dollars, and offer consistent long-term savings with relatively long, industry-accepted useful lives. However, given the prescriptive nature of this program and the varied conditions encountered in a statewide C&I setting, it seemed appropriate to examine these projects further.

At first, the gross population of interest consisted of 23 chiller projects from 2012 and nine projects from 2013 to date.[43] Given the limited population, the Evaluation Team sought to recruit each of the projects in the population. This resulted in successfully recruiting 18 of the total available population (32), aided in part by the concentration of some measures (e.g., some customers had installed multiple chillers across their facilities).

Prior to conducting engineering on-sites, the Evaluation Team requested any pertinent data or documents available from the participants. With all supplemental information available and the program documents (e.g., application file, additional transmitted specifications, invoices), the Evaluation Team reviewed the projects and planned on-site activities.

Wherever possible, engineers and electricians installed temporary metering equipment. Several sites had power logging capabilities. Many sites had data logging capabilities for pertinent parameters (e.g., chiller water supply temperatures, condenser water supply temperatures, chilled water flow) through an EMS. All but two units offered some form of package (manufacturer-supplied) controls with a user-interface that could display some data about the system. Wherever possible, the Evaluation Team installed power logging meters, even if site-provided power data were expected to be available. The Evaluation Team also installed weather logging stations where possible. This served as a measure of good practice and a check against other weather data provided from a site (via EMS) or a national weather station.

[43] For reference, the 2013 measure population closed the year at 24 chiller projects.

Participants proved very cooperative in providing data about their facilities. Of 18 chillers visited, only one project could not be analyzed due to limitations on meter installations and data transmission. Additionally, one chiller project could not be observed in person due to access constraints, but the Evaluation Team could still analyze the project based on meter data derived from its feeder panel (which could be accessed). Table 158 summarizes chiller projects observed through this effort, with some identifying information removed to preserve the customers' privacy.

Table 158: Study Sample Population Details

Unit #	Capacity (Tons)	Power (kW)	Type	Cooling	VSD?
1	750	428	Centrifugal	Water	No
2	2,500	1,468	Centrifugal	Water	No
3	415	251	Centrifugal	Water	Yes
4	300	179	Screw	Water	No
5	400	212	Centrifugal	Water	No
6	500	293	Centrifugal	Water	No
7	500	293	Centrifugal	Water	No
8	125	127	Scroll	Air	No
9	550	303	Screw	Water	Yes
10	550	303	Screw	Water	Yes
11	900	500	Centrifugal	Water	Yes
12	36	39	Scroll	Air	No
13	120	106	Screw	Water	No
14	1,500	864	Centrifugal	Water	Yes
15	440	239	Centrifugal	Water	No
16	380	210	Centrifugal	Water	No
17	125	72	Scroll	Water	No
18	125	72	Scroll	Water	No

The Evaluation Team analyzed collected data and parameters using several differing approaches, depending on available data. These methods included the following:

- **Bin analysis:** Parameters such as outdoor ambient temperatures often are grouped, with averages taken across a group to provide more powerful, less volatile relationships across a range of values. Efforts sometimes used this approach to reduce "signal noise" or volatility for a given calculation.
- **Modeling:** Chiller performance was modeled using curves from ASHRAE and/or eQuest. Metrics such as chiller capacity as a function of temperature, energy input ratio as a function of temperature, and energy input ratio as a function of part load ratio allowed modeling the relationships between chiller power demand and other parameters. Given the Evaluation Team installed or collected power logger data wherever possible, this framework could also be used in "reverse" to solve for chiller loading as a function of observed power, especially for sites without available load parameters.
- **Multivariate Regression:** Chiller power often was related to chiller load or outdoor ambient temperatures (dry bulb or wet bulb) using a multiple regression. Chiller load also often was related to outdoor ambient temperatures (dry bulb or wet bulb). Analysis tools used a least-squares approach to fit a line or curve to the underlying data, with the equation for that line or curve representing a predictive model for the variable, under constrained criteria. This

technique often worked in conjunction with other techniques, such as modeling or bin analysis.[44]

- **Cooling Degree Day scaling:** Some chillers installed through this program utilized an energy logger inherent in their package controls, using this data point to capture total energy expended since installation or the last reset (much like a car odometer). If available, this value or the energy observed during the metering period could be used to estimate annual energy use by relating to cooling degree days (CDDs) during the examined period. The sum of actual CDDs for the observation period was noted, with observed energy scaled to estimated annual energy using the average annual CDDs for the region. Though not an excellent predictor of performance, this estimate provided a good order-of-magnitude accuracy check for other calculation methods.

Figure 52 provides a sample plot from one site in the study. The solid blue and red areas indicate the actual power data collected from temporary meters during the observed period. The blue and red areas represent the newly-installed lead and lag chillers, respectively. The figure also provides good picture of the staging scheme utilized by the site: the lag chiller comes on when the outdoor air temperature approaches 70 degrees Fahrenheit, and then both chillers work to meet the building's load demands.

Figure 54 offers another example plot from the same site, illustrating the relationship between outdoor conditions and chiller demand. The blue line represents the total power demand of the chiller plant (i.e., the sum of demand data from each of the two chillers). The result clearly shows the relationship between outdoor conditions and chiller power consumption. The high coefficient-of-determination (R-squared) provide a good indicator of the fit of the curve to the underlying data. This good curve fit indicates the chiller was used for comfort cooling, with a moderately-static operating approach. If this unit was used for process cooling applications (e.g., cooling a data center), or if the operating profile was adjusted drastically or regularly (e.g., changing the lead/lag configuration), the figure would display a weaker relationship and a lower coefficient of determination.

[44] From a bin analysis, grouped in one-degree intervals of outdoor ambient dry bulb temperatures, and filtered to exclude weekends and unoccupied periods, the Evaluation Team could determine that this chiller's power demand (in kW) related to outdoor dry bulb temperatures (in units of degrees Fahrenheit), per the following equation:
$Power\ [kW] = -0.0524 * (OATDB\ [deg.f])^2 + 5.382 * (OATDB\ [deg.F]) - 13.107$

Figure 52. Chiller Load vs. Power

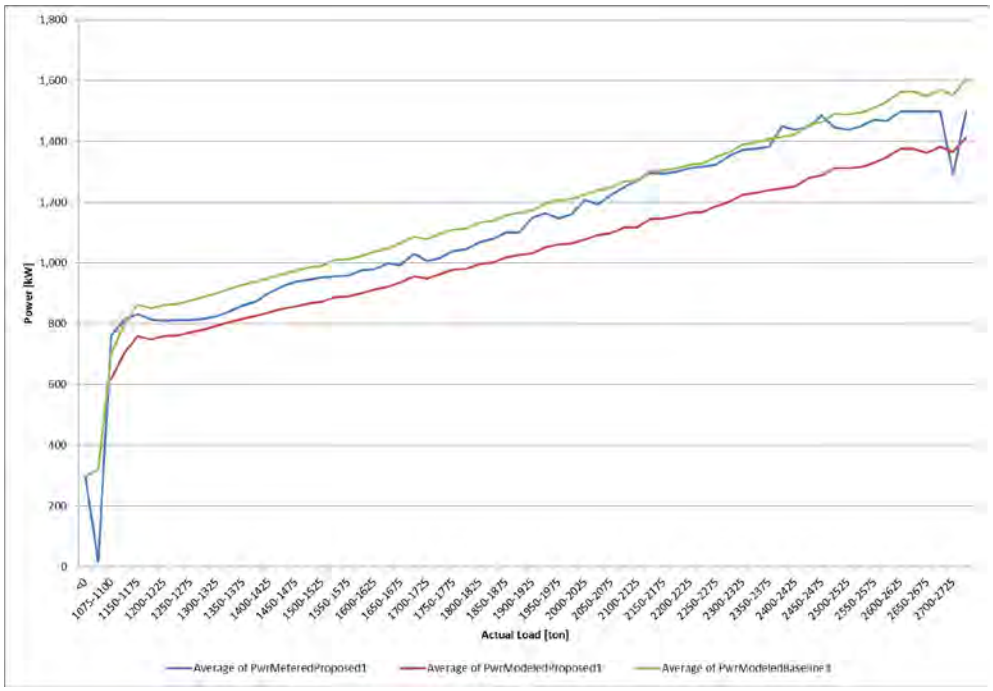


Figure 53: Outdoor Weather and Chiller Power Consumption

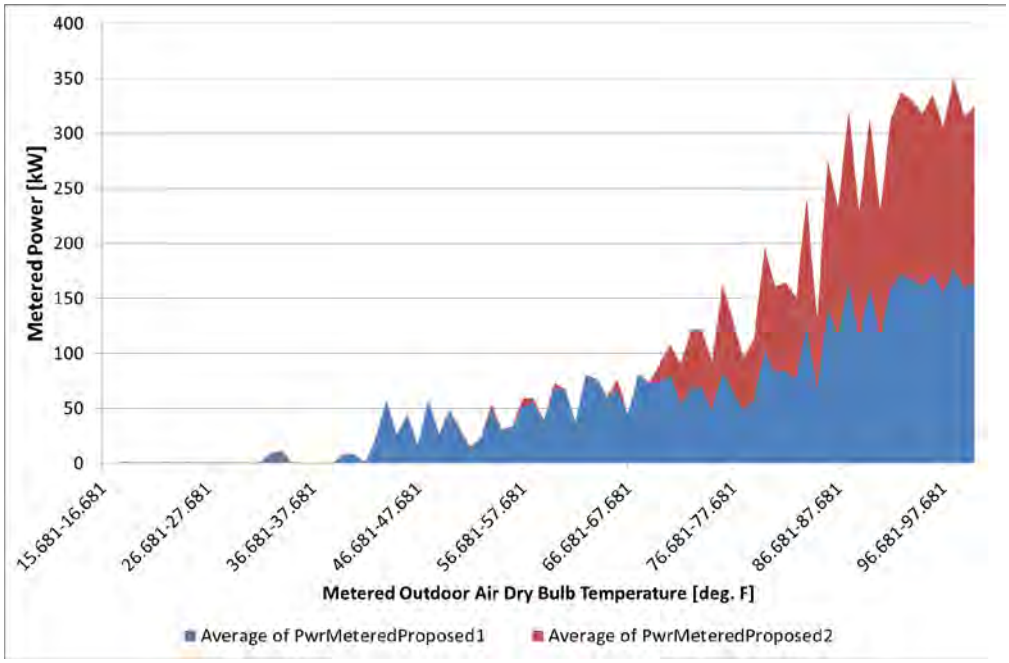
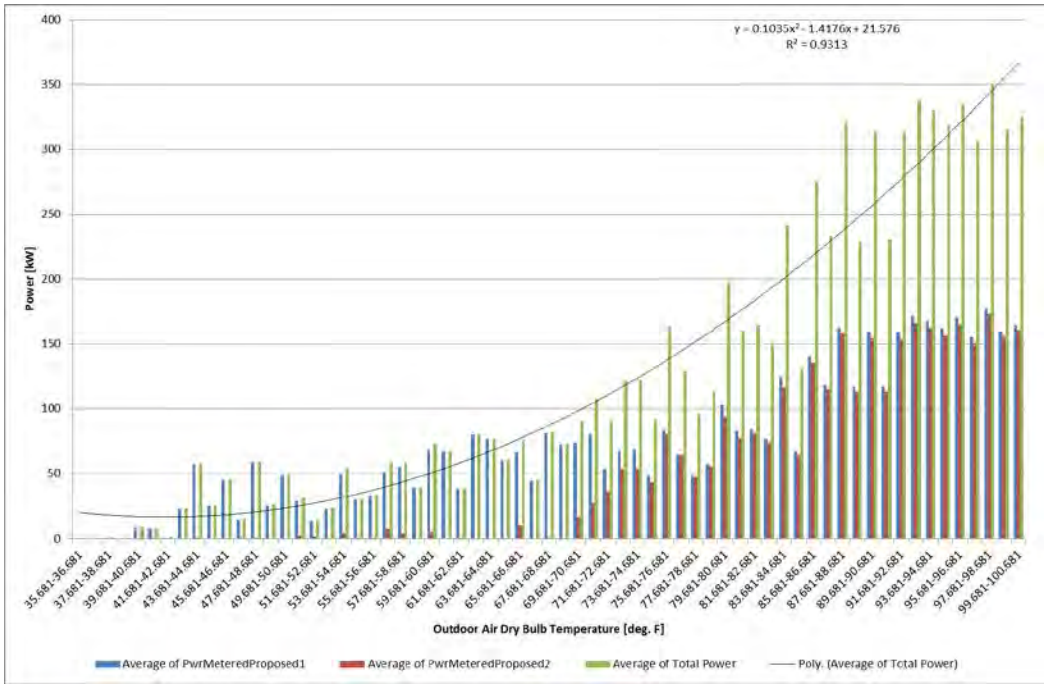


Figure 53 illustrates the strong relationship between observed load data and data collected or generated by the study.

Figure 54, another example plot from the study, illustrates the relationship between outdoor conditions and chiller demand. This particular site used two chillers, staged to meet its load profile: the blue series represents the primary or lead chiller and the red series represents the secondary or lag chiller. The

green data series provides the chiller plant's total power demand—that is, the sum of demand data from each of the two chillers.

Figure 54. Outdoor Air Dry Bulb Temperature vs. Chiller Power



This plot offers an effective picture of the staging scheme utilized by the site: the lag chiller comes on when outdoor air temperatures approach 70 degrees Fahrenheit, and both chillers work together to meet the building's load demands.

Figure 55: Dry Bulb vs. Power Consumption

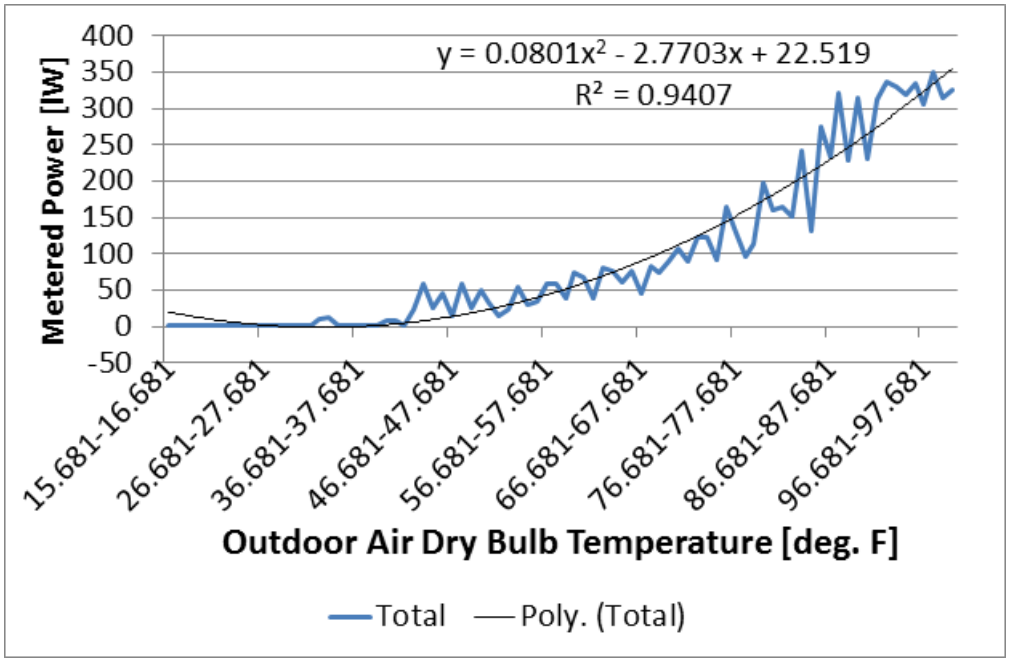


Figure 55 also illustrates the clear relationship between outdoor conditions and chiller power consumption. The high R-squared offers a good indicator of the curve's fit to the underlying data (i.e., as R-squared approaches 1.0, the curve fit approaches exact representation). This fit indicates the chiller was used for comfort cooling, with some moderately static operations. If this unit was used for process cooling applications (e.g., cooling a data center) or if the operating profile was adjusted drastically or regularly (e.g., changing the lead/lag configuration), the relationship would be weaker and the coefficient of determination would be lower.

Savings estimates calculated from this study did not directly factor into *ex-post* gross savings estimates. Rather, sampled chiller projects were evaluated through the discussed engineering reviews, per the same schema as the other projects. This approach prevented unfair weighting or judging of chiller measures, and allowed a uniform methodological approach to be applied across all measures and utilities. This approach also aligned with the calculation methodology for documented implementer savings and/or the Indiana TRM.

The approach offered an added benefit in that the Evaluation Team could contrast a traditional, less-intensive engineering review of these chiller measures with an in depth, intensive analysis benefiting from additional data and resources.

Of a potential match of five, two chiller projects overlapped between efforts (the engineering file review and the on-site engineering measurement and verification). One overlap project displayed some agreement between methods (an 18% difference in energy savings). The other project proved to be an outlier, given its operating practices, and ultimately became a non-qualifying measure. As this unit primarily operated for process load cooling and the program application stated the incentive only applied for comfort cooling chillers, the following findings discussion excludes this unit.

No agreement patterns readily emerged between the study's savings values and the claimed values from program tracking data. Study energy savings consistently averaged lower than *ex-ante* energy savings, but did not exhibit clear relationships or high sample standard deviations. Study peak-coincident demand savings exhibited values higher and lower than *ex-ante* values, again without clear relationships or a high sample standard deviation.

Table 159 summarizes of realization rates for the chiller study relative to *ex-ante* claimed savings. The table presents percentages and not actual savings values to preserve the anonymity of participating customers and because the study served the informative purposes previously detailed. With respect to sample counts, these tables reflect one removed project (a non-qualified measure) and include clustered data due to multiple units installed at some participating sites.

Table 159. Chiller Study Realization Rates

Chiller Site[1]	Study Energy Savings/ Baseline Usage (kWh)	Energy (kWh) Realization Rate (Study/*Ex-Ante*)	Demand (kW) Realization Rate (Study/*Ex-Ante*)	Notes
A	11%	5%	56%	Claimed savings are roughly double the annual total energy usage. Study findings align well with cumulative energy usage from package controls.
B	11%	14%	48%	Claimed savings are more than the annual total energy usage. Study findings align well with cumulative energy usage from package controls.
C	15%	5%	64%	Project had lower-than-expected load and usage.
D	28%	52%	17%	Project had lower-than-expected load and usage.
E	15%	20%	28%	Project had lower-than-expected load and usage. Claimed savings are roughly equal to the annual total energy usage.
F	28%	48%	0%	Claimed savings are roughly equal to the annual total energy usage. Study findings align well with cumulative energy savings from package controls.
G	29%	28%	169%	Cooling hours used do not match Indiana TRM values.
H	7%	29%	49%	Project had lower-than-expected load and usage, along with highly variable building occupancy.
I	7%	59%	28%	Project had highly variable building occupancy.
J	39%	39%	48%	Claimed savings are roughly equal to the annual total energy usage.
K	6%	3%	23%	Claimed savings are more than double the annual total energy usage.
L	27%	30%	14%	Claimed savings are more than the annual total energy usage.
	19%	28%	45%	Sample Mean
	11%	19%	43%	Sample Standard Deviation

(1) May include multiple units.

The disparity between the study findings and the *ex-ante* savings values likely arise from two sources:

1. First, the documented savings calculation methodology published by the implementer did not replicate claimed savings values from the tracking database. The implementer workpaper provides the following energy and demand savings algorithms:

$$\Delta kWh = TONS * ((3.516/IPLVbase) - (3.516/IPLVee)) * EFLH$$

$$\Delta kW = TONS * ((3.516/COPbase) - (3.516/COPee)) * CF$$

The Evaluation Team replicated these calculations, but could not recreate the ex-ante values from the tracking database.

2. The prescriptive nature of the program and Indiana TRM algorithm, which leans heavily on a deemed parameter for equivalent full load cooling hours (EFLH) and CF. The following energy and demand savings algorithms derive from the Indiana TRM, and match the implementer workpaper methodology:

$$\text{Annual kWh Savings} = \text{TONS} * ((3.516/IPLV_{base}) - (3.516/IPLV_{ee})) * \text{EFLH}$$

$$\text{Summer Coincident Peak kW Savings} = \text{TONS} * ((3.516/COP_{base}) - (3.516/COP_{ee})) * \text{CF}$$

It is difficult to formulate deemed parameters for all of the varied conditions a measure could be installed into, but, for a measure as complex as a chiller, it is extremely difficult. Much of the savings generated from a chiller measure is driven by its operating parameters and load profile.

7.7 NET SAVINGS

7.7.1 EVALUATED NET IMPACTS

The Evaluation Team implemented an NTG methodology for evaluating the C&I Prescriptive Rebates program in 2013. This methodology consisted of two components, freeridership and spillover, defined as follows:

- **Freeriders** are participating customers who would have purchased a measure without the program's influence, thereby reducing the savings attributable to the program.
- **Spillover** includes savings achieved through the participating customer's decision to invest in additional efficiency measures or activities due to the influences of program participation, resulting in increased savings attributable to the program and improved program cost-effectiveness.

The following formula provided final NTG ratios for each program:

Net-to-gross ratio = (1 – Freeridership) + Spillover

To determine freeridership, the Evaluation Team drew upon a previously developed approach, which identified freeridership using patterns or responses for a series of 10 simple questions. The questions—which allowed "yes," "no," or "don't know" responses—asked whether participants would have installed the same equipment in the program's absence, at the same time, in the same amount, and at the same efficiency. By assigning freerider scores to certain question response patterns, the Evaluation Team could estimate confidence and precision estimates on score distributions.[45]

[45] This approach follows methods outlined in: Schiller, Steven et. al. "National Action Plan for Energy Efficiency." *Model Energy Efficiency Program Impact Evaluation Guide*. 2007. Available online at: www.epa.gov/eeactionplan. The IPL Oversight Board reviewed and approved the Evaluation Team's NTG questions and question response scoring approach.

The Evaluation Team estimated participant spillover by calculating: (1) savings attributable to additional measures installed; and (2) whether respondents credited the program with influencing their decisions. Measures counted if customers did not request incentives, even though measures qualified for program incentives.

Appendix A provides a detailed explanation of the Evaluation Team's NTG methodology, including descriptions of freeridership and spillover evaluation methodologies, and some of NTG survey questions interviewers asked participants.

After conducting surveys with 233 lighting participants and 49 non-lighting participants, the Evaluation Team converted the resulting responses into a freeridership score for each participant, and then converted the scores using the Excel-based matrix approach, described in Appendix A's freeridership methodology section. Each participant's freerider score, derived from translating responses into a matrix value, used a rules-based calculation to obtain the final score.

The following tables and figures present: all combinations of responses received for the program; and the scores assigned to each combination. Participants' responses rarely reflected each potential combination. Rather, responses tended to group around subsets of common patterns.

Table 160 shows freeridership results for the prescriptive and custom programs. The surveyed lighting participants had a freeridership score of 16%, weighted by evaluated gross measure savings, with an absolute precision of ±3%. The Evaluation Team estimated freeridership for HVAC participants at 50%, weighted by gross evaluated measure savings, with an absolute precision of ±9%.

Table 160: Freeridership Results

Measure	Responses (N)	Freeridership Score	Precision at 90% Confidence
Lighting	233	16%	±3%
Non-Lighting	49	50%	± 9%

A few common patterns appeared in lighting respondents' answers to freeridership questions, representing 168 of the 233 (72%) of lighting participants surveyed. Details from survey responses include the following:

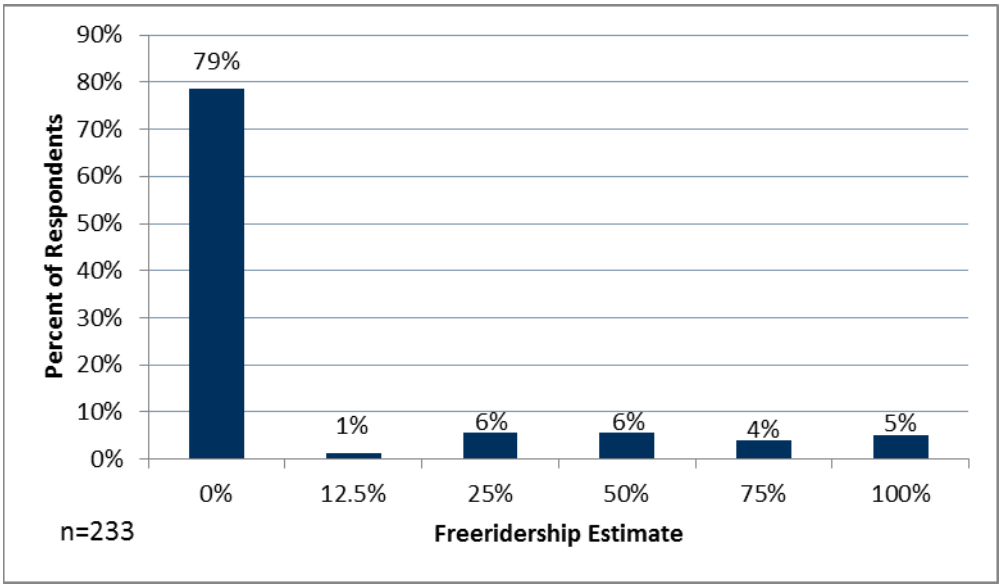
- One-hundred and twenty-two respondents would not have purchased the measures without the incentives. As these respondents said they would not have purchased the measures without the incentive, the Evaluation Team estimated them as 0% freeriders.
- Twenty-four respondents would not have purchased the measures at same efficiency level without the incentives, have been estimated as 0% freeriders.
- Twenty respondents would not have purchased the measures within two years without the incentives, and were considered 0% freeriders
- Twelve respondents planned to purchase the measures before learning about the incentive and had planned the purchase them within their most recent capital budget. They said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. Therefore, the Team considered them as 100% freeriders.

A few common patterns emerged regarding the non-lighting respondents' answers to freeridership questions, representing 39 of the 49 (80%) of non-lighting participants surveyed. Details from the survey responses included the following:

- Twelve respondents planned to purchase the measures before learning of the incentive and planned the purchase these in their most recent capital budgets. They said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. Therefore, the Evaluation Team estimated them as 100% freeriders.
- Eight respondents planned to purchase the measures before learning about the incentive and said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. However, these respondents did not plan for purchases in their most recent capital budgets; therefore, the Evaluation Team estimated them as 50% freeriders.
- Seven respondents planned for purchases in their most recent capital budgets, and said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. However, these respondents planned to purchase the measures before learning of the incentives; therefore, the Evaluation Team estimated them as 50% freeriders.
- Nine respondents would not have purchased the measures at the same efficiency level without the incentives and were estimated as 0% freeriders.
- Three respondents would not have purchased the measures without the incentives. As these respondents said they would not have purchased the measures at all without the incentive, the Evaluation Team estimated them as 0% freeriders.

The Evaluation Team analyzed individual freeridership scores by examining the distribution of custom respondents' freeridership scores, as shown in Figure 56.

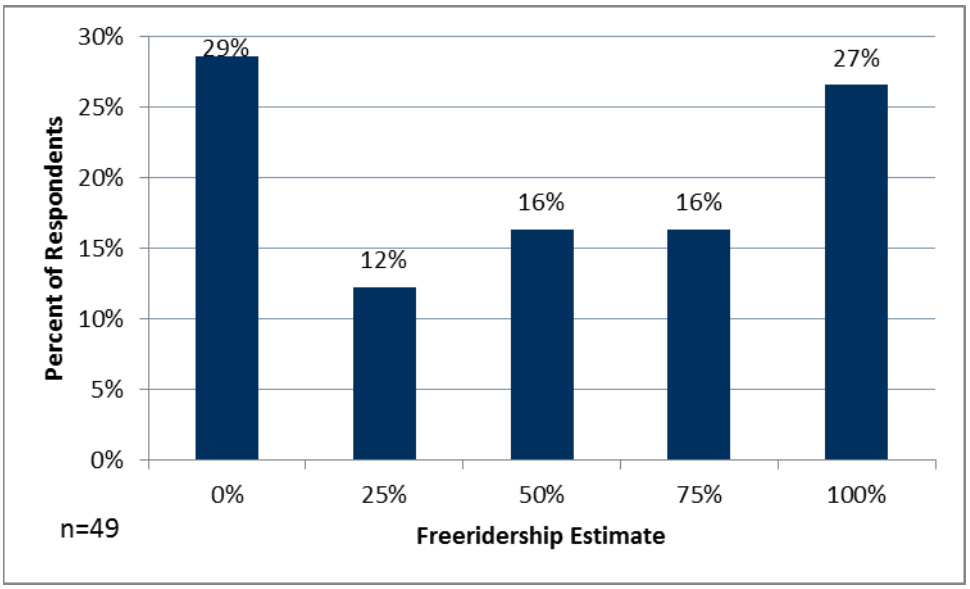
Figure 56: Distribution of Lighting Participants' Freeridership Scores



Though approximately 79% of respondents did not indicate freeridership, the Evaluation Team defined 15% percent of respondents as 50% or higher freeriders.

The Evaluation Team analyzed individual freeridership scores by examining distributions of non-lighting respondents' freeridership scores, as shown in Figure 57.

Figure 57: Distribution of Non-Lighting Participants' Freeridership Scores



Twenty-nine percent of respondents did not indicate freeridership, but the Evaluation Team estimated 59% percent of respondents as 50% or higher freeriders.

Ten lighting participants and three non-lighting participants surveyed purchased energy-efficient measures after participating in the program, where their program experiences proved highly influential on their additional energy-efficient purchases. These 13 surveyed participants cited 14 energy-efficient items with energy savings that should be attributed to the C&I Prescriptive Rebates program.[46]

As few details were collected about the efficiency of the new equipment, quantities of new equipment, and equipment replaced, estimating energy savings for the energy-efficient items cited would prove difficult and would require broad assumptions. The spillover measures discussed ranged from small (CFLs) to potentially very large (compressors or audits). Table 161 list a self-report spillover estimate of 2% for lighting and 1% for non-lighting.

Table 161: Survey Participant Program Savings Analysis

Measure	Spillover Savings (kWh)	Survey Participant Program Savings (kWh)	Spillover %
Lighting	244,350	12,825,326	2%
Non-Lighting	66,641	10,693,296	1%

Table 162 summarizes the percentage of freeridership, spillover, and NTG for the C&I Prescriptive Rebates program. Population *ex-post* net energy kWh savings were calculated by multiplying the population's *ex-post* gross energy kWh savings for each program option by their NTG ratios. The sum of the population *ex-post* net energy kWh savings, divided by the sum of the population *ex-post* gross energy kWh savings, equaled the program option population's 80% weighted NTG ratio for the program.

[46] Eleven items derive from lighting participants, and four items derive from non-lighting participants.

Table 162: Survey Participant Program Savings Analysis

Measure	Responses (n)	Freerider %	Spillover %	NTG Ratio	Population *Ex-Post* Gross Energy kWh Savings	Population *Ex-Post* Net Energy kWh Savings	Population Weighted NTG Ratio
Lighting	233	17%	2%	85%	221,927,278	177,541,822	80%
Non-Lighting	49	50%	1%	51%	19,161,649	15,329,319	

7.8 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy savings claimed by the program.

Table 163: Summary of Energy Savings Adjustments (kWh)

	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	248,465,099	62,529,961	60,012,345	60,012,345	79%	62,058,310	49,646,648
I&M	65,367,725	89,998,901	86,375,315	86,375,315	82%	89,320,058	71,456,046
IPL	85,540,216	38,050,097	36,518,103	36,518,103	109%	37,763,093	30,210,474
IMPA	51,363,415	17,642,220	16,931,899	16,931,899	95%	17,509,148	14,007,318
NIPSCO	85,778,214	22,670,350	21,747,449	21,747,449	100%	22,499,352	17,999,482
Vectren	40,158,951	10,509,259	9,152,629	9,152,629	103%	10,429,990	8,343,992
Statewide	**576,673,620**	**241,400,788**	**230,737,740**	**230,737,740**	**93%**	**239,579,951**	**191,663,961**
Opt-In		92,834	199,050	199,050	214%	121,245	121,245
Bulb-Drop(1)						117,437,757	125,658,400
Grand Total	**576,673,620**	**241,493,622**	**230,936,790**	**230,936,790**	**96%**	**357,138,953**	**317,443,606**

(1) Bulb drop kWh savings carryover from PY1 distribution, installed in PY2.

Table 164: Summary of Demand Savings Adjustments (kW)

	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	69,618	9,903	12,046	12,046	114%	14,438	11,550
I&M	22,172	15,585	18,956	18,956	106%	22,721	18,177
IPL	23,715	5,639	6,859	6,859	142%	8,222	6,578
IMPA	14,582	2,627	3,195	3,195	106%	3,830	3,064
NIPSCO	23,712	4,235	5,149	5,149	119%	6,172	4,938
Vectren	11,239	1,608	1,596	1,596	123%	1,913	1,530
Statewide	**165,038**	**39,597**	**47,801**	**47,801**	**119%**	**57,296**	**45,837**
Opt-In		29.43	39.54	39.54	134%	28.58	28.58
Bulb-Drop(1)						30,960	33,127
Grand Total	**165,038**	**39,626**	**47,841**	**47,847**	**121%**	**88,285**	**78,992**

(1) Bulb drop kWh savings carryover from PY1 distribution, installed in PY2.

Table 165: Lifetime Savings Achieved by C&I

Utility	Lifetime *Ex-Post* kWh
Duke	1,027,115,604
I&M	1,238,288,975
IPL	565,418,421
IMPA	278,314,903
NIPSCO	375,092,514

Utility	Lifetime *Ex-Post* kWh
Vectren	164,524,287
Statewide	**3,648,754,704**

7.9 PROCESS EVALUATION

The PY2 process evaluation sought to evaluate the program's effectiveness and to identify opportunities for improvements. The evaluation sought to inform and provide context to the impact evaluation results, while helping the TPA better understand: how customers and Trade Allies interact with the program; and any barriers they face.

7.9.1 PROGRAM DESIGN

The C&I Prescriptive program added seven new tracks to enhance program uptake through marketing and promotional efforts. In addition, a personnel change occurred: the TPA designated a new program manager. The program continued to offer the same equipment as in PY1 at the same rebate levels, and then increased its efforts through a double-incentive initiative. The Evaluation Team examined the measure offerings in the C&I Prescriptive program and compared these with the utilities' prescriptive Core Plus programs. While the measures were similar (the Evaluation Team found 4-foot T8 lamps offered by Energizing Indiana and by a utility prescriptive program, though with different wattages), overlap did not occur.

Statewide and utility-specific (Core vs. Core Plus) programs present challenges to customers who must choose a program. They also present challenges to programs that must register customer savings and participation. While the statewide program offers different measures than the utility programs, program managers may find themselves "competing" for savings from a given customer.

In PY2, the C&I Prescriptive program achieved 42% of its energy-saving goals—considerably lower than the 63% of its goals the program achieved in PY1.

7.9.2 PROGRAM MARKETING, OUTREACH, AND ENROLLMENT

Customer Outreach

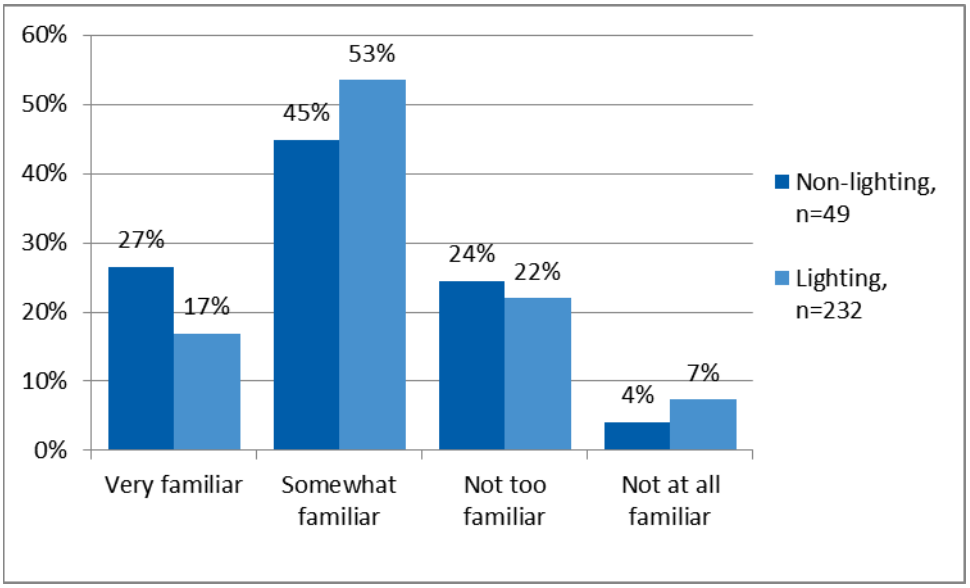
The C&I program relied on its Trade Ally base to promote the program to customers throughout the state. Trade Ally knowledge of the program remained critical to its success. The program used online and print materials, in addition to direct marketing by Trade Allies, to reach customers and to build program awareness. The program's overall PY2 goal was to raise awareness and drive participation in all of the statewide Energizing Indiana programs.

The program began additional marketing and outreach through one of seven tracks added to the program in August 2013. The opt-in track worked with businesses to promote Energizing Indiana through promotional CFL mailers and direct-install mechanisms.

The Evaluation Team surveyed customers to assess their Core C&I Program awareness. Seventy percent of lighting (n=233) and 72% (n=49) of non-lighting customers were somewhat or very familiar with the C&I Prescriptive Program (as shown in Figure 58). These responses represented an increase over the PY1

numbers, when 67% of lighting and non-lighting customers stated they were somewhat or very familiar with the program.[47]

Figure 58. How Familiar are You with the C&I Prescriptive Program?



The TPA staff told the Evaluation Team that early in PY2, customers expressed confusion between the Statewide Core Program and the utility-specific Core Plus programs. They also reported the variety of programs offered made it difficult for customers to determine which program best suited their needs. The Evaluation Team asked lighting and non-lighting customers questions to address this confusion, as shown in Figure 59 (below).

The majority of customers (>80%) reported not confusing the Statewide Core and Core Plus programs. The small percentage of customers expressing confusion cited the following concerns:

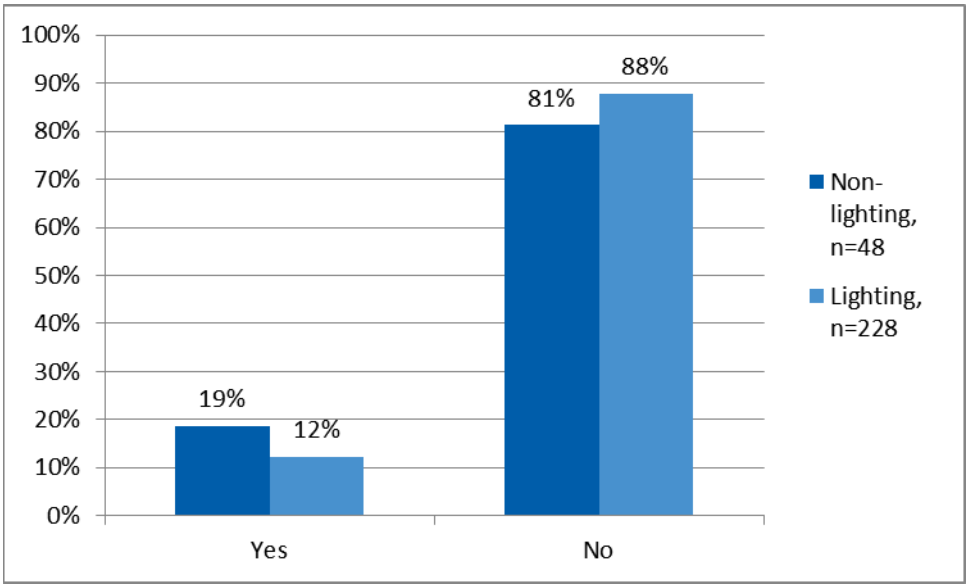
- Understanding how the programs differed across utilities and between Core and Core Plus;
- Understanding which items qualified under each program;
- Understanding how to apply for each program;
- Understanding who to call with questions; and
- Multiple companies offering assessments.

Some customers reported spending a great deal of time to understand the programs and applications. Some customers said the programs would be less confusing if they ran as one statewide program, due to having businesses in various utility territories. They asked for better informed Trade Allies to help them and clearer information on the different utility websites.

[47] Survey populations in PY1 were considerably smaller due to slower program uptake, with 91 lighting participants and 24 non-lighting participants.

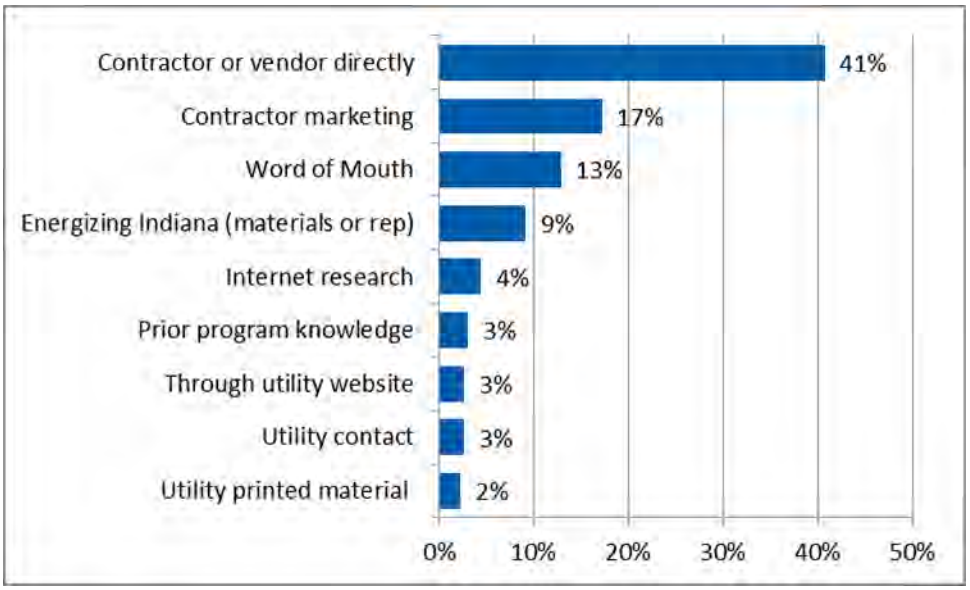
In a follow-up interview, the TPA told the Evaluation Team that they still received anecdotal reports from customers expressing confusion between the offered programs.

Figure 59. Did You Encounter Any Confusion between the Statewide Core Program and Other Utility Run Programs?



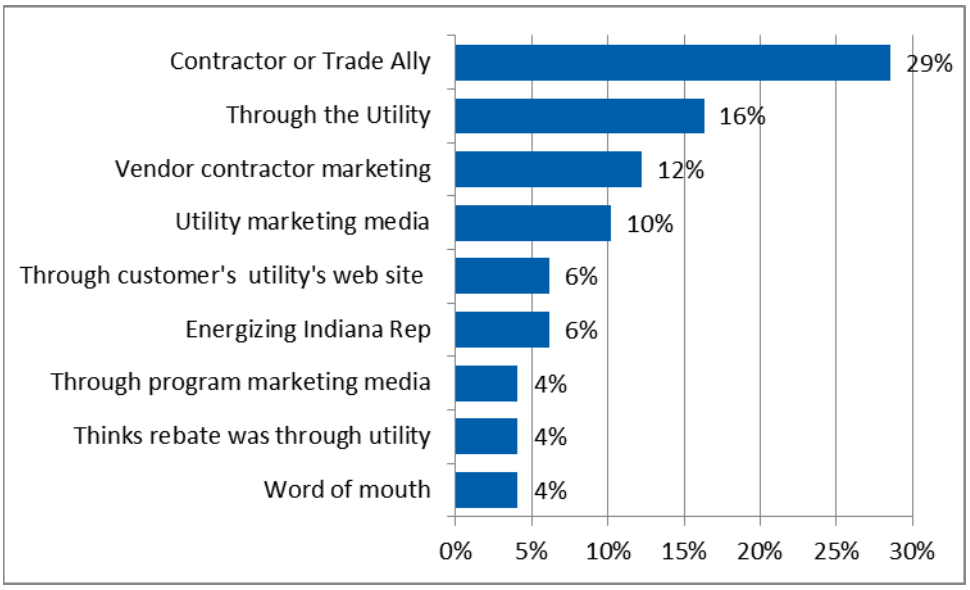
The survey asked customers how they learned of the programs. Both lighting (Figure 60) and non-lighting participants (Figure 61) principally learned of the programs through their Trade Allies.

Figure 60. How Did You Learn About the Energizing Indiana C&I Prescriptive Program?[1]



(1) Due to the large number of respondents, the figure only displays options with five or more responses.
n=233, Lighting Customers only

Figure 61. How Did You Learn About the Energizing Indiana C&I Prescriptive Program? (1)



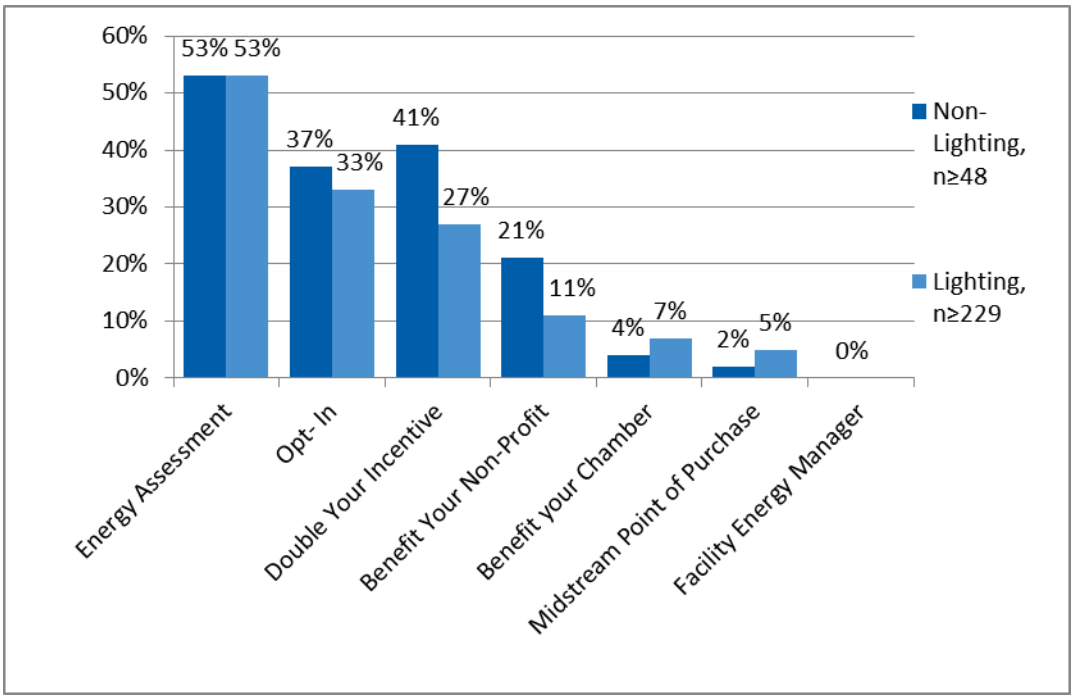
(1) Due to the large number of response categories, the figure only displays options with two or more responses.
n=49, Non-Lighting Customers only

In July 2013, the TPA launched the following seven promotional initiatives to stimulate program participation:

- Energy Assessment (a Trade Ally-generated, on-site efficiency opportunity assessment and report).
- CFL Opt-in (a direct-install program at no-cost to business owners).
- Double Your Incentive (a time-limited doubling of incentives to customers, with a $100 incentive to Trade Allies).
- Benefit Your Non-Profit (a 5% incentive bonus to non-profits).
- Benefit Your Chamber (a 5% incentive bonus to Chambers).
- Midstream Point-of-Purchase (a program promotion partnership with midstream equipment and services suppliers).
- Facility and Energy Manager Training (focusing on incentives and return-on-investments for the hotel industry).

Customers displayed a mixed awareness of these programs, with the Energy Assessment Initiative achieving the highest awareness levels. Figure 62 shows the survey results in greater detail.

Figure 62. Are you Aware of the Following Initiatives?



In a follow-up interview in February 2014, TPA staff told the Evaluation Team that:

- The "Double Your Incentive" promotion proved very successful in Q4 2013; and
- Only one Trade Ally participated in the "Midstream Point-of-Purchase" initiative.

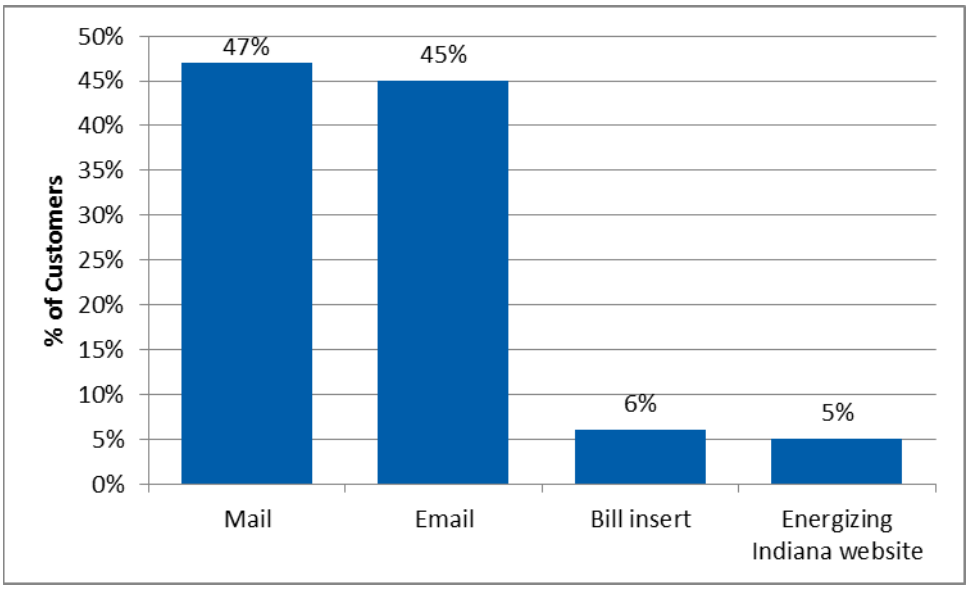
Consequently, the TPA began working with this Trade Ally to improve the sales verification and data tracking processes before expanding the initiative. The Facility and Energy Manager initiative did not acquire participants in PY2. In the follow-up interview, the TPA reported continuing to work with Trade Allies to develop the sales pipeline, and expected the initiative to achieve savings in 2014.

Nonparticipant Customers

The Evaluation Team surveyed 101 nonparticipant customers. Only 26% (n=26) knew of the program. Of that 26%, one-half knew of the ENERGY STAR program and the lighting program, and one-third knew of the non-lighting program.

Nonparticipants primarily learned of the program from printed advertisements, such as mailings or newspapers, or from their Trade Allies. Nonparticipants also asked to be kept informed about the C&I Prescriptive Rebate Program via mail or e-mail (as shown in Figure 63).

Figure 63. Future Communication Preferences



n=88 Multiple Responses Allowed

Trade Ally Outreach

Energizing Indiana staff played an important role in Trade Ally outreach, with 10 of the 18 surveyed Trade Allies saying they learned of the program from Energizing Indiana staff. Five Trade Allies learned of the program from a fellow Trade Ally.

Trade allies received brochures, access to the website, and other means of promoting the program. Two Trade Allies said they attended a luncheon hosted by the TPA. Thirteen of the Trade Allies expressed satisfaction with the program's resources. Four Trade Allies stated they had not received training or materials, and the final Trade Ally did not respond. When asked what program elements could be improved, Trade Allies most frequently requested more access to Energizing Indiana staff.

Only one Trade Ally said customers were very familiar with the C&I Prescriptive Program. Ten (56%) said customers were somewhat familiar, and seven (39%) said customers were not too familiar with the program. These responses substantiated the customers' own observations regarding their familiarity with the program.

Fifteen Trade Allies said customer awareness of the program increased in PY2, attributing this to program marketing, advertising, and word-of-mouth. Sixteen Trade Allies cited word-of-mouth as the most effective way to reach their customers. Several told the Evaluation Team that the program had been operating long enough that "word was getting around."

The opt-in direct-install program utilized additional Trade Allies.

1. The Evaluation Team conducted interviews with field technicians and Trade Ally coordinators from the C&I Program implementation team in multiple locations around Indiana. The TPA sent mailers to smaller commercial businesses, describing the project and offering CFLs to replace currently used, less-energy-efficient bulbs. Individual customers returned the flyers, having filled out the number of bulb sockets in their commercial spaces if they chose to participate, and

having indicated whether they wanted 13- or 18-watt bulbs. Field technicians received a list of customers in their regions, and took the following actions: if the customers had fewer than 12 sockets in their spaces, they received bulbs via mail; if they had more than 18 bulb retrofits available, technicians called to make appointments, visited stores to install bulbs directly, and removed the replaced bulbs (to ensure the less energy-efficient bulbs would not be used again). While field technicians in some territories visited 30 to 50 stores, others only visited one or two. Indiana Michigan Power sent mailers only to hotels/motels/lodging and realized very few returns, while other utilities sent mailers to an array of buildings and realized greater returns.

2. Businesses included: hospitals, animal clinics, offices (such as law firms), small restaurants, pubs, gas stations, yoga studios, small town grocers, hotels/motels, nursing homes, smaller private schools, cosmetic stores, strip malls, libraries, ice scream parlors, book shops, beauty salons, barber shops, and churches.
3. Feedback included that the program produced negligible actual savings, realizing greater benefits through the education/awareness component from Trade Allies or field technicians visiting local stores and informing business owners or managers about other programs for which they could qualify. For non-profit businesses, for example, Trade Allies or field technicians informed them of community outreach and provided paperwork for energy upgrades. If business used older machinery, contacts provided paperwork for community programs/rebates. Some businesses could participate in the custom program. Most stores used fluorescent lighting, and some business representatives did not know what CFL bulbs were.
4. Outreach produced very positive interactions with managers and store owners: businesses expressed gratitude for the help, for receiving CFLs, and for learning about other programs. A few customers followed up regarding their interests, mostly in weatherizing homes and arranging energy assessments.

Nonparticipant Trade Allies

The Evaluation Team spoke with four nonparticipating Trade Allies, all of whom knew of the C&I Prescriptive program. None knew of the $100 Trade Ally incentive for accepted program applications. Nonparticipating Trade Allies told the Evaluation Team that they learned of the program from program or utility staff, or from their suppliers. Two Trade Allies expressed interest in working with the program and said they would prefer to receive information about it via e-mail.

Commercial and Industrial Marketing Materials and Messaging

The Evaluation Team reviewed all program marketing materials provided by the TPA. Overall, pieces presented a consistent look and feel, and appeared to closely follow the Energizing Indiana Visual Identity Guide (e.g., fonts, colors, and layout). They typically included the Energizing Indiana logo (appropriately), in conjunction with utility logos (pending the piece of collateral). All pieces included a strong call-to-action, which consistently included the program website, e-mail address, and telephone number. The online advertisements directed customers to the program webpage, which served as a portal for customer engagement, education, and interaction.

The program also employed messaging and matching imagery utilizing a robber or masked light bulb. Energizing Indiana staff reported the imagery anecdotally provided strong brand recognition; the Evaluation Team did not test this hypothesis in the customer surveys. The creative design sought to

illustrate that customers might lose money by not participating in the program. All pieces appeared to deliver a strong, consistent and clear message.

The TPA indicated they closely tracked all marketing and communications initiatives. They provided the Evaluation Team with the response rates that follow, and reported satisfaction with the responses (specifically, that the online advertisements performed above the industry average):

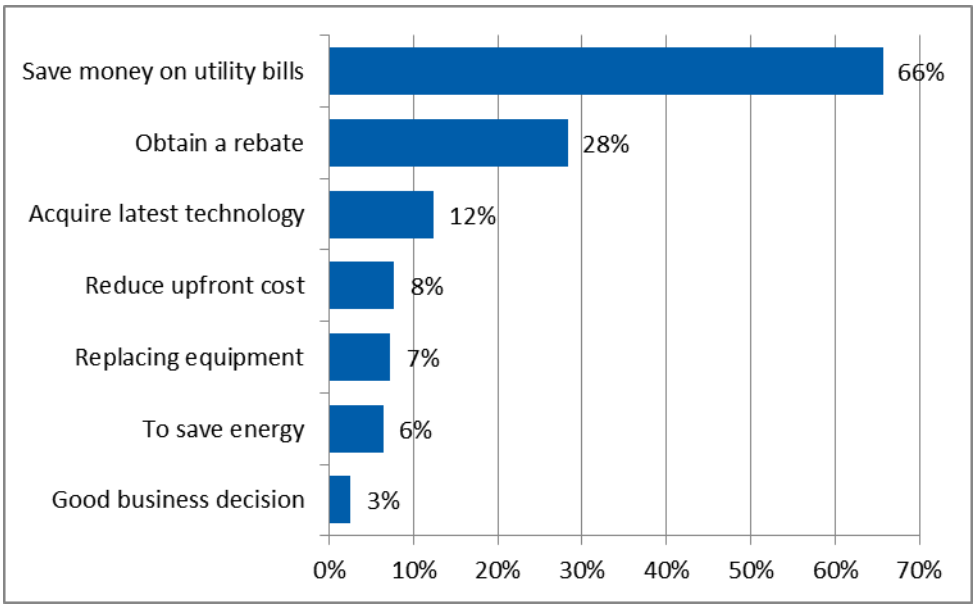
- **CFL Opt-In**: Overall Response rate: 7.4%
- **Facility Assessment Mailing:** Response rate: 1.7%
- **Online Display Campaign:**
    - 64,595,223 impressions
    - 147,201 clicks
    - Click-through Rate (CTR):[48] 0.228%
- **Google AdWords:**
    - 1,522,165 impressions
    - 8,475 clicks
    - CTR: 0.57%

Program Enrollment

Financial motives, including saving money and obtaining a rebate, primarily drove customer participation, as shown in Figure 64 and Figure 65.

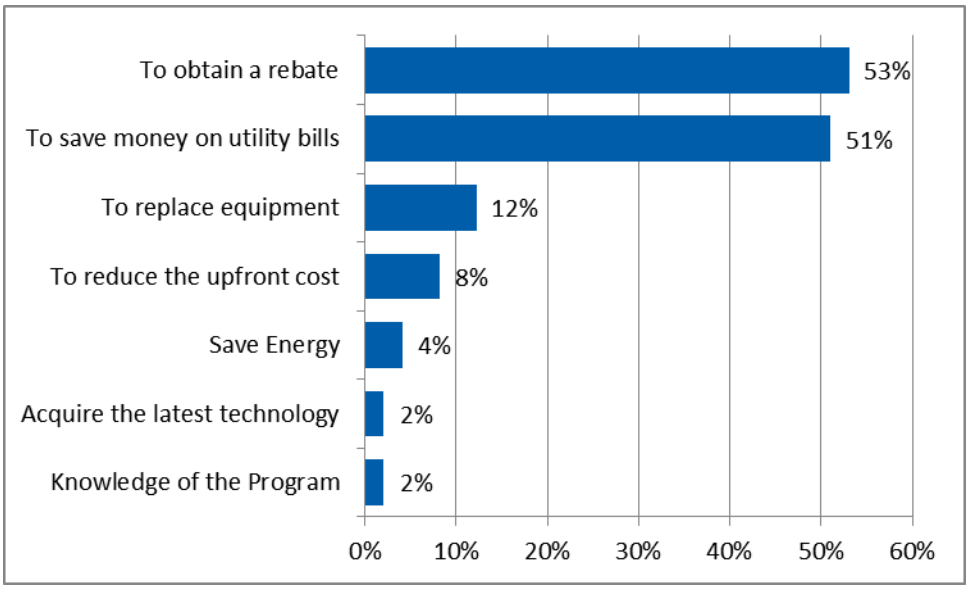
[48] The CTR represents the number of clicks an advertisement receives, divided by the number of times it was shown (impressions).

Figure 64: What Factors were Important in Your Decision to participate? (1)



(1) Options with less than three responses not included.
Lighting customers, n=233, Multiple Responses Allowed

Figure 65: What Factors were Important in Your Decision to Participate?



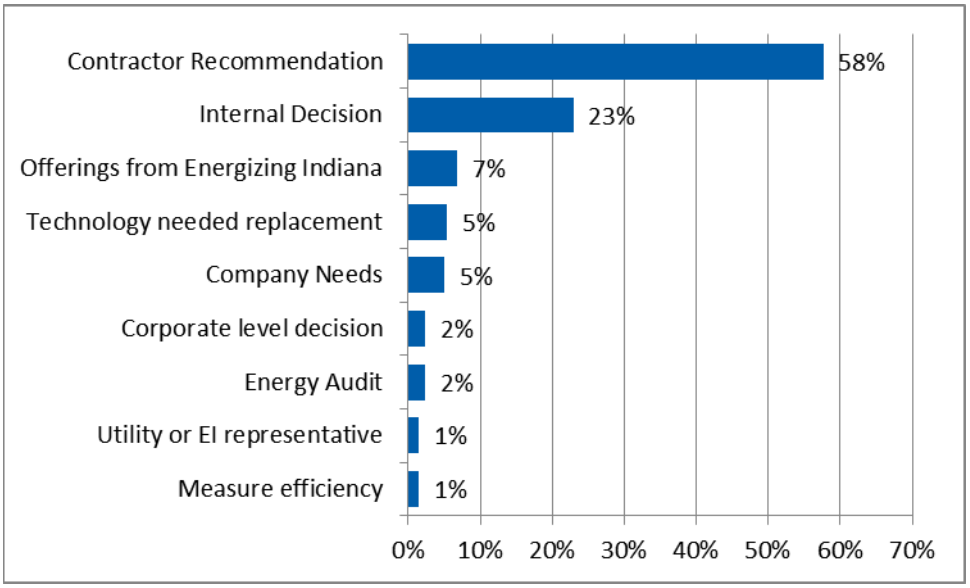
Lighting customers, n=49, Multiple Responses Allowed

Trade Allies primarily drove the PY2 program. In PY1, TPA staff expressed frustration with their inability to target customers directly; they found it extremely difficult to rely exclusively on the Trade Ally network to deliver a program with high savings goals; therefore, the Trade Allies played a large part in resolving this issue.

When the Evaluation Team asked participants how they determined which equipment to install, responses confirmed Trade Allies' importance in creating PY2 customer awareness. For lighting

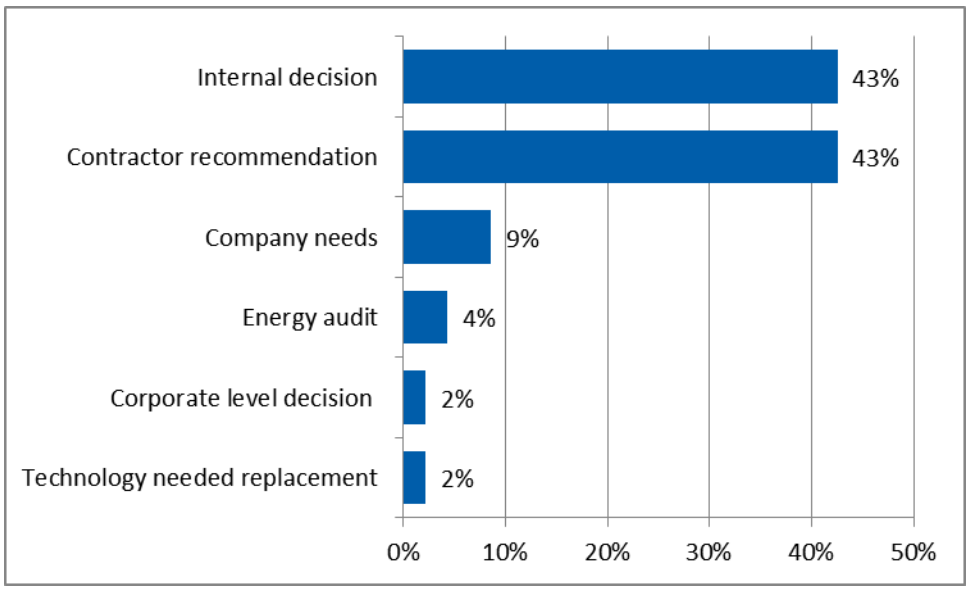
customers, more than one-half of respondents relied on a Trade Ally; non-lighting customers split between Trade Allies and internal decision making. Figure 66 and Figure 67 display lighting and non-lighting responses, respectively.

Figure 66: How did you Determine Which Equipment to Install?



Lighting Customers, n=222, Multiple Responses Allowed

Figure 67: How did you Determine Which Equipment to Install?



Non-Lighting Customers, n=47, Multiple Responses Allowed

7.9.3 PROGRAM SATISFACTION

The Evaluation Team examined customer satisfaction with several aspects of the C&I Prescriptive program, including: program materials, contractor (Trade Ally) knowledge, the application process, eligible measures, rebate arrival times, and the program overall. The Evaluation Team used a 10-point scale, where 1 meant very dissatisfied and 10 meant very satisfied. Overall, lighting and non-lighting customers expressed satisfaction with all program features.

Lighting Participants

Figure 68 and Figure 69 show lighting participants' satisfaction rates in PY1 and PY2, respectively.

Figure 68: How Satisfied Are You With… (PY1, Lighting Participants)

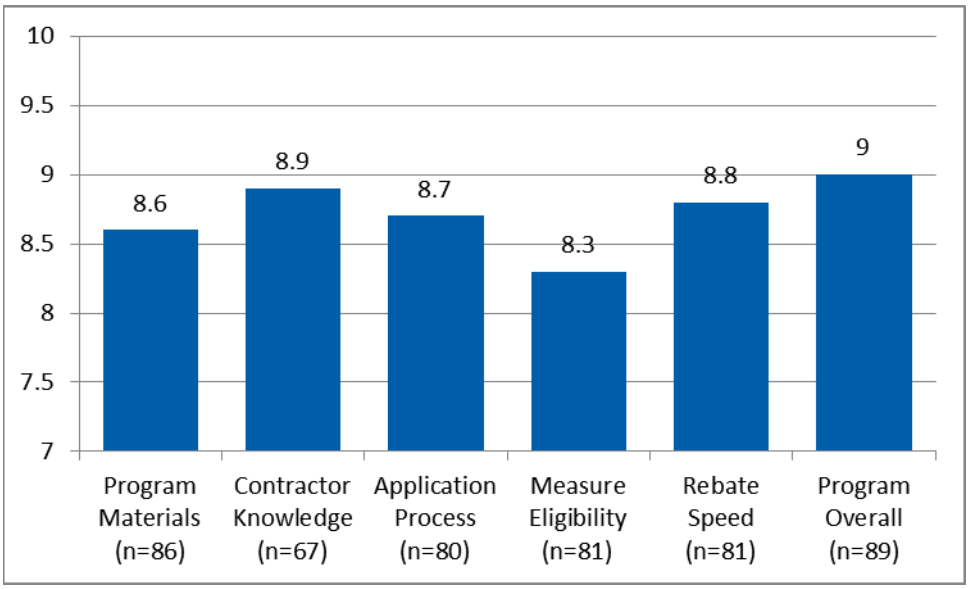
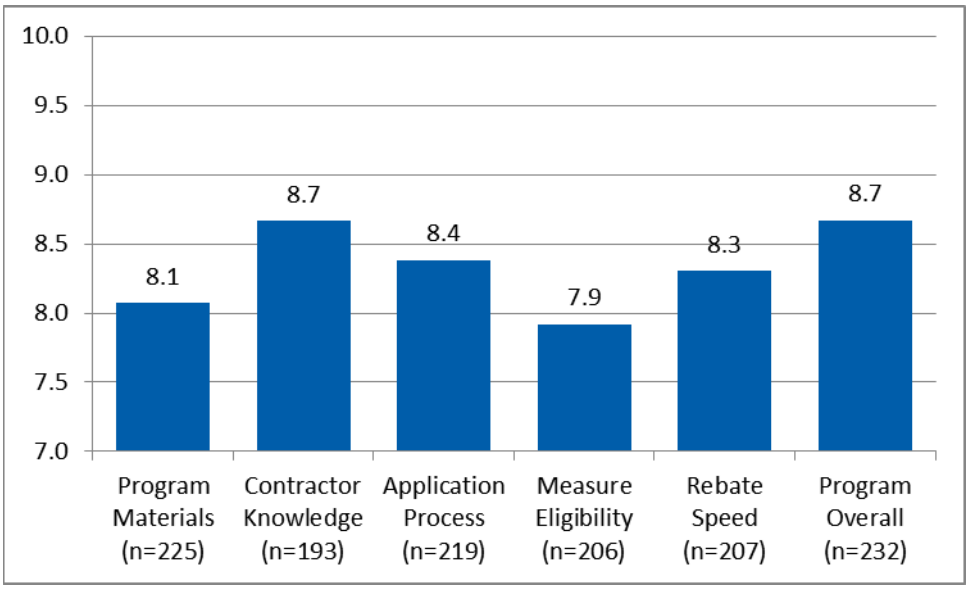


Figure 69: How Satisfied Are You With… (PY2, Lighting Participants)



PY2 customer satisfaction averaged high across all categories, despite a slight drop from PY1 response scores. At least 94% of lighting customers responded with a 5 or higher in every category. The Evaluation Team examined whether any response changes showed statistical significance. While the two years did not display a statistical difference in most categories, customer responses about satisfaction with program materials and rebate speeds proved statistically significant.

Of 1,282 total responses by lighting customers, just 114 rated the program a 5 or below. Those expressing dissatisfaction with program features most commonly cited the following areas:

- Program Materials: Respondents found program materials confusing and did not provide sufficient information. Twenty of 28 PY2 customers expressing dissatisfaction were somewhat or not at all familiar with the program.
- Trade Ally Knowledge: Customers stated the Trade Ally installing the measure did not know of the program.
- Application Process: The application was too long and confusing.
- Measure Eligibility: Measures were too limited (two customers specifically mentioned LEDs, which multiple Trade Allies also mentioned).
- Rebate Speeds: The time it took to receive a rebate was much longer than the customer anticipated.
- Overall: The process was complicated and program staff were not responsive.

Non-Lighting Participants

Non-lighting customers also expressed satisfaction in all areas, as shown by the responses in Figure 70 and Figure 71.

Figure 70: How Satisfied Are You With… (PY1, Non-Lighting Participants)

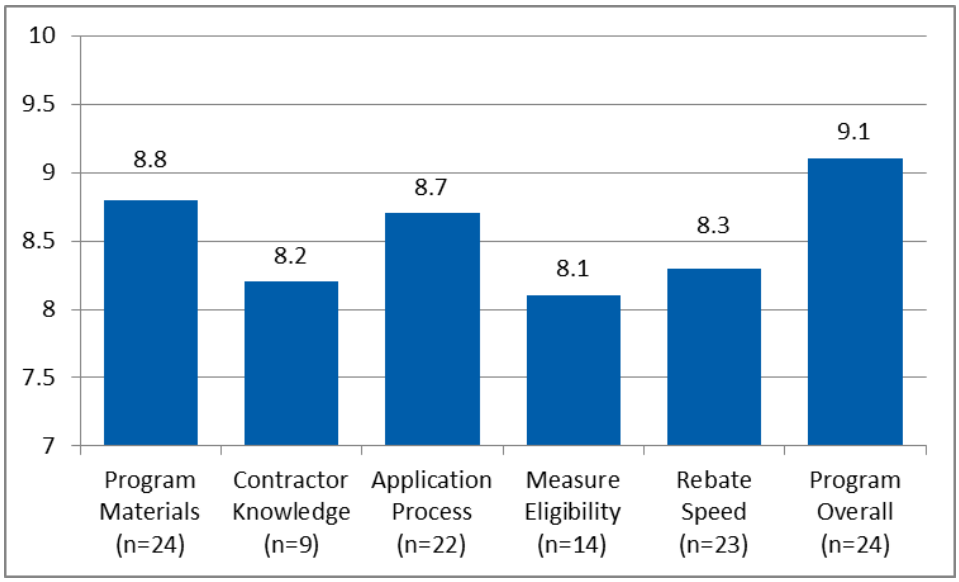
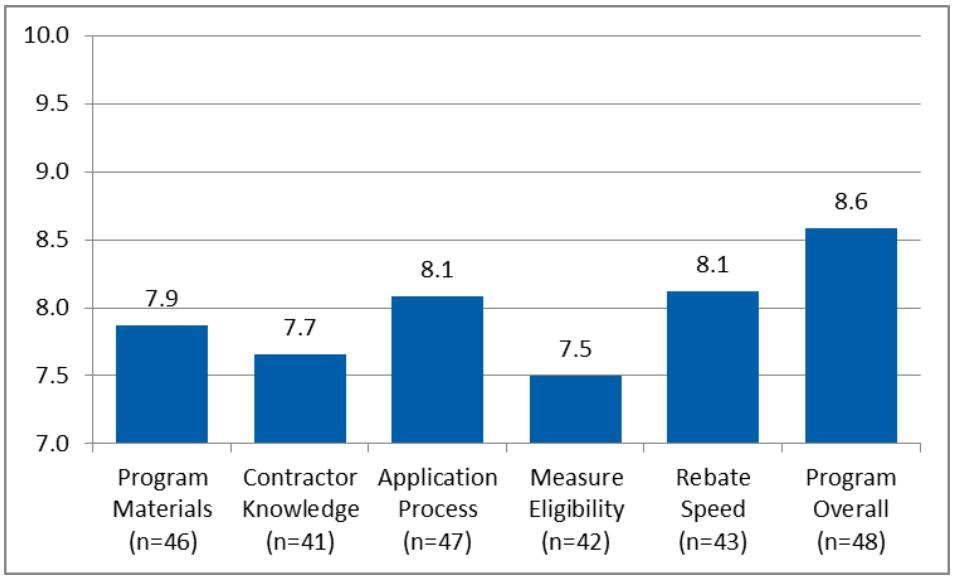


Figure 71: How Satisfied Are You With… (PY2, Non-Lighting Participants)



In all areas except Trade Ally knowledge, at least 98% of respondents awarded a 5 or higher in each category. Eighty-five percent of respondents indicated a 5 or higher when asked about Trade Ally knowledge. As with the lighting respondents, the only two categories exhibiting statistically significant differences between PY1 and PY2 were satisfaction with program materials and the speed with which rebates arrived.

Responses indicated limited dissatisfaction with each program feature, with just 31 of 267 total satisfaction responses below a 5. Customers expressed dissatisfaction for the following reasons:

- Program Materials: Materials were unclear.
- Trade Ally Knowledge: Trade allies were unaware of the program.

- Application Process: The application was too complex.
- Measure Eligibility: The measure selection was too limited.
- Rebate Speed: The rebate did not arrive fast enough.
- Program Overall: No customers ranked the overall program with a 5 or below.

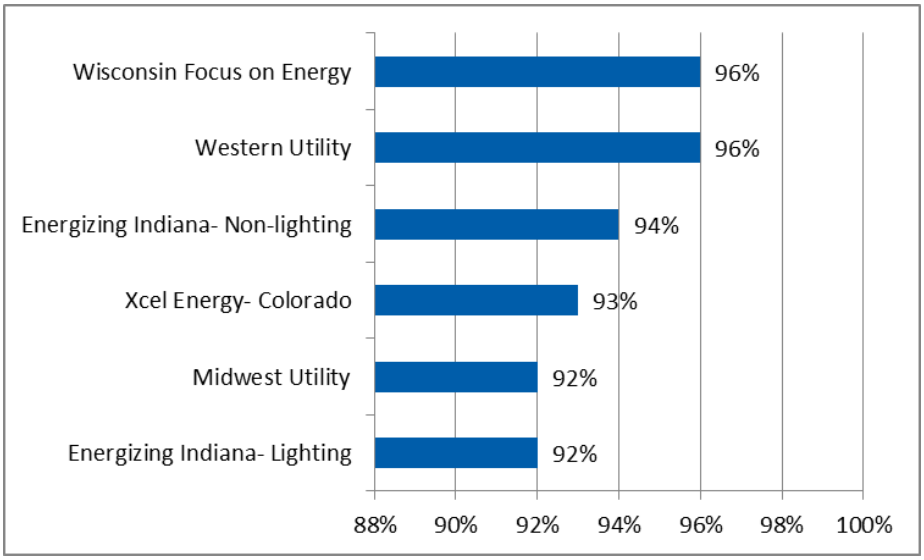
Twenty-five customers offered suggestions for program improvements, with the following ranking as the top three responses:

- Improve program outreach.
- Streamline the application process.
- Expand the measure list.

Customer Satisfaction Benchmarking

The Evaluation Team compared satisfaction levels for lighting and non-lighting customers to customers in several other prescriptive programs in the United States. As shown in Figure 72, program satisfaction,[49] in addition to being quite high, aligned with the other programs.

Figure 72: Satisfaction Benchmarking with Other Utility Programs

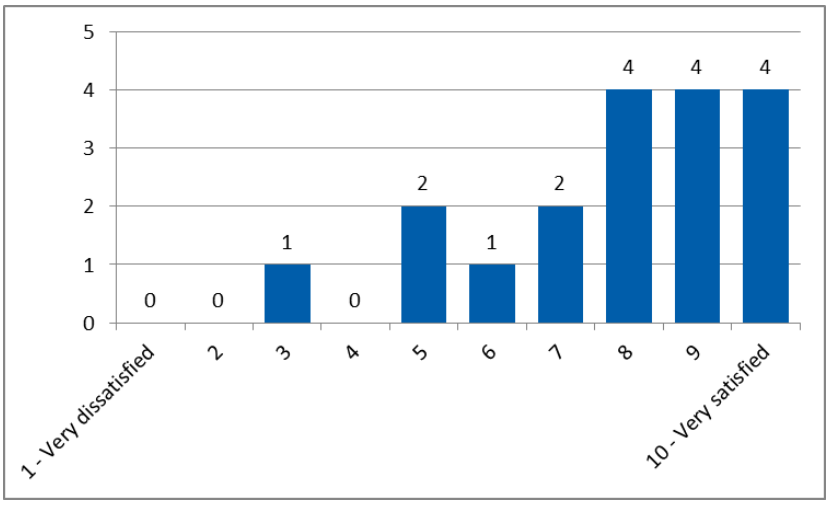


Trade Ally Satisfaction

Trade Allies expressed satisfaction with the program overall, as shown in Figure 73. The single Trade Ally expressing dissatisfaction with the program (rating it a 3) indicated his satisfaction rose to very satisfied (10) when the "Double Your Rebate" initiative took effect.

[49] The team used customers who gave a ranking of "7" or higher.

Figure 73: How Satisfied Were You with the Program Overall?



n=18

Participation Barriers

The Evaluation Team asked customers what they perceived as the greatest barriers to their participation in the C&I Prescriptive Program. Two customers cited obtaining corporate approval for project funding. Trade Allies also cited financial challenges, specifically the availability of upfront capital to invest in new energy-efficiency measures, as the biggest barriers their customers faced. Trade Allies also said increasing rebates and customer outreach would best improve the program for customers.

Forty-one nonparticipants' stated they encountered barriers when making energy-saving improvements in their facilities. These barriers aligned with those cited by participants and Trade Allies. More than one-half stated that financial limitations, either through initial upgrade costs or through budget limitations, presented their primary participation barriers. Approximately 20% (n=9) also cited building limitations.

Surveys also asked Trade Allies about barriers. Of 18 Trade Allies surveyed, 10 participated in the Core Plus programs and said dealing with different applications, program policies, and measure presented challenges.

7.9.4 DATA AND TRACKING SYSTEMS

Contact Databases

The Evaluation Team used Trade Ally contact information provided by the TPA to craft samples for the Trade Ally surveys. In preparing the samples for use, the Evaluation Team encountered two issues:

- The materials listed many Trade Allies multiple times, based on contact persons and on the spelling of the Trade Ally company name.
- The nonparticipant list missed many phone numbers, and the Evaluation Team found many Trade Allies on that list had, in fact, participated in the program.

Inaccurate project information presented difficulties when conducting the evaluation, and presented problems for the TPA's tracking of Trade Ally enrollment and participation. As this network serves as a primary source of project work, diligence in maintaining accurate Trade Ally project records is important.

7.10 INSIGHTS AND RECOMMENDATIONS

Conclusion 1*:* Trade allies serve a key program component and prove critical to its success. Trade allies provided the primary awareness source for lighting and non-lighting customers and continued to serve as the program's primary delivery vehicle. The "Double Your incentive" initiative successfully drove participation and offered an effective marketing tool for Trade Allies.

Recommendation 1: Continue to leverage Trade Allies as marketing ambassadors, and further develop engagement tactics and support. Increase awareness of marketing initiatives, such as the $100 Trade Ally incentive, to recruit more currently nonparticipating Trade Allies into the program.

Conclusion 2: Customers and Trade Allies expressed less confusion than anticipated regarding differences between the statewide and Core Plus programs. Interviews with program managers indicated customer confusion between the programs, but rates appeared less than expected (though some customers and Trade Allies did express confusion).

Recommendation 2: A website displaying all programs offered, including those run by Energizing Indiana and by the utilities, would help customers better understand offerings and provide an additional resource for Trade Allies promoting the program.

Conclusion 3: Trade ally tracking data contained duplicates and lacked complete information**.** The lists provided by the TPA listed Trade Ally names multiple times (with multiple spellings), and included many entries with missing contact information. Additionally, the materials listed many Trade Allies as having no applications ("nonparticipants"), when they were, in fact, participants.

Recommendation 3: Standardize Trade Ally names to avoid duplicates in different entries and require contact information, such as names, e-mail addresses, and telephone numbers. Consistent name use will allow the TPA to better track projects per Trade Ally, reducing errors regarding participation status. Mandatory contact information also would help the TPA conduct outreach/contacts (such as e-mail blasts and event invitations).

Conclusion 4: Participants are highly satisfied with the program. Both customers and Trade Allies expressed satisfaction with the program overall and with its individual components. Benchmarking analysis indicated customer satisfaction rates aligned with similar programs elsewhere in the United States.

Recommendation 4: Consider conducting routine customer surveys, online or as part of the application process, to monitor performance and satisfaction.

Conclusion 5: The C&I Prescriptive program did not meet its goals in PY1 or PY2, and likely will not meet them in PY3 without increasing customer awareness and understanding of the program. Trade allies told the Evaluation Team that only a small percentage of customers were "very familiar" with the program. Under the program's current design, only Trade Allies can directly access customers.

Recommendation 5: Evaluate Trade Ally participation levels and benchmark these against similar C&I programs to determine if the program maintains participation levels adequate to meet its goals. In addition, utility representatives should consider working with the TPA to allow program managers to access to medium and larger customer accounts, expanding direct contact and increasing customer access to program information.

Recommendation 6: Program data should include the marketing and outreach initiatives that led customers to participate. Including these will help managers track their effectiveness.

Conclusion 7: Chiller measures are highly complex and varied. Existing implementer and Indiana TRM savings estimate methodologies do not accurately reflect achievable savings values.

Recommendation 7: Shift the chiller measure to a custom or hybrid-custom model. Offer (relatively) low prescriptive savings values and incentives under a prescriptive offering, and enable added savings and incentives for conducting a custom energy savings analysis.

Conclusion 8: The three *ex-ante* sources provided by the implementer—the TPA web portal, the totals queried from the database, and the TPA report to the DSMCC—contained conflicting values for installed quantities, kWh savings, and kW savings. The implementer claimed the database was the governing data source; so the Evaluation Team referenced those quantities and savings for the analysis presented in this report. However, the database did not include the program's opt-in and bulb drop measures.

Recommendation 8: Given that the program tracking database provides the best record of implementer data, the web portal and any subsequent reports or scorecards should align with this source. This database should also track all program offerings to produce consolidated, accurate reporting.

8. COST-EFFECTIVENESS

8.1 *INTRODUCTION*

Evaluating the cost-effectiveness of energy efficiency programs for the set of Energizing Indiana energy efficiency programs involves following the procedures specified in the Indiana Evaluation Framework. The cost-effectiveness approaches in the Framework are based, to a large degree, on the California Standard Practice Manual (SPM). However, the Indiana Evaluation Framework takes precedence over the SPM when applicable. Adherence to the procedures in the Framework and the SPM may follow a number of paths; but, two approaches are the most prevalent. One involves evaluating the *ex-ante* cost-effectiveness (i.e., the cost-effectiveness of proposed programs). The second involves evaluating energy efficiency programs on an *ex-post* basis. The *ex-ante* approach uses projected measure impacts, while the *ex-post* approach uses actual results from the EM&V. This latter or *ex-post* approach is utilized for the cost-effectiveness analysis in this report and is consistent with the analysis requirements of the Indiana Evaluation Framework.

This report details the results of the cost-effectiveness analysis for the Statewide Core programs for each utility and the portfolio of programs for the measures implemented in the 2012 and 2013 program years. While this benefit cost analysis is for the second year of the Third Party Administrator's (TPA) operations, the avoided costs and program costs for both program year one (2012) and program year two (2013) are aggregated together for analyzing cost-effectiveness. This aggregation is appropriate for two reasons: (1) it provides results for the full program since inception and (2) it avoids timing issues that occur because there are carry-over load impacts or avoided costs counted in program year two that were associated with expenditures in program year one.

Given the May 9, 2014 Order by the Indiana Utility Regulatory Commission requesting standalone cost-effectiveness scores for just the second program year, those cost-effectiveness results have been prepared. The second program year cost effectiveness scores are provided in Appendix B to this report. However, these scores must be viewed with the caveats previously mentioned.

This report includes the costs associated with the development, start-up, rollout, and operational adjustments associated with the both years. Typically, as programs mature, programs become more cost-effective as the start-up costs and operational inefficiencies are combined with the typically more effective efforts in the years following the start-up year. The benefit cost assessment presented in this report includes the costs of the TPA to implement the program, including their administrative, marketing and overhead costs. It does not include the administrative, monitoring and tracking costs of the utilities overseeing the TPA's efforts. As a result, the benefit cost assessment provided in this report provides a perspective on the cost-effectiveness of the performance of the TPA rather than the cost-effectiveness of the TPA's activities plus the cost of the utility's oversight or management functions.

The benefit cost analysis will be repeated each year of the three year program cycle to reflect the accumulated costs and benefits of the programs as they are implemented. That is, the analysis for year two includes the costs of year one plus year two, and the benefits from year one and year two. The analysis from the third year will include program costs for all cycles (3 years) and all benefits achieved over that three-year cycle. The benefit cost assessments are guided by the Indiana Evaluation Framework of September 2012 as up-dated February 2013Cost-effectiveness analysis is a form of economic analysis that compares the relative costs and benefits from an investment. In the Energy

Efficiency (EE) industry, it is an indicator of the energy supply relative performance or economic attractiveness of any energy efficiency investment or practice when compared to the costs of energy produced and delivered in the absence of such an investment, but without consideration of the value or costs of non-energy benefits or non-included externalities. The typical cost-effectiveness formula provides an economic comparison of costs and benefits.

The cost-effectiveness analysis of energy efficiency and demand-response programs are conducted by relying on the Indiana Evaluation Framework's benefit cost test results for each program as well as for the portfolio level for each utility and the State of Indiana. These tests are not necessarily used to recover costs but to provide information to improve decisions on which program(s) to adjust or continue to offer within the energy efficiency portfolio. The required inputs and assumptions are outlined below. The results of this analysis include the Indiana Framework's primary tests at the program and portfolio level. All of the tests are reported based upon the net-present value (NPV) of the benefits versus the costs. These tests employ the full effective useful life of the measures installed and the utility's cost of capital, as if program funds were acquired via a utility loan from capital supply markets at a rate similar to that which would be borrowed to construct a new generation plant.

8.1.1 COST-EFFECTIVENESS MODEL DESCRIPTION

EM&V and cost-effectiveness modeling are critical to the long-term success of energy efficiency programs. To understand cost-effectiveness, the utility/program administrator should have a model that can evaluate changes to both the individual programs and to the portfolio. This includes but is not limited to the ability to evaluate the impact on cost-effectiveness of changes in numerous factors such as: incentive levels, participant levels, measure savings, measure costs, avoided costs, end-use load shapes, coincident peak factors, net-to-gross factors, administrative costs, and the addition or deletion of measures or programs.

To provide the best and most accurate demand side management (DSM)/demand-response (DR)/energy efficiency portfolio cost-effectiveness modeling, the evaluation team used the DSMore model. DSMore is considered the leading DSM/energy efficiency benefit cost modeling tool in the country. The DSMore tool, developed by Integral Analytics (IA), is currently being used by utilities in approximately 35 states and by numerous state regulatory commissions. Some of the leading users of the tool in the country include Duke Energy, Xcel, and American Electric Power. DSMore is the only tool in the country that captures hourly price and load volatility across multiple years of weather which is needed to assess the true cost-effectiveness of the programs under expected supply and load conditions, even in extreme weather situations.

In its simplest form, energy efficiency cost-effectiveness is measured by comparing the benefits of an investment with the costs. There are five primary cost-effectiveness tests that may be employed in energy efficiency program evaluation. These five cost-effectiveness tests are the participant cost test (PCT), the utility cost test (UCT) sometimes called the program administrator cost test, the ratepayer impact measure test (RIM), the total resource cost test (TRC), and the societal cost test (SCT). However, for purposes of this EM&V analysis, the societal cost test will not be conducted since estimates of environmental and other non-energy costs and benefits will not be available.

Each of the four remaining tests considers the impacts of energy efficiency programs from different points of view in the energy system. Each test provides a single stakeholder perspective; however, taken together the tests can provide a comprehensive view of the program. The tests are also used to help program planners improve the program design by answering questions such as: Is the program cost-

effective overall? Are some costs or incentives too high or too low? What will be the impact on customer rates?

Each cost-effectiveness test shares a common structure. Each test compares the total benefits and the total costs in dollars from a certain point of view to determine whether or not the overall benefits exceed the costs. A test passes cost-effectiveness if the benefit-to-cost ratio is greater than one, and fails if it is less than one.

$$Benefit/Cost\ Ratio = \frac{Benefits}{Costs} = \frac{NPV\ \sum benefits\ (\$)}{NPV\ \sum costs\ (\$)}$$

Table 175 and Table 176 below provide overview information on the four tests utilized in this report.

Table 166: Cost-effectiveness Test Overview

Cost-effectiveness Test	Objective	Comparison
Participant Cost Test (PCT)	Are there positive benefits to the customer?	Costs and Benefits of customer installing measure
Utility/Program Administrator Cost Test (UCT)	Will utility revenues increase?	Program administration cost to achieve supply-side resource cost savings
Ratepayer Impact Measure Test (RIM)	Will utility rates increase?	Program administration cost and utility bill reductions to achieve supply-side resource cost savings
Total Resource Cost Test (TRC)	Will the total cost of energy in the utility service territory decrease?	Program administrator and customer costs to achieve utility resource savings

Table 166: Cost-effectiveness Test Overview

Costs and Benefits	PCT	UCT	RIM	TRC
Avoided energy costs (fuel, O&M of power plants and T&D lines)		Benefit	Benefit	Benefit
Avoided capacity costs (constructing power plants, T&D lines, pipelines)		Benefit	Benefit	Benefit
Other benefits (fossil fuel savings, water savings, equipment O&M, etc.)				Benefit
Externalities (environmental benefits like emissions reductions)				
Participants' incremental cost (above baseline) of efficient equipment	Cost			Cost
Program administration costs (staff, marketing, etc.)		Cost	Cost	Cost
Incentives (rebates)	Benefit	Cost	Cost	
Lost utility revenue / lower energy bills (due to lower sales)	Benefit		Cost	

The cost-effectiveness tests examine the measure from different perspectives. The following formulas describe the tests again using the terminology from DSMore.

$$Utility\ \text{Cost}\ Test = \frac{Avoided\ Costs}{Utility\ Costs}$$

$$TRC\ Test = \frac{Avoided\ Costs + Tax\ Saved}{Utility\ Costs + Participant\ Costs\ Net\ of\ Incentives}$$

$$RIM\ Test = \frac{Avoided\ Costs}{Utility\ Costs + Lost\ Revenue}$$

$$RIM\ (Net\ Fuel)\ Test = \frac{Avoided\ Costs}{Utility\ Costs + Lost\ Revenue\ Net\ of\ Fuel}$$

$$Participant\ Test = \frac{Lost\ Revenue + Incentives + Tax\ Savings}{Participant\ Costs}$$

8.2 OVERVIEW OF DSMORE

DSMore is a financial analysis tool designed to evaluate the costs, benefits, and risks of energy efficiency programs and measures. DSMore estimates the value of an energy efficiency measure at an hourly level across distributions of weather and/or energy costs or prices. By examining energy efficiency

performance and cost-effectiveness over a wide variety of weather and cost conditions, the evaluator is in a better position to measure the risks and benefits of the energy efficiency measures.

The test results are provided for a range of weather conditions, including normal weather, and under various cost and market price conditions. Since DSMore is designed to be able to analyze extreme conditions, one can obtain a distribution of cost-effectiveness outcomes or expectations. Avoided costs for energy efficiency tend to increase with increasing market prices and/or more extreme weather conditions due to the covariance between load and costs/prices. Understanding the manner in which energy efficiency cost-effectiveness varies under these conditions allows a more precise valuation of energy efficiency programs and demand-response programs. Using valuation or modeling methods which use averages (e.g., annual use, monthly use, weather normal load profiles) instead of actual and forecasted hourly usage and avoided costs, by definition, will under-value energy efficiency and DSM programs which tend to exhibit higher savings during times of higher avoided costs (e.g., heating, ventilation, and air conditioning, typically referred to as HVAC, weatherization, demand-response). For programs which exhibit energy savings around-the-clock, averaging type methods yield valuation results that are equivalent to DSMore results; however, that type of program is not prevalent (exceptions include lighting that is on all hours, refrigeration, etc.). In all other cases, averaging based methods will yield cost-effectiveness test results that are lower than their actual value. DSMore methods and algorithms avoid this potential error through its very granular use of hourly energy savings and hourly avoided costs, linked via the same set of actual, local hourly weather histories.

Generally, the DSMore model requires the user to input specific information regarding the energy efficiency measure or program to be analyzed as well as the cost and rate information of the utility. These inputs enable one to then analyze the cost-effectiveness of the measure or program.

DSMore uses a set of program inputs, entered through the first two tabs (worksheets) of an Excel interface, combined with preconfigured load-shape and price data to calculate the cost-effectiveness tests. IA creates a custom set of hourly loads and prices based upon an analysis of over a 30+ year period for each customer. The load files are specific to the customer class served by the energy efficiency program. The user enters the measure information data into Excel, selects the appropriate load file, selects the appropriate price file and executes DSMore. DSMore uses the measure information data, the load file, and the price file to calculate the cost-effectiveness tests, and then exports the results into the same Excel workbook (i.e., worksheet tabs 3 through 8), but within the same Excel file as the measure inputs. The figure below provides an overview of the DSMore application and how the key inputs are related to the application engine.

Figure 74: DSMore Overview

8.2.1 ANALYTICAL APPROACH

Consider two scenarios (See table below): one using the *average* load and average prices and another scenario using *hourly* loads and prices. In both scenarios the average load is the same (2 MW) and the average price is also the same ($50/MWh) over the time period. However, the total value of the hourly analysis is greater ($500 versus $620). The actual value of the program in this example is almost 25% higher when hourly costs are used to estimate benefits compared to the use of average pricing.

Table 16768: Average vs. Hourly Valuation

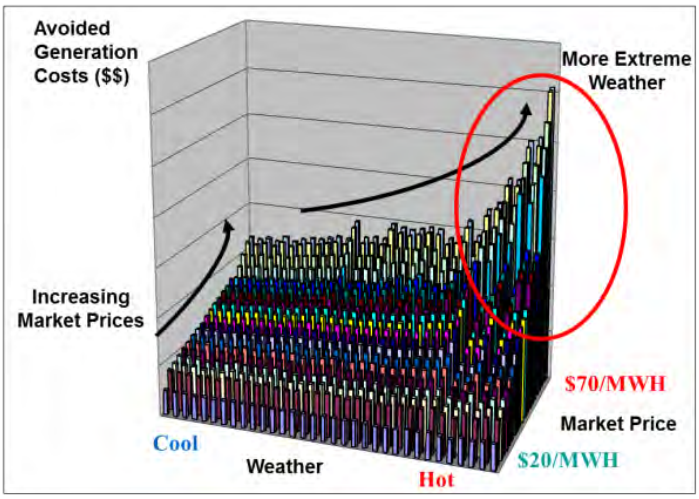
	Average				Hourly		
	Loads and Prices				Loads and Prices		
Hour	MW	$/MWH	Total $		MW	$/MWH	Total $
1	2	$50	$100		1	$20	$20
2	2	$50	$100		1	$20	$20
3	2	$50	$100		2	$50	$100
4	2	$50	$100		3	$80	$240
5	2	$50	$100		3	$80	$240
Average	2	$50			2	$50	
Total			$500				$620

To perform this hourly analysis, DSMore correlates historic loads and prices to actual historic weather. These relationships (along with the covariance) between loads, weather and price, and the probability distributions of these relationships, are used within DSMore to calculate approximately 700 different market/load/price scenarios, each with a unique test result. DSMore reports the endpoints or extremes of this distribution, for convenience, reducing the number of test results reported in the Excel output, to 5 to 9 test results, vs. 700. Of course, the user can simply adhere to one test result, which reflects their preferred set of avoided costs, across weather normal conditions, too.

One of the more versatile functions of DSMore is its ability to simultaneously assess multiple cost-effectiveness assessments over many different avoided cost scenarios. For each of the 30 years of weather scenarios, DSMore assesses 21 different electric market/cost/price scenarios. Typically, DSMore uses 33 years of weather as a default number of weather year scenarios, yielding 693 (33 weather scenarios x 21 market scenarios) cost-effectiveness test results to reflect a full spectrum of possible valuations of a particular program, or about 700 in total.

The figure below shows how the approximately 700 weather/price scenarios capture the extremes, which an averaging type of avoided cost method will ignore.

Figure 75: Weather & Market Scenarios



The average value of these approximately 700 tests represents an average, weather normal expectation across all possible market prices and forward cost scenarios. Selecting one market price scenario (today's value) provides test results for the current market, this year, but across 30+ weather scenarios. Using fewer than 30 years of weather jeopardizes accuracy of the estimation of weather normal and extreme weather effects. DSMore strives to reflect an appropriate range, or distribution of highs to lows, regarding weather. DSMore insures that the appropriately extreme hourly weather patterns are reflected, and valued, given historical observed extreme hourly weather.

With respect to forward market prices, DSMore uses 21 different forward curves. The model develops 21 such that the first set, or column, of avoided costs or prices, reflects traditional cost based avoided costs (i.e., system lambda, avoided production costs), leaving 20 columns for 20 different forward market price curves, ranging from low to high (e.g., $30/MWh to $70/MWh, on average over 8,760 hours). The use of 20 insures that approximately every 5th percentile of increase in the forward curves can be observed. We use 5th percentiles because it is generally safe to interpolate test results between, say, the 45th percentile and the 50th percentile, linearly. However, it is not appropriate to linearly interpolate test results between, for example, the 25th percentile and the 80th percentile. Energy prices are notoriously non-linear (i.e., peak prices are much more volatile than off-peak prices).

The key benefit to valuing energy efficiency across such a wide range of future cost and weather conditions lies in the ability of this approach to quantify not only short run cost-effectiveness, but long term predictions as well. The Option Test result reported by DSMore provides the long run cost-effectiveness perspective. Essentially, the Option Test result values the programs across 21 future possible sets of avoided costs, and across 30 to 40 years of actual hourly weather patterns. Traditionally, utilities only calculated one test result for the current year avoided costs. But, energy prices tend to "boom" and "bust" over time, reaching high price conditions during times of short supply (e.g., 1999, 2000) and low avoided cost conditions during times of excess supply (e.g., 2003, 2009). By valuing the energy efficiency programs across all possible future avoided cost possibilities, we are better able to determine if the programs will be cost-effective in the face of all these future possibilities, instead of just the current year. Both the short term test results and the long run test results are meaningful. But if a utility observes that the short run, current year test result is, say, .9, and the long run Option Test result is 1.3, then one might consider retaining this program for another couple years versus stopping the program. The reason that the long term test result is called the Option Test is that the energy savings

can be viewed as an option (albeit not executable, since, for example, the lighting equipment is already installed and cannot be removed) against having to pay for possible future higher avoided cost conditions.

8.2.2 INPUTS TO COST EFFECTIVENESS ANALYSIS

Best practice cost-effectiveness modeling starts with hourly prices and hourly energy savings from the specific measures/technologies being considered, and then correlates both to weather. In turn, this allows the model to capture the low probability, but high consequence weather events and apply appropriate values to them. Thus, a more accurate view of the value of the efficiency measure can be captured in comparison to other alternative supply options. Additionally, in order to complete the analysis, several inputs are required. These are summarized in the section below.

The foundation of the hourly price analysis used for the study is two years of historic hourly price data, matched with hourly weather to measure the price to weather covariance. The analysis is able to measure the overall variation and that portion attributable to weather, arriving at a weather normal price distribution. Price variation is a result of several uncertain variables, including weather. Using over 30 years of weather data regressed from two years of actual price data allows the analysis to measure the full range of possible outcomes, reflected in the DSMore results as Minimum, Todays (expected) and Maximum test ratios.

8.2.3 PROGRAM RELATED INPUTS

Program inputs into the model include participation rates, incentives paid, load savings of the measure, life of the measure, implementation costs, administrative costs and incremental costs to the participant of the high efficiency measure. These inputs were derived from the EM&V activities and supplied by the EM&V project team to IA for the cost-effectiveness analysis. The measured kWh savings are applied to the appropriate hours for that customer, based on the load curves of that customer group most likely to install the measure. For example, the commercial load curve is used for commercial measures and various commercial load curves may be used depending upon the type of measure installed and its size.

Values of these savings by hour are calculated based on that hour's market value for the life of the measure given the escalation rates assumed. This avoided cost is then present valued to understand the dollar value in today's dollars for those savings. These present values are then used by the model to determine the cost-effectiveness test results.

The EM&V project team also provided the program costs incurred by the third party administrator for each utility by program. The program costs included in the cost-effectiveness analysis presented in this report represents only the costs incurred by the third party administrator.[50] However, cost effectiveness assessments, including additional costs incurred by utilities, was provided separately for those utilities requesting that analysis.

[50] The cost information employed for each program by utility may be found in the "2012 Energizing Indiana Programs EM&V Report May 3, 2012 Final Report" and the "2013 Energizing Indiana Draft Evaluation Report April 1, 2013." See the specific tables for the Home Energy Audit program, the Low Income Weatherization program, the School Building Assessments and School Energy Efficiency Kit programs, the Residential Lighting program, and for the Commercial & Industrial Incentives program.

8.3 EFFECTIVE USEFUL LIFE

Measures installed via energy efficiency programs shall have the energy savings counted and valued over the full effective useful life (EUL) of the installed measures. In addition, the energy savings will be incorporated into the cost-effectiveness analysis for those technologies with a remaining useful life (RUL). In such situations, the energy savings will reflect a higher impact for the RUL and then step down to a level consistent with that associated with the current baseline for the rest of the EUL.

8.4 SPILLOVER AND FREERIDERS

"Spillover" is the term used in this report to describe the short term energy savings of participants that are caused by the program's activities, but are not captured in the tracking of the program's direct energy savings. An example might be a customer who is influenced by a program and who then buys two units of a qualifying piece of efficient equipment, but obtains a rebate for only one of those units. Another example is a participant who does participate in a program, and obtains a rebate in one location, but then replicates the program induced purchase decision in their building next door, but does not apply for a rebate for that purchase that was caused by the program. In these cases the customer is influenced by the programs to the extent that their short term actions induced by a program can "spillover" into other purchases or behaviors that are not rebated or tracked by a program yet were caused by the program and result in improved efficiency (energy savings). The spillover savings identified in this evaluation effort and included in the benefit cost assessment are those short term actions that were taken between the participation period and the time of the evaluation effort that were documented in the evaluation. As a result, the spillover included in this analysis is only a fraction of the total spillover that may be achieved. The longer term spillover that results from actions taken as a result of the program over many years, and the spillover that is associated with how programs change the way markets operate are not included in this assessment. The longer term market effects will be assessed in 2015 and these savings will be added to the assessment at the end of the 3 year program cycle.

"Freeriders" are people who participate in the program but would have installed the energy efficient piece of equipment without the program. All programs have freeriders as these are often the "early adopters" of a technology and have many different motivations beyond the program. However, program designs strive to increase the number of non-freeriders through several methods. First, incentives may be set at levels high enough to entice those who would not have participated due to financial concerns. And second, some measures are often eliminated that are known to have high freeridership. For example residential ENERGY STAR refrigerators are often eliminated even though they pass the cost benefit analysis because there already is a high adoption rate of these units in the market and other studies have shown high freerider rates. For this report, on the cost-effectiveness ratios, we net the impacts of freedrivers and freeriders.

8.5 UTILITY INPUTS

For utility information, DSMore needs utility rates, escalation rates, discount rates for the utility, society and the participant, and avoided costs. For this report, utilities in the DSMCC supplied the values used for avoided costs, escalation rates, discount rates, loss ratios, and electric rates. The projection of these values is being kept the same for the three-year cycle of programs.

8.5.1 AVOIDED COSTS

The recommended avoided cost framework develops each hour's electricity valuation using a bottom-up approach to quantify an hourly avoided cost as the sum of elements of forward-looking incremental costs for that hour. The resulting hourly electricity avoided costs are location-specific and vary by hour of day, day of week, and time of year. The results are weather dependent requiring a weather normal outcome and a distribution of outcomes corresponding to the weather related variation in outcomes. The location and time variations by cost component are as follows:

1. Generation Costs – variable by hour and location. The annual forecast of generation costs avoided is allocated according to an hourly price shape obtained from historic participant specific data that reflect a workably competitive market environment and expected weather variation. These hourly costs further vary by location, depending on locational capacity constraints and fuel costs. The average annual prices are provided by each utility with Core programs.

2. Capacity Costs – associated with generation or capacity markets reflect the cost of acquiring that additional capacity. These cost estimates are provided by each utility.

3. Transmission and Distribution (T&D) Costs – variable by hour and location. Non-peak hours have zero avoided T&D capacity costs, reflecting that T&D capacity investments are made to serve peak hours. These cost estimates are also provided by each utility.

8.5.2 NET PRESENT VALUE

Cost-effectiveness of an energy efficiency measure will be calculated based on the net present value of the costs and benefits valued in each test discounted over the effective useful life of the measures installed.

8.5.3 PROGRAMS

Each of the Core programs are evaluated for cost-effectiveness as implemented within each utility service area. The following programs are evaluated for cost-effectiveness:

Residential Programs

- Residential Lighting
- Low Income Weatherization
- Home Energy Audit
- School Energy Efficiency Kit

Non-Residential Program

- School Building Assessments
- Commercial & Industrial Incentives

Information was collected through the EM&V process by utility on the costs and impacts associated with each of the programs.

8.6 RESULTS

As part of the EM&V process, the use of DSMore provides energy efficiency planners with insights on the actual cost-effectiveness of the energy efficiency programs. The following tables provide the results of the cost-effectiveness analyses for each program for the PCT, UCT, RIM, and TRC tests. Results are reported by utility at the program level as well as for the utility portfolio level and an aggregation of all the programs for the State of Indiana. The tables include the results reported for program year one (2012) for comparison to results for the combination of program years one and two (2012 + 2013). In general, the portfolios of programs for the individual utilities and the state are cost-effective. The cost-effectiveness for most programs for the two year period increased, while the cost-effectiveness for others decreased. However, in general, the overall cost-effectiveness of the portfolios increased.

8.6.1 DUKE ENERGY INDIANA

For Duke Energy Indiana, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective except for Low Income Weatherization. The Home Energy Audit program is now cost effective for the two-year cycle. Most of the programs continue to fail the RIM test and the portfolio as a whole fails the RIM test. The Residential Lighting and Commercial and Industrial Incentives programs are narrowly cost-effective under the RIM test.

Note that PCT test results are not available (NA) for the Low Income Weatherization, Home Energy Audit, School Energy Efficiency Kit, and School Building Assessments programs since there are no participant costs involved. This occurs for the results for each utility below as well.

Table 168: Results for Duke Energy Indiana

Cost Effectiveness for Duke Energy Indiana Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	4.10	3.53	0.94	2.94		4.31	3.57	1.03	3.41
Low Income Weatherization	NA	0.64	0.44	0.64		NA	0.81	0.53	0.81
Home Energy Audit	NA	0.55	0.39	0.55		NA	1.26	0.70	1.26
School Energy Efficiency Kit	NA	2.43	0.86	2.43		NA	2.65	0.92	2.65
Non-Residential Programs									
School Building Assessments	NA	1.51	0.63	1.51		NA	1.36	0.59	1.36
Commercial & Industrial Incentives	3.28	2.98	0.99	2.09		7.34	6.21	1.09	5.39
Total Portfolio	5.05	2.20	0.84	1.89		7.68	3.34	0.97	3.17

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.6.2 INDIANA & MICHIGAN POWER

For Indiana & Michigan, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. With regard to the individual programs, the Low Income Weatherization and Home Energy Audit are not cost-effective, though the cost-effectiveness results have improved. All of the other individual programs are cost-effective. However, none of the programs pass the RIM test.

Table 169: Results for Indiana & Michigan

Cost Effectiveness for Indiana & Michigan Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	5.87	3.09	0.58	2.56		6.03	3.10	0.62	2.84
Low Income Weatherization	NA	0.58	0.32	0.58		NA	0.68	0.35	0.68
Home Energy Audit	NA	0.48	0.29	0.48		NA	0.93	0.42	0.93
School Energy Efficiency Kit	NA	1.81	0.54	1.81		NA	1.99	0.55	1.99
Non-Residential Programs									
School Building Assessments	NA	1.20	0.51	1.20		NA	1.03	0.47	1.03
Commercial & Industrial Incentives	3.09	2.49	0.70	1.66		12.89	3.99	0.85	7.59
Total Portfolio	4.89	1.77	0.57	1.45		11.88	3.16	0.77	4.58

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.6.3 INDIANA MUNICIPAL POWER AUTHORITY

For IMPA, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective except for Low Income Weatherization. The Home Energy Audit program is now cost effective for the two-year cycle. The Commercial & Industrial Incentives program is the only one that passes the RIM test.

Table 170: Results for IMPA

Cost Effectiveness for IMPA Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	5.99	2.99	0.57	2.53		6.32	2.54	0.56	2.36
Low Income Weatherization	NA	0.81	0.44	0.81		NA	0.95	0.48	0.95
Home Energy Audit	NA	0.61	0.37	0.61		NA	1.20	0.54	1.20
School Energy Efficiency Kit	NA	2.53	0.70	2.53		NA	2.81	0.73	2.81
Non-Residential Programs									
School Building Assessments	NA	1.55	0.69	1.55		NA	1.40	0.63	1.40
Commercial & Industrial Incentives	3.75	3.65	1.02	2.54		7.12	7.01	1.19	6.28
Total Portfolio	5.42	2.43	0.78	2.00		8.37	4.03	0.97	3.80

In general, the cost-effectiveness of the portfolio of programs for the two-year cycle increased somewhat from the first year results, but half of the individual programs declined in cost-effectiveness.

8.6.4 INDIANAPOLIS POWER & LIGHT

For Indianapolis Power & Light, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. Three of the individual programs are cost-effective. The Low Income Weatherization, Home Energy Audit, School Building Assessments programs were not found to be cost-effective. The Residential Lighting and Commercial & Industrial Incentives programs are the only ones that pass the RIM test.

Table 171: Results for IP&L

Cost Effectiveness for Indianapolis Power & Light Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	2.38	3.09	1.23	2.56		2.56	2.62	1.15	2.44
Low Income Weatherization	NA	0.53	0.40	0.53		NA	0.79	0.56	0.79
Home Energy Audit	NA	0.38	0.31	0.38		NA	0.84	0.58	0.84
School Energy Efficiency Kit	NA	1.68	0.86	1.68		NA	1.81	0.90	1.81
Non-Residential Programs									
School Building Assessments	NA	1.22	0.76	1.22		NA	0.96	0.62	0.96
Commercial & Industrial Incentives	1.84	2.65	1.15	1.76		3.13	3.72	1.39	3.38
Total Portfolio	2.71	1.41	0.82	1.23		3.89	1.94	1.00	1.87

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the Residential Lighting and School Building Assessments programs.

8.6.5 NIPSCO

For NIPSCO, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective. None of the programs pass the RIM test.

Table 172: Results for NIPSCO

Cost Effectiveness for NIPSCO Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	6.13	4.57	0.78	3.70		6.31	4.02	0.79	3.72
Low Income Weatherization	NA	0.68	0.41	0.68		NA	1.01	0.54	1.01
Home Energy Audit	NA	0.63	0.38	0.63		NA	1.50	0.64	1.50
School Energy Efficiency Kit	NA	2.24	0.70	2.24		NA	2.37	0.74	2.37
Non-Residential Programs									
School Building Assessments	NA	2.20	0.67	2.20		NA	1.76	0.57	1.76
Commercial & Industrial Incentives	4.37	3.77	0.69	2.68		7.13	5.93	0.76	5.24
Total Portfolio	6.40	2.27	0.65	1.98		8.75	3.09	0.72	2.95

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.6.6 VECTREN

For Vectren, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective except for Home Energy Audit and School Building Assessments. The School Buildings Assessments program is the only program that declined in cost-effectiveness. The extent of the decline has now made the two-year cycle not cost-effective for this program. None of the programs pass the RIM test.

Table 173: Results for Vectren

Cost Effectiveness for Vectren Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	8.04	2.49	0.36	1.78		8.65	2.52	0.41	2.33
Low Income Weatherization	NA	0.66	0.33	0.66		NA	1.14	0.48	1.14
Home Energy Audit	NA	0.54	0.28	0.54		NA	0.96	0.37	0.96
School Energy Efficiency Kit	NA	2.08	0.47	2.08		NA	2.10	0.47	2.10
Non-Residential Programs									
School Building Assessments	NA	1.47	0.61	1.47		NA	0.88	0.44	0.88
Commercial & Industrial Incentives	7.56	5.50	0.78	3.63		7.57	5.91	0.87	4.77
Total Portfolio	10.28	2.05	0.53	1.77		11.43	2.34	0.59	2.20

8.6.7 RESULTS FOR THE STATE OF INDIANA

Looking at the Energizing Indiana programs, the aggregation of the individual utility portfolios of programs for the two-year cycle continues to be cost-effective under the PCT, UCT, and TRC Tests. In addition, all of the individual programs are cost-effective except for Low Income Weatherization. The Home Energy Audit program improved to become cost-effective at the state level.

The benefit cost analysis performed for the six utilities and aggregated for the State of Indiana, indicates that the levelized cost of conserved energy achieved by the portfolio over the two year period (the cost at which the portfolio is acquiring energy resources as additional supply) is 3.0 cents per annual kWh saved.

Table 174: Results for the State of Indiana

State of Indiana Program Cost Effectiveness									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	4.81	3.42	0.77	2.80		5.02	3.24	0.81	3.03
Low Income Weatherization	NA	0.64	0.39	0.64		NA	0.88	0.49	0.88
Home Energy Audit	NA	0.50	0.33	0.50		NA	1.10	0.57	1.10
School Energy Efficiency Kit	NA	2.24	0.77	2.24		NA	2.42	0.81	2.42
Non-Residential Programs									
School Building Assessments	NA	1.48	0.64	1.48		NA	1.21	0.56	1.21
Commercial & Industrial Incentives	3.51	3.19	0.86	2.19		7.67	5.00	0.97	5.49
Total Portfolio	5.23	2.00	0.71	1.71		8.24	2.94	0.84	3.02

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.7 CONCLUSIONS

In general, the energy efficiency program portfolios for each of the individual utilities as well as the aggregation to the State of Indiana continue to be cost-effective for the combined 2012 and 2013 program years under the PCT, UCT, and TRC tests. Most of the programs were also found to be cost-effective; however, the Low Income Weatherization did not pass cost-effectiveness for most of the program portfolios. Also, there has been a decline in the level of cost-effectiveness for the School Building Assessments program for all the utilities that deserves further investigation.

The cost-effectiveness analysis of the portfolio, providing new energy resources to the State of Indiana, indicates that the levelized cost for new energy efficiency supplied electric resources acquired via the Statewide Core programs was $0.03 dollars per kWh for the two-year period of program implementation.

A. APPENDIX: OTHER SECTIONS

COMMERCIAL & INDUSTRIAL NTG CALCULATIONS

SURVEY DESIGN

Direct questions (such as "Would you have installed measure X without the program incentive?") tend to result in exaggerated "yes" responses. Participants often provide answers they believe surveyors seek; so a question becomes the equivalent of asking: "Would you have done the right thing on your own?" Effectively avoiding such bias involves asking a question in several different ways, then checking for consistent responses.

The Evaluation Team designed the survey questions to determine why customers installed a given measure, and what influence the program had on their decisions. The survey sought to establish what decision makers might have done in the program's absence, using six freeridership questions to address that issue:

1. Would participants have installed measures without the program?
2. Were participants planning on ordering or installing the measures before learning about the program?
3. Would participants have installed the measures at the same efficiency levels without the program incentive?
4. Would participants have installed the same quantity of measures without the program?
5. In the program's absence, when would respondents have installed the measures?
6. Was the purchase of the measures in the organization's most recent capital budget?

The spillover survey sought to answer three primary questions:

1. Since participating in the evaluated program, did participants install additional energy-efficient equipment or services?
2. How influential was the evaluated program on the participants' decisions to install additional energy-efficient equipment in their facilities?
3. Did customers receive incentives for additional measures installed?

FREERIDERSHIP SURVEY QUESTIONS

The participant survey's freeridership portion included 10 questions, addressing the six freeridership questions. The survey's design included several skip patterns, allowing interviewers to confirm answers previously provided by respondents by asking the same question in a different format. Freeridership questions (as asked in the survey format) included:

1. Without the rebate from Energizing Indiana would you have still purchased [MEASURE]?
2. [Ask if question 1 is Yes] Did your organization have specific plans to install the [MEASURE 1] BEFORE learning about the Energizing Indiana program rebate?
3. [Ask if question 1 is Yes and if question 2 is Yes] Prior to hearing about the rebate program, was the equipment included in the organization's capital budget?
4. [Ask if question 1 is Yes and if measure quantity > 1] And would you have installed the same quantity of high-efficiency equipment without the rebate?
5. [Ask if question 1 is Yes] Without the rebate from Energizing Indiana would you have still purchased [MEASURE1] that was just as efficient, more efficient, or less efficient than the one you purchased?
6. [Ask if question 1 is Yes] When would you have installed this equipment without the program? Would you have installed it … [READ LIST]
7. [Ask if question 1 is No] So, you would not have installed [MEASURE1] at all. Is that correct?
8. [Ask if question 7 is No and if measure quantity > 1] Again, help me understand. Would you have implemented similar but less energy-efficient measures?
9. [Ask if question 7 is No] Would you have installed less equipment without the rebate?
10. [Ask if question 7 is No] In terms of project timing, when would you have completed [MEASURE]?

SPILLOVER SURVEY QUESTIONS

As discussed, spillover questions sought to determine whether program participants installed other energy-saving measures since participating in the program. Savings participants received from additional measures would be considered spillover savings if: (1) the program significantly influenced their decisions to purchase additional measures; and (2) they did not receive additional incentives for those measures.

If the participant installed one or more measures, additional questions addressed the quantity they installed, and how influential (highly influential, somewhat influential, not at all influential) the program was on their purchasing decisions.

The Evaluation Team combined freeridership and spillover questions into the same survey, simultaneously asking the questions via telephone interviews with randomly selected program participants. Before beginning the live participant phone calls, the team worked with the survey company to pretest the survey, ensuring all appropriate prompts and skip patterns would be followed. The team also monitored initial phone calls to verify:

- Survey respondents understood the questions; and
- Adjustments were not required.

FREERIDERSHIP METHODOLOGY

The Evaluation Team developed a transparent, straightforward matrix for assigning scores to participants, based on their objective responses to targeted survey questions. Question response patterns received freeridership scores, with confidence and precision estimates calculated through the distribution of these scores (a specific approach for this technique can be found in the *NAPEE Handbook on DSM Evaluation*, 2007 edition, page 5-1).

Response patterns and scoring weights remained explicit; they could be discussed and changed, with results shown in real time. The approach provided the following important features:

- Derivation of a partial freeridership score, based on the likelihood of a respondent taking similar actions in the incentive's absence.
- Use of a rules-based approach for consistency among multiple respondents.
- Use of open-ended questions to ensure quantitative scores matched respondents' more detailed explanations regarding program attribution.
- The ability to change weightings in a "what if" exercise, thus testing the response set's stability.

The Evaluation Team's method offered a key advantage in introducing the concept of partial freeridership. Experience has shown program participants do not fall neatly into freerider and non-freerider categories. For example, the Evaluation Team assigned partial freeridership scores to participants that planned to install a measure; though the program exerted some influence over their decisions, other market characteristics outside the program also proved influential. Further, the Evaluation Team could assign partial credit to "don't know" and "refused" responses, rather than removing respondents entirely from the analysis.

The study assessed freeridership at three levels:

1. It converted each participant survey response into a freeridership matrix terminology.
2. Each participant's combination of responses received a score from the matrix.
3. All participants were aggregated into an average freeridership score for the entire program category.

CONVERT RESPONSES TO MATRIX TERMINOLOGY

The study independently evaluated each survey question's response, assessing participants' freeridership levels for each question, with each survey response option converted into the following values:

- "Yes" (Indicative of freeridership)
- "No" (Indicative of non-freeridership)
- "Partial" (Partially indicative of freeridership)

PARTICIPANT FREERIDERSHIP SCORING

Following conversion of survey responses into matrix terminology, a freeridership matrix could be created, allowing each participant's combined responses to be assigned a freeridership score. All combinations of survey question responses were considered in creating the matrix, with each combination receiving a freeridership score of 0% to 100%. Using this matrix, every participant's combination of responses could be assigned a score of 0% to 100%.

PROGRAM CATEGORY FREERIDERSHIP SCORING

After assigning a freeridership score to every survey respondent, the Evaluation Team calculated a savings-weighted average freerider score for the program category. Respondents' freerider scores were individually weighted by estimated savings of equipment installed, using the following calculation:

$$\text{SavingsWeightedFreeridership} = \frac{\sum[\text{Respondent Score}] * [\text{Measure kWh Savings}]}{\sum[\text{All Respondents Measure kWh Savings}]}$$

THE FREERIDERSHIP SCORING MODEL

The Evaluation Team developed an Excel-based model to assist with freeridership calculations and to improve the consistency and the quality of results. The model translated raw survey responses into matrix terminology, and then assigned each participant's response pattern a score drawn from the matrix. Program participants in the sample then could be aggregated to calculate average freerider scores.

The model incorporated the following inputs:

- Raw survey responses for each participant, along with their incented measures and energy savings from those measures, if applicable.
- Figures converting raw survey responses into matrix terminologies for each program category.
- Custom freeridership scoring matrices for each unique survey type.

The model used a simple interface, allowing users to quickly reproduce a scoring analysis for any program category. It displayed each participant's combination of responses and corresponding freeridership score, and produced a summary table that provided the average score and precision estimates for the program category. The model used the sample size and a two-tailed test target at the 90% confidence interval to determine the average score's precision. A finite population correction was applied to the precision estimates because the population fell below 300.

Table 175 summarizes the prescriptive program's results, with the final weighted mean freeridership score appearing in the lower right corner. The program example averaged 16% freeridership, meaning 16% of energy savings derived from freeriders and should be removed from gross program savings. Based on a 233-response sample size, the program had an adjusted absolute precision of ±3.0%.

Table 175: Freerider Scoring Model Output

Variable	Value	Variable	Value
Population (P)	5,591	Adjusted Standard Error	0.02
Responses (n)	233	Adjusted Relative Precision	17.49%
Variance Of Mean	0.077	Adjusted Absolute Precision	0.030
Standard Deviation	0.277	Coefficient of Variation	1.623
Standard Error of Mean	0.018	Upper Bound Score	0.20
Relative Precision	17.49%	Weighted Mean Score	0.17
Finite Population Correction	1.000	Lower Bound Score	0.14

SPILLOVER METHODOLOGY

Spillover refers to additional savings program participants generate through their participation, but not captured by program records. Spillover occurs when participants choose to purchase energy-efficient measures or adopt energy-efficient practices due a program's influence, but do not participate (or otherwise cannot participate) in the program. As these customers do not participate, they typically do not appear in program records of savings generated by spillover impacts.

Spillover examples include:

- Program participants adopting additional measures without an incentive.
- Consumers acting on the programs' influence, resulting from changes in available energy-using equipment in the marketplace.
- Changes brought about by more efficient practices employed by architects and engineers, ultimately forcing consumer behaviors into desired patterns.
- Changes in nonparticipants' behaviors, resulting from direct marketing or changes in stocking practices.

The energy-efficiency programs' spillover effect serves as an additional impact, which can be added to the program's direct results.

The Evaluation Team measured spillover by asking a sample of participants purchasing and receiving an incentive for a particular measure if, due to the program, they installed another efficient measure or undertook another energy-efficiency activity. Respondents were asked to rate the program's (and the incentive's) relative influence (either highly, somewhat, or not at all influential) on their decisions to pursue additional savings.

PARTICIPANT SPILLOVER ANALYSIS

Calculating spillover savings used a top-down approach. Analysis began with a subset containing only survey respondents, indicating they installed additional energy-savings measures after participating in the program. From this subset, participants were removed if they indicated the program had little influence on their decisions to purchase additional measures, thus only retaining participants rating the incentive as highly influential.

For remaining participants with spillover savings, energy savings were estimated for additional measures installed. The Evaluation Team's engineers calculated savings values based on average savings per

measure installed in the program, which were matched to additional measures installed by survey participants.

The spillover percentage per program category was calculated by dividing the sum of additional spillover savings reported by respondents for a given program category by total incentivized gross savings achieved by all respondents in the program category:

$$\text{Spillover \%} = \frac{\sum[\text{Spillover Measure kWh Savings for All Suvery Respondents}]}{\sum[\text{Program Measure kWh Savings for All Survey Respondents}]}$$

Net savings reflect the application of the program NTG ratio to the *ex-post* energy savings.

Table 176: Measure-Level NTG Ratios

Measure	NTG
Lighting	85%
Non-Lighting	51%

Applying the NTG ratios to the measures' installed resulted in the following net savings.

Table 177: Net Energy (kWh) Savings by Utility and Statewide

	Ex-Post kWh	NTG	Net kWh Savings
Duke	62,058,310	80%	49,646,648
I&M	89,320,058	80%	71,456,046
IPL	37,763,093	80%	30,210,475
IMPA	17,509,148	80%	14,007,319
NIPSCO	22,499,352	80%	17,999,481
Vectren	10,429,990	80%	8,343,992
Statewide	**239,579,951**	**80%**	**191,663,961**

Table 178: Net Demand (kW) Savings by Utility and Statewide

	Ex-Post kW	NTG	Net kW Savings
Duke	14,438.33	80%	11,550.66
I&M	22,721.32	80%	18,177.06
IPL	8,221.98	80%	6,577.58
IMPA	3,829.73	80%	3,063.78
NIPSCO	6,171.88	80%	4,937.51
Vectren	1,913.25	80%	1,530.60
Statewide	**57,296.50**	**80%**	**45,837.20**

Residential Lighting Program Data Collection Activities

In-Store Intercept Survey

The Evaluation Team conducted interviews with 393 customers purchasing lighting at 11 participating retail locations in Indiana during 2013 and 2014. Interviews took place in two waves. The first wave included six stores and took place in October and November 2013; the second wave included five stores and took place in January and February 2014. The survey used a convenience sample of stores for

budgetary reasons and because not all retailers allowed in-store customer research. Despite these constraints, the selected sample of stores represented a large percentage of program sales across Indiana. The stores visited represented 13% of program bulbs sold and invoiced in 2013.

The Evaluation Team conducted interviews at DIY, big box, and club retailers, prioritizing retail locations that sold the most bulbs through the program and allowed the interviews to be conducted.

To gain entry to the stores, an Evaluation Team member first accompanied a program field representative conducting a lighting event. The program representative helped the interviewer receive permission to return and conduct additional interviews during the following two days. Facilities granted permission in all cases.

The Evaluation Team conducted interviews during various days of the week (Fridays, Saturdays, Sundays, and Mondays) and during different times of the day, seeking to capture a variety of customer types. Interview participants included customers purchasing: CFLs discounted through the program; CFLs not discounted through the program; and incandescent, halogen, and LED light bulbs.

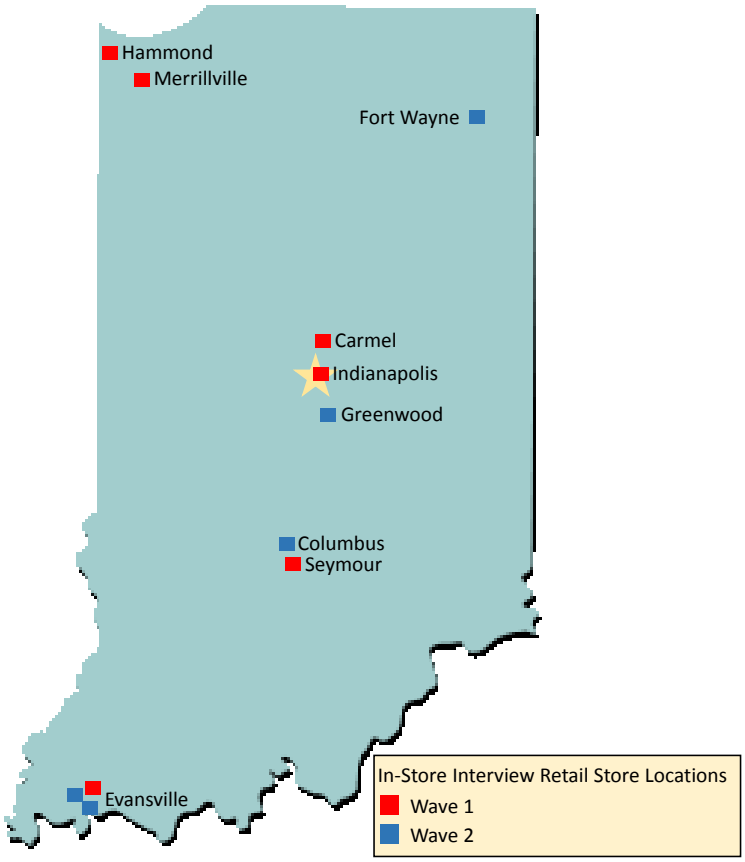
Table 179 shows the number of locations visited for this research, the total number of days spent in-stores, and the total number of interviews completed by retailer type.

Table 179: In-Store Interview Retailer Categories

Store Type	Stores	Days	Interviews
DIY	6	18	224
Big Box	3	8	105
Club	2	6	64
Total	**11**	**32**	**393**

Figure 74 shows intercept store locations, marked by the interview wave.

Figure 74: Map of the Intercept Store Locations



To eliminate measurement and data entry errors, highly trained interviewers administered the surveys, using tablet computers to capture the data. Use of tablet computers allowed streamlining of the data collection process, asking questions only if relevant for each individual respondent. Interviewers positioned themselves in a store's lighting aisle and approached customers after they made their purchase decisions and prepared to leave the aisle. Interviewers asked customers to complete a short survey in exchange for a $5 gift card to that particular retail store (and which they could use that day).

The survey included questions designed to determine customer lighting preferences and purchase behaviors and to estimate program freeridership.

MANUFACTURER INTERVIEWS

Evaluation Team staff interviewed lighting manufacturers participating in Energizing Indiana's Residential Lighting program, conducting 11 telephone interviews with staff from eight lighting manufacturers. Interviews occurred between December 2 and December 10, 2013, and typically lasted 15 to 30 minutes, covering multiple topics (including program interactions, product pricing, and promotion timing).

The interviews also explored manufacturers' satisfaction with the program processes as well as program impacts on retailer revenues and energy-efficient lighting sales. Questions also explored EISA's role in

changing manufacturer product offerings and manufacturers' recommendations for future program improvements.

RESIDENTIAL LIGHTING PROGRAM FREERIDERSHIP ALGORITHM

To develop a freeridership estimate for the Residential Lighting program, Evaluation Team used two methods:

- Sales data modeling results from PY1; and
- In-store customer intercepts performed in PY2.

A discussion of the these approaches follows.

SALES DATA MODELING

As part of the PY2 evaluation, the Evaluation Team performed sales data modeling using the Revenue-Neutral Sales Model, a method of estimating lighting program freeridership based on a theory regarding retailer behavior and decision making. Using program pricing and sales data, the method provided an estimate of what product sales would have been at regular retail pricing, absent the program (in essence, what the pre-program baseline sales would have been). Using this estimate of pre-program sales, the Evaluation Team could back out the numbers of units sold above and beyond the pre-program baseline to estimate program freeridership.

The Revenue-Neutral Sales Model assumes that retailers only participate in a utility-sponsored lighting program if their gross revenues do not drop due to participation: revenues could drop if lighting products sell at a lower price, given the program discount. If retailers do not sell more of the discounted product than they sold prior to the program, their gross revenue falls. Thus, gross revenues depend on sales alone.

Because the program fully reimburses retailers for lighting discounts, retailer profits cannot decline because of program participation. In fact, retailers only need to sell one additional bulb under the program to see an increase in their profits. Program reimbursements for the discounted lighting products, however, cannot count toward retailer gross revenue. By discounting high efficiency lighting products, retailers effectively bring the product price down, thus reducing product gross margins that they are able to report. As a result, if the lighting sales do not increase enough to make up for the lost gross margins, retailers are at risk of having their gross revenues decline. Retailers care about gross revenue because it influences investors, and corporate bonuses are often tied to it.

To ensure their program participation remains, at a minimum, revenue-neutral, retailers avoid participating in utility lighting programs with incentive levels and sales goals that do not stimulate sufficient additional sales to recover lost gross sales revenue. For example, if a retailer seeks to ensure that its gross revenue does not drop from participating in a program that discounts the CFL prices by 50%, the retailer must, at a minimum, double its CFL sales. Retailers have enough information about

product pricing and sales to evaluate program contractual agreements; so they only agree to contracts that allow them to sell at least[51] enough products to prevent a negative impact on their gross revenues.

The Evaluation Team verified this model of retailer behavior through multiple corporate-level retailer interviews, including interviews with most key retailers participating in the Energizing Indiana program.

Using retailer behavior theory as a background, the Evaluation Team used the following program data to estimate what lighting sales would have been at regular retail pricing: the regular retail product price; the program discounted price; the number of units the retailer may sell at program pricing; and the number of units actually sold at program pricing.

In Table 180, the retailer establishes an agreement with the program to sell 100,000 bulbs at $2.00 per bulb (a $3.00 discount). Program revenue will equal the program price per unit multiplied by the number of units a retailer is allowed to sell.

Table 180: Revenue-Neutral Sales Model Example: Program Revenue

	Price	Sales	Revenue
Without Program	$5.00	Unknown	Unknown
With Program	$2.00	100,000	$200,000

To at least remain revenue-neutral, retailers only agree to a program contract if the allocated sales at program pricing can make up for the revenue lost to the discount. Knowing this, the Evaluation Team could set revenue without the program equal to revenue with the program (or units sold in the program's absence).

Table 181: Revenue-Neutral Sales Model Example: Revenue without Program

	Price	Sales	Revenue
Without Program	$5.00	Unknown	$200,000
With Program	$2.00	100,000	$200,000

The Evaluation Team estimated the number of products sold at a regular retail price by setting regular sales revenue equal to program sales revenue, then dividing the estimated sales revenue by the regular retail price. Table 182 illustrates how the estimate of pre-program sales and actual program sales can be used to establish a program's freeridership rate.

Table 182: Revenue-Neutral Sales Model Example: Sales without Program

	Price	Sales	Revenue
Without Program	$5.00	40,000	$200,000
With Program	$2.00	100,000	$200,000

Once the Evaluation Team established the number of products that would have been sold at regular retail pricing to equal the program sales revenue, program freeridership could be estimated as the ratio of estimated sales at the regular retail price to actual program sales:

[51] This model does not assume retailers only want to sell enough to be revenue neutral; retailers prefer growing revenues. But, when agreeing to participate in an upstream lighting program, retailers confirm they will negotiate a contract that will stimulate sufficient sales to prevent a drop in revenues (i.e., they will remain neutral), despite program discounts.

$$Freeridership = Sales\ without\ Program\ /\ Sales\ with\ Program$$
$$0.40 = 40{,}000\ /\ 100{,}000$$

In this example, program freeridership would have been 40%: or 40% of bulbs sold through the program would have sold in program's absence, providing this hypothetical program with an NTG of 0.60.

Analysis results for the Energizing Indiana Residential Lighting program, based on 74% of all units sold, show overall program freeridership of 0.43, meaning that 43% of discounted program bulbs would have been purchased at full price without the program discount.

IN-STORE CUSTOMER INTERCEPT SURVEY

The program encourages customers to purchase energy-efficient lighting by discounting purchase prices, making them closer to less-efficient alternatives. The program also educates consumers about the benefits of efficient lighting. The in-store intercept survey sought to measure the influence of both the discount and information program components.

Each respondent received a freeridership score ranging from 0 to 1, with a score of 0 meaning the participant would not have purchased CFLs without the program, and a score of 1 meaning the participant would have purchased all CFLs without help from the program. The questions and the algorithm allowed the determination of partial freeriders: customers who would have purchased some but not all of the bulbs or were partially influenced by program information. Discussions follow regarding development of these scores and of the methodology used to combine them into an overall freeridership estimate.

Program Discount Score

The study based the program discount score on questions measuring the program discount's impact on the quantity and efficiency of purchased lighting products. Part of the survey asked customers what they would have purchased had the CFLs been more expensive, and referenced the average per-bulb discount as an incremental cost that customers would have to pay in the program's absence.

Two scores made up the discount score: a quantity score and an efficiency score. To determine the effect that the discount had on the quantity of bulbs purchased, the Evaluation Team first asked customers if they would have purchased all, some, or none of the CFLs had they cost more. If customers stated they would have purchased some of the CFLs, the survey asked how many bulbs they would have purchased had they cost more. Using the responses from the two questions and the actual CFL quantity purchased by each customer, the Evaluation Team calculated a quantity score that represented the number of bulbs that the customer would have purchased at full price. Scores ranged from 0 to 1, with 0 representing not a freerider and 1 representing a full freerider. Table 183 further outlines this scoring method.

Table 183: Program Discount Freeridership Score—Quantity

Question	Response	Program Discount Freeridership Score
(QH24/29) I see you are buying X standard/specialty CFLs that are discounted by Energizing Indiana. If the discount had not been offered, and this/these standard/specialty CFLs had instead cost $1.50 more PER BULB, would you still have purchased all of these standard/specialty CFLs, some of them, or none of them?	All	1
	Some	Go onto QH25 (for standard CFLs) or QH30 (for specialty CFLs)
	None	0
(QH25/30) How many of the X standard/specialty CFLs would you have purchased if they had cost $1.50 more per bulb? *(Only for respondents who answered "some" to the question above)*	Record Number	Divide the proportion of bulbs that the customer would have purchased at full price by the total number of discounted bulbs that the customer actually purchased

The efficiency score gave the program additional credit if it prevented the sale of incandescent or halogen bulbs, causing the customer to purchase CFLs instead. Customers who said they would have purchased fewer CFLs could have either: purchased fewer CFLs and no other bulb type; or purchased less-efficient bulbs instead of CFLs. The quantity score (calculated above) already accounted for the discount's impact on the number of CFLs purchased.

The efficiency score assigned the program additional credit for preventing the sale of incandescent light bulbs. Customers received a value of 0 if they would have purchased less-efficient bulbs (incandescent or halogen light bulbs) that cost less than the CFLs. The study did not assign efficiency scores for customers who would not have purchased a less-efficient bulb: their program discount score depended solely on the quantity score. Table 184 further outlines this scoring method.

Table 184: Program Discount Freeridership Score—Efficiency

Question	Response	Program Discount Freeridership Score
(QH26,27/QH31,32) Would you have purchased a different type of light bulb today instead of the standard/specialty CFLs?	Yes	Go to QH28 (for standard CFLs) or QH33 (for specialty CFLs)
	No	1
(QH28/33). What type of light bulbs would you have purchased instead of standard CFLs? Would you have purchased…	Incandescents Halogens	0
	LEDs	1

The study determined an overall program discount score by taking the average of the discount quantity score and the discount efficiency score:

$$Program\ Discount = Average(Discount\ Quantity; Discount\ Efficiency)$$

Program Information Score

To determine the influence of program education and outreach, the Evaluation Team asked customers who recalled seeing in-store information or displays on CFL benefits about the influence of these materials on their purchasing decisions. The survey asked customers to rate the program on a 1 to 5 scale, where 1 means no influence and 5 means an extreme amount of influence. Converting this scale

to range from 0 to 1 and reversing its order (so 0 meant the program information had extreme influence and 1 meant the information had no influence) made the scale consistent with the freeridership score (where 0 meant not a freerider and 1 meant a full freerider). Customers who did not recall seeing program information did not receive a program information score: their overall freeridership score depended solely on their program discount score (calculated above). Table 185 details how the program information score was calculated.

Table 185: Program Information Freeridership Score

Question	Response	Program Information Freeridership Score
(QH36) Using a scale of 1 to 5 where 1 means not at all influential and 5 means extremely influential, how influential was the in-store information sponsored by Energizing Indiana in your decision to buy CFLs today?	1 to 5	1 – ((Response – 1)/4)

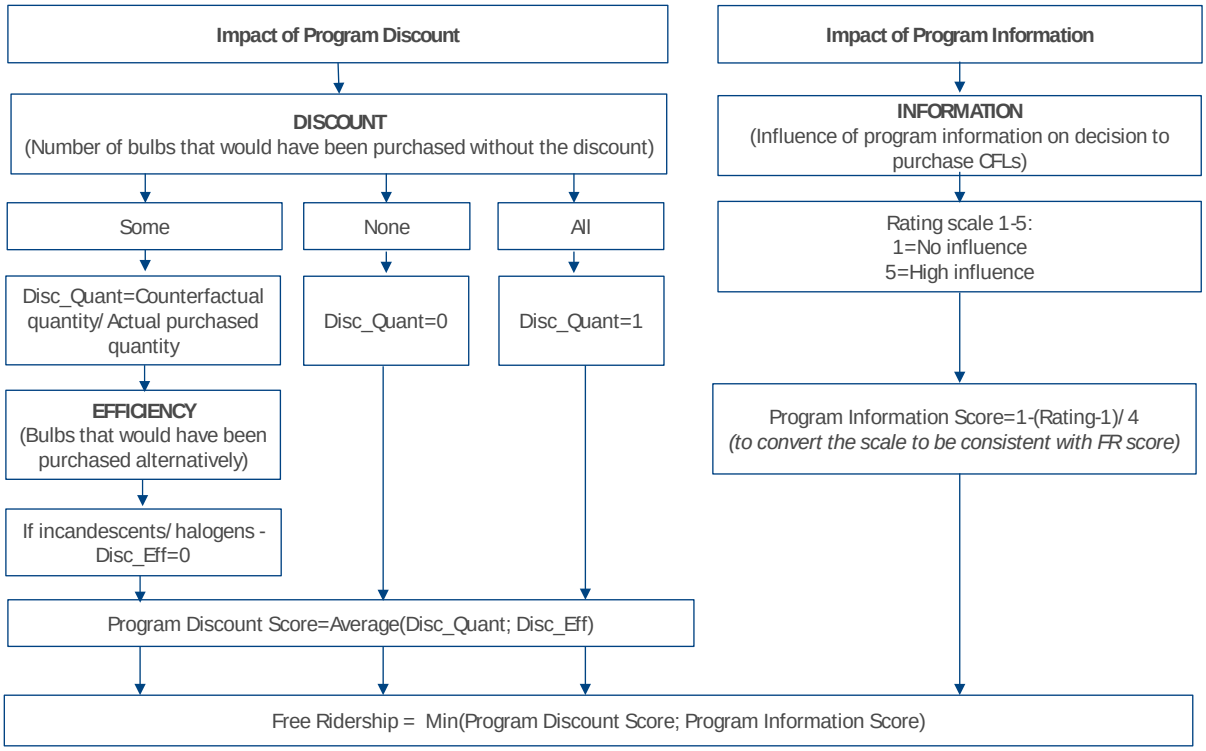
Overall Freeridership Score

The overall freeridership score equaled the minimum of the program discount score and the program information score. Taking the minimum of the two components ensured the program received credit for the avenue that most influenced the customer to purchase CFLs. (Averaging the components would have penalized the program if it did not influence both components equally. For example, a customer might understand CFLs' benefits, but would not buy them at full price. Averaging the two components would reduce the program's overall influence, as it implied the customer said informational materials did not influence their purchases.)

$$Overall\ Freeridership\ Score = Min(Program\ Discount\ Score; Program\ Information\ Score)$$

Figure 75 provides a graphical depiction of the freeridership algorithm.

Figure 75: Freeridership Algorithm



The study calculated an overall freeridership score for each customer and for each bulb type the customer purchased. If the customer purchased both standard and specialty bulbs, the customer received two freeridership scores. These customers' overall freeridership scores derived from a weighted average, based on the number of each type of bulb purchased.

Calculating the final program freeridership score required weighting the sample estimates of standard and specialty freeridership by the number of each type of bulb a customer purchased. The study weighted the overall freeridership scores by the total number of program-discounted CFLs each customer purchased. This method assigned greater weight to customers who purchased more bulbs.

Results

As discussed in the *Residential Lighting Data Collection Activities* section, to gain entry to the stores, the Evaluation Team first accompanied a program field representative conducting a lighting event. Interviews then took place for two additional days at each store (and not during lighting demonstrations). Using the method discussed above, the program received a 0.53 freeridership score. Comparing freeridership estimates for purchases made during event hours to those outside of event hours revealed considerable differences, which proved so large (and the ratio of event hours to non-event hours so small) that the study excluded customers interviewed during event hours from the final freeridership estimate.

Another option would have been to weight those respondents to represent the proportion of shoppers and light bulbs purchased during event hours. However, the exact estimates for developing such weights remain unknown. Based on informal calculations, it appears such a small fraction of store hours,

shoppers, and program-rebated products would leave the 0.60 freeridership score largely unchanged. As such, the program received a final freeridership estimate of 0.60.

Table 186: Program Freeridership

Day Type	Freeridership
All hours (n=177)	0.50
Event hours (n=40)	0.20
Non-event hours (n=137)	0.60

RESIDENTIAL LIGHTING PROGRAM EX-POST SAVINGS ENGINEERING ASSUMPTIONS

Engineering analysis determined *ex-post* gross savings for the PY2 Residential Lighting program. Adjustments reflect engineering adjustments made to *ex-ante* measure savings claimed by the program.

CFLs

CFL savings derived from calculating differences between baseline light[52] bulbs and replacement CFLs. Equivalent baseline incandescent bulbs were chosen depending on how their lumen output compared to a replacement, further adjusted for baseline conditions due to EISA legislation. EISA legislation effectively phases out the manufacturing and import of traditional incandescent light bulbs over a three-year period, beginning in January 2012. The legislation first addressed 100-watt incandescent bulbs in January 2012, followed by 75-watt incandescents in January 2013, and 60- and 40-watt incandescents in January 2014.

To account for EISA, the baseline wattage had to be adjusted downward, but in a manner phased similarly to the legislation's implementation. Adjustments for PY2 only affected baseline wattages for 100-watt incandescent equivalent standard CFLs and LEDs. The Evaluation Team used a dynamic approach to making the baseline adjustment, supported by market data collected through the mystery shopper survey of retailers in Indiana.

The following equations determined CFL energy and demand savings:

$$kWh\ savings = \frac{(W_{baseline} - W_{CFL}) * (Daily\ hours\ of\ use * 365) * ISR * (1 + WHFe)}{1000}$$

$$kW\ savings = \frac{(W_{baseline} - W_{CFL}) * Coincidence\ Factor * ISR * (1 + WHFd)}{1000}$$

$$Therm\ savings = \left(\frac{(W_{baseline} - W_{CFL}) * (Daily\ hours\ of\ use * 365) * ISR * WHFg}{1000}\right) * 10$$

[52] Most often assumed to be incandescent.

Where:

Baseline Wattage ($W_{baseline}$) = Assigned incandescent equivalent wattage of the lamp or bulb replaced with a CFL (see Table 187).

CFL Wattage (W_{CFL}) = The actual wattage of the installed CFL (13W, 19W, or 23W).

ISR = A number less than one, indicating how many lamps actually are in use, and including variables such as: the installation rate (bulbs installed versus placed into storage); bulbs taken outside the program service territory; and persistence (bulbs installed and then removed before end-of-life).

Daily HOU = Average number of hours a day the light remains in use.

WHF_e = WHF for energy use, accounting for the effects of more efficient lighting on cooling energy use.

WHF_d = WHF for demand, accounting for the effects of more-efficient lighting on cooling energy demand.

WHF_g = WHF for gas use, accounting for the effect of more-efficient lighting on heating energy use.

CF = A number between 0 and 1, indicating how many CFLs are expected to remain in use and saving energy during the peak summer demand period.

Table 187 lists the final assumptions used to evaluate and calculate CFL savings and identifies the source of each assumption.

Table 187: CFL *Ex-Post* Energy and Demand Savings Assumptions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Baseline Wattage (W_{base}) – For under 13W CFLs	40	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 13W-18W CFLs	60	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 19W-22W CFLs	75	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 23W-36W, Standard CFLs	85	ENERGY STAR Lighting Calculator values adjusted for Indiana-specific post-EISA market conditions
Baseline Wattage (W_{base}) – For 23W-36W, Specialty CFLs	100	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 37W- 54W CFLs	150	Illinois TRM
Baseline Wattage (W_{base}) – For 55W-67W CFLs	200	Illinois TRM
Baseline Wattage (W_{base}) – For 68W+ CFLs	200	Illinois TRM
CFL Wattage (W_{CFL})	Actual	Actual
Daily HOU	2.47	2012-2013 Indiana Lighting Logger Study

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Energy WHF (WHF_e)	Duke, IMPA, IPL = -0.061 I&M = -0.082 NIPSCO = -0.070 Vectren = -0.034	Indiana TRM
Demand WHF (WHF_d)	Duke, IMPA, IPL = 0.055 I&M, NIPSCO = 0.038 Vectren = 0.092	Indiana TRM
Gas WHF (WHF_g)	Duke, IMPA, IPL = -0.0018 I&M, NIPSCO = -0.0019 Vectren = -0.0017	Indiana TRM
CF	0.11	Indiana TRM
ISR	0.79	2012 Indiana Residential Baseline Study

LEDs

Similarly to CFLs, LED savings derived from calculating differences between baseline light[53] bulbs and replacement LEDs. Equivalent baseline incandescent bulbs were chosen, based on how their lumen output compared to the replacement LEDs, and then further adjusted for baseline conditions resulting from EISA legislation.

The following equations determined LED energy and demand savings:

$$kWh\ savings = \frac{(W_{baseline} - W_{LED}) * (Daily\ hours\ of\ use * 365) * ISR * (1 + WHFe)}{1000}$$

$$kW\ savings = \frac{(W_{baseline} - W_{LED}) * Coincidence\ Factor * ISR * (1 + WHFd)}{1000}$$

$$Therm\ savings = \left(\frac{(W_{baseline} - W_{LED}) * (Daily\ hours\ of\ use * 365) * ISR * WHFg}{1000}\right) * 10$$

Where:

$W_{baseline}$ = The wattage of the lamp or bulb replaced with an LED.

W_{LED} = The wattage of the replacement LED.

ISR = A number less than one indicating how many lamps actually remain in use, and including variables such as: the installation rate (bulbs installed versus placed into storage); bulbs taken

[53] Most often assumed to be incandescent.

outside the program service territory; and persistence (bulbs installed and then removed before end-of-life).

Daily HOU = Average number of hours a day the light remains in use.

WHF_e = WHF for energy use, accounting for the effects of more-efficient lighting on cooling energy use.

WHF_d = WHF for demand, accounting for the effects of more-efficient lighting on cooling energy demand.

WHF_g = WHF for gas use, accounting for the effect of more-efficient lighting on heating energy use.

Coincidence Factor = A number less than one, indicating how many LEDs are expected to remain in use and saving energy during the peak summer demand period.

Table 188: LED *Ex-Post* Energy and Demand Savings Assumptions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Baseline LED Wattage (W_{base}) – For LEDs up to 6W	25	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from>6 to 7W	35	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from>7 to 8.7W	40	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from > 8.7 to 13W	60	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from >13 to 16W	53	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from >16+W	72	Indiana TRM
LED Wattage ($W_{fixture}$)	Actual	Actual
Daily HOU	2.47	2012-2013 Indiana Lighting Logger Study
Energy WHF (WHF_e)	Duke, IMPA, IPL = -0.061 I&M = -0.082 NIPSCO = -0.070 Vectren = -0.034	Indiana TRM
Demand WHF (WHF_d)	Duke, IMPA, IPL = 0.055 I&M, NIPSCO = 0.038 Vectren = 0.092	Indiana TRM
Gas WHF (WHF_g)	Duke, IMPA, IPL = -0.0018 I&M, NIPSCO = -0.0019 Vectren = -0.0017	Indiana TRM
CF	0.11	Indiana TRM
ISR	1	Indiana TRM

FIXTURES

Similarly to CFLs, fixture savings derived from calculating differences between baseline units using incandescent light bulbs and replacement fixtures using pin-based CFLs. Equivalent baseline incandescent bulbs were chosen, based on how their lumen output compared to replacement CFLs included in the fixture, and further adjusted for baseline conditions due to EISA legislation.

The following equations determined fixtures' energy and demand savings:

$$kWh\ savings = \frac{(W_{baseline} - W_{Fixture}) * (Daily\ hours\ of\ use * 365) * ISR * (1 + WHFe)}{1000}$$

$$kW\ savings = \frac{(W_{baseline} - W_{Fixture}) * Coincidence\ Factor * ISR * (1 + WHFd)}{1000}$$

$$Therm\ savings = \left(\frac{(W_{baeline} - W_{Fixture}) * (Daily\ hours\ of\ use * 365) * ISR * WHFg}{1000}\right) * 10$$

Where:

$W_{baseline}$ = The wattage of the lamp or bulb replaced with a CFL pin-based bulb.

$W_{fixture}$ = The wattage of the individual replacement CFL pin-based bulb.

ISR = A number less than one, indicating how many of the lamps actually remain in use and including variables such as: installation rate (bulbs installed versus placed into storage); bulbs taken outside the program service territory; and persistence (bulbs installed and then removed before end of life).

Daily HOU = Average number of hours a day the light remains in use.

WHF_e = WHF for energy use, accounting for the effects of more-efficient lighting on cooling energy use.

WHF_d = WHF for demand, accounting for the effects of more-efficient lighting on cooling energy demand.

WHF_g = WHF for gas use, accounting for the effect of more-efficient lighting on heating energy use.

Coincidence Factor (CF) = A number less than one, indicating how many fixtures are expected to remain in use and saving energy during the peak summer demand period.

Table 189: Fixture *Ex-Post* Energy and Demand Savings Assumptions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Baseline Fixture Wattage (W_{base}) – For 13W CFL	60	ENERGY STAR Lighting Calculator
Baseline Fixture Wattage (W_{base}) – For 23W CFL	85	ENERGY STAR Lighting Calculator values adjusted for Indiana-specific post-EISA market conditions
Baseline Fixture Wattage (W_{base}) – For 27W CFL	85	ENERGY STAR Lighting Calculator values adjusted for Indiana-specific post-EISA market conditions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Fixture Wattage ($W_{fixture}$)	Actual	Actual
Daily HOU	2.47	2012-2013 Indiana Lighting Logger Study
Energy WHF (WHF_e)	Duke, IMPA, IPL = -0.061 I&M = -0.082 NIPSCO = -0.070 Vectren = -0.034	Indiana TRM
Demand WHF (WHF_d)	Duke, IMPA, IPL = 0.055 I&M, NIPSCO = 0.038 Vectren = 0.092	Indiana TRM
Gas WHF (WHF_g)	Duke, IMPA, IPL = -0.0018 I&M, NIPSCO = -0.0019 Vectren = -0.0017	Indiana TRM
CF	0.11	Indiana TRM
ISR	1	Indiana TRM

MYSTERY SHOPPER SURVEY RESULTS

MEMORANDUM

TO: **Indiana Demand Side Management Coordination Committee, EM&V Subcommittee**

FROM: **TecMarket Works Evaluation Team**

DATE: **February 7, 2014**

RE: Residential Lighting Program—Mystery Shopper CFL Baseline Real-Time Feedback Memo

This memo presents *real-time* feedback to the EM&V-SC from the mystery shopper survey that assessed the availability of 100- and 75-watt incandescent light bulbs in Indiana.

The Evaluation Team designed and fielded the mystery shopper survey to support the evaluation's dynamic approach for reducing CFL baseline wattages, following implementation of the 2007 EISA. The Evaluation Team presented this approach to the DSMCC EM&V-SC in a document entitled: "EISA Schedule and CFL Baseline." This recommended reducing CFL baselines over time, based on the availability of incandescent light bulbs in the market. Once standard wattage incandescent light bulbs no longer become available, baseline wattages will be EISA-compliant bulbs.

Mystery shopper surveys assessed availability of 100- and 75-watt incandescent light bulbs in Indiana and established CFL savings baselines for the Core Program 2013 and 2014 program years, using empirical data specific to the state.

Method and Sample

This mystery shopper survey took place during the second wave of a longitudinal panel study.[54] The first wave took place in January 2013, among a sample of 101 home and hardware stores as well as general retailers selling light bulbs.[55] Home and hardware stores included: Home Depot, Lowe's, Menard's, True Value and Mister Hardware. General retailers included Wal-Mart, Family Dollar, Meijer, Kroger, Save-A-Lot, Osco, and Walgreens.

Consistent with the panel study design, the phone survey attempted to complete interviews with the same 101 stores as interviewed in 2013. The fielding efforts resulted in completed interviews with 100 retailers, representing an exceptionally low attrition rate (just less than 1%). Interviews occurred between January 14 and January 17, 2014.

[54] A panel study is a type of longitudinal study that uses the same (constant) sample in each consequent wave, allowing for changes in individual responses over time.

[55] The sample for Wave 1 was chosen to include an equal numbers of home and hardware stores (such as Home Depot, Lowes, Menards, Ace, True Value, and Mister Hardware) and general retailers (such as Wal-Mart, Family Dollar, Meijer, Kroger, Save-A-Lot, Osco, and Walgreens). The completion rate for home and hardware stores surveyed was 88.9% (48 completes from a list of 54), and the rate for general retailers was 98.1% (53 completes from a list of 54).

The first wave explored availability of 100- and 95-watt incandescent light bulbs. The second wave explored the presence of 100-, 95-, and 90-watt incandescent light bulbs as well as 75-watt incandescent light bulbs.[56] Survey questions also explored: reasons for incandescent light bulbs not being available; expectations for possible future availability; and retailer-recommended alternatives. EISA affected 100-watt incandescents in 2012 and 75-watts in 2013, and just began affecting 60- and 40-watt incandescent bulbs in January 2014. The study assumed those bulbs remained widely available and did not include them as part of either survey.

Summary of Findings and Conclusions

The mystery shopper survey results indicated that, while EISA considerably affected the availability of 100- and 75-watt incandescent light bulbs, a sizable number of stores in Indiana still carried those bulbs. In addition, and perhaps more importantly, the removal rate of EISA non-compliant bulbs from the market appears to be slowing (rather than increasing), as reflected in the rate at which those bulbs are stocked and sold.

Overall, 39% of retailers still carry 100-watt incandescent bulbs, and the same percentage of retailers carry 75-watt incandescent light bulbs. Availability of 100-watt incandescent light bulbs only decreased by 6% from January 2013 to January 2014. That is, the rate at which 100-watt bulbs become unavailable has slowed at a more gradual pace than expected. However, these bulbs continue to be removed from the market. Of retailers without 100- or 75-watt incandescent light bulbs or with less than 20 bulbs left in stock, very few (less than one in 10) expects to obtain more in the near future. This finding reflects a similar finding from the 2013 study. Most of these retailers cited EISA legislation as the reason for incandescent light bulbs no longer being available.

Based on the relatively small but continued, incremental decline in the percentage of stores selling 100-watt incandescents between 2013 and 2014, and on the varying stocking patterns from year-to-year at individual store levels, EISA's longer-term impact on the availability of incandescent bulbs remains uncertain and unpredictable. Study findings support the stair-step baseline reduction approach adapted by the Evaluation Team; however, the findings also mean the market has not eroded as fast as expected; thus impacts on CFL baselines for 2014 have not been as severe as anticipated.

Given the market conditions and current availability of the phased-out lighting products in Indiana stores, the Evaluation Team will use the baseline adjustments to match market conditions found in this study. Table 190 outlines these adjustments. Numbers in the table have been rounded to the nearest 5%. As part of future evaluation efforts, the Evaluation Team will conduct subsequent studies to develop baseline adjustments for future years (currently marked at TBD in the table).

[56] As EISA affected 75-watt incandescent light bulbs from the beginning of 2013, the study assumed those bulbs were widely available and did not explore them as part of the Wave 1 survey.

Table 190: EISA Compliant Baselines by Year and Wattage

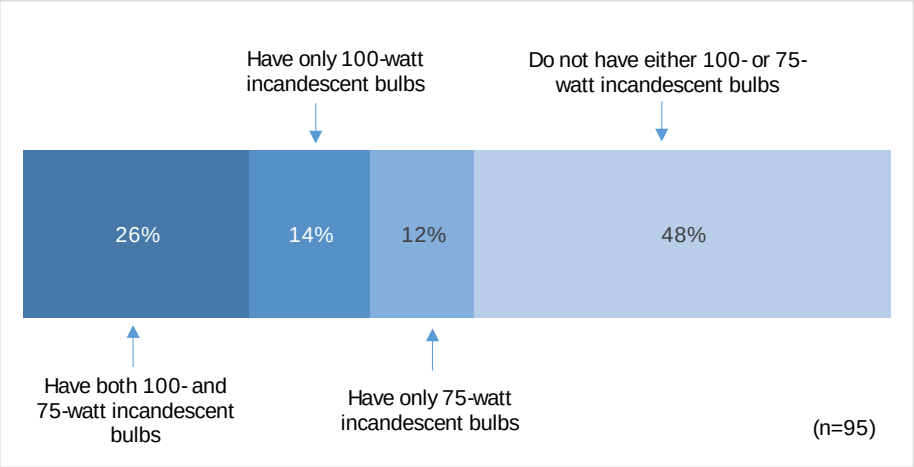
100-watt			75-watt			60-watt			40-watt		
Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)
2012	0%	100	2012	0%	75	2012	0%	60	2012	0%	40
2013	55%	85	2013	0%	75	2013	0%	60	2013	0%	40
2014	60%	83	2014	60%	62	2014	0%	60	2014	0%	40
2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD
2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD
2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD

Detailed Results

Current Availability of 100- and 75-watt Incandescent Light Bulbs

Two years after implementation of EISA, 100- and 75-watt incandescent light bulbs remain significantly present and readily available on many Indiana store shelves. Some retailers, however, only had one wattage in stock, though some had both (as shown in Table 191). Just over one-half of retailers included in this study had *either* 100- or 75-watt bulbs in stock (52%). Slightly over one-quarter of retailers (26%) had *both* 100- and 75-watt incandescents.

Table 191: Availability of Incandescent Wattage Combinations



Examining the availability of a single wattage, 100- and 75-watt incandescents remain equally available. That is, 100-watt and 75-watt bulbs have matched market availability. Four in 10 retailers still offer 100-watt incandescents, while the same percentage also offers 75-watt bulbs (39% for each wattage type) (as shown in Table 192).

Despite the continued availability of these bulbs, fewer retailers had large quantities in stock, indicating sales may be slowing. Approximately one-quarter of retailers interviewed had 20 or more bulbs available (26% had 20 or more 100-watt bulbs available, and 22% had 20 or more 75-watt bulbs available).

Though home and hardware stores carried larger stocks of the bulbs, the difference did not prove statistically significant.[57] This could result from a limited stocking capacity of general retailers. Stores such as Walgreens, Family Dollar, and others, often have limited shelf and stocking space dedicated to lighting products and might not be able to stock extensive quantities of given bulb types.

Table 192: Availability of 100- and 75-watt Incandescent Light Bulbs

Bulb Wattage	Home and Hardware Stores	General Retailers	Total*
100-watt Incandescent Light Bulbs			
Have any in stock	**(n=52)**	**(n=48)**	**(n=100)**
	38%	40%	39%
Have 20+ in stock	**(n=52)**	**(n=48)**	**(n=100)**
	31%	21%	26%
75-watt Incandescent Light Bulbs			
Have any in stock	**(n=51)**	**(n=46)**	**(n=97)**
	39%	39%	39%
Have 20+ in stock	**(n=51)**	**(n=44)**	**(n=95)**
	29%	14%	22%

*The total number of respondents does not equal 100. Respondents saying "don't know" were excluded from the valid respondent base.

**Includes high-wattage incandescent bulbs, such as 90-watt bulbs. Only one retailer had 90-watt incandescent light bulbs in stock.

Changes in Incandescent Bulb Availability over Time

Compared to a year ago, slightly fewer stores offer 100-watt incandescent light bulbs for purchase in and in slightly smaller quantities. As shown in Table 193, the percentage of retailers with 100-watt incandescents in stock in 2014, when compared to those in 2013, fell by 6%, as did the percentage of retailers with 20 or more bulbs in stock.[58]

Table 193: Change in 100-watt Incandescent Light Bulb Availability over Time

	Wave 1 (January 2013) (n=101)	Wave 2 (January 2014) (n=100)	*% Drop*
Have any amount of 100-watt incandescent light bulbs	45%	39%	***6%***
Have 20+ 100-watt incandescent light bulbs	32%	26%	***6%***

These relatively small stocking changes at the aggregate level may mask some larger changes happening at individual store levels. EISA allows retailers to continue to sell regulated wattages until they have exhausted their inventory, but retailers cannot legally import additional bulbs. Given this regulation, it remains unclear whether an individual store selling through its inventory would receive additional bulbs, or, upon depleting that inventory, would no longer sell that wattage. Retailers may possibly continue to acquire these bulbs.

[57] Using a Chi-Square test to test the proportions for significance.

[58] Due to the 75-watt incandescent light bulb ban taking place in January 2013, most stores will likely carry 75-watt incandescents; therefore, the study did not explore the availability of those bulbs over time during the survey's first wave.

As the study addressed the same stores in both years, the percentage of stores changing their stocking of 100-watt bulbs from one year to the next can be readily identified. A slight majority (56%) did not change their stocking practices: 36% did not carry the bulbs in 2013 and still did not in 2014; while 20% carried them in 2013 and continued to do so in 2014 (as shown in Table 194). These results were not expected, unless the combined wholesale and retail inventory of bulbs remained greater than the two-year, EISA-impacted demand for those bulbs or the importing of those bulbs continued. The study also found some stocking changes. One in four stores (25%) carried the bulbs in 2013, but did not do so in 2014, a finding consistent with the "sell through and done" concept. The study also found, however, a somewhat lower number (19%) of stores did not stock the bulbs in 2013, but had them in stock in 2014.[59] It appears EISA's implementation at the store level not only took place more slowly than anticipated but may be more complicated than simply selling through a store's existing inventory.

Table 194: Comparison of Stocking of 100-watt Incandescent Bulbs in 2013 and 2014 at Same Stores

	Wave 1 and Wave 2 Respondents (n=100)
Same Stocking	**56%**
Did not sell in either year	36%
Sold in both years	20%
Different Stocking	**44%**
Stocked in 2013 Only	25%
Stocked in 2014 Only	19%

Expectations for Future 100- and 75- Watt Incandescent Bulb Availability

Because it was unclear whether stores without 100- or 75-watt bulbs in stock would receive additional bulbs, the study asked store associates if they expected to obtain more bulbs in the near future (asking this question of retailers with fewer than 20 bulbs in stock and those with none). In 2014, less than one in 10 expected to have their supplies of either wattage replenished in the near future. The results did not vary significantly by general retailers or home and hardware stores.

The percentage of stores not expecting to receive 100-watt incandescent light bulbs in the Wave 2 survey nearly equaled those in Wave 1.

Table 195: Expected 100- and 75-watt Incandescent Bulb Availability

	100-watt Incandescent Light Bulbs		75-watt Incandescent Light Bulbs
	Wave 1 (January 2013) (n=69)	Wave 2 (January 2014) (n=73)	Wave 2 (January 2014) (n=74)*
Expect more bulbs soon	9%	8%	5%
Do not expect any more bulbs	84%	82%	82%
Do not know	7%	10%	12%

*The sum of categories does not equal 100% due to rounding.

[59] To mitigate measurement error, the Evaluation Team thoroughly trained the interviewers. As part of the interview process, interviewers carefully explained to respondents the types of lighting examined, seeking to avoid confusion as much as possible (e.g., confusion between 100-watt equivalent halogen and 100-watt incandescent bulbs).

The overwhelming majority of retailers not expecting to obtain additional 100- or 75-watt incandescent light bulbs soon cited the bulb phase-out due to federal regulations as the reason for not keeping those wattages in their stores. Some, however, did not know why 100- or 75-watt incandescent bulbs would no longer be available. Other responses included: corporate policies/decisions to not stock the bulbs and stores switching to energy-efficient lighting technologies.

Table 196: Reasons for 100- and 75-watt Incandescent Bulbs No Longer Available

	100-watt Incandescents (n=60)	75-watt Incandescents (n=61)
Phasing them out (due to federal regulations)	63%	66%
No consumer demand	5%	8%
Other	15%	13%
Don't know	17%	13%

Retailer Recommendations for Alternative Lighting Technologies

The study asked retailers with fewer than 20 bulbs of 100- or 75-watt incandescent light bulbs or who did not have either wattage in stock to recommend an alternative lighting technology for purchase. Slightly over one-half (56%) recommended energy-efficient lighting options, with CFLs the most frequent response (as shown in Table 197). Fewer recommended halogens or lower-wattage incandescent light bulbs. Some retailers did not offer any suggestions, while a small number provided recommendations of other stores where the bulbs might be available.

Table 197: Recommendation to Replace 100-watt Incandescent Light Bulbs

	Total (n=47)
Energy-efficient light bulbs	***60%****
CFLs	43%
LEDs	13%
Energy saving light bulbs (general)	9%
Halogens	17%
Lower-wattage incandescents	13%
No suggestions	9%
Other stores	4%
Other recommendation	11%

*The categories sum is higher than the total due to multiple responses and retailers providing recommendation for more than one lighting technology (e.g., retailer could recommend CFLs and LEDs).

In summary, the baseline reduction approach the Evaluation Team used operated consistently with the erosion of available EISA non-compliant bulbs; however, the erosion took place more slowly than expected for 100-watt bulbs and was significantly higher for 75-watt bulbs. The Evaluation Team will use findings from this research to adjust the CFL *ex-ante* evaluated baseline calculation approach to match market conditions identified in the study.

B. Appendix: Cost-Effectiveness by Utility

Pursuant to the Indiana Utility Regulatory Commission Order of May 9, 2014, the standalone second year program for PY2, cost-effectiveness results are provided for each program and utility as well as for the State level assessment.

It is incumbent upon the Evaluation Team to caution the reader from over-interpreting or drawing specific conclusions using the PY2 vs. PY1 benefit cost assessment for comparative purposes. There are carryover load impacts or avoided costs counted in PY2 that were associated with expenditures in PY1. As a result, the benefit cost analysis of these two years should not be directly compared. It is recommended that the cost-effectiveness of the Core portfolio be viewed in its entirety for the 3-year goal and contract period.

The following tables provide the individual PY2 cost-effectiveness results.

Table 198: Duke Energy PY2 Cost-Effectiveness

Cost Effectiveness for Duke Energy Indiana Programs				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	4.52	3.6	1.13	3.94
Low Income Weatherization	NA	0.95	0.6	0.95
Home Energy Audit	NA	1.5	0.77	1.5
School Energy Efficiency Kit	NA	2.84	0.97	2.84
Non-Residential Programs				
School Building Assessments	NA	0.99	0.46	0.99
Commercial & Industrial Incentives	9.84	8.33	1.11	8.58
Total Portfolio	9.69	4.12	1.03	4.21

Table 199: I&M PY2 Cost-Effectiveness

Cost Effectiveness for Indiana & Michigan Programs				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	6.23	3.1	0.67	3.26
Low Income Weatherization	NA	0.78	0.37	0.78
Home Energy Audit	NA	1.26	0.47	1.26
School Energy Efficiency Kit	NA	1.99	0.55	1.99
Non-Residential Programs				
School Building Assessments	NA	0.81	0.4	0.81
Commercial & Industrial Incentives	19.01	4.23	0.87	11.42
Total Portfolio	17.29	3.61	0.81	6.98

Table 200: IMPA PY2 Cost-Effectiveness

Cost Effectiveness for IMPA Programs				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	6.72	2.16	0.55	2.19
Low Income Weatherization	NA	1.09	0.52	1.09
Home Energy Audit	NA	1.42	0.58	1.42
School Energy Efficiency Kit	NA	3.1	0.75	3.1
Non-Residential Programs				
School Building Assessments	NA	1.13	0.52	1.13
Commercial & Industrial Incentives	9.02	8.92	1.24	9.53
Total Portfolio	10.37	4.96	1.04	5.12

Table 201: IPL PY2 Cost-Effectiveness

Cost Effectiveness for Indianapolis Power & Light Programs				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	2.73	2.26	1.08	2.33
Low Income Weatherization	NA	1.01	0.67	1.01
Home Energy Audit	NA	1.04	0.67	1.04
School Energy Efficiency Kit	NA	1.92	0.94	1.92
Non-Residential Programs				
School Building Assessments	NA	0.73	0.48	0.73
Commercial & Industrial Incentives	3.69	4.05	1.45	4.16
Total Portfolio	4.58	2.2	1.08	2.22

Table 202: NIPSCO PY2 Cost-Effectiveness

Cost Effectiveness for NIPSCO Programs				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	6.52	3.56	0.79	3.73
Low Income Weatherization	NA	1.31	0.63	1.31
Home Energy Audit	NA	1.85	0.7	1.85
School Energy Efficiency Kit	NA	2.49	0.77	2.49
Non-Residential Programs				
School Building Assessments	NA	1.32	0.45	1.32
Commercial & Industrial Incentives	8.92	7.2	0.79	7.46
Total Portfolio	10.61	3.59	0.76	3.65

Table 203: Vectren PY2 Cost-Effectiveness

Cost Effectiveness for Vectren Programs				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	9.17	2.55	0.46	2.97
Low Income Weatherization	NA	1.56	0.57	1.56
Home Energy Audit	NA	1.19	0.4	1.19
School Energy Efficiency Kit	NA	2.13	0.48	2.13
Non-Residential Programs				
School Building Assessments	NA	0.52	0.3	0.52
Commercial & Industrial Incentives	7.57	6.2	0.93	5.92
Total Portfolio	12.31	2.53	0.62	2.55

Table 204: Statewide PY2 Cost-Effectiveness

State of Indiana Program Cost Effectiveness				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs				
Residential Lighting	5.25	3.08	0.86	3.3
Low Income Weatherization	NA	1.09	0.56	1.09
Home Energy Audit	NA	1.36	0.64	1.36
School Energy Efficiency Kit	NA	2.57	0.85	2.57
Non-Residential Programs				
School Building Assessments	NA	0.84	0.43	0.84
Commercial & Industrial Incentives	10.09	5.67	1	8
Total Portfolio	10.43	3.44	0.9	3.97

Public Report

This summary provides an assessment of the 2013 Energizing Indiana statewide Core programs during the second Program Year (PY2). This Public Summary presents key findings from the Indiana statewide evaluation. This summary includes evaluation findings designed to document the savings, operations, and delivery of the programs'. Overall, the portfolio continues to be cost effective over the two year period with Core program energy efficiency resources being acquired at $0.03 per kWh.

CORE OFFERINGS

The program consists of five Energizing Indiana offerings, delivered by an independent Third Party Administrator (TPA). PY2 represented the second year of a three-year program cycle. The programs address homes, schools, and commercial facilities.

HOME ENERGY ASSESSMENT

This program provides a walk-through energy audit that: analyzes participant energy use; recommends efficiency measures or upgrades; and facilitates direct installation of low-cost, energy efficient showerheads, CFL bulbs, hot water pipe wrap, and sink aerators.

RESIDENTIAL LIGHTING

This program provides upstream discounts on a variety of lighting products (Compact fluorescent [CFLs], light-emitting diodes [LEDs], and lighting fixtures). The program works with retailers and manufacturers across the state to offer reduced prices at the point-of-sale.

LOW-INCOME WEATHERIZATION

This program provides a walk-through home energy assessment that includes full diagnostic testing (blower-door) for the home. Auditors recommend weatherization measures or upgrades that facilitate direct installation of low-cost, energy-saving measures, including energy-efficient showerheads, CFL bulbs, sink aerators, pipe wrap, water heater tank wrap and air sealing. In addition, eligible homes may receive attic insulation through the program.

ENERGY EFFICIENT SCHOOLS

This program has two components:

- The first works with fifth-grade students, teaching them about energy efficiency and how they can make an impact at school and home. Participating schools receive classroom curriculum and Energizing Indiana take-home efficiency kits.
- The second, the School Audit and Direct Install Program, works with schools to assess all energy systems to determine if they operate efficiently. Assessment results guide schools to install appropriate upgrades and rebates available through the Commercial and Industrial (C&I) program. The schools also receive a bundle of direct-install measures at no additional cost.

COMMERCIAL AND INDUSTRIAL

Addressing the use of C&I customers, this program provides prescriptive rebates to customers, based on the installation of energy-efficiency equipment and system improvements. Additional program components targeted to small businesses include: the Opt-in Install program and targeted relationships with Trade Allies. Rebates address: lighting, variable frequency drives (VFDs), Heating, Ventilation, Air Conditioning (HVAC), and efficient ENERGY STAR® commercial kitchen appliances. In addition, the program began offering direct-mail CFLs kits, starting in Fall 2012.

HIGHLIGHTS

In 2013, Energizing Indiana saved **551,720,184 kWh.** Enough electricity to power 52,330 homes for an entire year.

Continued savings from the measures installed will achieve over **5 billion kWh** over their lifetime.

$31 Million worth of rebates were distributed to the community to assist with energy efficient upgrades.

HIGHLIGHTS

The savings achieved from PY2 installations, continue to have an effect for the lifetime of the equipment installed. These tables highlight the savings per program, by utility. Consisting of savings from each program as presented below:

HOME ENERGY ASSESSMENT

Utility	*Lifetime Ex-Post kWh*
Duke	150,458,734
I&M	48,368,009
IPL	204,177,936
IMPA	39,049,297
NIPSCO	106,173,539
Vectren	54,617,374

STATEWIDE
602,844,889 kWh

LOW-INCOME WEATHERIZATION

Duke	32,892,744
I&M	18,306,585
IPL	15,656,523
IMPA	4,039,140
NIPSCO	23,315,360
Vectren	20,072,673

STATEWIDE
114,283,026 kWh

RESIDENTIAL LIGHTING

Duke	220,570,660
I&M	86,546,260
IPL	112,869,659
IMPA	25,702,116
NIPSCO	88,896,020
Vectren	58,034,703

STATEWIDE
592,619,418 kWh

ENERGY EFFICIENT SCHOOLS

Duke	162,359,282
I&M	25,917,264
IPL	41,213,557
IMPA	9,857,458
NIPSCO	32,945,470
Vectren	11,526,608

STATEWIDE
283,819,639 kWh

COMMERCIAL AND INDUSTRIAL

Duke	1,027,115,604
I&M	1,238,288,975
IPL	565,418,421
IMPA	278,314,903
NIPSCO	375,092,514
Vectren	164,524,287

STATEWIDE
3,648,754,704 kWh

STATEWIDE ANNUAL VERIFIED SAVINGS

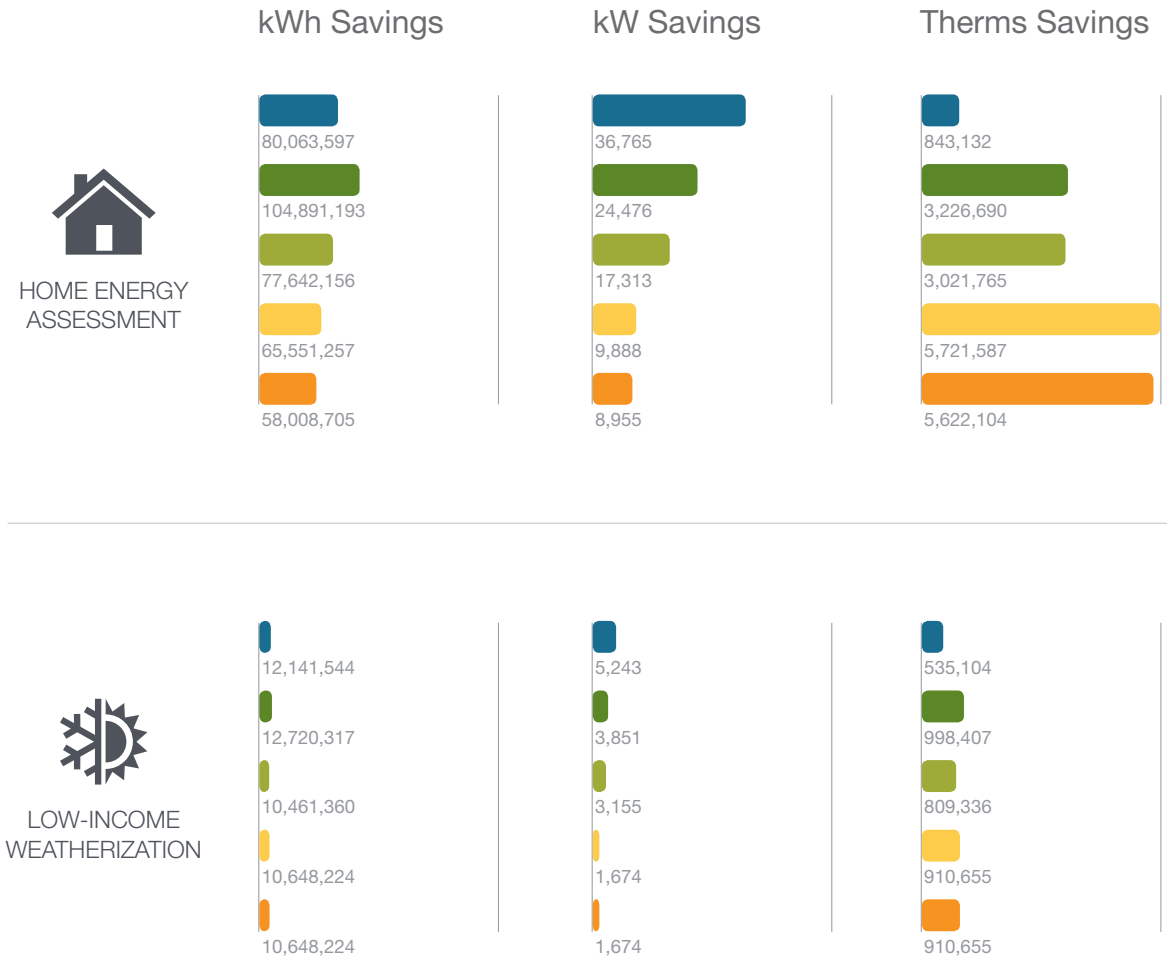
The PY2 portfolio moved from a start-up to more efficient, established operation for residential programs. Almost every program improved its design, marketing, and operations, leading to increased or steady energy savings and improved cost-effectiveness.

The Energizing Indiana programs' designs anticipated the TPA would meet very aggressive energy-savings objectives, requiring high participation levels immediately upon launch. The programs did not achieve these aggressive objectives in the first year. However, the TPA significantly improved energy-savings performance for all residential programs, increasing their energy savings by 41% compared to PY1 achievements.

THE SAVINGS ARE REPORTED AS

The impacts achieved from the programs for a single year are as follows:

- ***Ex-Ante:*** Energy savings from program tracking system as reported by the TPA.
- **Audited:** Ex-ante savings after deemed calculations and project/measure counts have been confirmed by the evaluation administrator.
- **Verified:** Savings estimated following confirmation of the installation and use of a sample of project/measure installations.
- ***Ex-Post* Gross:** Evaluated savings resulting from the installation and use of all program-incented or provided technologies.
- **Net Energy Savings:** Evaluated savings resulting from the installation and use of incented or provided technologies directly attributable to the program.



STATEWIDE ANNUAL VERIFIED SAVINGS

PROGRAM LEVEL INSIGHT AND FINDINGS

HOME ENERGY ASSESSMENT

The Home Energy Assessment Program offers walk-through audits and direct-installations of energy-efficiency measures. In 2013, the program achieved 88% of its verified energy-savings goals and 44% of its verified demand-savings goals, while using 90% of its budget.

- HEA significantly increased participation in PY2 compared to PY1 (by 229%), maintaining participation at an approximate average of 5,900 homes per month over the course of the year. Despite this, the HEA program was only able to reach 84% of its PY2 participation goals.
- Customers remained satisfied with the program, rating it an 8.9 satisfaction score on a scale of 1 to 10.

LOW-INCOME WEATHERIZATION

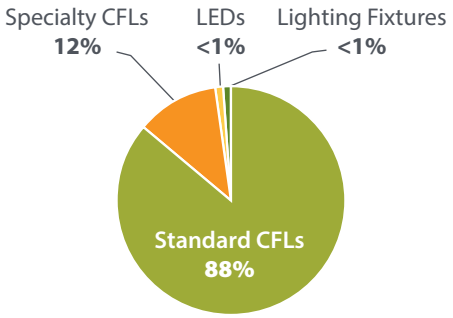
The LIW program offers walk-through audits and direct installations of energy-efficiency measures. Similarly to the HEA program, the program includes air sealing and, in some cases, attic insulation. In PY2, the program achieved 91% of its energy-savings goals and 62% of its demand-savings goals, while using 101% of its budget.

- LIW program participants reported very high satisfaction levels, rating the program a 9.2 satisfaction score on a scale of 1 to 10.

RESIDENTIAL LIGHTING

The Residential Lighting program performed well in 2013 and exceeded its ex-ante goals. The program continued to offer discounts on a variety of lighting products and increased its footprint by adding new participating retail locations. The program operated smoothly, resulting in high levels of manufacturer satisfaction.

Breakdown of Light Bulbs Sold through the Program



(n=3,826,331)

- When asked to rate the program on a 10-point scale, where 1 as very dissatisfied and 10 as very satisfied, the majority of manufacturers (five out of eight) interviewed rated the program either an 8, 9, or 10. The lowest satisfaction rating was 6, provided by only one manufacturer.

PROGRAM LEVEL INSIGHT AND FINDINGS

ENERGY EFFICIENT SCHOOLS

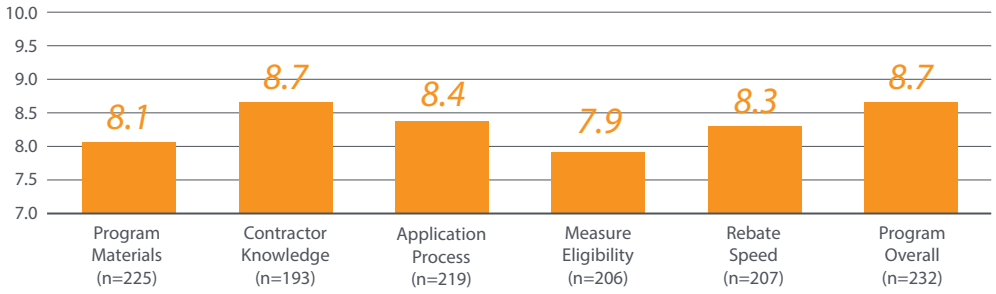
The Energy Efficient Schools program offers kits to students and energy assessments of school buildings, coupled with installing low-cost, energy-saving measures. In 2013, the program achieved 114% of its energy-savings goals and 101% of its participation goals, while using 101% of its budget.

- Satisfaction ran high among participating teachers and facility staff. Almost all surveyed teachers (89%) reported they would be highly likely to recommend the program to other teachers. Ninety-three percent of facility staff reported high satisfaction levels with the School Audit and Direct Install program.

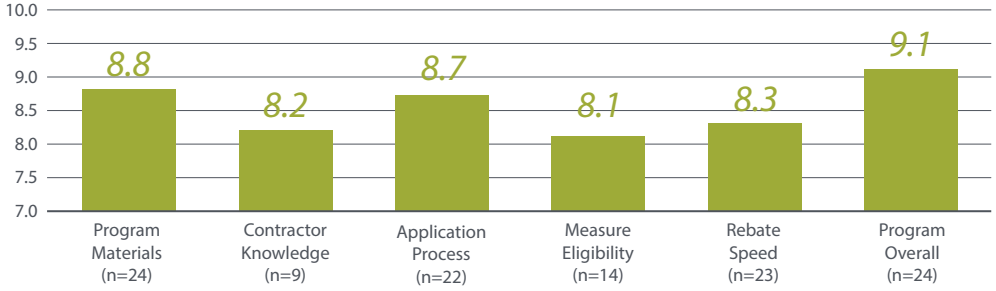
COMMERCIAL AND INDUSTRIAL

The C&I Prescriptive Rebates program seeks to achieve long-term, cost-effective savings. This program relies on a prescriptive rebate structure that offers participants monetary incentives, based on their installation of energy-efficiency equipment upgrades. Upgrades include: lighting, VFDs, HVAC, and ENERGY STAR kitchen equipment. The C&I program fell just short of meeting savings targets set for PY2. The TPA addressed lessons learned through PY1 implementation and added seven new tracks to the program to enhance its customer reach. In 2013, the program achieved 42% of its energy-savings goals and 24% of its demand savings goals, while using 66% of its budget.

- Lighting customer satisfaction averaged high across all categories, despite a slight drop from PY1 response scores. At least 94% of lighting customers responded with a 5 or higher in every category.



- Non-lighting customers also expressed satisfaction in all areas.



CONCLUSION AND RECOMMENDATIONS

RECOMMENDATION

The Core portfolio offers a breadth of measures, hoping to capture as many energy savings opportunities as possible. Components of each program succeeded and some areas fell short in meeting the desired savings and program effects. The evaluation aims to assist the TPA and utilities in overcoming barriers within the Indiana efficiency market to obtain the highest level of savings. Overall the evaluation found the programs have improved since PY1 and have observed PY2 recommendations being implemented already as well.

REVIEW OF RECOMMENDATIONS

1. For HEA and LIW, the TPA should work to increase savings per home by targeting high-usage sockets and homes with electric water heat. The program should continue to target high-usage sockets while installing bulbs.
2. In-store lighting demonstrations offer a powerful, highly effective tool to increase customer awareness of program discounts and sales of energy-efficient lighting products over less-efficient options and should be offered more frequently. Moreover, events encourage customers who would not have purchased CFLs at full price to buy program-discounted bulbs.
3. Limit turning off and on program discounts for Residential Lighting qualifying technologies. However, the program's success and the need to stay within the utility-specific program budgets may require turning program discounts on and off across Indiana, and avoiding this situation may not be possible.
4. Although the TPA updated the 2012 curriculum for Energy Efficient Schools in 2013, teachers continued to report that program lesson plans better aligned with a fourth-grade curriculum than fifth-grade standards. If the program's lessons better aligned with the curriculum targeted teachers must teach, they would be able to spend more time on the program topics.
5. As in 2012, upfront capital costs proved prohibitive to Energy Efficient Schools SADI participants, even with rebates and expectations of energy cost savings over time.
6. Continue to leverage Trade Allies as marketing ambassadors, and further develop engagement tactics and support. Increase awareness of marketing initiatives, such as the $100 Trade Ally incentive, to recruit more currently nonparticipating Trade Allies into the program.
7. Consider conducting routine customer surveys, online or as part of the application process, to monitor performance and satisfaction.
8. Program data should include the marketing and outreach initiatives that led customers to participate. Including these will help managers track their effectiveness.

STATEWIDE PROGRAMMATIC SAVINGS for PY2

Ex Ante	Audited	Verified	Ex Post	**Net**
529,477,534 kWh	551,720,184 kWh	508,177,867 kWh	480,679,752 kWh	**347,168,234 kWh**

UTILITY SPECIFIC FINDINGS

The bar charts that follow present an assessment of the PY2 Indiana Core Programs' ex-ante, audited, verified, ex-post gross, and net energy savings, achievements by utility.

Energizing Indiana overcame the slower than projected start to capturing energy savings experienced in 2012, with 2013 showing strong growth in savings across residential programs. The strongest uptake was obtained by Home Energy Assessments, Income Qualified Weatherization, and Residential Lighting. The lowest growth occurred in the Commercial and Industrial Program.

The slower than expected first year savings are attributed to the need to hire, organize and staff the newly offered programs and to put in place the operational systems needed to launch and maintain the programs. Many of these first year difficulties were addressed or corrected in the second year.

THE SAVINGS ARE REPORTED AS

- ***Ex-Ante:*** Energy savings from program tracking system as reported by the TPA.
- **Audited:** Ex-ante savings after deemed calculations and project/measure counts have been confirmed by the evaluation administrator.
- **Verified:** Savings estimated following confirmation of the installation and use of a sample of project/measure installations.
- ***Ex-Post* Gross:** Evaluated savings resulting from the installation and use of all program-incented or provided technologies.
- **Net Energy Savings:** Evaluated savings resulting from the installation and use of incented or provided technologies directly attributable to the program.

UTILITY SPECIFIC FINDINGS

DUKE ENERGY.

	kWh Annual Savings	kW Annual Savings	Therms Annual Savings
HOME ENERGY ASSESSMENT	20,195,052	9,345	315,364
	25,770,855	6,119	798,970
	19,308,195	4,371	751,094
	16,384,640	2,693	1,427,151
	14,609,486	2,463	1,391,458
LOW-INCOME WEATHERIZATION	3,912,000	1,689	109,610
	4,037,478	1,270	224,688
	3,105,012	1,017	92,634
	2,721,484	323	186,860
	2,721,484	323	186,860
RESIDENTIAL LIGHTING	56,461,616	9,024	
	59,516,162	7,119	
	65,337,698	8,247	
	49,764,026	6,758	
	24,667,160	3,345	
ENERGY EFFICIENT SCHOOLS	21,576,001	80	252,003
	21,576,001	80	252,003
	23,379,141	79	255,406
	24,462,618	3,121	685,251
	25,515,284	3,168	839,269
COMMERCIAL AND INDUSTRIAL	62,529,961	9,903	
	60,012,345	12,046	
	60,012,345	12,046	
	62,058,310	14,438	
	49,646,648	11,550	

UTILITY SPECIFIC FINDINGS

AEP INDIANA MICHIGAN POWER
A unit of American Electric Power

	kWh Annual Savings	kW Annual Savings	Therms Annual Savings
HOME ENERGY ASSESSMENT	6,321,156	2,805	0
	8,490,851	1,974	260,811
	6,329,546	1,382	243,474
	5,050,190	682	467,037
	4,409,967	623	506,675
LOW-INCOME WEATHERIZATION	2,115,088	913	0
	2,079,052	691	110,799
	1,748,559	558	61,325
	1,718,316	176	117,695
	1,718,316	176	117,695
RESIDENTIAL LIGHTING	19,861,198	3,174	
	23,380,245	2,796	
	26,618,426	3,392	
	19,541,520	2,663	
	9,711,922	1,321	
ENERGY EFFICIENT SCHOOLS	3,968,064	23	0
	3,968,064	23	0
	4,124,736	22	0
	3,999,228	527	82,297
	4,345,424	535	118,692
COMMERCIAL AND INDUSTRIAL	89,998,901	15,585	
	86,375,315	18,956	
	86,375,315	18,956	
	89,320,058	22,721	
	71,456,046	18,177	

UTILITY SPECIFIC FINDINGS

	kWh Annual Savings	kW Annual Savings	Therms Annual Savings
HOME ENERGY ASSESSMENT	26,977,410	12,318	0
	35,708,023	8,089	1,104,731
	24,950,485	5,097	1,033,075
	22,060,426	2,949	1,923,779
	19,489,529	2,621	1,873,279
LOW-INCOME WEATHERIZATION	1,305,304	564	0
	1,352,993	447	144,498
	1,154,136	371	142,973
	1,411,323	205	149,033
	1,411,323	205	149,033
RESIDENTIAL LIGHTING	31,416,251	5,021	
	30,737,626	3,676	
	33,262,345	4,182	
	25,472,793	3,462	
	12,615,011	1,712	
ENERGY EFFICIENT SCHOOLS	6,539,046	90	0
	6,539,046	90	0
	6,863,624	89	0
	6,307,013	822	157,322
	7,457,106	830	223,267
COMMERCIAL AND INDUSTRIAL	38,050,097	5,639	
	36,518,103	6,859	
	36,518,103	6,859	
	37,763,093	8,222	
	30,210,474	6,578	

UTILITY SPECIFIC FINDINGS

IMPA Indiana Municipal Power Agency

	kWh Annual Savings	kW Annual Savings	Therms Annual Savings
HOME ENERGY ASSESSMENT	5,143,792	2,365	0
	6,945,424	1,563	211,840
	5,148,417	1,109	197,133
	4,213,502	561	371,184
	3,725,032	499	361,085
LOW-INCOME WEATHERIZATION	395,112	171	0
	381,077	133	24,264
	326,832	108	23,871
	346,928	40	24,376
	346,928	40	24,376
RESIDENTIAL LIGHTING	7,296,511	1,166	
	7,021,406	840	
	7,828,020	992	
	5,834,316	792	
	2,895,237	392	
ENERGY EFFICIENT SCHOOLS	1,360,048	12	0
	1,360,048	12	0
	1,442,426	12	0
	1,535,482	192	39,542
	1,640,842	195	50,468
COMMERCIAL AND INDUSTRIAL	17,642,220	2,627	
	16,931,899	3,195	
	16,931,899	3,195	
	17,509,148	3,830	
	14,007,318	3,064	

UTILITY SPECIFIC FINDINGS

NIPSCO

	kWh Annual Savings	kW Annual Savings	Therms Annual Savings
HOME ENERGY ASSESSMENT	14,109,132	6,606	347,524
	18,925,653	4,147	629,890
	15,162,352	3,547	594,716
	11,906,901	1,529	998,558
	10,523,118	1,363	972,035
LOW-INCOME WEATHERIZATION	2,789,256	1,204	268,872
	3,082,239	806	286,188
	2,595,228	672	282,307
	2,654,471	418	250,052
	2,654,471	418	250,052
RESIDENTIAL LIGHTING	23,555,640	3,765	
	24,309,190	2,908	
	26,582,751	3,352	
	20,160,172	2,721	
	9,990,522	1,347	
ENERGY EFFICIENT SCHOOLS	6,774,683	30	149,450
	6,774,683	30	149,450
	7,355,211	30	147,393
	5,510,464	854	67,303
	5,547,929	862	113,024
COMMERCIAL AND INDUSTRIAL	22,670,350	4,235	
	21,747,449	5,149	
	21,747,449	5,149	
	22,499,352	6,172	
	17,999,482	4,938	

UTILITY SPECIFIC FINDINGS

VECTREN Live Smart

	kWh Annual Savings	kW Annual Savings	Therms Annual Savings
HOME ENERGY ASSESSMENT	7,317,055	3,326	180,244
	9,050,387	2,584	220,448
	6,743,161	1,807	202,273
	5,935,598	1,474	533,878
	5,251,573	1,386	517,572
LOW-INCOME WEATHERIZATION	1,624,784	702	156,622
	1,787,478	504	207,970
	1,531,593	429	206,226
	1,795,702	512	182,639
	1,795,702	512	182,639
RESIDENTIAL LIGHTING	14,580,582	2,330	
	15,600,281	1,866	
	16,584,277	2,075	
	13,099,116	1,793	
	6,478,246	885	
ENERGY EFFICIENT SCHOOLS	2,389,131	50	33,733
	2,389,131	50	33,733
	2,619,753	49	33,723
	1,802,446	234	31,285
	2,373,071	235	55,987
COMMERCIAL AND INDUSTRIAL	10,509,259	1,608	
	9,152,629	1,596	
	9,152,629	1,596	
	10,429,990	1,913	
	8,343,992	1,530	

BUDGET

	2013 Budget	2013 Reported Expenditures	% of Budget Goals
HOME ENERGY ASSESSMENT	$ 27,915,723	$ 25,174,399	90%
LOW-INCOME WEATHERIZATION	$ 7,133,314	$ 7,222,297	101%
RESIDENTIAL LIGHTING	$ 7,712,844	$ 7,763,131	101%
ENERGY EFFICIENT SCHOOLS	$8,179,321	$8,283,575	101%
COMMERCIAL AND INDUSTRIAL	$ 56,377,283	$ 37,328,403	66%
TOTAL	**$ 107,318,485**	**$ 85,771,805**	80%

	2013 Budget Goals	2013 Reported Expenditures	% of Budget Goals
DUKE ENERGY	$ 42,380,071	$ 23,620,535	56%
AEP INDIANA MICHIGAN POWER A unit of American Electric Power	$ 11,610,122	$ 21,295,504	183%
ipl an AES company	$ 23,547,703	$ 18,413,785	78%
IMPA Indiana Municipal Power Agency	$ 4,551,585	$ 4,697,226	103%
NIPSCO	$ 17,450,502	$ 12,147,125	70%
VECTREN Live Smart	$ 8,123,282	$ 5,942,407	73%
TOTAL	**$ 107,663,263**	**$ 86,116,582**	80%

Redline

2013 Energizing Indiana ~~Draft~~ Evaluation Report

~~April 1~~June 19, 2014

An Evaluation of the Statewide Core Second Year Energy Efficiency Programs

Prepared for

The Indiana Demand Side Management Coordination Committee

Submitted by

The Indiana Statewide Core Program Evaluation Team:

TecMarket Works, Cadmus, Opinion Dynamics Corporation, Integral Analytics, and Building Metrics

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1. EXECUTIVE SUMMARY

This report presents an assessment of the ~~second~~program year (PY2)~~ Indiana Core Programs'~~ *ex-ante,* audited, verified, *ex-post* gross, and net energy savings, achieved by the Energizing Indiana statewide Core programs. ~~Table 1 defines the saving types~~The report also provides a benefit cost assessment of the Core programs over the combined two-year (PY1 & PY2) period ending on December 31, 2013. In summary, the portfolio continues to be cost effective over the two year period with Core program energy efficiency resources being acquired at $0.03 cents per kWh. Table 1 defines the types of energy savings presented in this report.

Table 1: Savings Type Definitions

Savings Type	Definitions
Ex-Ante	Energy savings from program tracking system as reported by the third-party administrator (TPA).
Audited	*Ex-ante* savings after deemed calculations and project/measure counts have been confirmed by the evaluation administrator.
Verified	Savings estimated following confirmation of the installation and use of a sample of project/measure installations.
Ex-Post Gross	Evaluated savings resulting from the installation and use of all program-incented or provided technologies.
Net Energy Savings	Evaluated savings resulting from the installation and use of incented or provided technologies directly attributable to the program.

Energy savings presented in this report derive from three types of savings conditions:

1. Savings from measures distributed during the first year, but not installed or used until the second year.
2. Continued use and savings from measures installed during the first program year.
3. Savings from measure installations and actions during the second program year.

Savings reported in this report's impact sections are limited to those occurring during the second year. The report includes process evaluation findings. These assessments document program operations for use in enhancing or improving future delivery.

The TecMarket Works Energizing Indiana Core Program Evaluation Team (Evaluation Team) completed this report. The Evaluation Team includes representatives from: TecMarket Works (the Evaluation Administrator), Cadmus, Opinion Dynamics, Integral Analytics, and Building Metrics.

Energizing Indiana consists of five Core energy-efficiency programs serving low-income, residential, and commercial and industrial customers as well as schools. Specifically, these programs include the following:

1. The Residential Home Energy Assessment (HEA) program.
2. The Residential Low-Income Weatherization (LIW) program (also known as the Income-Qualified Weatherization program).

3. The Energy Efficient Schools (EES) Education and Schools Audit and Direct Install (SADI) programs.
4. The Residential Lighting (Lighting) program.
5. The Commercial and Industrial (C&I) Prescriptive Rebates program.

Six utility companies participate in the Core program effort:

- Duke Energy
- Indianapolis Power & Light Company (IPL)
- Indiana Michigan Power Company (I&M)
- Northern Indiana Public Service Company (NIPSCO)
- Indiana Municipal Power Agency (IMPA)
- Vectren

While IMPA discontinued its third-year programmatic efforts (2014), this agency served as part of the Core Programs for the complete 2013 calendar year. The programs are administered by a third-party administrator: GoodCents, hired through a competitive bid process in 2011.

This evaluation efforts seek to achieve the industry's highest reliability standards, conforming to definitions and requirements established by the Indiana Evaluation Framework (the Framework). The Framework requires reliable studies, with a 90% confidence level and a precision level within 10% over the standard three-year program cycle, at both the utility and program levels. As this includes five programs, sponsored by six utility companies, the evaluation presents 30 individual program-impact assessments. The report then rolls up utility-specific, energy-impact assessment results to provide program-level energy impacts, achieving greater than 90% confidence levels and ±10% precision levels for each program and for the portfolio level results.

While savings reported in this PY2 evaluation can be considered reliable at the program level, the highest level of utility-specific reliability will be reported at the end of the program cycle, once all three years' of program sampling and evaluation analysis efforts have been completed and rolled up into the final program-cycle evaluation report (to be delivered in Spring 2015). This report's language and terminology conforms to the Demand-Side Management (DSM) Impact Steps outlined in the Framework.

Across the portfolio, the programs achieved savings levels lower than set goals. Figure 1 shows the savings progress for portfolio-level savings.

Figure 1 Portfolio Level Savings

Overall, at a high level, this evaluation determined verified savings slightly lower than *ex-ante* gross savings reported by the TPA. Savings reported and realization rates achieved varied by program and utility. Residential program performance continued to meet targets or improve. The C&I program performed well, relative to savings claims, but fell short of savings goals.

1. School Education: the program achieved expected verified savings, with installation rates for the kit measures consistent with the previous year and with *ex-ante* assumptions.

2. School Audit and Direct Install: The program achieved the verified savings generally expected; vending machine sensors, however, achieved lower verified savings, as some schools reported removing them, as advised by the vending machine vendors.
3. The Residential Lighting program performed well in PY2. Overall *ex-ante* savings represented 110% of the program goal. Verified savings reached 96% of reported *ex-ante* energy savings ~~reported by the TPA~~ and 72% of *ex-ante* demand savings at the statewide level. *Ex-ante* savings calculations generally were accurate and in compliance with the agreed-upon assumptions.
4. Although missing its participation goals, the Residential Home Energy Assessment program performed well in 2013. The program achieved PY2-verified savings very close to *ex-ante* savings ~~for PY2~~ (97%), including canvassing measures. The largest contributing factor to this was the TPA installing more measures in each home than assumed in the per-home energy savings value used to calculate *ex-ante* energy savings.
5. The Residential Low Income Weatherization program achieved 101% of its participation goals for 2013. Although the program achieved 105% of its goals at the audited level, ~~its~~it produced verified savings 10% lower than *ex-ante* savings. This partly resulted from a compact fluorescent lamp (CFL) verification rate of 79% and an energy-efficient showerhead verification rate of 76%.
6. The C&I Prescriptive program realized 96% of its energy claim and 81% of its coincident peak demand claim. The program, however, only achieved verified energy and demand savings of 60% and 37%, respectively, for PY2 program goals.

The PY2 portfolio moved from a start-up to more efficient, established operation for residential programs. Almost every program improved its design, marketing, and operations, leading to increased or steady energy savings and improved cost-effectiveness.

The Energizing Indiana programs' designs anticipated the TPA would meet very aggressive energy-savings objectives, requiring high participation levels immediately upon launch. The programs did not achieve these aggressive objectives in the first year (see the PY1 report). However, the TPA significantly improved energy-savings performance for all residential programs, increasing their energy savings by 41% compared to PY1 achievements. Given the savings shortcomings relative to goals set for the C&I program, it appears unlikely that the TPA can continue achieving savings at a rate sufficient to overcome PY1 levels, unless the process of acquiring participants and the completion of new energy projects can be substantially improved.

The process evaluation identified the following potential improvements to program operations for increasing savings.

1. Consider tactics to improve student survey response rates for the School Education Program.
2. Consider providing financing mechanisms to implement capital projects for schools participating in the School Audit and Direct Install Program.
3. Prioritize installing occupancy sensors in locations that yield the greatest savings (such as gymnasiums and cafeterias) in schools participating in the School Audit and Direct Install Program.
4. Limit the fluctuating availability of program discounts for the Residential Lighting program. Though a tactic originally adopted to stay within budget, sales data can better inform stable incentive offerings as the program has operated for two years.

5. Actively seek methods to increase participation in the Residential HEA program and meet annual (and three-year) goals. To increase participation in PY3, the TPA could increase staffing resources, continue to identify key geographic areas, and expand the targeted customer base.
6. Increase savings per home for the Residential HEA and LIW programs by targeting: high-usage sockets; and homes using electric water heat. Emphasis on installing bulbs in high-usage sockets should continue. Specifically, based on past research in Indiana, CFLs should be installed in rooms experiencing the highest hours-of-use (HOU~~): dining rooms (3.08 hours per day), kitchens (2.95 hours), and living spaces (2.60 hours).~~). This will require a minor adjustment to the Optimizer tool (Optimizer), allowing inclusion of dining rooms in the list of possible room types.

~~6.~~7. The program should continue to reach homes with electric water heating to realize greater savings from faucet aerators and showerheads.

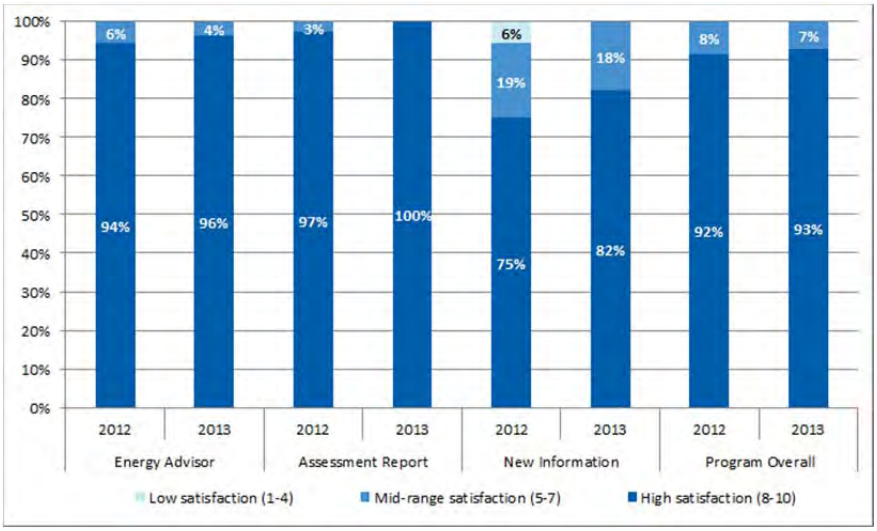
If the TPA continues to focus significant efforts on increasing *ex-ante* gross savings accomplishments, and can improve C&I program performance, a strong probability exists that the following conditions can be achieved:

1. The residential portfolio may reach its energy-savings goal for combined PY1 and PY2 during PY3.
2. The C&I program may increase its energy savings performance in PY3, but likely will not increase its savings to a level near its goals, unless significant uptake based on the last two years of planning takes place or capital becomes available to companies implementing large projects.
3. If the Core programs increase their coordination and degree of channeling success, Core and Core Plus programs may see increased energy savings.

The Evaluation Team highlights many positive outcomes below and throughout this report. Notably, the following highlights indicate PY1 start-up issues and the speed of energy-saving achievements largely have been solved for the residential programs. These findings suggest PY3 will be delivered upon a fairly solid base, built in PY1 and refined in PY2. Positives outcomes include the following:

1. Satisfaction remains high and, in some cases, has improved.
    a. Residential Lighting program: Interviews with participating manufacturers revealed high satisfaction levels with the program design and implementation process. To ensure timely service of participating retail locations, the program hired two additional staff field service representatives.
    b. The Schools Audit and Direct Install Program experienced improved satisfaction levels in each category (facility staff satisfaction).

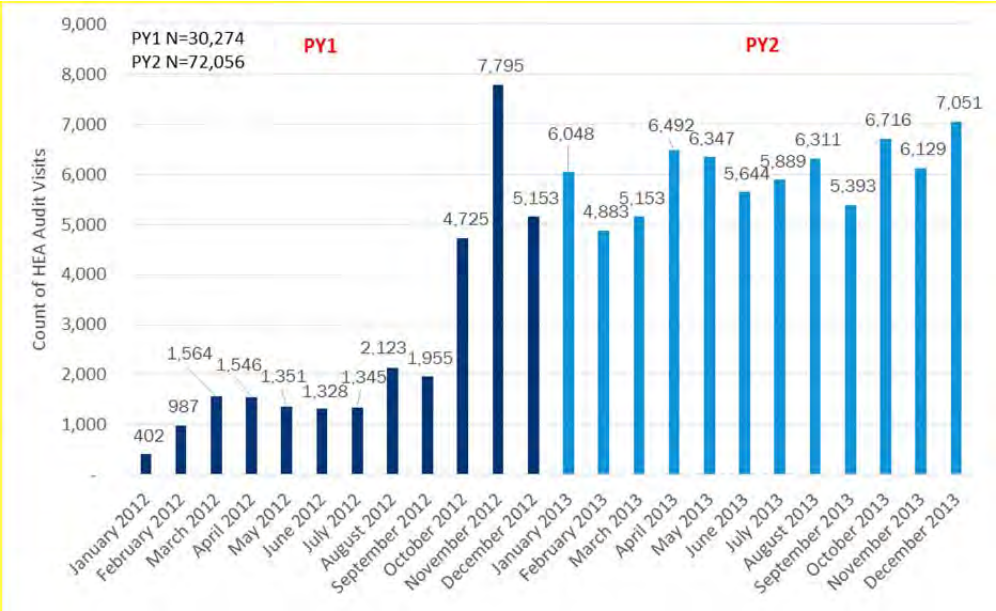
Figure 2. Satisfaction with the Schools ~~program, using a 1-10 Scale, 1 is Extremely Dissatisfied and 10 as Extremely Satisfied, (~~Program~~2012 n=36, 2013 n = 28)~~



Using a 1-10 Scale, 1 is Extremely Dissatisfied and 10 as Extremely Satisfied, (2012 n=36, 2013 n = 28)

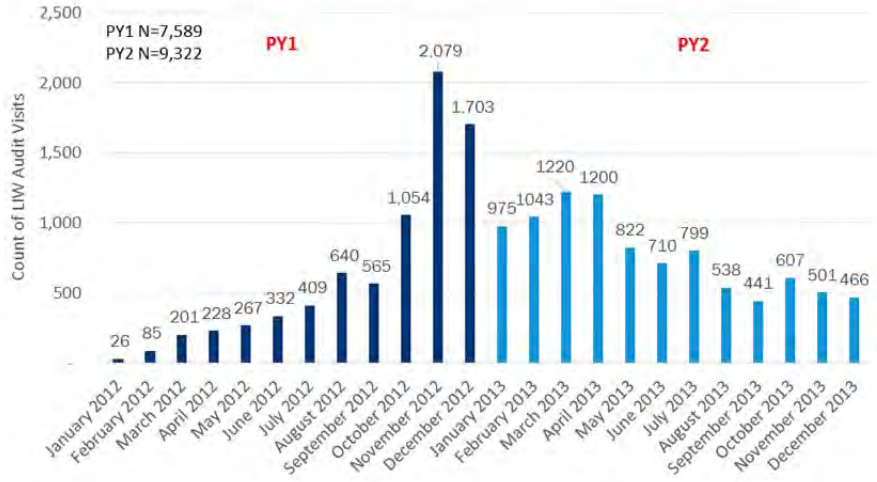
2. Participation rates have improved.
   a. The School Education Program: Participation remains high as the program achieved its goals each year. In 2012, 72,695 kits were distributed; in 2013, the total rose to 83,222 kits.
   b. Residential Lighting program: Consistent with the increase in program goals and budgets, sales of lighting products increased by about 30% from PY1.
3. The level and quality of marketing and outreach efforts have increased participant interest and enrollments. The LIW program exceeded (101%) its participation PY2 goals
4. Coordination between the statewide Core Programs and the individual utility programs has improved, benefitting both portfolios, and helping customers' access energy services.
5. HEA satisfaction remains high, with customers reporting an 8.9 mean satisfaction score on a scale of 1 to 10: a slight improvement over the previous year's mean satisfaction score (8.8).
6. HEA participation rates improved. Figure 3 shows the number of audits completed by month since introduction of the HEA program. A clear ramp-up period can be observed in the first half of PY1, with the program reaching a steady state in the fourth quarter of PY1 and remaining relatively consistent throughout PY2.

Figure 3: HEA Audits Completed per Month Since Program Inception



7. After a significant increase in audits at the end of PY1 the Residential LIW program reduced the number of audits completed monthly as auditors shifted from LIW to HEA when it became apparent the LIW program remained on track to achieve its targeted number of audits.

Figure 4: LIW Audits Completed per Month Since Program Inception



~~8. The TPA's program tracking systems improved reliability and currently represents the monthly accomplishments accurately.~~

~~a. The TPA bolstered auditor training and quality assurance/quality control (QA/QC) for the HEA and LIW programs, ensuring the database more accurately reflected auditors' actual installations in homes. The TPA also instituted a QA/QC protocol, consisting of live observations of auditors, enhanced reporting, and post-inspections of treated homes.~~

1.1 PROGRAM DESCRIPTIONS

The Indiana Office of Utility Consumer Counselor (OUCC), participating utilities, and consumer organizations describe Energizing Indiana as "a united effort" to offer comprehensive energy-efficiency programs that bring savings to communities across the state. The program consists of five offerings, delivered by an independent TPA (GoodCents). PY2 represented the second year of a three-year program cycle for Energizing Indiana. The programs address homes, schools, and commercial facilities. f Energizing Indiana offerings.

provides a program-by-program summary of Energizing Indiana offerings.

Table 2: Core Programs

Programs	Brief Program Description
Home Energy Assessment (HEA)	This program provides a free walk-through energy audit that: analyzes participant energy use; recommends efficiency measures or upgrades; and facilitates direct installation of low-cost, energy-saving measures, including low-flow showerheads, CFL bulbs, hot water pipe wrap, and sink aerators.
Low Income Weatherization (LIW)	This program provides a free walk-through home energy assessment that includes all Home Energy Assessment elements, plus full diagnostic testing (blower-door) for the home. Auditors recommend weatherization measures or upgrades that facilitate direct installation of low-cost, energy-saving measures, including energy-efficient showerheads, CFL bulbs, sink aerators, pipe wrap, water heater tank wrap and air sealing. In addition, eligible homes may receive attic insulation through the program.
Residential Lighting (Lighting)	This program provides upstream discounts on a variety of lighting products (CFLs, light-emitting diodes [LEDs], and lighting fixtures). The program works with retailers and manufacturers across the state to offer reduced prices at the point-of-sale.
Energy Efficient Schools (Schools)	This program has two components: • The first works with fifth-grade students, teaching them about energy efficiency and how they can make an impact at school and home. Participating schools receive classroom curriculum and Energizing Indiana take-home efficiency kits. • The second, the School Audit and Direct Install Program, works with schools to assess all energy systems to determine if they operate efficiently. Assessment results guide schools to install appropriate upgrades and rebates available through the C&I program. The schools also receive a bundle of direct-install measures at no cost.
Commercial and Industrial (C&I)	Addressing the use of commercial customers, this program provides prescriptive rebates to facilities, based on the installation of energy-efficiency equipment and system improvements. Additional tracks targeted to small businesses include: the Opt-in Direct Install program and targeted relationships with Trade Allies. Rebates address: lighting, variable frequency drives (VFDs), Heating, Ventilation, Air Conditioning (HVAC), and efficient ENERGY STAR® commercial kitchen appliances. In addition, the program began offering direct-mail CFLs kits, starting in Fall 2012.

1.2 BUDGET AND EXPENDITURES

Overall, the TPA spent 80% of the total 2013 implementation budget for all programs evaluated in this report. Table 3 shows budgets and reported expenditures by program at the statewide level, and Table 4

shows the budgets by utility. The budget by program is slightly lower than the utility-based budget total as it does not include the portfolio costs of $344,778 for branding.

Table 3: Budget and Expenditures by Program and Statewide

Program	2013 Budget(1)	2013 Reported Expenditures(1)	% of Budget Goals
Home Energy Assessment	$ 27,915,723	$ 25,174,399	90%
Low Income Weatherization	$ 7,133,314	$ 7,222,297	101%
Lighting	$ 7,712,844	$ 7,763,131	101%
Energy Efficient Schools	$8,179,321	$8,283,575	101%
Commercial and Industrial	$ 56,377,283	$ 37,328,403	66%
Total	**$ 107,318,485**	**$ 85,771,805**	**80%**

(1) Provided by the TPA via e-mail. Ben Becht, GoodCents, February 15, 2014.

Table 4: Budget and Expenditures by Utility and Statewide

Utility	2013 Budget Goals(1)	2013 Reported Expenditures(1)	% of Budget Goals
Duke	$ 42,380,071	$ 23,620,535	56%
I&M	$ 11,610,122	$ 21,295,504	183%
IPL	$ 23,547,703	$ 18,413,785	78%
IMPA	$ 4,551,585	$ 4,697,226	103%
NIPSCO	$ 17,450,502	$ 12,147,125	70%
Vectren	$ 8,123,282	$ 5,942,407	73%
Total	**$ 107,663,263**	**$ 86,116,582**	**80%**

(1) Provided by the TPA via e-mail. Ben Becht, GoodCents, February 15, 2014.

1.3 GOALS AND EX-ANTE SAVINGS SUMMARY

The TPA provides goal and *ex-ante* savings. Figure 5 demonstrates the distribution of electric savings among programs planned to be achieved by the portfolio in 2013.

Figure 5: Percent, by Program, Toward kWh Goal

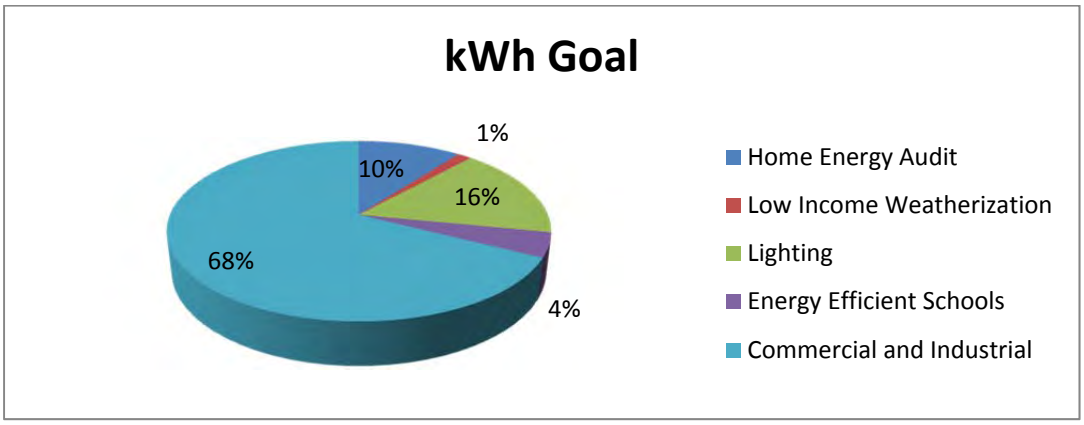


Table 5 summarizes the TPA's *ex-ante* savings, compared to planned savings for 2013. These savings do not include adjustments from the Evaluation Team; rather, they show goal and reported savings in 2013.

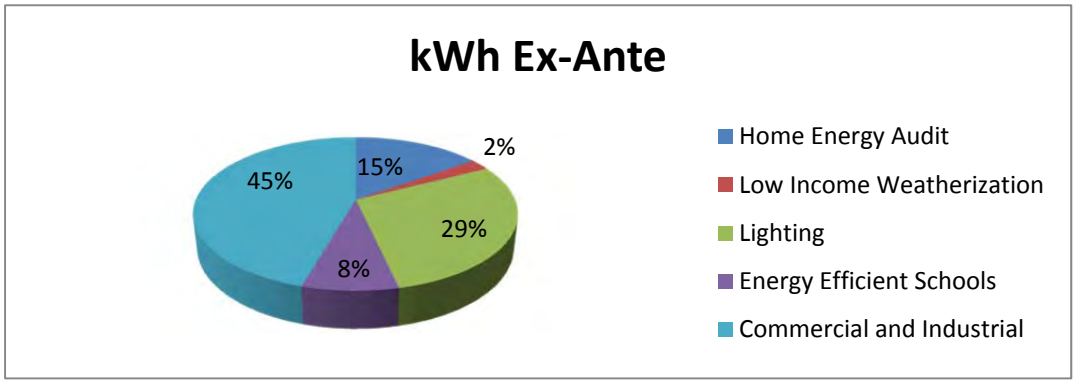
Table 5: Statewide *Ex-Ante* Savings by Program for PY2[1]

Program	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goal
Home Energy Assessment	88,556,244	80,063,597[3]	90%	39,458	36,766[3]	93%
Low Income Weatherization	11,992,888	12,141,544	101%	5,177	5,242	101%
Lighting	139,542,000	153,171,798	110%	22,302	24,480	110%
Energy Efficient Schools Audit	1,571,360	5,087,159	324%	n/a	286	n/a
Energy Efficient Schools Education	35,683,132	37,519,814	105%	n/a	n/a	n/a
Commercial and Industrial[2]	576,673,620	241,493,622	42%	165,038	39,627	24%
Statewide Total	**854,019,244**	**529,477,534**	**62%**	**231,975**	**106,401**	**46%**

(1) Source: From GoodCents Portal, yearend savings statement, pulled January 24, 2014.
(2) Data updated on February 13, 2014 based on data moved for I&M. Complete updated information was received on February 19, 2014.
(3) Includes Canvassing Measures

Figure 6 demonstrates the distribution of electric savings among programs reported as achieved (*ex-ante)* by the portfolio in 2013.

Figure 6: Percent (by Program) Toward *Ex-Ante* kWh Savings



1.4 *AUDITED SAVINGS SUMMARY*

Following guidance from the Indiana Framework, the Evaluation Team audited the Energizing Indiana savings, reviewing the programs' tracking databases and the portal provided by the TPA. This included reviewing claimed *ex-ante* savings. Revisions included:

1. Adjusting for tracking errors of measures installed.
2. Ensuring program *ex-ante* savings applied correctly to a sampling of measures.

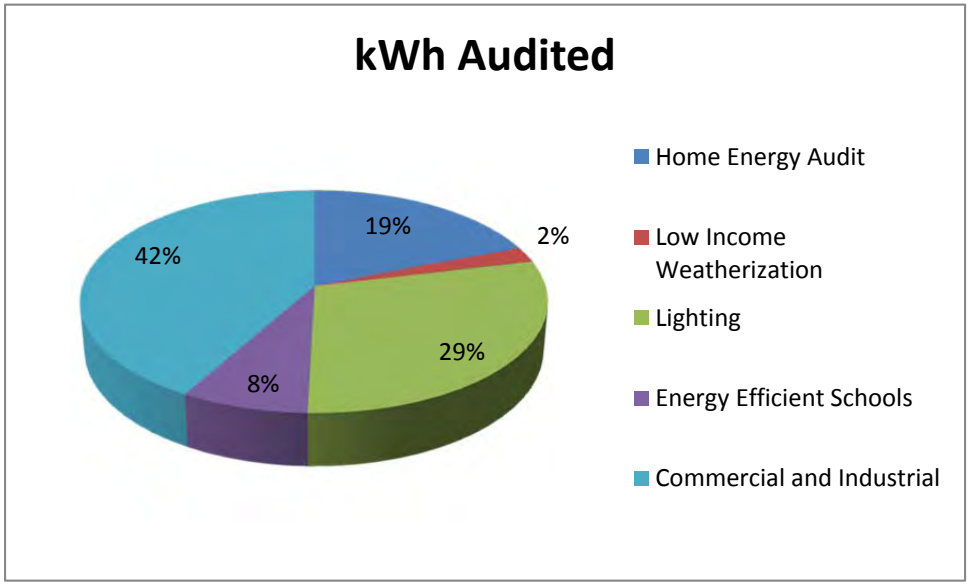
Adjustments corrected for errors or omissions (as identified above). This allowed recalculation of program savings, based on the adjusted audited number of measures. Table 6 compares total PY2 audited savings by program against *ex-ante* savings reported by the TPA.

Table 6: Statewide Audited Savings by Program

Program	2013 kWh *Ex-Ante*	2013 kWh Audited	2013 kW Ex-Ante	2013 kW Audited
Home Energy Assessment	80,063,597	104,891,194	36,766	24,476
Low Income Weatherization	12,141,544	12,720,318	5,242	3,851
Lighting	153,171,798	160,564,910	24,480	19,205
Energy Efficient Schools	42,606,973	42,606,973	286	286
Commercial and Industrial	241,493,622	230,936,789	39,627	47,841
Statewide Total	**529,477,534**	**551,720,184**	**106,401**	**95,659**

Figure 7 demonstrates the distribution of electric savings among programs audited in the portfolio in 2013.

Figure 7: Percent (by Program) Toward kWh Audited Savings



1.5 *Verified Savings Summary*

Verified savings calculations occurred after confirming measures had been installed and remained in operation. This process leveraged savings values claimed by the TPA.

Verification typically employs detailed analysis of a stratified random sample of installations. Typical methods for collecting necessary data include telephone surveys and/or site visits. For this step, the Evaluation Team adjusted total savings to address issues such as the following:

- Measures rebated/distributed but never installed;
- Measures not meeting program qualifications;

- Measures installed but later removed; or
- Measures improperly installed.

Table 7 presents savings credited for PY2 in a way differentiating the two time periods, which correspond to the actions taken that produce savings. The program-specific sections of the report present more detailed savings, depending on the measure and time of installation. The following table summarizes kWh savings for the portfolio reported for each program. The two time periods included ~~have been divided into~~are: *Incremental kWh Savings (PY1)* and *Cumulative kWh Savings (PY1 and PY2).*

The cumulative kWh savings equaled total savings from three sources:

1. Incremental savings from the PY1 actions that continued to save energy in PY2.
2. PY2 savings from measures acquired by participants during PY1, but not installed and used until PY2.
3. Savings from actions taken and measures implemented in PY2.

Table 7: Verified Year-Two (2013) Cumulative Savings from PY1 and PY2 Installations[(1)]

	Program	kWh Savings from Measures Installed in PY1 that Continue to Save Energy in PY2	kWh Savings from Measures Acquired by Participants in PY1, but not Installed Until PY2	kWh Savings from Measures Installed in PY2	Total kWh Savings in PY2
Year 2	Home Energy Assessment	17,190,585	1,192,244	77,642,156	96,024,985
	Low Income Weatherization	4,118,006	174,494	10,461,359	14,753,859
	Lighting	92,944,601	28,649,881	147,563,636	269,158,118
	Energy Efficient Schools	28,718,896	4,210,963	41,573,927	74,503,786
	Commercial and Industrial	152,014,384	117,437,757	230,936,789	500,388,930
	Statewide Total	**294,986,473**	**151,665,339**	**508,177,867**	**954,829,678**
	(1) kWh for measures distributed in PY1 but not installed until PY2 are *ex-post* gross.				

Figure 8: Percent (by Program) Toward kWh Verified Savings

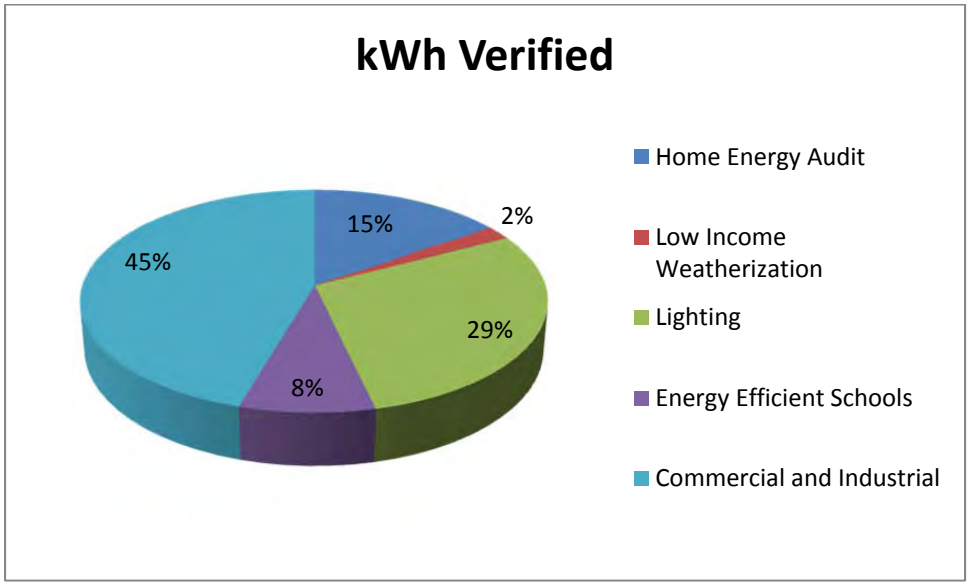


Table 8 compares *ex-ante* savings to verified savings by program, and Table 9 compares *ex-ante* savings to verified savings by utility per program. Details have been included in the report's program sections.

Table 8: Statewide *Ex-Ante* and Verified Savings by Program for PY2

Program	2013 kWh *Ex-Ante*	2013 kWh Verified	kWh Realization Rate	% of kWh Goal	2013 kW *Ex-Ante*	2013 kW Verified	kW Realization Rate	% of kW Goal
Home Energy Assessment	80,063,597	77,642,156	~~88~~97%	89%	36,766	17,314	47%	44%
Low Income Weatherization	12,141,544	10,461,359	90%	91%	5,242	3,155	61%	62%
Lighting	153,171,798	147,563,636	96%	~~106~~123%	24,480	17,650	72%	79%
Energy Efficient Schools	42,606,973	~~41,573,927~~45,784,890	~~98~~107%	~~112~~123%	286	281	98%	N/A
Commercial and Industrial	241,493,622	230,936,789	96%	40%	39,627	47,841	121%	29%
Statewide Total	**529,477,534**	**~~508,177,867~~512,388,830**	**~~96~~97%**	**60%**	**106,401**	**86,241**	**81%**	**37%**

Table 9: Statewide *Ex-Ante* and Verified Savings by Program by Utility

Program	2013 kWh *Ex-Ante*	2013 kWh Verified	kWh Realization Rate	% of kWh Goal	2013 kW *Ex-Ante*	2013 kW Verified	kW Realization Rate	% of kW Goal
DUKE								
Home Energy Assessment	20,195,052	19,308,195	96%	87%	9,345	4,371	47%	44%
Low Income Weatherization	3,912,000	3,105,102	82%	84%	1,689	1,017	61%	62%
Lighting	56,461,616	54,693,532	97%	100%	9,024	6,542	72%	75%
Energy Efficient Schools	21,576,001	~~21,093,942~~23,379,141	~~98~~108%	~~105~~116%	80	79	98%	N/A
Commercial and Industrial	62,550,987	60,058,328	96%	24%	9,910	12,054	122%	17%
Total DUKE	**164,695,656**	**~~158,259,099~~160,544,298**	**~~96~~97%**	**45%**	**30,048**	**24,063**	**80%**	**27%**
I&M								
Home Energy Assessment	6,321,156	6,329,546	100%	103%	2,805	1,382	49%	50%
Low Income Weatherization	2,115,088	1,748,559	87%	87%	913	558	62%	62%
Lighting	19,861,198	21,487,684	108%	132%	3,174	2,570	81%	99%
Energy Efficient Schools	3,968,064	~~3,838,811~~4,124,736	~~97~~104%	~~167~~180%	23	22	98%	N/A
Commercial and Industrial	90,000,457	86,378,457	96%	132%	15,585	18,956	122%	85%
Total I&M	**122,265,963**	**~~119,783,057~~120,068,982**	**98%**	**130%**	**22,500**	**23,488**	**104%**	**83%**
IPL								
Home Energy Assessment	26,977,410	24,950,485	92%	73%	12,318	5,097	41%	33%
Low Income Weatherization	1,305,304	1,154,136	92%	93%	564	371	67%	68%

Lighting	31,416,251	28,250,432	90%	109%	5,021	3,379	67%	82%
Energy Efficient Schools	6,539,046	6,~~290,268~~863,624	~~96~~105%	~~111~~121%	90	89	98%	N/A
Commercial and Industrial	38,087,107	36,600,707	96%	43%	5,651	6,876	122%	29%
Total IPL	**104,325,118**	**97,~~246,028~~819,384**	**~~93~~94%**	**64%**	**23,644**	**15,812**	**67%**	**36%**
IMPA								
Home Energy Assessment	5,143,792	5,148,417	100%	92%	2,365	1,109	47%	45%
Low Income Weatherization	395,112	326,832	86%	87%	171	108	64%	65%
Lighting	7,296,511	6,452,898	88%	90%	1,166	772	66%	67%
Energy Efficient Schools	1,360,048	1,~~291,817~~442,426	~~95~~106%	~~114~~127%	12	12	98%	N/A
Commercial and Industrial	17,642,220	16,931,899	96%	33%	2,627	3,195	122%	22%
Total IMPA	**31,837,683**	**30,~~151,863~~302,472**	**95%**	**46%**	**6,341**	**5,196**	**82%**	**28%**
NIPSCO								
Home Energy Assessment	14,109,132	15,162,352	107%	104%	6,606	3,547	54%	55%
Low Income Weatherization	2,789,256	2,595,228	97%	98%	1,204	672	57%	57%
Lighting	23,555,640	22,341,169	95%	103%	3,765	2,672	71%	77%
Energy Efficient Schools	6,774,683	~~6,687,203~~7,355,211	~~99~~109%	~~104~~114%	30	30	98%	N/A
Commercial and Industrial	22,685,196	21,779,651	96%	25%	4,239	5,155	122%	22%
Total NIPSCO	**69,913,907**	**~~68,565,603~~69,233,611**	**~~98~~99%**	**52%**	**15,844**	**12,076**	**76%**	**35%**
Vectren								
Home Energy Assessment	7,317,055	6,743,161	92%	118%	3,326	1,807	54%	71%
Low Income Weatherization	1,624,784	1,531,593	98%	98%	702	429	62%	62%
Lighting	14,580,582	14,337,920	98%	104%	2,330	1,715	74%	77%
Energy Efficient Schools	2,389,131	2,~~371,885~~619,753	~~99~~110%	~~153~~168%	50	49	98%	N/A
Commercial and Industrial	10,527,655	9,187,747	87%	23%	1,614	1,604	99%	14%
Total Vectren	**36,439,207**	**34,~~172,306~~420,174**	**94%**	**54%**	**8,022**	**5,604**	**70%**	**34%**

1.6 *EX-POST AND NET SAVINGS SUMMARY*

The Evaluation Team determined *ex-post* gross evaluated savings for the Energizing Indiana PY2 programs through: engineering analysis; building simulation modeling; billing analysis; metering analysis; or other accepted impact evaluation methods.

Verified savings adjustments could include changes to the following:

1. Baseline assumptions.
2. Weather.
3. Occupancy levels.
4. Hours-of-use (HOU).
5. Decreased or increased production levels.
6. Other assumptions resulting from the impact analysis research.

Net savings reflect *ex-post* savings, with the net-to-gross (NTG) ratio applied to evaluated savings estimates. These NTG ratios account for freeridership and short-term[1] spillover effects[2], which ultimately contribute to the programs' cost-effectiveness calculations.

~~Table 11 and Table 12 provide: the program-level *ex-post* gross and net savings; and the utility-level, *ex-post* gross and net savings.~~ Table 10 shows the statewide *ex-post* and net savings by program attributable to PY2 program actions only.

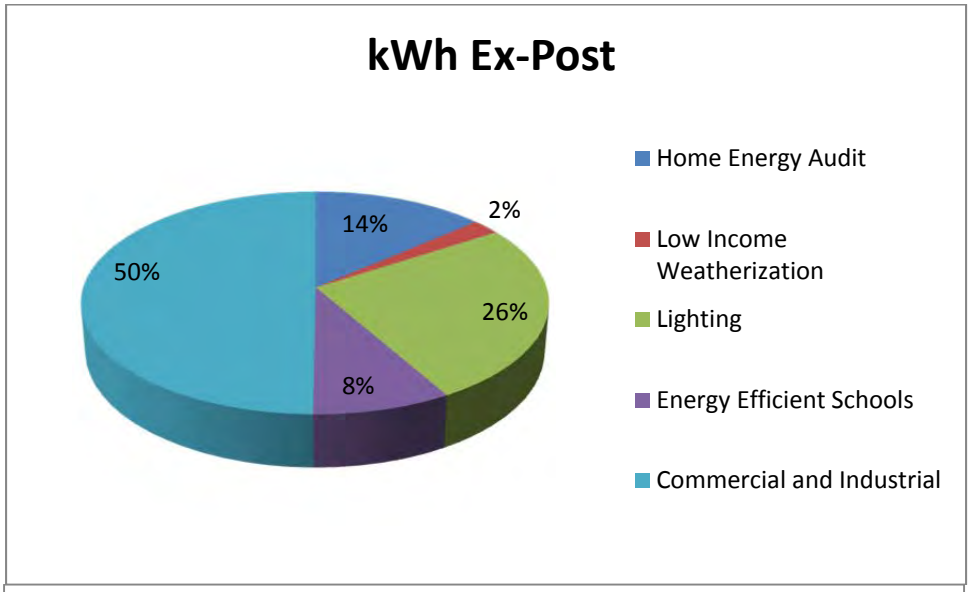
~~Table 11 includes savings achieved from measures distributed during PY1, but not installed until PY2. Given the TPA did not identify these savings in the goals or *ex-ante* savings they are represented as *ex-post* and net savings for the statewide achievements.~~

~~The program sections below provide details on *ex-post* savings and NTG ratios by program and utility.~~

[1] Short-term means between the period of participation and the evaluation contact made to confirm savings, typically between 3 to 12 months.

[2] The only program to not have annual spillover savings applied is the Residential Lighting program which will receive market effects savings at the end of the cycle.

Figure 9: Percent (by Program) Toward kWh *Ex-Post* Savings



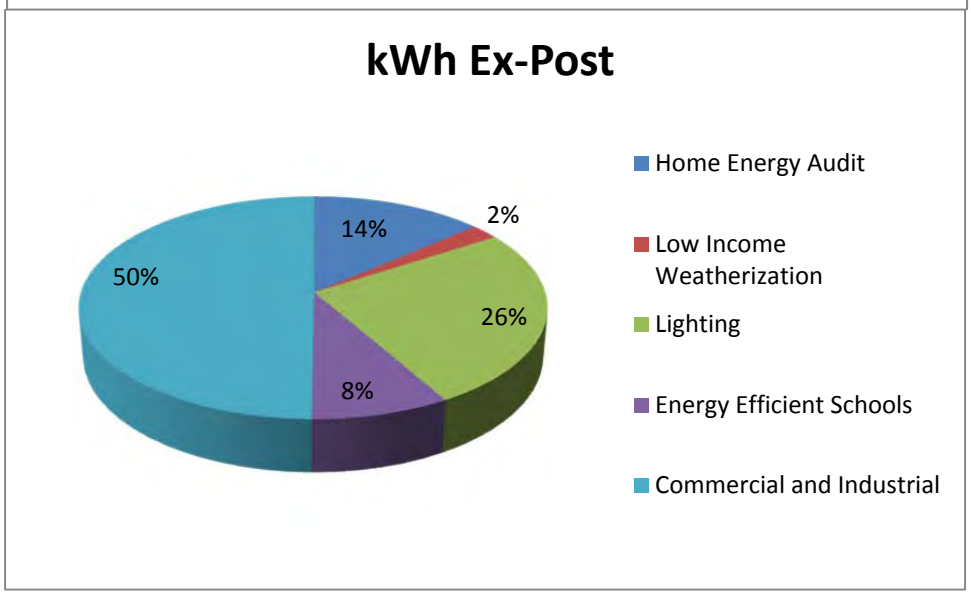


Table 10: Statewide *Ex-Post* and Net Savings by Program

Program	2013 kWh *Ex-Post*	2013 kWh NTG Ratio	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG Ratio	2013 kW Net
Home Energy Assessment	65,551,258	88%	58,008,705	9,888	91%	8,955
Low Income Weatherization	10,648,224	100%	10,648,224	1,674	100%	1,674
Lighting	124,361,368	49%	60,937,070	17,057	49%	8,358
Energy Efficient Schools: Education Program	38,847,964	97%	37,802,826	5,266	102%	5,363
Energy Efficient Schools: School Audit and Direct Install Program	1,690,987	366%	6,187,292	97	100%	97
Commercial and Industrial[(1)]	239,579,951	80%	173,584,117	57,296	80%	45,837

Statewide Total	**480,679,752**		**347,168,234**	**91,278**		**70,284**

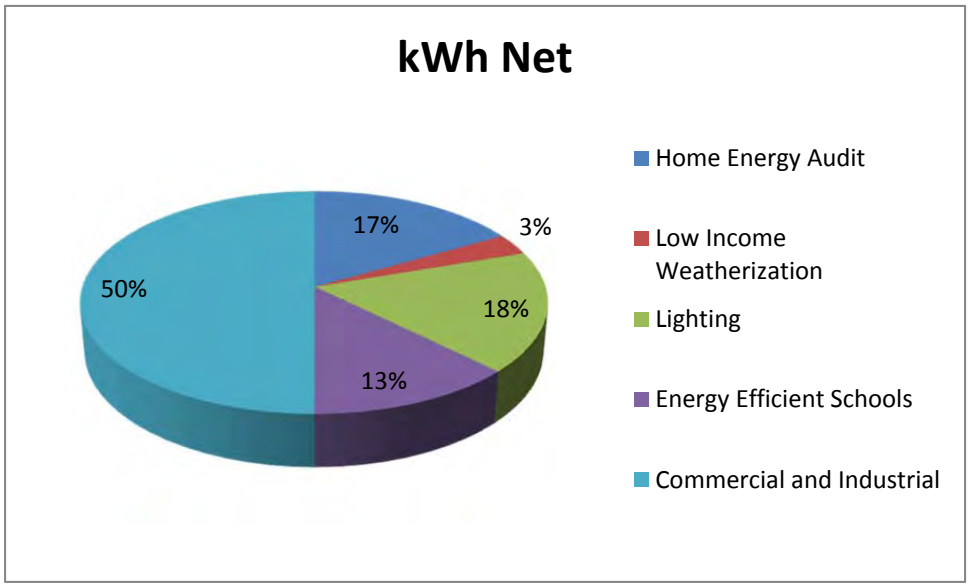
(1) C&I totals are for Portal Savings only. These savings do not include Bulb Drop or Opt-in offerings.

Some measures, such as CFLs, contain carryover savings. Carryover savings refers to the installation of a measure after the year it was distributed. For example, if a CFL was purchased or given to a participant in 2012, but not installed until 2013, the savings from that measure would not be applied until the actual installation date. This is based off of in-service rate (ISR) research, also discussed in subsequent chapters, that indicates CFLs in storage will go into use within 3 years from the date of receiving or purchasing them. Within program chapters and provided in Table 12, utilities can see additional savings applied based on the savings accrued from measures that continue to be installed, even if they were not distributed and counted in the current year's *ex-ante* savings.

Table 11 and Table 12 provide the program-level *ex-post* gross and net savings and the utility-level, *ex-post* gross and net savings. Table 11 includes savings achieved from measures distributed during PY1, but not installed until PY2. Given the TPA did not identify these savings in the goals or *ex-ante* savings they are represented as *ex-post* and net savings for the statewide achievements.

The program sections provide details on *ex-post* savings and NTG ratios by program and utility.

Figure 10: Percent (by Program) Toward kWh Net Savings



~~Additional savings can be contributed to the portfolio based on measures that were purchased or distributed in PY1, but were not installed until PY2. Those~~Carryover savings, shown in Table 11, maintain the NTG values from the year they were acquired by the participant. Table 12 includes carryover savings and the NTG values reflect ~~these~~the additional savings metrics.

Table 11: Statewide *Ex-Post* and Net Savings by Program from PY1 Achieved in PY2

Program	2013 kWh *Ex-Post*	2013 kWh NTG Ratio	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG Ratio	2013 kW Net
Home Energy Assessment	1,192,244	88%	1,049,175	447	91%	407
Low Income Weatherization	174,494	100%	174,494	95	100%	95
Lighting	9,510,574	57%	5,421,027	1,131	57%	644
Energy Efficient Schools	3,078,301	94%	2,889,538	388	94%	364
Commercial and Industrial(1)	117,437,757	107%	125,658,400	30,960	107%	33,127
Statewide Total	**131,393,370**		**135,192,634**	**33,021**		**34,637**

(1) Bulb drop installations carryover from PY1 to PY2

Table 12: Statewide *Ex-Post* and Net Savings by Program by Utility

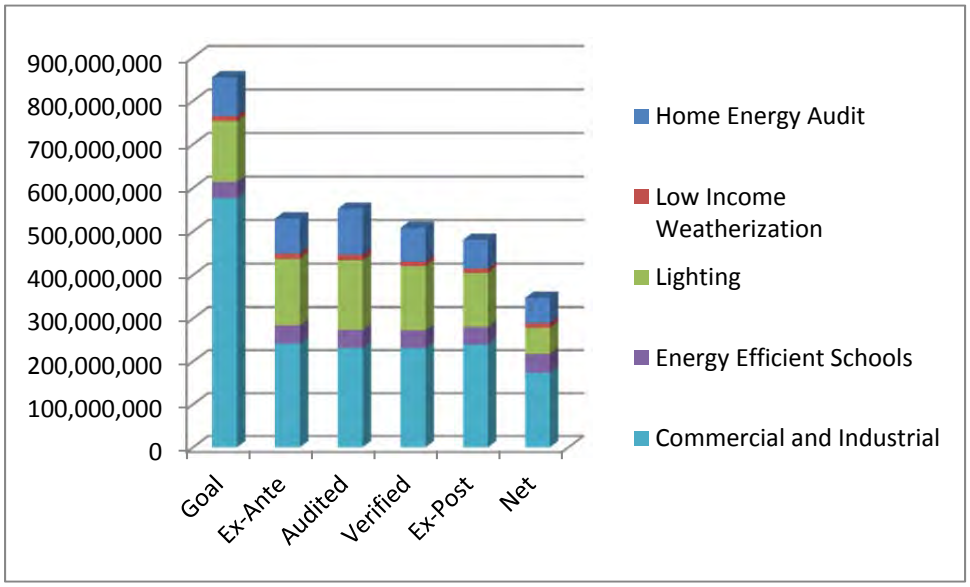
Program	2013 kWh *Ex-Post*	2013 kWh NTG	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG	2013 kW Net
Duke						
Home Energy Assessment	16,384,640	89%	14,609,486	2,693	91%	2,463
Low Income Weatherization	2,721,484	100%	2,721,484	323	100%	323
Lighting	49,764,026	50%	24,667,160	6,758	49%	3,345
Energy Efficient Schools	24,462,618	104%	25,515,284	3,121	101%	3,168
Commercial and Industrial	105,864,570	91%	96,517,442	25,986	92%	23,906
Total Duke	**199,197,338**		**164,030,856**	**38,881**		**33,205**

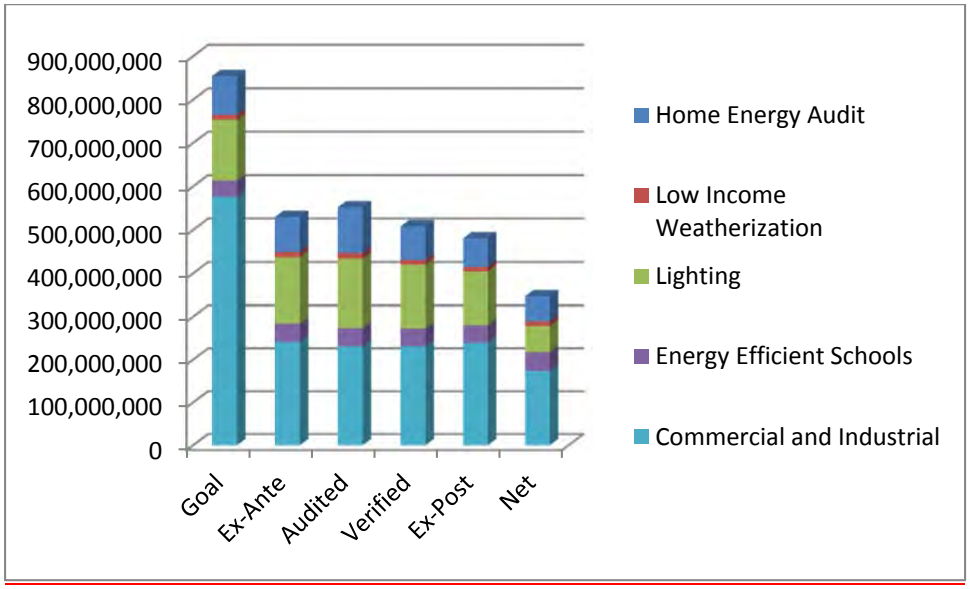
Program	2013 kWh *Ex-Post*	2013 kWh NTG	2013 kWh Net	2013 kW *Ex-Post*	2013 kW NTG	2013 kW Net
I&M						
Home Energy Assessment	5,050,190	87%	4,409,967	682	91%	623
Low Income Weatherization	1,718,316	100%	1,718,316	176	100%	176
Lighting	19,541,520	50%	9,711,922	2,663	50%	1,321
Energy Efficient Schools	3,999,228	109%	4,345,424	527	101%	535
Commercial and Industrial	108,523,427	85%	92,003,529	27,784	85%	23,594
Total I&M	**138,832,681**		**112,189,158**	**31,832**		**26,248**
IPL						
Home Energy Assessment	22,060,426	88%	19,489,529	2,949	89%	2,621
Low Income Weatherization	1,411,323	100%	1,411,323	205	100%	205
Lighting	25,472,793	50%	12,615,011	3,462	49%	1,712
Energy Efficient Schools	6,307,013	81%	7,457,106	822	101%	830
Commercial and Industrial	52,830,889	88%	46,329,582	12,193	89%	10,826
Total IPL	**108,082,444**		**87,302,551**	**19,631**		**16,195**
IMPA						
Home Energy Assessment	4,213,502	88%	3,725,032	561	89%	499
Low Income Weatherization	346,928	100%	346,928	40	100%	40
Lighting	5,834,316	50%	2,895,237	792	49%	392
Energy Efficient Schools	1,535,482	107%	1,640,842	192	101%	195
Commercial and Industrial	29,179,850	91%	26,494,969	6,906	92%	6,356
Total IMPA	**41,110,078**		**35,103,008**	**8,492**		**7,482**
NIPSCO						
Home Energy Assessment	11,906,901	88%	10,523,118	1,529	89%	1,363
Low Income Weatherization	2,654,471	100%	2,654,471	418	100%	418
Lighting	20,160,172	50%	9,990,522	2,721	50%	1,347
Energy Efficient Schools	5,510,464	101%	5,547,929	854	101%	862
Commercial and Industrial	43,219,738	93%	40,168,931	11,634	93%	10,781
Total NIPSCO	**83,451,746**		**68,884,971**	**17,156**		**14,771**
Vectren						
Home Energy Assessment	5,935,598	88%	5,251,573	1,474	94%	1,386
Low Income Weatherization	1,795,702	100%	1,795,702	512	100%	512
Lighting	13,099,116	49%	6,478,246	1,793	49%	885
Energy Efficient Schools	1,802,446	132%	2,373,071	234	101%	235
Commercial and Industrial	17,520,480	91%	15,929,154	3,782	93%	3,530
Total Vectren	**40,153,342**		**31,827,746**	**7,795**		**6,548**

Figure 11 provides a high-level summary of EM&V findings, with the impact evaluation steps and overall Energizing Indiana results are summarized as follows:

- ***The overall portfolio goal for 2013 was set at 854 GWh.*** This corresponds to the 2013 portion of the TPA's three-year goal, as stated in its contract scope of work. With respect to savings goals, the largest proportion was expected from the C&I program (68%). Energy goals for the remaining residential programs ranged from 1% for the Low Income Weatherization Program to 16% for the Lighting Program. The goal was based on summation of per-measure *ex-ante* gross savings, projected to be achieved from the installation and use of program-induced actions taken by program participants.
- ***The TPA's ex-ante claimed savings for 2013 was approximately 529 GWh,*** with the majority of claimed savings occurring through the Residential Lighting (29%) and the C&I (45%) programs. Only one residential program (HEA) fell just below its goal. The other residential programs compensated for this small shortfall by achieving from 101% (LIW) to over 300% (Schools—Audit) of their goals. The C&I Program achieved 42% of the program-specific goal; the program primarily did not reach its goal due to lower-than-projected participation rates.
- ***The evaluation audit actually increased the total ex-ante saving achievement to 551 GWh,*** primarily due to additional savings credited to the HEA and Residential Lighting programs. This recalculation of ex-ante claimed savings, based on detailed examination of the program tracking data, found the two programs accounted for more measures installed than claimed in the ex-ante totals from the portal.
- ***The verification step reduced portfolio savings to ~~508~~512 GWh***. This resulted from the Evaluation Team's efforts to confirm that measures reported were installed and in use. To verify this, the Evaluation Team conducted a series of on-site visual confirmation examinations and telephone verification efforts. Verified savings served as the basis of measurement of compliance
against goals.
- ***The Evaluation step resulted ex-post savings of 481 GWh***. *Ex-post* savings are the outcome of conducting as assessment of factors such as baseline assumptions. This is the value to be used for future cycle program design.
- ***Application of NTG ratios resulted in net savings estimates at 347 GWh.*** This equals the amount of savings that can be directly attributed to the programs' efforts. This energy-saving estimate is used for the cost-effectiveness analysis for the Energizing Indiana portfolio and to calculate lost revenues by the utilities.

Figure 11: Savings by Program in Each Savings Category





1.7 CORE PROGRAMS HIGH-LEVEL INSIGHT AND FINDINGS

Each program provides a unique offering to target all Indiana customers. The broad range of program designs has effectively reached residential customers and facilitated high-priority energy-saving actions. Not only have immediate energy-efficiency improvements been made to qualifying homes, but the schools program has educated young people. This program's use of education elements can help shape habit-forming behaviors and attitudes toward energy-efficiency for generations to come. Overall, uptake across all residential programs exceeds the goals set for the TPA.

With a robust measure list, the C&I program can assist an array of customers, from small business to large industrial process plants. Enhancements made to the C&I program helped market services offered by Energizing Indiana. The improvements—including direct installation of CFLs, mailings, Trade Ally

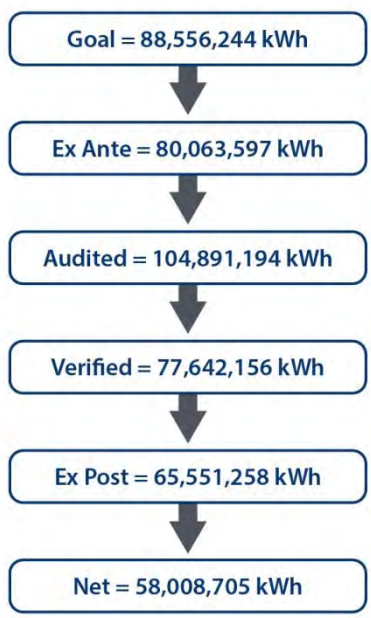
networks—build relationships with businesses and inform decision makers, aiding them in planning upcoming energy-efficiency improvements.

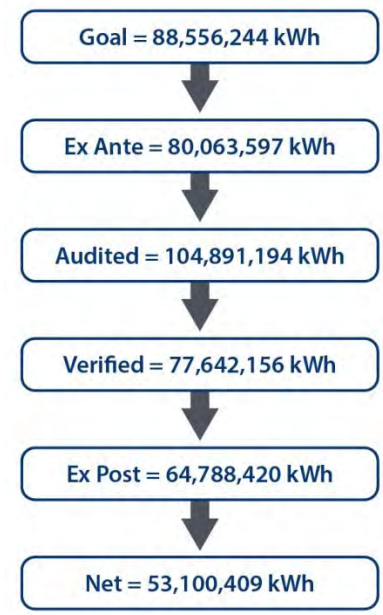
Each program uses its own methods for gauging success, based on the population targeted. Program-specific findings ~~follow~~are highlighted below, with each program-specific section containing greater detail on the methods used for capturing data and additional recommendations based on these findings.

1.7.1 HOME ENERGY ASSESSMENT

The Home Energy Assessment Program offers walk-through audits and direct-installations of energy-efficiency measures. In 2013, the program achieved ~~96~~88% of its verified energy-savings goals and 44% of its verified demand-savings goals, while using 90% of its budget. Figure 12 presents an overview of its savings achievements.

Figure 12: HEA Overview of Savings





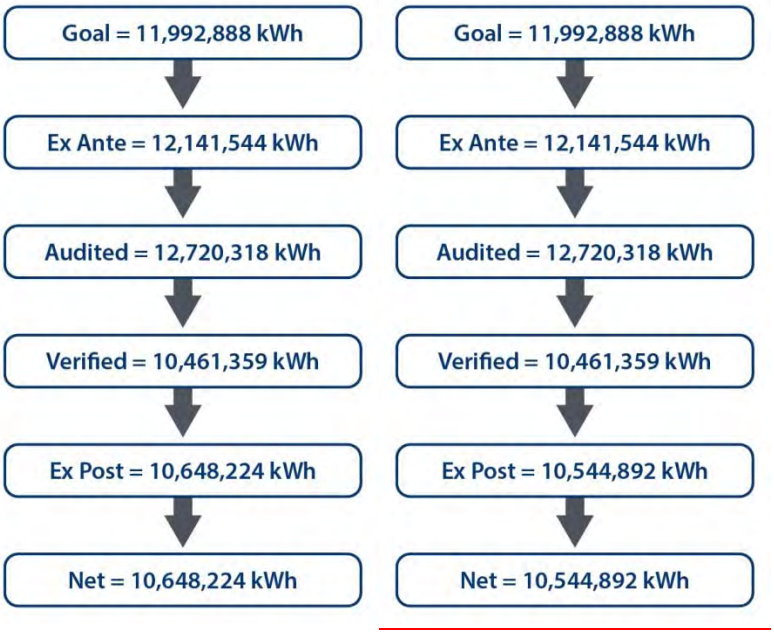
Key evaluation findings include the following:

- HEA significantly increased participation in PY2 compared to PY1 (by 229%), maintaining participation at an approximate average of 5,900 homes per month over the course of the year. Despite this, the HEA program did not reach its PY2 participation goals, meeting 84% of its goals.
- The program installed more measures in homes than in PY1, yielding higher savings per home. This resulted from programmatic changes, allowing installation of more measures, improved auditor training, and an enhanced QA/QC process.
- In PY2 the TPA made a number of enhancements to the database, allowing it to more accurately capture the auditors' activities.
- Customers remained satisfied with the program, rating it an 8.9 mean satisfaction score on a scale of 1 to 10.

1.7.2 LOW INCOME WEATHERIZATION

The LIW program offers walk-through audits and direct installations of energy-efficiency measures. Similarly to the HEA program, the program includes air sealing and, in some cases, attic insulation. In 2013, the program achieved 91% of its energy-savings goals and 62% of its demand-savings goals, while using 101% of its budget. Figure 13 presents an overview of the savings achievements.

Figure 13: LIW Overview of Savings



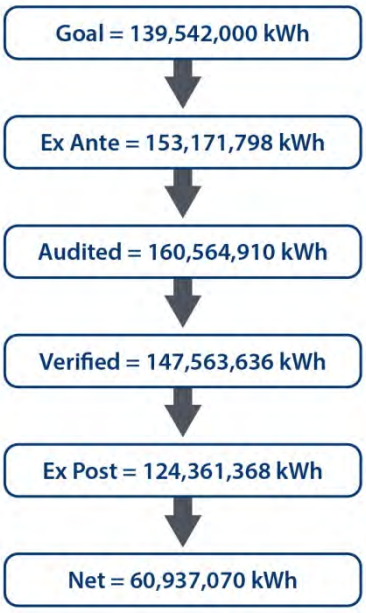
Key evaluation findings include the following:

- The program performed well in 2013, meeting its participation goals, despite shifting staffing resources to the HEA program to boost the number of HEA audits completed.
- The TPA actively worked to increase savings per home in PY2 by increasing the number of bulbs per home and ensuring (in the second part of the year) that measures provided to homes were installed before leaving the sites.
- The TPA revised its planning assumptions between PY1 and PY2, ensuring the program met its energy-savings targets. Several changes occurred mid-year and increased the accuracy of planning assumptions, compared to data from the tracking database.

1.7.3 RESIDENTIAL LIGHTING

The Residential Lighting program performed well in 2013 and exceeded its *ex-ante* goals. Agreed-upon gross savings calculations were generally applied accurately and consistently. The program continued to offer discounts on a variety of lighting products and increased its footprint by adding new participating retail locations. The program operated smoothly, resulting in high levels of manufacturer satisfaction. Figure 14 presents an overview of program savings achievements.

Figure 14: Lighting Overview of Savings



Key evaluation findings include the following:

- Despite the smooth operations, some interviewed manufacturers expressed concerns regarding information that program incentives could be turned on and off unexpectedly, and cited the inconvenience of retailers having to remove program signage and marketing and of making adjustments to their point-of-sale data systems. Consequently, manufacturers thought retailers might be hesitant to participate in the program in the future.
- In-store lighting demonstrations offered a powerful and highly effective tool to increase customer awareness of program discounts and sales of energy-efficient lighting products over less-efficient options. Moreover, the events encouraged customers, who would not have purchased CFLs (at full price), to buy program-discounted bulbs.
- In PY2, close to 90% of all bulbs sold through the program were standard CFLs, according to in-store intercept survey results. Sales of efficient specialty bulbs lagged behind standard CFLs. In-store customer intercept surveys suggested customer dissatisfaction with specialty CFLs and a lack of awareness regarding specialty CFL bulbs serving as a barrier to specialty CFL purchases.

1.7.4 ENERGY EFFICIENT SCHOOLS

The Energy Efficient Schools program offers energy-efficiency kits to students and energy assessments of school buildings, coupled with installing low-cost, energy-saving measures. In 2013, the program achieved 114% of its energy-savings goals and 101% of its participation goals, while using 101% of its budget. Figure 15 presents an overview of the savings achievements.

Figure 15: Schools Overview of Savings

Key evaluation findings include the following:

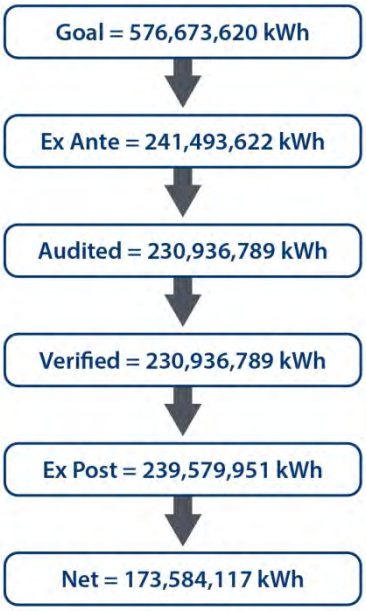
- Satisfaction ran high among participating teachers and facility staff. Almost all surveyed teachers (89%) reported they would be highly likely to recommend the program to other teachers. Ninety-three percent of facility staff reported high satisfaction levels with the School Audit and Direct Install program.
- The TPA received 41% of completed student surveys. While exceeding its goal of 37.5%, this response rate decreased substantially from 50% in 2012. Similar school kit programs have successfully implemented a tiered incentive approach, encouraging teachers to return as many surveys as they receive from students (and experience response rates between 66% and 75%).
- Teachers continued to report that program lesson plans aligned better with fourth-grade students than fifth-grade students. The program's lessons would prove more effective if better aligned with the curricula targeted for the fifth-grade.
- As in PY1, a lack of funding presented a major participation barrier for the program's audit portion. Providing a financing mechanism or a list of available financing options could help schools procure funds to implement recommendations.
- Several School Audit and Direct Install program measures experienced significantly negative *ex-post* adjustments. These occurred due to: the reported location of measure installations, such as occupancy sensors, did not maximize potential savings; and a lack of data exists regarding the circumstances in which measures were installed.

1.7.5 COMMERCIAL AND INDUSTRIAL

The C&I Prescriptive Rebates program seeks to achieve long-term, cost-effective savings. This program relies on a prescriptive rebate structure that offers participants monetary incentives, based on their installation of energy-efficiency equipment upgrades. Upgrades include: lighting, VFDs, HVAC, and

ENERGY STAR kitchen equipment. The C&I program fell just short of meeting savings targets set for PY2. The TPA addressed lessons learned through PY1 implementation and added seven new tracks to the program to enhance its program customer reach. In 2013, the program achieved 42% of its energy-savings goals and 24% of its demand savings goals, while using 66% of its budget. Figure 16 presents an overview of the program's savings achievements.

Figure 16: C&I Overview of Savings



Key evaluation findings include the following:

- Trade allies serve as a key driver and marketing channel for reaching C&I customers. Overall, customers and Trade Allies expressed satisfaction with the program as well as with its individual components.
- While the Evaluation Team received reliable data to work from, some conflicting numbers appeared when comparing the portal reported savings to other reporting sources, such as the Year-end Scorecard supplied by the TPA. This can be attributed to some new marketing ~~tracks~~channels lead by the TPA, which yielded some savings and were tracked in a separate database.
- To assist in participant uptake in commercial and industrial sectors, providing financing mechanisms, such as a loan program, should be considered.
- Enhanced marketing efforts have helped potential C&I participants become aware of the program. Nonparticipants learned of the program primarily from printed advertisements, such as mailings or newspapers, or from their ~~Trade Allies~~contractors. Continuing to target these marketing channels will help the program grow and better achieve its savings goals.

1.7.6 BENEFIT COST ASSESSMENT

The energy efficiency program portfolios for each of the utilities as well as the aggregation to the state of Indiana continue to be cost-effective for the combined 2012 and 2013 program years under the PCT, UCT, and TRC tests. Most of the individual programs were also found to be cost-effective; however, the Low Income Weatherization did not pass cost-effectiveness for most of the program portfolios. In addition, there has been a decline in the level of cost-effectiveness for the School Building Assessments program for all the utilities that deserves further investigation.

The cost-effectiveness analysis of the portfolio, providing new energy resources to the State of Indiana, indicates that the levelized cost for new energy efficiency supplied electric resources acquired via the Statewide Core programs was $0.03 dollars per kWh for the two-year period of program implementation.

2. EM&V METHODOLOGY OVERVIEW

Overall, this evaluation sought to quantify each program's energy and demand savings (via the impact evaluation) and to understand and help improve the Indiana Core Programs' performance (via the process evaluation).

Process Evaluation: The process evaluation included documenting program efforts and improving program design and delivery, involving the following key efforts: a review of program materials; in-depth interviews with third-party administrator program staff and program implementer staff; participant surveys; and participant/nonparticipant contractor in-depth interviews. The process evaluations sought to answer the following overall questions:

- Does the program, as designed and implemented, meet its goals?
- Can improvements be made in the program design and implementation processes, including marketing and database tracking efforts?
- What specific customer/contractor insights could improve the program and increase satisfaction levels?

Impact Evaluation: The impact evaluation sought to accurately quantify energy savings and to provide information leading to more accurate energy savings, including demand reduction, and estimates in future program years. Data were gathered from various sources, including: the tracking database, management interviews, independent operational observation, and participant surveys. Data analysis included conducting an audit of the tracking system, analysis of participant survey data, conducting statistical and engineering analysis of *ex-ante* savings, and other efforts. A description of the evaluation approach and its application follows in the section below.

2.1 *IMPACT ANALYSIS APPROACH*

This section describes the typical steps taken in conducting impact evaluations of Indiana-based demand-side management (DSM), using steps consistent with the approaches described in the Indiana Evaluation Framework (the Framework).[3] These steps guided the Evaluation Team's evaluation approaches.

~~These steps guided the Evaluation Team's evaluation approaches.~~ In addition to outlining the evaluation approaches, this section provides summary descriptions of actions taken to determine savings estimations for the overall Energizing Indiana portfolio and for program- and utility-specific energy and demand savings. Figure 17 illustrates steps used in the impact evaluation approach. Table 13 elaborates on the actions taken within each of these steps. The methods employed varied by program, accurately representing the program designs and target populations.

[3] Indiana Evaluation Framework. TecMarket Works. September 25, 2013.

Figure 17: DSM Impact Evaluation Steps

Table 13 provides summary descriptions of impact analysis steps:

Table 13: EM&V Impact Analysis Steps

Savings Categories	Definition, Sources, and Activities
Ex-Ante Savings	Reported savings values provided by the third-party administrator (TPA), as shown in its portal. Savings resulted from the TPA's Energizing Indiana activities, using savings values and assumptions provided in its scope of work.
Audited Savings	Once the following activities have been conducted through the "audit savings" step, audited savings are produced: • Reviewing the program tracking databases. • Reviewing hardcopy program applications from a sample to verify consistency with data recorded in the program tracking databases. • Checking *ex-ante* savings estimates and calculations to make sure the implementer/utility applied the agreed-upon values appropriately/correctly. • Adjusting program tracking data as necessary to correct errors or identified omissions. • Recalculating program savings, based on the adjusted, audited number of measures and on any errors found in the program tracking data.

Savings Categories	Definition, Sources, and Activities
Verified Savings	Verified savings can be computed after confirming measures have been installed and remain operational. This step typically employs a stratified random sample of installations, selected for detailed analysis. Typical methods for collecting necessary data include telephone surveys and/or site visits. This step may result in adjustments in *total* savings to address issues such as the following: • Measures rebated but never installed, or not installed in the correct program year; • Measures not meeting program qualifications; • Measures installed but later removed; or • Measures improperly installed. This step does not alter the per-unit, energy-saving values.
Ex-Post Gross Evaluated Savings	*Ex-post* gross evaluated savings can be determined using: engineering analysis, building simulation modeling, billing analysis, metering analysis, or other accepted impact evaluation methods. Adjustments to the verified savings may include: changes to the baseline assumption; adjustments for weather; adjustments for occupancy levels; adjustments for decreased or increased production levels; and other adjustments following from the impact analysis approach.
Net Savings	Determined by adjusting the *ex-post* evaluated gross savings estimates to account for a variety of circumstances related to program attribution, including savings weighted freerider and spillover effects. *Total Net Savings* involves extrapolation of sample-based *ex-post* net savings to the population of Energizing Indiana participants (*ex-ante* tracking data), using appropriate weights corresponding to sampling rates for the adjustment factor research activities. This incorporates adjustments for freeridership, participant spillover, and market effects (applied at the end of the current program cycle): *Net-to-Gross Ratio = (1- freerider adjustment + participant spillover adjustment + market effects adjustment)*

Table 14 shows the origins and different uses for energy-savings estimates in the Core Programs.

Table 14: Uses of Various Saving Estimates

Savings Estimate	Purpose
Ex-Ante Savings	Goal setting.
Audited Savings	Reconciling the program tracking database with the portal.
Verified Savings	Determine if utilities, portfolio, and programs have achieved their statutory goals. A realization rate, provided at this point, equals: verified savings divided by the program *ex-ante* savings claimed.
Ex-Post Gross Evaluated Savings	Use for program planning purposes and future target setting.
Net Savings	Program design improvements, planning future programs, cost-effectiveness analysis, and calculations of lost revenues.

2.1.1 FREERIDER ASSESSMENT

Assigning energy-savings credits to customers who would have opted for more efficient choices without the program's influence overstates its net savings. For technologies with a minimum, normally available efficiency level used as the energy-savings baseline, a portion of these participants can be expected to take more energy-efficient actions in the program's absence. When a minimum efficiency technology

normally available in the market is used as the baseline, analysis includes a set of participant questions that ask what they would have done in the program's absence.

For the percentage of participants saying they would have made a more energy-efficient choice without the program, savings would be adjusted by the difference in energy use of the program-provided technology and the efficiency of the technology they would have installed without the program. This approach adjusted out savings associated with participants who would have made the energy-efficient choice without the program.

In some cases, energy impact analysis need not be adjusted for freeriders as an energy-savings baseline can be selected already net of freeriders. By setting baselines at the mean efficiency those participants already include freeridership within the adopted efficiency levels. These savings approaches produce net savings directly without identifying gross savings.

In some cases, however, one applies the baseline decision at the participant level; so each participant receives a baseline appropriate for their conditions. For example, with commercial compact fluorescent lamps (CFLs), if participants use the CFL to replace an incandescent bulb in their business and have no history of buying and installing CFLs, the baseline would be the minimum standard efficiency of an incandescent bulb, at the wattage of the replaced bulb, with no additional freeridership adjustments made for the participant.

Similarly, if a participant replaces a CFL with a program-provided CFL, the participant's standard market practice for that socket would be a CFL, and the baseline would be set at the CFL level for that socket, thus requiring no other freeridership adjustments. Savings for that socket would already be net (zero savings). The evaluation effort selected the baseline approach at the same time it defined the freeridership approach due to linkages between these two conditions. The individual program chapters report each approach used in the Energizing Indiana program evaluations.

Residential CFLs, installed as part of one of the three kit-based programs,[4] required a different approach, described below.

2.1.2 Residential Freeridership for CFLs Diffusion of Innovation Approach

As homes present a limited number of sockets that can use CFLs, and because light bulbs are repetitive-purchase consumables, the Evaluation Team used a standard diffusion of innovation adoption curve approach to estimate freeridership, provided customer survey information proved available that provided insights into how many bulbs customers installed in their homes prior to the program.

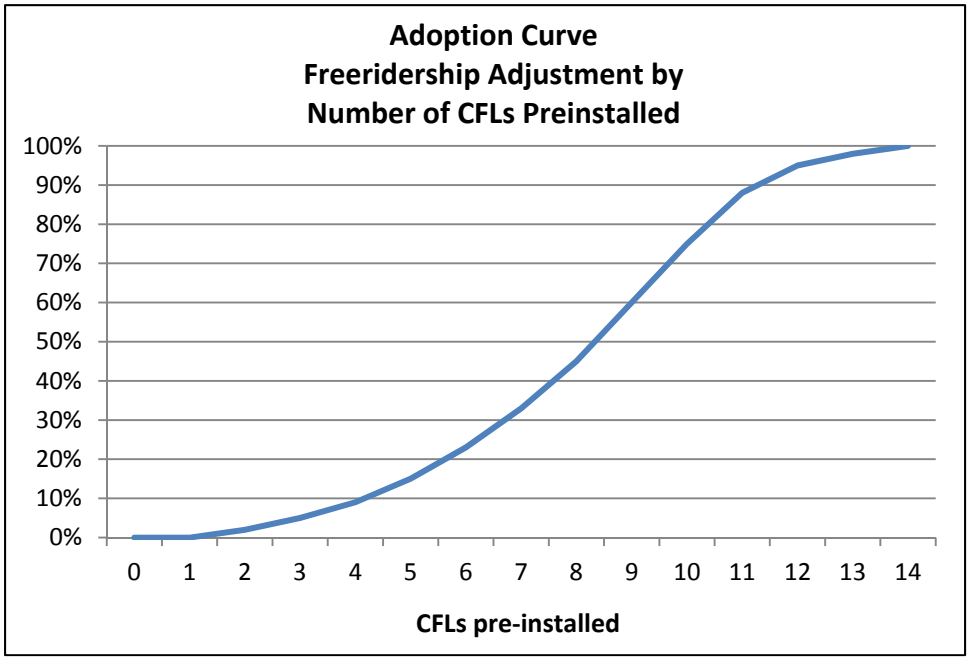
Basically, this approach followed a standard, S-shaped adoption curve, associated with market adoption literature addressing how and why customers buy products. Essentially, the more known about whether or not a homeowner previously used CFLs and already had them installed in their homes, the more likely they would adopt additional CFLs without the program. This approach based freeridership ratios on

[4] This includes HEA, LIW, and EES. An alternative approach was used for Residential Lighting, as described in detail in that program's section.

participant[5] survey responses, with each response assigned a freeridership ratio using a market adoption curve. A response of 0 preinstalled CFLs corresponded to a 0% freeridership level as no history of CFL adoption and use existed. On the other end of the S-curve, a score of 14 or more CFLs corresponded to a 100% freeridership level as it documented strong, consistent use in their homes. The remaining responses, between 0 and 14, were scored as a function of their placement on a standard, consumable-product adoption curve.

The adoption curve in Figure 18 shows corresponding freeridership levels by CFL count, as presented in Table 15. This freeridership estimation approach remained consistent with the product adoption research field and represented a standard approach.

Figure 18: Adoption Curve



[5] For the Indiana programs, this only applied where participant survey data informed the results. The approach was not used in Residential Lighting because these participants were not surveyed.

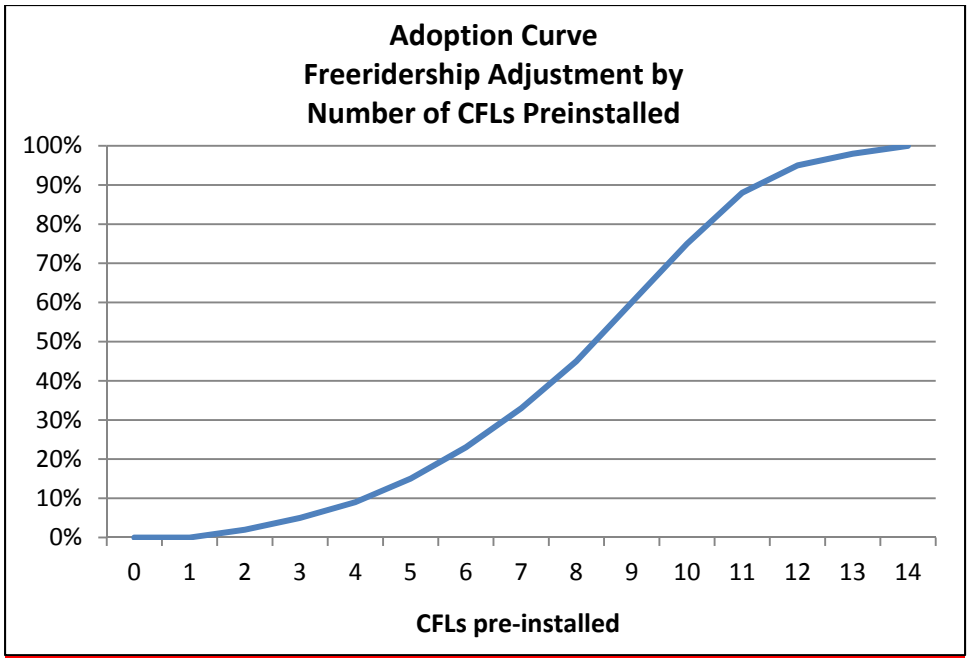

Adoption Curve
Freeridership Adjustment by
Number of CFLs Preinstalled
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
CFLs pre-installed

Table 15: CFL Freeridership Adjustment Determined by S Curve

Number of Preinstalled CFLs	Freeridership Preinstallation Adjustment Factor
0	0%
1	0%
2	2%
3	5%
4	9%
5	15%
6	23%
7	33%
8	45%
9	60%
10	75%
11	88%
12	95%
13	98%
14 or more	100%

2.1.3 SPILLOVER ASSESSMENT

Spillover savings must be added to program-induced net savings when a participant replicates actions that save energy in their facilities, and they attribute that non-program-incented or provided action to the program. Spillover savings in the Energizing Indiana PY1 evaluation report only included short-term participant spillover savings, representing but a portion of the spillover savings typically achieved by programs.

That is, more spillover savings typically occur than those identified in the evaluation efforts. Spillover savings are based on short-term spillover, which include actions taken between program participation, identified by the evaluation's survey with participants.

Longer-term spillover savings also occur in the future, after completion of an evaluation effort, as a portion of the participant population retake actions caused by the program. Nonparticipants also take spillover actions if directly or indirectly influenced by a program, and, typically, remain unaware of that influence.

Savings from groups of unaware nonparticipants, taking actions due to a program's influence but not perceiving that influence, more traditionally are termed "market effects savings." In this report, the Evaluation Team only included participant spillover.

To assess spillover, surveys asked participants if they took additional actions to save energy in their facilities or homes.[6] If they reported taking additional actions, follow-ups asked them to describe that action in sufficient detail to allow estimation of savings achieved. An attribution question then indicated whether the program influenced or caused the action.

[6] For the HEA program, responses to audit recommendations were not included in spillover; rather, they were included as direct program impacts. For the LIW program, captured spillover was identified as Audit Recommendations.

If respondents reported actions influenced by the program, surveys asked them to rate that influence level on a 1 to 10 scale, allowing the percent of influence to be attributed, based on the score provided. Using a 1 to 10 scale, cause could be attributed using a direct linear conversion of their score to a percentage (2=20% / 5=50% / 8=80%). As an attribution score differs from an adoption curve, a direct assignment approach proved more appropriate than an S-curve approach (more typical of an adoption approach). To estimate spillover, engineering or modeling approaches allowed savings from reported actions to be multiplied by the degree of influence score. That level of energy savings would then be added to the direct program-induced energy savings to estimate the net savings addition from spillover and to set the program's net-to-gross (NTG) ratio.

2.1.4 EISA BASELINE ADJUSTMENT APPROACH

In 2007 the United States passed the Energy Independence and Security Act (EISA), which restricts sales of standard incandescent light bulbs (standard bulbs), but allows bulbs in the supply chain to be sold via retail sales. Upon exhausting the supply of standard bulbs, new incandescent bulbs could not be manufactured, distributed, or sold in the United States. If standard bulbs no longer proved available, savings from standard bulbs could not be used to estimate program savings. Rather, the energy saving baseline must reflect the market and products available for sale.

As this law affects bulbs sold in Indiana stores and therefore affects the energy-savings baselines used to estimate program impacts, the Evaluation Team conducted research in two waves across Indiana, focusing on the availability of incandescent bulbs addressed by EISA.

The research used a mystery shopper approach, which called retail stores to inquire if a store offered 100- and 75-watt bulbs for sale, how many they carried, and other questions regarding future availability.

The first wave, conducted in January 2013, was used for the PY1 CFL impact calculations. This research indicated that EISA-impacted incandescent bulbs remained readily available in 2012, and the baseline did not require adjustment.

In January 2014, the second phase of the EISA impact study began. This study indicated the availability of 100- and 75-watt incandescent bulbs eroded due to EISA's effects. The mystery shopper survey results indicated that, while EISA considerably affected the availability of 100- and 75-watt incandescent light bulbs, a sizable number of Indiana stores still carried those bulbs.

In addition, and perhaps more importantly, the removal rate of EISA noncompliant bulbs from the market appeared to slow (rather than increase), regarding the rate at which bulbs were stocked and sold. As the second wave study indicated the market supply of 100- and 75-watt bulbs eroded the baseline from which CFL energy savings are estimated, adjustments were made for the PY2 savings analysis. Calibration of energy-savings estimates of CFL savings used the baselines shown in Table 16 for 2013 (PY2).

The table presents best estimates of baselines to be used for PY3, based on the second-wave research. Baselines presented in the table for 2014 were not applied to the PY2 impact estimates and should be considered placeholders for PY3. If the decrease in market-available of 100-, 75-, and 60-watt bulbs continues to slow into PY3, baseline estimates for these years will require adjustment.

Table 16. Lighting Baseline Wattage with EISA

100-watt			75-watt			60-watt			40-watt		
Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)
2012	0%	100	2012	0%	75	2012	0%	60	2012	0%	40
2013	55%	85	2013	0%	75	2013	0%	60	2013	0%	40
2014	60%	83	2014	60%	62	2014	0%	60	2014	0%	40
2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD
2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD
2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD

2.2 PROCESS EVALUATION APPROACH

Although the process evaluation efforts differ somewhat for each program, to an extent, these studies follow a similar theme and approach. The process evaluation consists of program-specific efforts, designed to address each program's researchable issues, and generally include the following methodologies:

- Reviewing program materials and operation methods;
- Conducting interviews with program managers and implementers;
- Designing interview and survey instruments;
- Conducting interviews with Trade Allies and partners;
- Conducting surveys with participants and/or nonparticipants;
- Reviewing marketing materials;
- Analyzing process evaluation data; and
- Developing process evaluation reports.

The PY2 process efforts focused on identifying key researchable issues most relevant for a program in its second year of implementation. This included exploring researchable issues such as the following:

- *Reviews of the Key Performance Indicators (KPIs)*: During PY1 process efforts, the Evaluation Team focused on development of KPIs that served as a "road map" for the evaluation efforts. PY2 process efforts continued assessments of program operations in comparison with those indicators.
- *Verification of robust program tracking databases:* In PY2, the Evaluation Team continued working with the TPA to ensure program tracking systems remained robust and collected the correct information for accurately reporting savings at the end of each program cycle.
- *Assessment of marketing efforts:* PY2 efforts also focused on understanding operations of the program's marketing and outreach efforts, ensuring marketing effectively raised program awareness among the targeted customers.
- *Assessment of participation processes:* Continued assessment of the participation process and the sharing of insights to: streamline program processes, increase customer satisfaction, and increase overall program savings levels.

- *Assessment of market actor interactions/processes:* Continued assessment of communication lines between program implementers and Trade Allies, along with training and marketing opportunities for these market actors.
- *Analysis of program design:* Qualitative and quantitative efforts in PY2 explored issues regarding the participant service development and interaction process, and the participant's experiences relative to expectations and satisfaction.
- *Verification of program processes:* Continued to assure quality assurance/quality control (QA/QC) procedures remained in place during PY2, this included verifying the achievement of administrative responsibilities and performance expectations (per the statement of work) and that on-site QA/QC occurred.

2.3 UNCERTAINTY

Program evaluations seek to reliably determine energy and demand savings, along with some reasonable accuracy level. Whenever selecting a population *sample* to represent a population—whether of appliances, individuals, households, premises, or organizations—some amount of *sampling error* occurs. Sampling error arises as only a portion of actual values can be measured (e.g., metering energy consumption over one week, metering 5% of the affected equipment). Different samples lead to different estimates of energy and demand savings.

If randomly drawing a sample from the population, the sampling error should be random and provide an unbiased estimate of true savings. The Evaluation Team uses *precision* to characterize sampling error, defined as the degree that additional measures would produce the same or similar results. Convenient measures such as confidence intervals and statistical significance tests provide quantitative estimates of the uncertainty introduced through sampling.

Each program, across each utility, will achieve a level of 90% confidence with a 10% precision rate across the three-year program cycle. Consequently, each sample was designed to limit uncertainty and to maintain a high level of accuracy within the evaluation. Survey findings in their program-specific sections include the number (n=) of participants sampled throughout PY2.

2.4 SAMPLING DESIGN

The evaluation included on-site surveys and field EM&V work for a sample of participating sites. The Evaluation Team developed a sampling plan for each project, outlining: the sampling design, the population, and the sample sizes needed to meet the evaluation's overall precision requirements. This report's program sections provide the sampling detail for each program. Samples generally derived from the participant tracking data, per the sampling plan.

The sampling design depended on: the analysis' data quality objectives; development of the sample frame; and potential uses of the data. These designs included the following:

- Simple random sampling;
- Stratified random sampling;
- Two-stage or cluster sampling;

- Nested sampling (time-of-use meters used within a smaller sample of interval meters); and
- Systematic sampling.

The PY2 efforts' overall data quality resulted in a margin of error of ±10% with 90% confidence at the program or subprogram level (subprogram as a specific effort nested within a program). Several factors affected the required samples' size, including the number of participants in the population, and the variance of measures.

Table 17: EM&V Activities by Program

Core Program	Process Evaluation Approach	Impact Evaluation Approach	Market Effects Evaluation Approach
Residential Programs			
Residential Lighting Lead: Kessie Avseikova, Opinion Dynamics	Program manager and implementer interviews; in-store customer intercept survey; manufacturer interviews.	Upstream supply-side data review; engineering review of savings estimates, in-store customer intercept survey; sales data modeling (used PY1 results).	Review of market-based data (e.g., Indiana sales trends, ENERGY STAR® awareness and/or penetration rates, and planning documents). Interviews with customers. On-sites.
Home Energy Assessment Lead: Erinn Monroe, Opinion Dynamics	Program manager and implementer interviews. Auditor ride-alongs. Partial "null" survey. Participant survey covering, at a minimum: actions taken as a result of audit, freeridership, satisfaction with the audit.	Participant surveys; engineering review; database review; peak demand savings analysis.	
Low Income Weatherization Lead: Erinn Monroe, Opinion Dynamics	Program manager and implementer interviews. Auditor ride-alongs. Partial "null" survey. Participant survey covering, at a minimum: actions taken as a result of the audit, freeridership, satisfaction with the audit.	Participant and nonparticipant surveys; engineering review, supplemented by simulations, as required for measure-specific savings; peak demand savings analysis.	
Energy Efficient Schools Lead: Sarah Brooks, Cadmus	Program manager interviews; other interviews to understand the value of education-based efforts. Recommendations for additional information needed to encourage action.	Participating school surveys; engineering reviews, with an emphasis on savings values claimed by program; assessing indirect impacts (e.g., spillover).	

Core Program	Process Evaluation Approach	Impact Evaluation Approach	Market Effects Evaluation Approach
Nonresidential Program			
Commercial and Industrial Lead: Vanessa Frambes, Cadmus	Program manager and implementer interviews. Interviews with C&I participants to understand satisfaction with program processes (e.g., application process), use of equipment, operational changes, freeridership and spillover. Nonparticipant surveys.	Participant surveys; nonparticipant surveys; engineering modeling and energy and demand savings review; peak demand savings analysis; on-site metering evaluations.	Review of market-based data (e.g., Indiana technical resource manual [TRM], penetration rates, and planning documents). Interviews with C&I customers and account reps. Nonparticipant surveys.

The following sections describe the program-specific evaluation efforts conducted.

3. HOME ENERGY ASSESSMENT

3.1 *PROGRAM DESIGN AND IMPLEMENTATION*

The HEA program offers a walk-through audit and direct installation of energy-efficiency measures: the Direct Install program is available for all single-family homes. Additionally, the TPA canvassed neighborhoods, soliciting energy savings pledges and encouraging residents to participate in the HEA program.

Energy auditors conduct a walk-through audit of participating customers' homes to assess the homes' energy performance. While on-site, auditors install energy-efficiency measures such as CFLs and energy-efficient faucet aerators. In addition, the customer receives a report about their homes' energy use, suggesting further actions to reduce customers' energy consumption.

The HEA program delivery model shifted in the middle of PY2. Figure 19 provides an overview of the key program delivery changes implemented from PY1 to PY2. Interviews with the program implementers indicated that, as of July 1, 2013, the program moved from a model of providing an energy "kit" and leaving uninstalled measures with the customer (to install later on their own) to a revised model where auditors were instructed to install as many measures as possible in homes (without leaving any measures behind) and recording all of the installed measures in the program tracking database. Besides the model shifts, the program increased the number of CFLs installed and removed water heater tank wrap and Smart Strips.

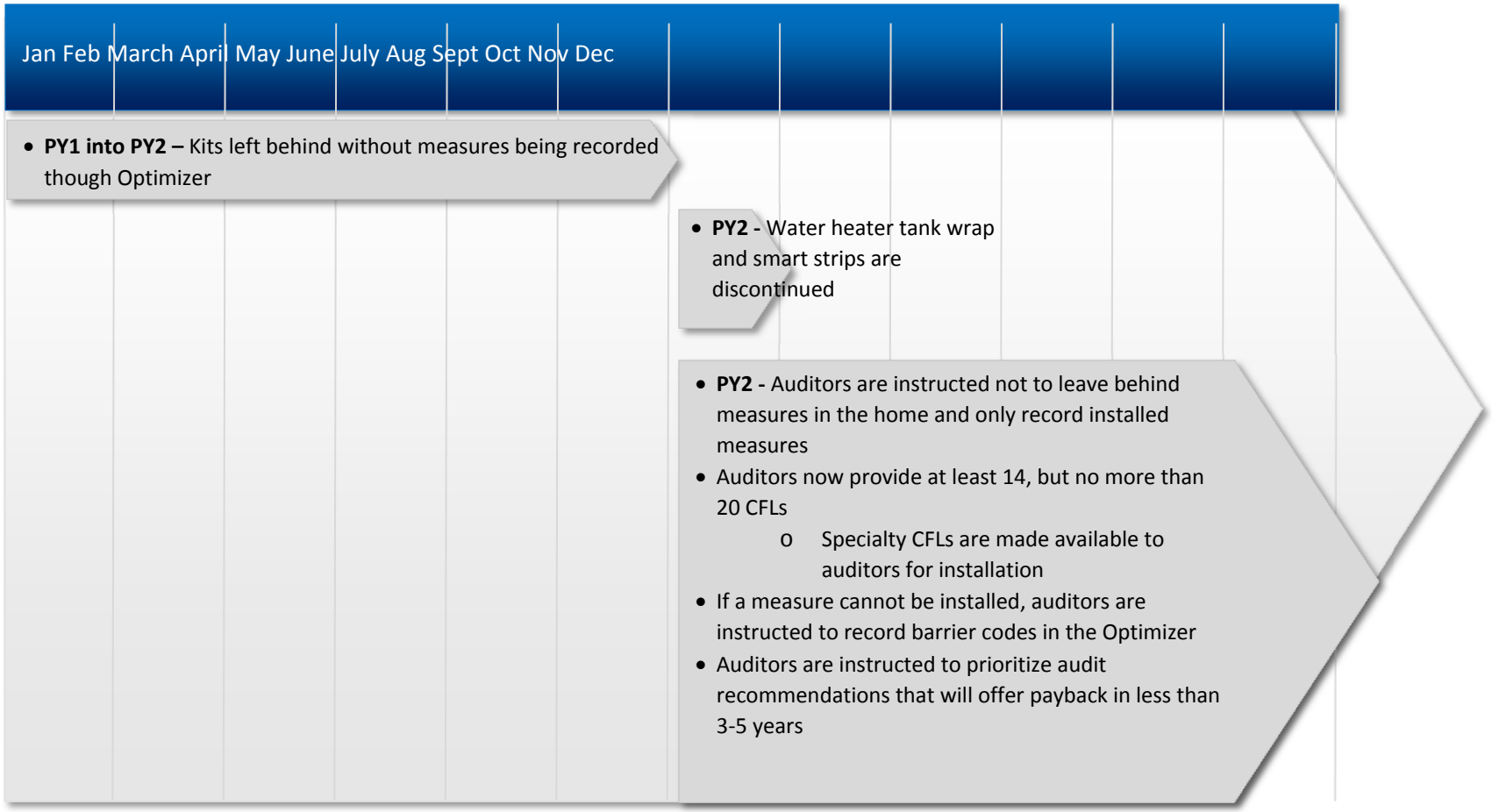
As of July 1, 2013, auditors could install up to 20 CFLs in a participant's home—a change supported by the program's need for increased electric savings. Alternatively, the program removed water heater tank wrap and Smart Strips, which did not greatly impact the program savings and offerings. Generally, few customers received water heater tank wrap due to safety issues, and Smart Strip savings in the Indiana TRM proved much lower than assumed by the TPA.

The program served about twice as many homes in PY2 than in PY1. Part of this can be attributed to the significant ramp-up necessary upon the program's PY1 launch; in PY2, it appears the program operated at a steady state in terms of participation, while continuing to implement operational improvements, including the following:

- Providing additional training to auditors;
- Improving data collection and tracking;
- Enhancing the rigor of the QA/QC process; and
- Installing more measures while in the homes.

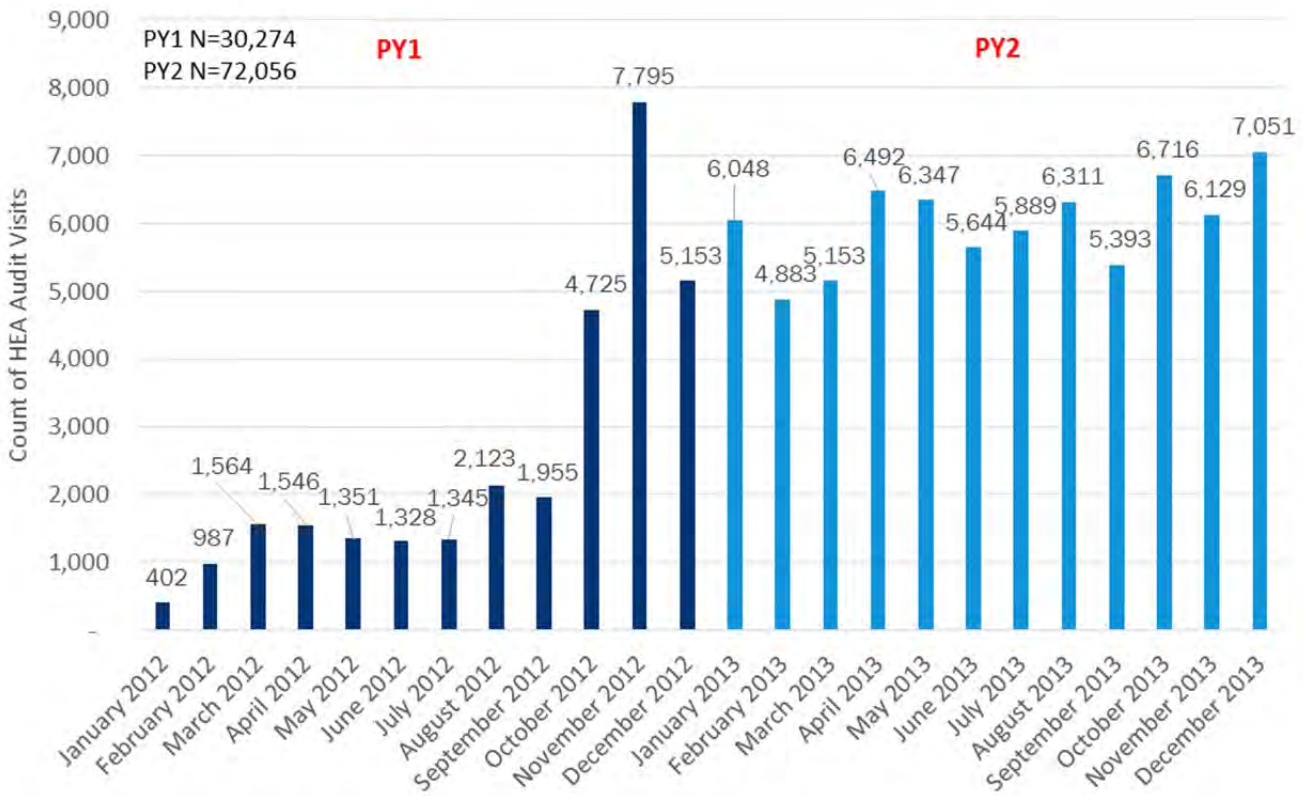
These activities resulted in a number of positive outcomes for the program, including: increasing the number of homes served in the state; increasing the savings captured within each home; and improving the quality of program tracking data.

Figure 19: Program Changes in PY2



Since the initial ramp up of audit visits in late PY1, the TPA has maintained the number of HEA visits completed each month, over the course of PY2. Visits averaged about 5,900 per month, with the highest number conducted in December 2013. Figure 20 shows the number of audits completed in each month during PY1 and PY2. A rapid increase in completed audits clearly can be seen in the fourth quarter of PY1, followed by a steady rate in PY2.

Figure 20: HEA Audits Completed by Month in PY1 and PY2



Note: This represents the number of homes as they appear in the program database. Differences may occur from the report's (*ex-ante*) number of completions.

3.2 *EM&V METHODOLOGY*

The evaluation of the Direct Install Home Energy Assessment program incorporated impact and process elements. Table 18 provides an overview of tasks used for evaluating this program.

Table 18: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• Interviewed Implementation manager.
Auditor Surveys	• Conducted a survey of program auditors. • Conducted ride-along observations and in-depth interviews with program auditors.
Program Database Review/ Verification	• Reviewed the participant data tracking database.
Program Materials Review	• Reviewed materials to assess marketing and outreach efforts.
Participant Interviews	• Conducted telephone survey with 230 program participants. • Conducted follow-up survey with 100 PY1 program participants to revisit energy kit receipt and installation.
Impact Analysis	• Audited the measure installations reported in the program database. • Verified the reported measure installations using participant interviews. • Performed engineering calculations of installed measures. • Estimated NTG (freeridership and spillover), based on self-reported data from participant interviews.

For the PY2 evaluation, the Evaluation Team moved to a measure-level approach, rather than a "per home" approach. Several factors lead to that decision.

First, the TPA is moving to a measure-level savings approach for PY3. By shifting the evaluation approach, the Evaluation Team could better make year-over-year comparisons and provide detailed recommendations to help inform future program design.

Second, midway through PY2, the TPA changed the program delivery model from "kit-based," whereby all participants received the same kit of measures, to one where auditors could install up to 20 CFLs in a home and not leave measures behind for participants to install later. This program delivery change meant savings achieved in each home varied, depending on measures installed in that home, making the "per home" value less relevant (although the TPA was contractually bound to using the per-home value in tracking for PY2).

Finally, measure-level savings streamlined inclusion of measures distributed during the canvassing activities conducted by the TPA. Previously, canvassing measures were calculated separately from savings achieved through the audit activities, and combined with energy savings occurring due to the audits.

3.2.1 SAMPLING DESIGN

The Evaluation Team developed a sampling plan to produce telephone survey findings within agreed bounds of 90% confidence level and 10% precision. The Evaluation Team conducted interviews with program participants in two waves during PY2, acknowledging changes in program delivery. The first wave of the participant survey occurred in September 2013 and included customers receiving audit visits between January and June 2013. The second wave of the survey occurred in January 2014 and included customers receiving audit visits between July and November 2013.

In October 2013, as a part of the HEA program's PY2 evaluation, the Evaluation Team interviewed auditors attempting to achieve a census of auditors working in the HEA program through use of an online survey that collected their feedback on the program's process and design.

Table 19 provides the sample frame, response, and cooperation rates for each survey effort.

Table 19: Auditor and Participant Survey Sample Design

Action	Population	Completions	Response Rate	Cooperation Rate
Online Auditor Surveys	45	20	45%	N/A
Telephone Participant Interviews	61,842	230	5%	42%

3.3 PROGRAM PERFORMANCE

Table 20 shows how reported program performance compared to goals established in program planning. *Ex-ante* savings reported by the program (and shown below) did not reflect adjustments made due to the evaluation. The TPA reported the program met 84% of the participation (home), kWh, and kW goals.

Table 20: *Ex-Ante* Statewide Results

	kWh			kW			Therms		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	22,078,196	20,195,052	91%	9,838	9,345	95%	347,857	315,364	91%
I&M	6,161,092	6,321,156	103%	2,745	2,805	102%	-	-	NA
IPL	34,413,848	26,977,410	78%	15,334	12,318	80%	-	-	0%
IMPA	5,580,932	5,143,792	92%	2,487	2,365	95%	-	-	0%
NIPSCO	14,591,024	14,109,132	97%	6,501	6,606	102%	389,404	347,524	89%
Vectren	5,731,152	7,317,055	128%	2,554	3,326	130%	153,236	180,244	118%
Statewide	**88,556,244**	**80,063,597**	**90%**	**39,458**	**36,766**	**93%**	**890,497**	**843,132**	**95%**

The program achieved 84% of its participation goals in terms of homes served, as shown in Table 21.

Table 21: Number of Homes Served by the HEA Program

	Number of Homes		
	Goal	Reported	% Achieved
Duke	21,311	18,121	85%
I&M	5,947	5,906	99%
IPL	33,218	24,222	73%
IMPA	5,387	4,643	86%
NIPSCO	14,084	12,546	89%
Vectren	5,532	6,507	118%
Statewide	**85,479**	**71,945**	**84%**

3.4 PROGRAM BUDGET AND EXPENDITURES

Table 22 shows PY2 program budgets and expenditures reported at the conclusion of 2013. The program spent 90% of its allotted budget; however, utility-specific budget expenditures varied from 78% to 128%.

Table 22: Program-Level Budget and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$7,042,945	$6,441,388	91%
I&M	$1,901,929	$1,951,277	103%
IPL	$10,867,893	$8,472,645	78%
IMPA	$1,766,923	$1,627,523	92%
NIPSCO	$4,526,136	$4,371,326	97%
Vectren(1)	$1,809,898	$2,310,239	128%
Statewide	$27,915,723	$25,174,399	90%

(1) The TPA indicated that, at the end of PY1, Vectren asked for the number of visits completed in their territory to be increased beyond the set program goals over the course of PY2. The overage reported here results from the program goals not aligning with this requested change.

3.5 *Ex-Ante Energy Savings*

Ex-ante savings are those reported by the program, compared to goals set forth in program planning. While measure-specific estimates changed mid-year, per an agreement between the TPA and the DSMCC, all parties maintained the same per-home savings estimate throughout 2013 as this value was negotiated within the program contract.[7] The savings value of 1,036 kWh per home was used to obtain the *ex-ante* savings estimates shown in the total *ex-ante* savings in Table 23 (which provides *ex-ante* savings for the HEA program).

Table 23: *Ex-Ante* Savings from Audits By Utility and Statewide

	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goal	2013 Therm *Ex-Ante*	% of Therm Goals
Duke	22,078,196	18,773,356	85%	9,837	8,365	85%	347,857	315,364	91%
I&M	6,161,092	6,118,616	99%	2,745	2,726	99%	-	-	NA
IPL	34,413,848	25,093,992	73%	15,334	11,181	73%	-	-	NA
IMPA	5,580,932	4,810,148	86%	2,487	2,143	86%	-	-	NA
NIPSCO	14,591,024	12,997,656	89%	6,501	5,791	89%	389,404	347,524	89%
Vectren	5,731,152	6,741,252	118%	2,554	3,004	118%	153,236	180,244	118%
Statewide	**88,556,244**	**74,535,020**	**84%**	**39,458**	**33,210**	**84%**	**890,497**	**843,132**	**NA**

Table 24 provides utility level *ex-ante* savings for audits and canvassing measures. In addition to installing measures in homes as a part of the program audits, the TPA distributed CFLs and Smart Strips to potential customers as a part of recruitment and enrollment, although the program dropped Smart Strips in June 2013. *Ex-ante* savings from these "canvassing measures" were then added to ex-ante savings from the audits, also shown in Table 24.

[7] Per-unit values were used for planning purposes, trying to ensure they achieved savings in the homes.

Table 24: *Ex-Ante* Savings from Audits and Canvassing Measures Combined

	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goals	2013 *Ex-Ante* Therms	% of Therm Goals
Duke	22,078,196	20,195,052	91%	9,837	9,345	95%	347,857	315,364	91%
I&M	6,161,092	6,321,156	103%	2,745	2,805	102%	0	0	NA
IPL	34,413,848	26,977,410	78%	15,334	12,318	80%	0	0	NA
IMPA	5,580,932	5,143,792	92%	2,487	2,365	95%	0	0	NA
NIPSCO	14,591,024	14,109,132	97%	6,501	6,606	102%	389,404	347,524	89%
Vectren	5,731,152	7,317,055	128%	2,554	3,326	130%	153,236	180,244	118%
Statewide	**88,556,244**	**80,063,597**	**90%**	**39,458**	**36,766**	**93%**	**890,497**	**843,132**	**NA**

3.6 *IMPACT ANALYSIS*

This evaluation included a database review of: quantities of measures installed in each home; a survey of participating customers to determine behavioral elements related to the energy savings (such as removal of measures or installation of measures outside of the program); and an engineering analysis of *ex-post* savings.

3.6.1 AUDITED SAVINGS

The impact evaluation process began by reviewing the program database and totaling the number of reported measures installed in homes. In addition, audited savings included savings from canvassing measures distributed through customer recruitment. As noted, the PY2 evaluation approach drew upon the actual number of measures installed, as opposed to applying a uniform, per-home value across all treated homes. Table 25 shows measures the program installed in participant homes.

Table 25: Audited Measure Quantities

		Measures in Database						
	Measure	**Duke**	**I&M**	**IPL**	**IMPA**	**NIPSCO**	**Vectren**	**Statewide**
CFLs	Bulb	225,744	72,443	311,462	57,681	164,029	71,749	**903,108**
Pipe Wrap	Home	6,321	3,270	9,882	1,804	6,668	1,728	**29,673**
Energy Efficient Showerhead	Shower-head	10,210	3,196	13,315	2,706	6,497	3,328	**39,252**
Faucet Aerators	Aerator	25,039	8,751	35,000	7,482	17,616	9,429	**103,317**
Tank Wrap	Wrap	15	17	33	5	13	9	**92**
Audit Recommendations	Home	18,163	5,918	24,260	4,644	12,560	6,511	**72,056**

The program most frequently installed CFLs in homes. As noted, the program eliminated tank wrap in the middle of 2013; hence, that measure seldom appears in the database.

In addition to measures installed in homes, the TPA distributed CFLs and Smart Strips while conducting neighborhood canvassing activities as a part of customer recruitment. Table 26 shows measures distributed through canvassing, as they appear in the program database.

Table 26: Audited Canvassing Measure Quantities

	Canvassing Measures						
	Duke	I&M	IPL	IMPA	NIPSCO	Vectren	Statewide
CFLs	18,020	3	17,079	3,895	16,134	4,164	**59,295**
Smart Strips	6,470	1,741	10,727	1,499	4,224	3,207	**27,868**

HEA design and agreed-upon *ex-ante* savings values changed mid-year based on the PY1 evaluation results. Specifically, the TPA, at the request of the DSMCC, changed *ex-ante* savings estimates from a "per-home" value of 1,036 kWh and 0.462 kW, to using "per-unit" *ex-ante* for each measure installed in the home. This change produced more accurate energy and demand savings estimates as the measures installed in homes can vary.

To calculate savings after this program change, the Evaluation Team also changed the impact evaluation approach. The Evaluation Team multiplied the agreed upon *ex-ante* savings per unit by the quantity of measures installed—both the canvassing efforts and the measures installed in participating homes (e.g., number of CFLs * *ex-ante* savings per CFL)—to arrive at the program's total audited energy savings (see Table 27).

After calculating the energy savings from the canvassing measures, it was discovered that the files the evaluation team received documenting program measure counts were incomplete. As a result, some Smart Strips (representing less than a tenth of one percent of the HEA program's savings) were left out of the analysis. The savings associated with this portion of the Smart Strips installations will be included in the PY3 analysis and reported savings.

Table 27: Audited Energy Savings from Direct Install and Canvassing Measures Combined

	Audited kWh	Audited kW Savings	Audited Therms
Duke	25,770,855	6,119	798,970
I&M	8,490,851	1,974	260,811
IPL	35,708,023	8,089	1,104,731
IMPA	6,945,424	1,563	211,840
NIPSCO	18,925,653	4,147	629,890
Vectren	9,050,387	2,584	220,448
Statewide	**104,891,194**	**24,476**	**3,226,689**

This method resulted in significantly higher audited kWh savings than the *ex-ante* kWh savings (74,535,020 kWh) reported on the portal. The actual number of measures installed per home exceeded estimates used to develop the original "per-home" value. For example, the "per-home" value assumed nine CFLs would be installed in each participating home, and the tracking database indicated 12 CFLs were installed.

3.6.2 VERIFIED SAVINGS

After determining the audited savings, the Evaluation Team compared the database results with those customers reported during the participant surveys. Adjustments to the audited savings included changes to the numbers of installed measures as well as changes for customers removing measures after the audits. These adjustments were made at a statewide level rather than at the utility level, given the sample size of survey participants for each utility was required to be significant at the statewide level for the first and second years and at the utility level over the course of the three-year evaluation effort. Table 28 shows adjustments for installation rates and measure removals.

Table 28: Statewide Verification Adjustments

	Statewide Installation Rate	Statewide Persistence
CFLs	70%	99%
Pipe Wrap	100%	100%
Energy Efficient Showerhead	55%	93%
Faucet Aerators	66%	98%
Tank Wrap	100%	100%
Audit Recommendations	100%	100%
Canvassing CFLs	79%	99%
Canvassing Smart Strips	100%	100%

Note: The Evaluation Team did not receive primary data on installation rates for canvassing CFLs. The CFL installation rate within the direct-install audit for HEA did not prove appropriate. Thus, the Evaluation Team applied the installation rate from the residential lighting program as the best estimate of how customers installed bulbs received through this outreach effort.

Installation rates indicated that customers confirmed the majority of measures reported were installed during the audit. Additionally, statewide persistence rates indicated that, once measures were installed in the home, customers tended to leave them in place. Installation rates for CFLs distributed through the canvassing activities aligned with the installation rate for CFLs purchased through the residential lighting program. While the installation rate for Smart Strips distributed through canvassing measures may not equal 100%, very little research has been done on installation rates for Smart Strips, and the Evaluation Team did not conduct primary research on this measure, as it did not contribute greatly to energy savings (and had been dropped by the program). Consequently, no basis existed on which to make an adjustment.

Verification adjustments were then applied to audited savings to calculate verified energy savings shown in Table 29.

Table 29: Audited and Verified Savings from Audits and Canvassing Activities

	Audited kWh	Verified kWh	Audited ~~KW~~kW	Verified kW	Audited Therms	Verified Therms
Duke	25,770,855	19,308,195	6,119	4,371	798,970	751,094
I&M	8,490,851	6,329,546	1,974	1,382	260,811	243,474
IPL	35,708,023	24,950,485	8,089	5,097	1,104,731	1,033,075
IMPA	6,945,424	5,148,417	1,563	1,109	211,840	197,133
NIPSCO	18,925,653	15,162,352	4,147	3,547	629,890	594,716
Vectren	9,050,387	6,743,161	2,584	1,807	220,448	202,273
Statewide	**104,891,194**	**77,642,156**	**24,476**	**17,314**	**3,226,689**	**3,021,765**

The realization rate equaled the percentage of *ex-ante* savings verified through this evaluation step. Table 30 shows verified savings and utility-specific realization rates. As noted, the agreed-upon, per-unit savings values changed in PY2. When new per unit values applied to measures in the database, a decline occurred in verified kW achieved by the program. This resulted from kW values, used to build the original "per home" value, considered too high and subsequently lowered in PY2.

Table 30: Verified Realization Rates from Audit and Canvassing Activities

	Verified kWh	*Ex-Ante* kWh	Reali-zation Rate	Verified kW	*Ex-Ante* kW	Reali-zation Rate	Verified Therm	*Ex-Ante* Therm	Reali-zation Rate
Duke	19,308,195	20,195,052	96%	4,371	9,345	47%	751,094	315,364	238%
I&M	6,329,546	6,321,156	100%	1,382	2,805	49%	243,474	-	NA
IPL	24,950,485	26,977,410	92%	5,097	12,318	41%	1,033,075	-	NA
IMPA	5,148,417	5,143,792	100%	1,109	2,365	47%	197,133	-	NA
NIPSCO	15,162,352	14,109,132	107%	3,547	6,606	54%	594,716	347,524	171%
Vectren	6,743,161	7,317,055	92%	1,807	3,326	54%	202,273	180,244	112%
Statewide	77,642,156	80,063,597	**97%**	17,314	36,766	**47%**	3,021,765	843,132	NA

Additionally, some activities the TPA conducted in PY1 could not be included in the PY1 energy savings, but could be included in the PY2 savings. For the residential HEA program, these savings occurred due to CFLs left behind in homes and not installed by the PY1 audits. Several studies indicated up to 99% of stored bulbs became installed within a few years of purchase, causing savings to occur several years after initial purchases. This suggests the program should receive additional credit for bulbs left behind with customers for future installation.

To calculate these "PY1 Carryover" savings, the Evaluation Team followed the approach used in other programs where this occurred (such as the Schools Program). Specifically, the Evaluation Team calculated measures left behind in homes by subtracting the PY1 utility-specific incidence rates from the quantity of CFLs included in the kits (nine) to arrive at the number of CFLs left behind in homes. This was then multiplied by the number of homes served by the program in PY1. To determine the portion of CFLs left behind that likely remained installed in PY2, the Evaluation Team used the Uniform Methods Project (UMP)[8] recommended method. The UMP explains most bulbs placed into storage (99%) become installed within two years and recommends calculating the installation rate for the two years after the bulb purchase, as follows:

$$ISR_{Y2} = ISR_{Y3} = \frac{99\% - ISR_{Y1}}{2}$$

Where:

ISR	=	In-service rate
Y1	=	Year 1, the year the bulb was purchased
Y2, Y3	=	Years 2 and 3, the two years following the bulb's purchase date
99%	=	Percentage of program bulbs installed within three years, including the program year

[8] The UMP is a framework and set of protocols established by the U.S. Department of Energy for determining energy savings from energy-efficiency measures and programs. More details are available online: https://www1.eere.energy.gov/office_eere/de_ump_protocols.html.

The Evaluation Team applied a 55% installation rate for the PY1 left-behind CFLs installed in PY2, and will apply a 44% installation rate for installations of PY1 left-behind CFLs in PY3. Table 31 summarizes additional carryover savings from bulbs distributed in PY1 but installed in PY2.

Table 31: Verified PY1 Carryover Savings from CFLs Left Behind in Homes (Savings Added to PY2)

	Quantity Left in Homes in PY1	Installation Rate	Verified Quantity	Verified Carryover kWh	Verified Carryover kW
Duke	9,212	55%	5,067	272,300	100
I&M	3,718	55%	2,045	111,669	47
IPL	16,391	55%	9,015	483,550	174
IMPA	2,232	55%	1,228	66,024	24
NIPSCO	5,731	55%	3,152	166,987	53
Vectren	2,957	55%	1,626	91,714	48
Statewide	**40,241**	**55%**	**22,133**	**1,192,244**	**447**

Verified energy savings, including both the PY2 measures installed as well as PY1 carryover savings, appear in the following tables.

Table 32: Verified PY2 and PY1 Carryover Savings (kWh)

	PY2 Verified kWh	PY1 Carryover kWh	Total Verified
Duke	19,308,195	272,300	19,580,495
I&M	6,329,546	111,669	6,441,215
IPL	24,950,485	483,550	25,434,035
IMPA	5,148,417	66,024	5,214,441
NIPSCO	15,162,352	166,987	15,329,339
Vectren	6,743,161	91,714	6,834,875
Statewide	**77,642,156**	**1,192,244**	**78,834,400**

Table 33: Verified PY2 and PY1 Carrover (kW)

	PY2 Verified kW	PY1 Carryover kW	Total Verified kW
Duke	4,371	100	4,471
I&M	1,382	47	1,429
IPL	5,097	174	5,272
IMPA	1,109	24	1,134
NIPSCO	3,547	53	3,601
Vectren	1,807	48	1,855
Statewide	**17,314**	**447**	**17,761**

Table 34: Verified PY2 and PY1 Carryover (Therms)

	PY2 Verified Therms	PY1 Carryover Therms	Total Verified Therms
Duke	751,094	0	751,094
I&M	243,474	0	243,474
IPL	1,033,075	0	1,033,075
IMPA	197,133	0	197,133
NIPSCO	594,716	0	594,716
Vectren	202,273	0	202,273
Statewide	**3,021,765**	**0**	**3,021,765**

3.6.3 *EX-POST* SAVINGS

Ex-post savings reflect engineering adjustments made to *ex-ante* measure savings claimed by the program. Discussions follow of engineering analyses for each measure included in the HEA program, with details included in the engineering appendix for HEA and LIW. Explanations of high-level differences between PY1 and PY2 within the engineering analyses follow.

CFLs

Unlike in PY1, the Evaluation Team estimated *ex-post* savings based on more detailed information drawn from the program tracking database. Specifically, the analysis included the wattage of actual bulbs removed and bulbs installed, along with the bulb location. The program tracking database also included information on the presence of central air conditioners and fuel types for space heating. This information proved critical to the correct application of the waste heat factors (WHFs). If the space heat type could not be determined and central air conditioning was present, weighted average values applied. Application of the various wattages and HOU resulted in *ex-post* per-bulb savings, about 70% of PY1 per-bulb energy estimates, and 84% of PY1 per-bulb demand savings.

Showerheads

Energy-efficient showerhead savings varied, depending on the number of people using the shower and the length of the showers they took. Similar to the CFL calculations, savings calculations included more detailed information about each home with a measure installed. Specifically, algorithms included the number of people within each household. Additionally, since the previous evaluation, Michigan funded a large research effort that gathered information on how people used their showers and faucets.[9] Decreasing three parameters (minutes per day of a shower, showers per day per person, and mixed water temperature) caused expected savings to fall by about 28%, while increasing the household number brought average savings up by about 10%. In PY1, savings ranged from 441 to 516, while they ranged from 303 to 416 in PY2.

Faucet Aerators

As with showerheads, the Evaluation Team included information from the recent Michigan water study, data from the Indiana TRM, the Indiana Residential Market Baseline 2012, and the Domestic Hot Water Event Scheduler Generator (developed by the National Renewable Efficiency Laboratory (NREL)) for faucet aerators. Using these additional sources, four parameters changed between PY1 and PY2. Differing from showerheads, the Evaluation Team increased three parameters for faucet aerators (minutes per day per person for kitchen faucets, mixed water temperature, and the number of occupants per home) and caused the expected kitchen savings to increase substantially (by around 270%). Increasing the mixed water temperature and the number of occupants while decreasing the minutes per day per bathroom faucet produced an increase in average bathroom savings, but also resulted in a smaller increase (about 115%). Per-unit kWh savings in PY1 ranged from 68.1 to 97.8, an average reflecting the number of different kitchen and bathroom aerators installed in homes. PY2 per-unit savings ranged from 155 to 255 kWh, a change that reflected the substantial estimated per-unit savings for kitchen faucets.

Water Heater Tank Wrap

The TPA discontinued inclusion of tank wrap measures in PY2, but, simply because of timing, PY2 estimates included a few of these measures (n=149). The Evaluation Team spent little time on this measure due to its low incidence and very low savings. The same algorithm and inputs applied as in PY1.

For PY1, the Evaluation Team reviewed algorithms and assumptions for hot water tank wrap from various references, including: the 2010 Ohio TRM; the Indiana TRM; and the Mid-Atlantic TRM. The program did not install water heater tank wrap blankets for participants with gas water heaters due to combustion safety. Savings were calculated for electric water heaters only. The same per-unit value applied for all utilities, as the savings calculations drew upon an increase in efficiency resulting from the added tank wrap insulation.

[9] Findings from this research, while publicly available, are not available online. If stakeholders wish to obtain this research, the Evaluation Team can provide materials on request.

Smart Strip Algorithms

Little empirical research exists regarding actual savings from Smart Strips, though the Indiana TRM references some of the latest data available. The Northeast Energy Efficiency Partnership (NEEP) reported on a deemed methodology for advanced power strips (i.e., Smart Strips) that references multiple documents.[10] Within that document, NEEP estimated these devices can save 31 kWh per year for television entertainment centers and 75.1 kWh per year for items such as home computers and printers. However, the Evaluation Team chose to use the values within the Indiana TRM for two reasons: the lack of industry knowledge about how the average consumer actually uses these devices to achieve possible savings; and the conservative savings applied in the Indiana TRM.

For PY2, Indiana Core programs *ex-post* savings for a Smart Strip measure are: 22.6 kWh/year, 0.00178 kW/year, and -0.41 Therms/year. The TPA moved this value to in the second half of the year. However, all Smart Strips were installed before July 2013, with an *ex-ante* estimate of 102.8 kWh. For this measure, therefore, the *ex-post* per-unit energy savings value equals 22% of the *ex-ante* value.

Ex-Post Savings

Table 35 shows total *ex-post* savings by TPA and statewide.

Table 35. HEA *Ex-Post* Savings by Utility and Statewide

	Ex-Post kWh	*Ex-Post* KW	*Ex-Post* Therms
Duke	16,384,640	2,693	1,427,151
I&M	5,050,190	682	467,037
IPL	22,060,426	2,949	1,923,779
IMPA	4,213,502	561	371,184
NIPSCO	11,906,901	1,529	998,558
Vectren	5,935,598	1,474	533,878
Statewide	**65,551,258**	**9,888**	**5,721,586**

3.6.4 NET SAVINGS

Net savings reflect the application of the program NTG ratio to *ex-post* energy savings. As identified in the Core Evaluation Plan,[11] NTG analysis refers to: "the analytical process associated with isolating the savings that are caused by a program's efforts from the savings that are caused by other market forces."

In PY1, the freeridership approach drew upon participant responses to survey questions regarding the timing, quantity, and prior usage of the measure in question. In PY2, an update to the freeridership approach for CFLs accounted for light-emitting diode (LED) ownership via a series of questions gauging interest and intent to purchase. Other changes to the PY2 freeridership approach included minor updates to NTG measure batteries, based on fielding the PY1 participant survey.

[10] Northeast Energy Efficiency Partnership. "Advanced Power Strips Deemed Savings Methodology." January 2012. http://www.neep.org/Assets/uploads/files/market-strategies/NEEP-APS-Deemed-Savings-Report-4-30-12.pdf

[11] Submitted to the DSMCC on November 14, 2012.

Table 36: Measure-Level NTG Ratios (Includes PY1 Carryover)

Measure	NTG
CFLs	82%
Pipe Wrap	85%
Low-Flow Showerhead	84%
Faucet Aerators	85%
Tank Wrap	100%
Audit Recommendations	100%
PY1 Carryover CFLs	100%

Applying the NTG ratios to *ex-post* savings from measures installed through the program resulted in the following net savings.

Table 37: Net Savings

	Net kWh	Net kW	Net Therms
Duke	14,609,486	2,463	1,391,458
I&M	4,409,967	623	506,675
IPL	19,489,529	2,621	1,873,279
IMPA	3,725,032	499	361,085
NIPSCO	10,523,118	1,363	972,035
Vectren	5,251,573	1,386	517,572
Statewide	**58,008,705**	**8,955**	**5,622,104**

3.6.5 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy savings claimed by the program. Table 38 shows energy (kWh) savings, and Table 39 shows demand (kW) savings. The PY1 carryover savings appear in the *ex-post* gross and net savings.

Table 38: Energy Savings Adjustments (kWh)

	~~Planned~~ kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* Gross kWh	~~*Ex-Post*~~ Net kWh
Duke	22,078,196	20,195,052	25,770,855	19,308,195	96%	16,384,640	14,609,486
I&M	6,161,092	6,321,156	8,490,851	6,329,546	100%	5,050,190	4,409,967
IPL	34,413,848	26,977,410	35,708,023	24,950,485	92%	22,060,426	19,489,529
IMPA	5,580,932	5,143,792	6,945,424	5,148,417	100%	4,213,502	3,725,032
NIPSCO	14,591,024	14,109,132	18,925,653	15,162,352	107%	11,906,901	10,523,118
Vectren	5,731,152	7,317,055	9,050,387	6,743,161	92%	5,935,598	5,251,573
Statewide	**88,556,244**	**80,063,597**	**104,891,194**	**77,642,156**	97%	**65,551,258**	**58,008,705**

Table 39: Demand Savings Adjustments (kW)

	~~Planned~~ kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* Gross kW	~~*Ex-Post*~~ Net kW
Duke	9,837	9,345	6,119	4,371	47%	2,693	2,463
I&M	2,745	2,805	1,974	1,382	49%	682	623
IPL	15,334	12,318	8,089	5,097	41%	2,949	2,621
IMPA	2,487	2,365	1,563	1,109	47%	561	499
NIPSCO	6,501	6,606	4,147	3,547	54%	1,529	1,363
Vectren	2,554	3,326	2,584	1,807	54%	1,474	1,386
Statewide	**39,458**	**36,766**	**24,476**	**17,314**	**47%**	**9,888**	**8,955**

Table 40. Therm Savings Adjustments (therms)

	~~Planned~~ Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Gross Therms	~~*Ex-Post*~~ Net Therms
Duke	347,857	315,364	798,970	751,094	216%	1,427,151	1,391,458
I&M	0	0	260,811	243,474	NA	467,037	506,675
IPL	0	0	1,104,731	1,033,075	NA	1,923,779	1,873,279
IMPA	0	0	211,840	197,133	NA	371,184	361,085
NIPSCO	389,404	347,524	629,890	594,716	153%	998,558	972,035
Vectren	153,236	180,244	220,448	202,273	132%	533,878	517,572
Statewide	**890,497**	**843,132**	**3,226,689**	**3,021,765**	**NA**	**5,721,586**	**5,622,104**

Table 41: Lifetime Savings Achieved

Utility	Lifetime *Ex-Post* kWh	~~Lifetime *Ex-Post* kW~~	~~Lifetime *Ex-Post* Therms~~
Duke	150,458,734		
I&M	48,368,009		
IPL	204,177,936		
IMPA	39,049,297		
NIPSCO	106,173,539		
Vectren	54,617,374		
Statewide	**602,844,889**		

Overall, verified kWh savings were slightly lower than *ex-ante* kWh savings reported by the program. While savings underwent key changes during the verified savings step, with some changes increasing savings and some decreasing savings, the verified savings ended up close to the planned values. For example, measure-by-measure analysis, which more accurately reflected measures installed in the homes, increased savings; however, the application of installation and persistence rates then reduced

this, bringing savings per home down to around the planned numbers. Ultimately, verified savings were 97% of *ex-ante* reported savings.

The *ex-post* evaluation then reduced verified savings, primarily due to reductions of per-unit savings for CFLs and showerheads. Ultimately, *ex-post* savings were 82% of *ex-ante* reported savings.

Differing from kWh savings, kW savings averaged much lower than *ex-ante* kW savings reported by the program. The same key changes to savings made during this step impacted the kW savings, plus planned assumptions were too high. These included: decreases in savings resulting from measure-by-measure analysis, which more accurately reflected measures installed in the homes; and another reduction from the application of installation and persistence rates. Ultimately, verified savings equaled 57% of *ex-ante* reported savings.

The *ex-post* evaluation then reduced verified savings, primarily due to reductions of per-unit savings for CFLs and showerheads. *Ex-post* savings equaled 27% of *ex-ante* reported savings.

3.7 PROCESS ANALYSIS

The PY2 process analysis for the HEA program drew upon on data collected from the following sources:

- A participant survey (administered in two waves—Fall 2013 and January 2014);
- An online survey of program auditors;
- Ride-along observations of auditors working in the field;
- Interviews with the TPA; and
- The Evaluation Team's review of the program database.

Participant surveys included questions related to:

- How participants learned of the program;
- Awareness of ways to save energy;
- Program satisfaction levels; and
- The program's participation processes.

Auditor interviews and ride-along observations explored:

- Areas of program training;
- The audit process;
- Participant perceptions; and
- Health and safety issues.

The Evaluation Team also interviewed the TPA to discuss the program's goals, changes from PY1, operations, strengths, and challenges.

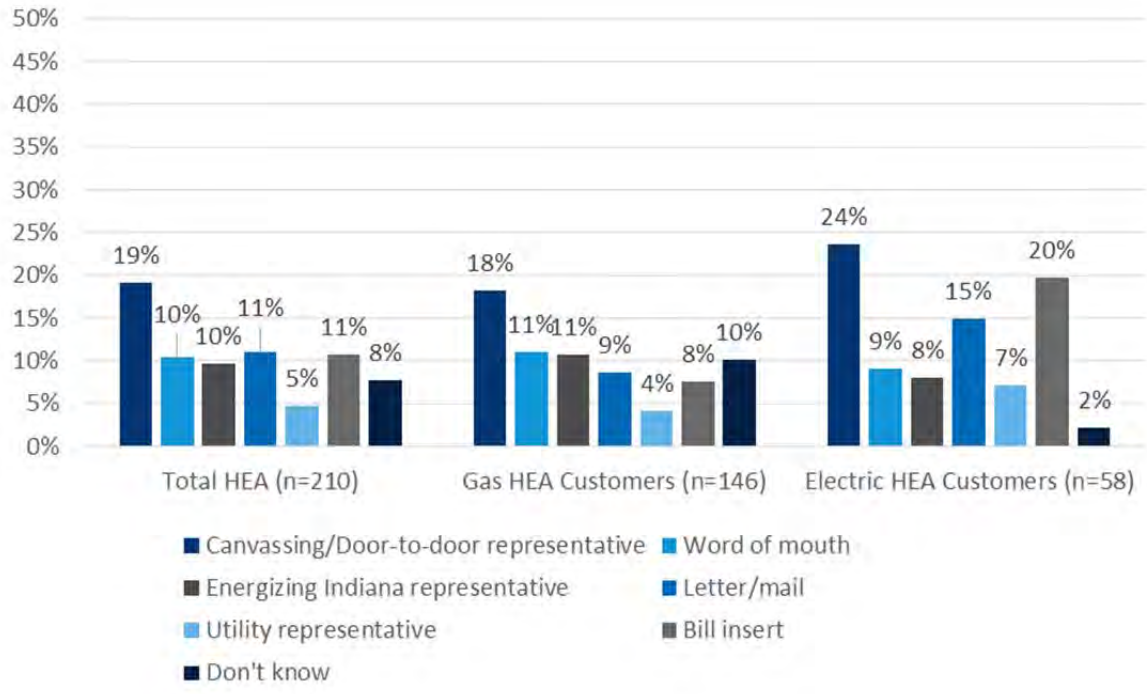
Program administration staff reported making significant changes to the program's design and implementation in July 2013. Implementation during the first half of PY2 remained consistent with PY1

practices, with auditors leaving a "kit" of measures behind for program participants. In July 2013, the program model changed, allowing auditors to install up to 20 CFLs in each home (with an average goal of 14 CFLs per home) and to no longer leave uninstalled measures with customers. Additionally, the program dropped the water heater tank wrap measure from its slate of offerings. As a result, the participant survey took place in two waves: one in Fall 2013 to capture feedback from the first half of the year; and one in January 2014 to capture customer feedback from the second half of the year.

3.7.1 PROGRAM MARKETING

The program targets all single-family homes, 10 years or older, within a participating utility territory and with a specific focus on electric-only homes. The TPA employs a number of tactics to draw customers into the program, including: the Internet, mailings, community action agencies, and neighborhood canvassing. In 2013, the TPA partnered with several utilities to send bill inserts to target ZIP codes, identified as having lower saturation rates. The participant survey asked customers how they learned of the program, and some differences emerged between electric and gas customers. Electric customers primarily learned of the program through canvassing, bill inserts, and letters/direct mail, while natural gas participants primarily learned about the program through canvassing, word-of-mouth, and Energizing Indiana representatives. Figure 21 shows how participants learned of the program.

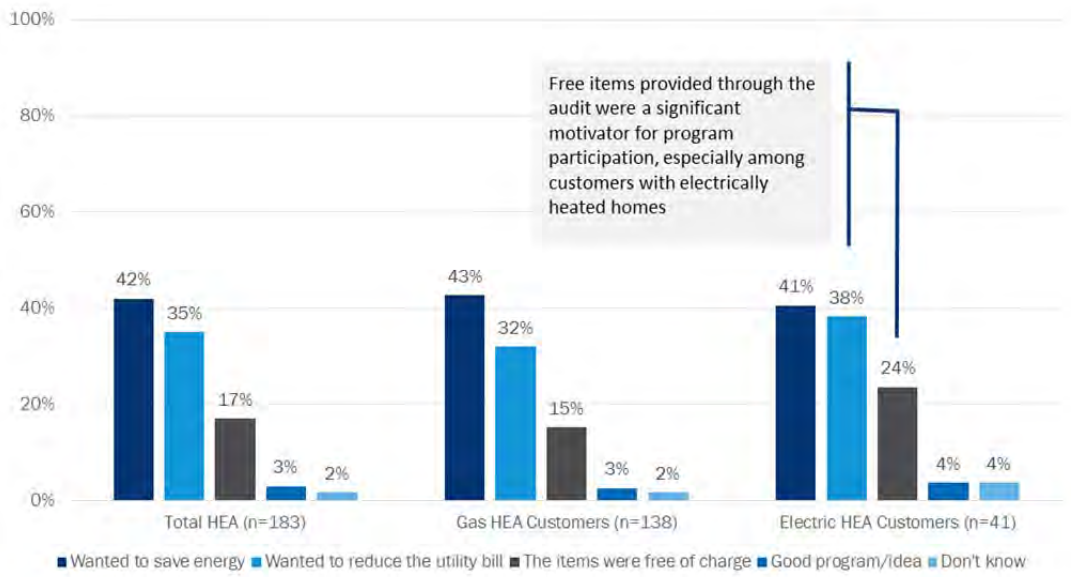
Figure 21: How Participants Learned of the HEA Program (Multiple Responses)



Note: Analysis excluded responses under 4%.

Respondents cited saving energy and reducing energy bills as their primary reasons for program participation. The availability of free measures also motivated some customers. Though the report presents overall findings as well as findings by electric and gas homes to reveal trends, samples sizes proved insufficient to detect significant differences.

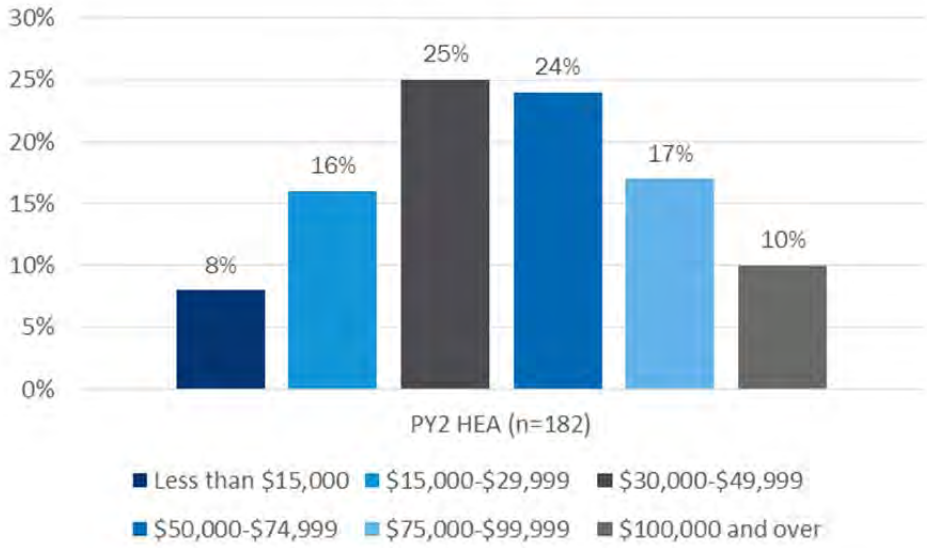
Figure 22: Reason for Participating in the HEA Program (Multiple Responses)



Note: Analysis excluded responses under 4%.

The Evaluation Team also collected basic demographic information from survey participants. For an individual, 200% of the 2013 federal poverty level (FPL [also known as the federal poverty guidelines]) equaled $22,980; for a family of four, it equaled $47,100. As shown in Figure 23, a number of participants receiving HEA audits still could have qualified for the LIW program, though this number was quite a bit lower than in PY1.

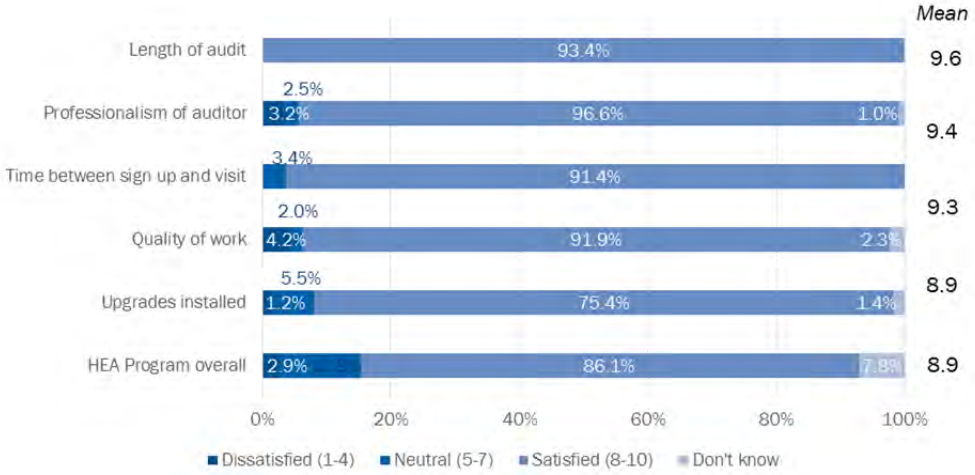
Figure 23: HEA Participant Reported Income Levels



3.7.2 CUSTOMER SATISFACTION

The program continued to produce high customer satisfaction levels. As shown in Figure 24, participants expressed the greatest satisfaction with the auditors' professionalism and the time required to complete the audit. Participants expressed the lowest satisfaction with measures provided through the program, though that program aspect still received a mean score of 8.9 on a 1 to 10 scale, indicating high satisfaction levels.

Figure 24: Satisfaction with Program Elements



Note: Questions only addressed respondents in the second survey wave.

Over 70% of HEA program participants reported nothing could be done to improve the program or they did not know of things to improve the program.

3.7.3 PROGRAM OPERATIONS

Auditor Training

Auditors completed a two-week training and then spent five to 10 days in the field with more experienced auditors. Training focused on: job requirements; company policies; audit procedures; tablet operations; and training on technical equipment used during the audits. In addition, supervisors held trainings for their teams and could select the topics they thought would most benefit their field staff. In PY2, auditor training emphasized the importance of installing as many measures as possible in the home at the time of the audit (not leaving measures behind uninstalled) and accurately capturing all installed measures in the tracking database.

The TPA reported expanding training efforts and adding enhancements to the Optimizer Tool (Optimizer) to provide feedback for auditors regarding energy savings achieved in each home, as evidenced by higher PY2 incidence rates. According to the auditor survey data, 82% of HEA auditors reported completing an audit in one to two hours, compared to 55% reporting this in PY1. Process improvements reduced the overall time, increasing the program's ability to serve more homes.

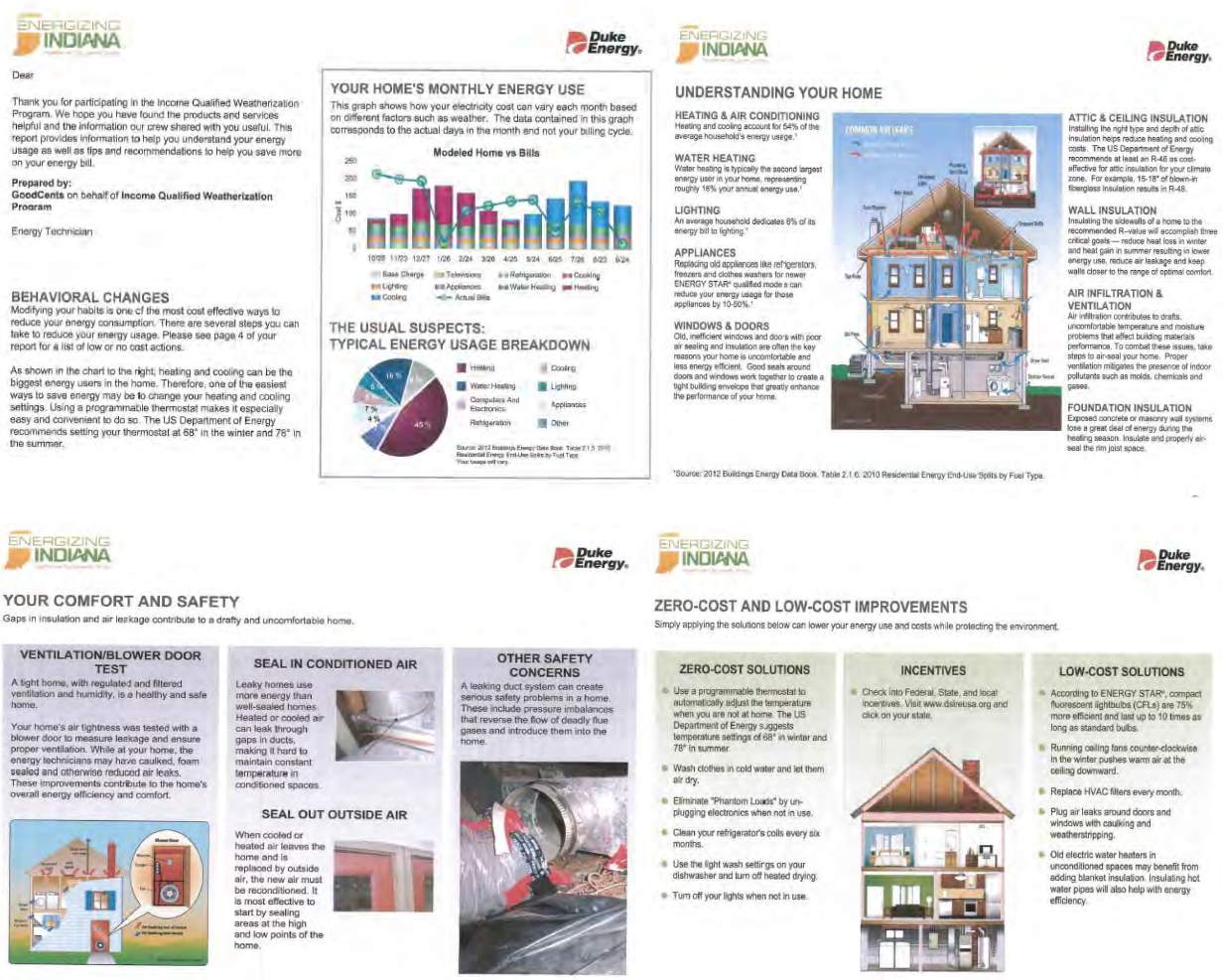
QA/QC Process

The TPA implemented several QA/QC mechanisms, including: on-site verifications of measure installations; review of Optimizer files; and compliance reporting requirements for field staff. Key indices reviewed in the quality processes included: field staff production (the number of homes served); and installation rates (the number of measures installed). Additionally, the TPA changed the interface, allowing auditors to determine the amount of energy savings that could be achieved within each home; thus, they could adjust their practices to meet measure installation targets.

Customer Participation Process

As in the previous past year, once a participant enrolled in the program, an appointment was scheduled for an auditor to visit the participant's home. While at the home, the auditor conducted a one- to two-hour audit and installed the prescribed measures. The homeowner received a report, including recommendations for additional steps they could take to improve their home's efficiency. Figure 25 provides an example of the audit report provided to customers during audit visits. A total of 98% of participants reported the program participation had been clearly explained to them.

Figure 25: Example of Audit Reports Provided to Customers



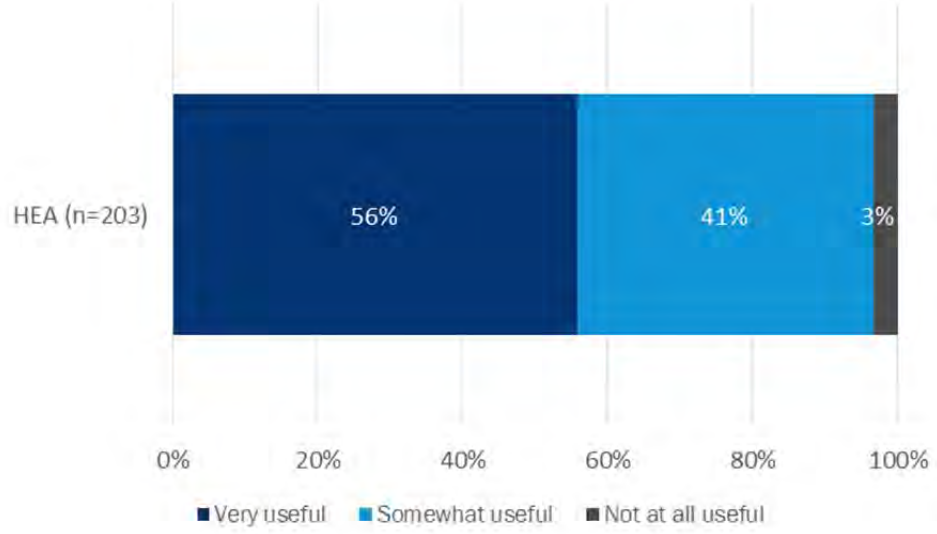
The Evaluation Team also conducted observations of audits where it appeared that auditors led visits in

a consistent manner with minor deviations, based on ease and preference that would not affect program outcomes and savings.

During observation visits and in survey data, auditors cited the large geographic area as a barrier to completing more program audits. The program, however, appeared to provide adequate statewide coverage.

Ninety-three percent of customers reported receiving an audit as a part of their program participation. Among this group, significant differences occurred between homeowners and renters.[12] Renters (83%) found information provided during the audit useful, compared to only 52% of homeowners. Although direct-install programs often target homeowners, renters also benefit from audit information and tips to reduce energy usage. Figure 26 shows how useful participants found the information provided during the audit.

Figure 26: Usefulness of the Information Provided During Audit



3.7.4 DATA AND TRACKING SYSTEMS

Database tracking improved over the course of PY2. The TPA initiated more thorough QA/QC procedures for data collection, which markedly reduced data quality issues over the course of 2013. Applied QA/QC procedures included: the introduction of regular field observations, with auditors shadowed during visits by supervisors; and the addition of post-audit visits, where a field supervisor returned to a home to confirm installation of measures recorded through the program-tracking software (the Optimizer). The TPA also reported increasing auditor training on use of the Optimizer through weekly check-in meetings, designed to address issues occurring in the field and to provide opportunities to streamline the program delivery process.

[12] Per the 2012 American Community Survey One-year Estimates, Indiana has 69.4% owner-occupied housing units and 30.6% renter-occupied housing units.

Program delivery changes also affected data collection. Prior to July 2013, the TPA noted the program-tracking software only allowed documentation of measures installed at the time of the audit, although some measures were left for future on-site installation by customers. Given this data collection approach, the Evaluation Team could not rely on program databases to accurately represent measures installed within homes between January and June 2013. From July 2013 forward, auditors did not leave uninstalled measures with the customer. All measures recorded in the Optimizer currently represent those received by the customer and installed during the audit visit, as confirmed through data gathered from the two surveys. Table 42 shows large increases in installations between Wave 1 and Wave 2, signifying that the quality of program track data improved due to the TPA not leaving measures behind and increased accuracy within the database.

Table 42. HEA Installation Rates by Waves

	Installation Rate by Waves		
HEA	CFL	Faucet Aerator	Showerhead
Wave 1	19%	39%	36%
Wave 2	93%	93%	85%

3.8 INSIGHTS AND RECOMMENDATIONS

For HEA, the Evaluation Team provides the following recommendations to increase participation and to target high-usage sockets to increase savings per home.

Conclusion 1: The HEA program significantly increased participation in PY2 compared to PY1 (more than a 200% increase), maintaining participation at an average of approximately 5,900 homes per month over the course of the year. Despite this, the HEA program did not reach its PY2 participation goals, reaching 84% of its goals while spending 90% of its budget.

Recommendation 1: Actively seek methods for increasing participation to meet annual (and three-year) goals. To increase participation in PY3, the TPA could undertake the following actions:

- ***Continue to increase HEA staffing resources*:** The TPA shifted staffing resources to the HEA program from the LIW program when it became clear that LIW would reach its participation goals. The TPA should consider: continuing to assign auditors to the HEA program (as the LIW program remains on track to meet its goals); and/or find other ways to increase the number of auditors in the field, thus reaching even more homes.
- ***Continue to seek geographic pockets to target*:** HEA reached more than 71,000 homes in PY2, and over 100,000 homes over the program's two years. Mapping PY1 and PY2 participants shows distributions of participating homes across the state, with deeper participation in urban areas. While the TPA uses ZIP codes to determine program saturation rates across the state, it could continue to analyze participation in the state, seeking potentially underserved areas. These findings, however, may reflect rural areas, which prove more difficult and costly to reach. Given these costs, it may prove more cost-effective to identify and target pockets of homes

within urban areas. (Notably, many auditors cited "windshield time" as a challenge faced in completing audits. Geo-targeting underserved areas also would reduce driving times.)[13]

- ***Target messaging and expand target*:** This program actively targets customers with electric water heating (as these customers achieve savings from aerators and showerheads). While the program has targeted such homes, it still achieves significant savings from homes with gas water heating/gas heated homes, primarily due to increases in the number of CFLs installed in PY2 and a more favorable WHF adjustment for these homes (i.e., gas-heated homes achieve more savings from CFLs). Homes with electric water heating should continue to be targeted, but, given the need for increased participation, broadening the target may increase overall participation. Customers reported learning of the program in three primary ways: canvassing, bill inserts, and letters/direct mail. These methods appeared even more effective among electrically heated homes (which tended to have electric water heating).

Conclusion 2: The TPA actively worked to increase savings per home in PY2 by increasing the number of bulbs per home and by ensuring (during the second part of the year) installations of measures provided to homes before leaving. Through this process, the TPA provided data related to room types in which CFLs were installed. These data were used to apply an HOU factor in the savings calculations. Continuing to increase savings per home can help meet overall savings goals.

Recommendation 2: Work to increase savings per home by targeting high-usage sockets and homes with electric water heat. The program should continue to target high-usage sockets while installing bulbs. Specifically, based on past research in Indiana, CFLs should be installed in dining rooms (3.08 hours per day), kitchens (2.95 hours), and living spaces (2.60 hours). This would require a small adjustment to the Optimizer, allowing for inclusion of dining rooms in the list of possible room types. Continuing to reach homes with electric water heating, thus allowing the program to realize more savings from faucet aerators and showerheads, would increase electric savings per home.

Conclusion 3. The TPA revised its planning assumptions between PY1 and PY2 to ensure meeting program targets. Several changes made mid-year increased the accuracy of the planning assumptions. In addition, expected CFL installation rates (using program tracking data) rose from 20% in the first half of the year to 93% in the later part of the year due to program model changes. While planning assumptions will never exactly match in-field conditions, analysis of energy-savings planning assumptions indicated overall assumptions proved valid, when taken together.[14] Moreover, the Evaluation Team anticipates that average CFL installation rates in PY3 will match higher rates in the second half of PY2 due to requirements that auditors install as many measures as possible and not leave measures behind uninstalled.

Recommendation 3. Continue use of existing planning assumptions, but revisit assumptions (particularly kW assumptions) prior to setting 2015 values. The Evaluation Team does not recommend

[13] Note that the Evaluation Team could help the Program Administrator with this area in PY3, though this would require coordinating closely with the Administrator and allocating resources to an early feedback process memo to aid the Administrator with targeting.

[14] *Ex-post*, per-unit savings for CFLs were lower than the planning assumptions, but *ex-post,* per-unit savings for showerheads and faucet aerators were higher, tending to cancel each other in providing similar per-home savings when using the measure-specific planning assumptions.

changes to HEA planning assumptions for PY3, as per-unit savings values may shift around as program implementation adjusts to changes. For Indiana, where Energizing Indiana enters only its third year, the Evaluation Team believes it may be prudent to wait until the end of the program year before making changes. If possible, a 2014 mid-year partial evaluation of the HEA measures should be performed, using the latest program tracking data. This would clarify whether differences seen in this year's *ex-post,* per-unit savings continue. If so, choices could be made to prospectively apply any updated values at the beginning of 2015. This would require shifting dollars between programs, as the current HEA evaluation budget does not address this.

4. LOW INCOME WEATHERIZATION

4.1 PROGRAM DESIGN AND IMPLEMENTATION

The LIW program provides walk-through audits and direct installations of energy-efficiency measures to single-family homeowners or renters with a total household income of up to 200% of the FPL. Specific target neighborhoods were identified using 2010 U.S. Census block data. All residents, regardless of income, within a qualified census block are eligible for the LIW program. Income-qualified homeowners or renters outside of the targeted census blocks also may participate by referral through a Community Action Program (CAP) agency. Though all single-family homes could take advantage of the Direct Install program, the program primarily targets high-usage customers with electric power. Customers are recruited for LIW participation through door-to-door canvassing, outreach through community action agencies, and various marketing strategies that rely on word-of-mouth connections.

The LIW energy auditors conduct a walk-through audit of participating customer homes to assess the home's energy performance. While on-site, auditors install energy-efficiency measures, conduct carbon monoxide and gas leak tests, and perform blower-door guided air sealing. Attic insulation may also be upgraded to R-48 after the initial walk-through assessment, if the home's existing attic insulation level falls below R-19. In addition, the customer receives a report about their home's energy use that suggests further actions to reduce the customer's energy consumption.

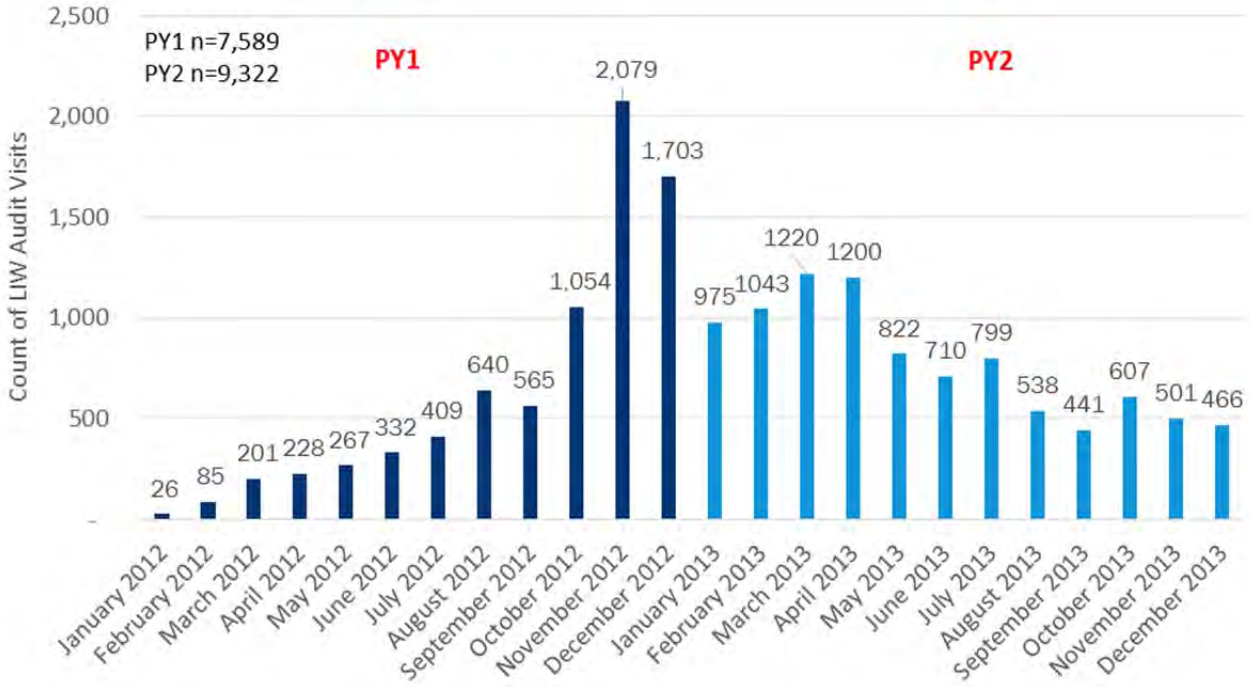
LIW program changes mirrored those in the HEA program. These included shifting the program delivery model in the middle of PY2. Interviews with program implementers indicated that, as of July 1, 2013, the program shifted from a model that provided an energy "kit" and left measures behind for the customers to install independently at a later date. The revised model requires the installation of as many measures as applicable and does not allow measures to be left behind uninstalled .

Besides the program model shifts, various measures were added or removed from each program's slate of offerings. As of July 1, 2013, auditors could install up to 20 CFLs in a participant's home, which was a change supported by the program's need for increased electric savings. Alternatively, water heater tank wrap and Smart Strips were removed from the program. Few customers received water heater tank wrap, and Smart Strip savings, based on the Indiana TRM, proved much lower than previously assumed by the TPA.

Over the course of PY2, database tracking significantly improved, with more measures and details regarding measure installation recorded in the database. Prior to July 1, 2013, the TPA noted the program database only documented measures installed at the time of the audit; yet some measures were left at the site for later installation by customers. To close this data gap, program delivery in the second half of PY2 changed to prevent leaving measures behind; so the database would reflect the measures actually installed at the time of the audit.

Since the initial ramp up of audit visits in late PY1, the TPA has maintained the number of LIW visits completed each month over the course of PY2. Figure 27 shows the number of LIW audits completed in each month during PY1 and PY2. In the second half of PY2, auditors shifted from the LIW program to the HEA program as the LIW program safely remained on track to meet its goals, and the HEA program required increased audit activity.

Figure 27: LIW Audits Completed by Month



Note: The figure represents the number of homes appearing in the program database. Differences may occur from the reported (*ex-ante*) number of completions.

4.2 EM&V METHODOLOGY

Evaluation of the Direct Install Low Income Weatherization program included impact and process elements. Table 43 provides an overview of tasks used for evaluating the program.

Table 43: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• Interviewed Implementation manager.
Auditor Surveys	• Conducted a survey of program auditors. • Conducted ride-along observations and in-depth interviews with program auditors.
Program Database Review/ Verification	• Reviewed the participant data tracking database.
Program Materials Review	• Reviewed materials to assess marketing and outreach efforts.
Participant Interviews	• Conducted telephone surveys with 189 program participants. • Conducted follow-up surveys with 100 PY1 program participants to revisit energy kit receipt and installation.
Impact Analysis	• Verified reported measure installations in the program database. • Calculated installation and persistence rates through participant interviews. • Performed engineering calculations for installed measures. • Estimated NTG (freeridership and spillover) based on self-reported data from participant interviews.

As with HEA, for the PY2 evaluation of the LIW program, the Evaluation Team moved to a measure-level approach, as opposed to a "per home" approach. Several factors guided that decision:

- First, due to the TPA's move toward a measure-level savings approach for PY3, shifting the evaluation approach allowed the Evaluation Team to make better year-over-year comparisons.
- Second, midway through PY2, the TPA changed the program delivery model from a "kit-based" model, whereby all participants received the same kit of measures, to a model where auditors could install up to 20 CFLs in a home and did not leave measures behind for participants to install later. This change to program delivery meant savings achieved in each home would vary, depending on whether measures installed in the home made the "per home" value obsolete.

4.2.1 SAMPLING DESIGN

The Evaluation Team developed a sampling plan, designed to produce telephone survey findings at a precision level of ±10% and 90% confidence. Interviews with program participants were conducted in two waves over the course of PY2 to acknowledge changes in program delivery. The Evaluation Team conducted the first wave of the participant survey in September 2013, and included customers receiving audit visits between January and June 2013. The second wave of the survey was conducted in January 2014 and included customers receiving audit visits between July and November 2013.

As a part of the LIW program evaluation, the Evaluation Team attempted to conduct a census among LIW auditors through use of an online survey addressing the program's process and design.

Table 44 presents the sample frame, response, and cooperation rates for each survey effort.

Table 44: Auditor and Participant Survey Sample Design

Action	Population	Completions	Response Rate	Cooperation Rate
On-line Auditor Surveys	42	16	41%	N/A
Telephone Participant Interviews	8,479	189	9%	41%

4.3 *PROGRAM PERFORMANCE*

Table 45 shows how reported program performance compared to goals established in program planning. Savings reported by the program do not reflect adjustments made due to the evaluation.

Table 45: *Ex-Ante* Results by Utility and Statewide

	kWh			kW			Therms		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	3,819,416	3,912,000	102%	1,649	1,689	102%	211,176	109,610	52%
I&M	2,115,088	2,115,088	100%	913	913	100%	0	0	NA
IPL	1,284,440	1,305,304	102%	555	564	102%	0	0	NA
IMPA	391,200	395,112	101%	169	171	101%	0	0	NA
NIPSCO	2,773,608	2,789,256	101%	1,197	1,204	101%	267,364	268,872	101%
Vectren	1,609,136	1,624,784	101%	695	702	101%	155,114	156,622	101%
Statewide	**11,992,888**	**12,141,544**	**101%**	**5,177**	**5,242**	**101%**	**633,654**	**535,104**	**84%**

As shown in Table 46, the program met its participation goals in terms of numbers of homes served.

Table 46: Number of Homes Served by the LIW Program

	Number of Homes		
	Goal	Reported	% Achieved
Duke	2,929	3,000	102%
I&M	1,622	1,622	100%
IPL	985	1,001	102%
IMPA	300	303	101%
NIPSCO	2,127	2,139	101%
Vectren	1,234	1,246	101%
Statewide	**9,197**	**9,311**	**101%**

4.4 PROGRAM BUDGET AND EXPENDITURES

Table 47 shows PY2 program budgets and expenditures reported at the conclusion of 2013. The program slightly exceeded its allotted budget. Utility-specific budget expenditures ranged from 100% to 102% of the goal.

Table 47: Program-Level Budget and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$2,289,358	$2,344,853	102%
I&M	$1,240,711	$1,240,711	100%
IPL	$770,664	$783,182	102%
IMPA	$235,346	$237,699	101%
NIPSCO	$1,626,444	$1,635,620	101%
Vectren	$970,792	$980,232	101%
Statewide	$7,133,314	$7,222,297	101%

4.5 EX-ANTE ENERGY SAVINGS

Ex-ante savings equaled savings reported by the program, compared to goals set forth in program planning. Table 48 provides statewide *ex-ante* savings for the LIW program, and Table 49 provides utility-level *ex-ante* savings.

Table 48: LIW *Ex-Ante* Savings Statewide

2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goal	2013 Therm *Ex-Ante*	% of Therm Goals
11,992,888	12,141,544	101%	5,177	5,242	101%	633,654	535,104	NA

Table 49: LIW *Ex-Ante* Savings By Utility

Utility	2013 kWh Goal[1]	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal[1]	2013 kW *Ex-Ante*	% of kW Goals	2013 Therm Goal	2013 Therm *Ex-Ante*	% of Therm Goal
Duke	3,819,416	3,912,000	102%	1,649	1,689	102%	211,176	109,610	52%
I&M	2,115,088	2,115,088	100%	913	913	100%	0	0	NA
IPL	1,284,440	1,305,304	102%	555	564	102%	0	0	NA
IMPA	391,200	395,112	101%	169	171	101%	0	0	NA
NIPSCO	2,773,608	2,789,256	101%	1,197	1,204	101%	267,364	268,872	101%
Vectren	1,609,136	1,624,784	101%	695	702	101%	155,114	156,622	101%

4.6 *IMPACT ANALYSIS*

This evaluation effort included an engineering analysis of: *ex-ante* energy savings claimed; a database review of measure quantities installed in each home; and a survey of participating customers to determine if behavioral elements related to the energy savings (such as the removal of measures or the installation of measures outside of the program).

4.6.1 AUDITED SAVINGS

The impact evaluation process first reviewed the program database and the total number of reported measures installed during audits and through canvassing activities. As noted, the PY2 evaluation approach drew upon the actual number of measures installed, as opposed to applying a uniform, per-home value across all treated homes. Table 50 shows measures installed by the program in participant homes, as they appeared in the program database.

Table 50: Audited Measure Quantities

	Measures in Database						
	Duke	I&M	IPL	IMPA	NIPSCO	Vectren	Statewide
CFLs	31,505	16,504	10,787	2,866	26,264	14,978	102,904
Pipe Wrap	1,637	1,160	751	217	1,808	1,009	6,582
Energy-Efficient Showerhead	2,057	1,139	634	158	1,599	705	6,292
Faucet Aerators	3,657	2,664	1,409	470	3,875	1,992	14,067
Tank Wrap	14	5	36	-	1	1	57
Infiltration Reduction	871	458	723	146	1,027	878	4,103
Attic Insulation	475	31	169	7	371	366	1,419
Audit Recommendations	3,015	1,625	1,003	289	2,142	1,248	9,322

CFLs were the measures most frequently installed in homes. As noted, the program eliminated tank wrap, thus the database includes few incidences of that measure. The measure quantity installed in homes was multiplied by *ex-ante* (unevaluated) savings claimed per unit to arrive at the program's audited energy savings, as shown in Table 51.

Table 51: Audited Energy Savings from Direct-Install Measures

	Audited kWh	Audited KW	Audited Therms
Duke	4,037,478	1,270	224,688
I&M	2,079,052	691	110,799
IPL	1,352,993	447	144,498
IMPA	381,077	133	24,264
NIPSCO	3,082,239	806	286,188
Vectren	1,787,478	504	207,970
Statewide	**12,720,318**	**3,851**	**998,405**

4.6.2 VERIFIED SAVINGS

After determining audited savings, the Evaluation Team compared database results to results customers reported during the participant survey. Adjustments to audited savings included changes to the numbers of installed measures and changes for customers removing measures after the audits. These adjustments took place at a statewide level, as opposed to a utility level, as the sample size of survey participants had to be significant at the statewide level for the first year and at the utility level over the course of the three-year evaluation effort. Table 52 shows adjustments for installation rates and measure removals.

Table 52: Statewide Verification Adjustments

	Statewide Installation Rate	Statewide Persistence
CFLs	79%	99%
Pipe Wrap	100%	100%
Low-Flow Showerhead	80%	95%
Faucet Aerators	91%	99%
Tank Wrap	100%	100%
Air Sealing	100%	100%
Attic Insulation	100%	100%
Audit Recommendations	100%	100%

The installation rates indicated customers confirmed the majority of measures reported installed during audits had actually installed. Additionally, persistence rates indicated that, once measures had been installed in the home, customers tended to leave them in place.

Table 53 shows utility and statewide verified energy savings.

Table 53: Audited and Verified Savings

	Audited kWh	Verified kWh	Audited kW	Verified kW	Audited Therms	Verified Therms
Duke	4,037,478	3,105,012	1,270	1,017	224,688	92,634
I&M	2,079,052	1,748,559	691	558	110,799	61,325
IPL	1,352,993	1,154,136	447	371	144,498	142,973
IMPA	381,077	326,832	133	108	24,264	23,871
NIPSCO	3,082,239	2,595,228	806	672	286,188	282,307
Vectren	1,787,478	1,531,593	504	429	207,970	206,226
Statewide	**12,720,318**	**10,461,359**	**3,851**	**3,155**	**998,405**	**809,337**

The realization rate equals the percentage of *ex-ante* savings verified through this evaluation step. Table 54 shows verified savings and utility-specific realization rates.

Table 54: Verified Realization Rates

	Verified kWh	*Ex-Ante* kWh	Realization Rate	Verified kW	*Ex-Ante* kW	Realization Rate	Verified Therms	*Ex-Ante* Therms	Realization Rate
Duke	3,105,012	3,912,000	79%	1,017	1,689	60%	92,634	109,610	85%
I&M	1,748,559	2,115,088	83%	558	913	61%	61,325	0	NA
IPL	1,154,136	1,305,304	88%	371	564	66%	142,973	0	NA
IMPA	326,832	395,112	83%	108	171	63%	23,871	0	NA
NIPSCO	2,595,228	2,789,256	93%	672	1,204	56%	282,307	268,872	105%
Vectren	1,531,593	1,624,784	94%	429	702	61%	206,226	156,622	132%
Statewide	10,461,359	12,141,544	86%	3,155	5,242	**60%**	**809,337**	**535,104**	**NA**

Additionally, the TPA conducted activities in PY1 that could not be included in the PY1 energy savings, but could be included in PY2 savings. For the residential LIW program, these savings occurred for CFLs left behind in homes and not installed at the time of PY1 audits. As mentioned in the HEA section, several studies have shown up to 99% of stored bulbs are installed within a few years of purchase, causing savings to take place several years after the initial purchase. This indicates the program should realize additional credits for light bulbs left behind with customers for future installation.

To calculate "PY1 Carryover" savings, the Evaluation Team calculated measures left behind in homes by subtracting the PY1 utility-specific incidence rates from the quantity of CFLs included in the kits (nine). The resulting number of CFLs left behind in homes could then be multiplied by the number of homes served by the program in PY1.

To determine the portion of CFLs left behind that would likely be installed in PY2, the Evaluation Team used the UMP-recommended method, which notes most bulbs placed into storage (99%) subsequently become installed within two years. The Evaluation Team applied a 55% installation rate for PY1 left-behind CFLs installed in PY2, and will apply a 44% installation rate for the installation of PY1 left-behind CFLs in PY3. Table 55 summarizes additional carryover savings from bulbs purchased in PY1 but installed in PY2.

Table 55: Verified PY1 Carryover Savings from CFLs Left Behind in Homes

	Quantity	Installation Rate	Verified Quantity	Verified Carryover kWh	Verified Carryover KW
Duke	2,900	55%	1,595	91,137	51
I&M	512	55%	282	16,257	10
IPL	1,052	55%	579	32,739	17
IMPA	329	55%	181	10,615	7
NIPSCO	329	55%	181	9,788	4
Vectren	469	55%	258	13,957	5
Statewide	**5,591**		**3,075**	**174,494**	**95**

Table 56 and Table 57 show verified energy savings, including PY2 measures installed and PY1 carryover savings.

Table 56: Verified PY2 and PY1 Carryover Savings (kWh)

	PY2 Verified kWh	PY1 Carryover kWh	Total Verified
Duke	3,105,012	91,137	3,196,149
I&M	1,748,559	16,257	1,764,816
IPL	1,154,136	32,739	1,186,875
IMPA	326,832	10,615	337,447
NIPSCO	2,595,228	9,788	2,605,016
Vectren	1,531,593	13,957	1,545,550
Statewide	**10,461,359**	**174,494**	**10,635,852**

Table 57: Verified PY2 and PY1 Carrover (kW)

	PY2 Verified kW	PY1 Carryover kW	Total Verified kW
Duke	1,017	51	1,069
I&M	558	10	568
IPL	371	17	388
IMPA	108	7	115
NIPSCO	672	4	676
Vectren	429	5	434
Statewide	**3,155**	**95**	**3,250**

4.6.3 *EX-POST* SAVINGS

Ex-post savings reflect engineering adjustments made to *ex-ante* measure savings claimed by the program. Discussions of the engineering analyses for each measure included in the HEA program follow.

CFLs

Unlike in PY1, the Evaluation Team estimated *ex-post* savings based on more detailed information from the program tracking database. Specifically, analysis included the wattage of the actual bulb removed and the bulb installed, along with the location of the bulb. The program tracking database also included information on the presence of a central air conditioner and the fuel type for space heating. This information proved critical to correctly applying the WHF. If the space heat type could not be determined and if a central air conditioning was present, weighted average values applied. Applications of the various wattages and HOU resulted in *ex-post*, per-unit savings lower than assumed within the *ex-ante* estimate.

Showerheads

Savings from low-flow showerheads varied, depending on the number of people using the shower and the length of showers taken. Similarly to CFL calculations, determination of savings this year included more detailed information about each home, with the measures installed. Specifically, the Evaluation Team included the number of people within each household in the algorithm used. Additionally, since the last evaluation, Michigan has funded a large research effort to gather information on how people

use their showers and faucets.[15] Decreasing three parameters (e.g., minutes per day of a shower, showers per day per person, and mixed water temperature) caused expected savings to fall by about 28%, while increasing the household numbers led to a rise of about 10% of average savings. PY1 savings ranged from 441 to 516, while PY2 savings ranged from 303 to 416.

Faucet Aerators

As with showerheads, the Evaluation Team included information from the recent Michigan water study, data from the Indiana TRM, Indiana Residential Market Baseline 2012, and the Domestic Hot Water Event Scheduler Generator (published by NREL) to develop savings for faucet aerators. The Evaluation Team changed four parameters between PY1 and PY2. Increasing three parameters (e.g., minutes per day per person for kitchen faucets, mixed water temperature, and number of occupants per home) caused the expected kitchen savings to increase substantially (by around 270%). Increasing the mixed water temperature and number of occupants, while decreasing the minutes per day per bathroom faucet, increased average bathroom savings, though by a smaller amount (about 115%). Per-unit kWh savings in PY1 ranged from 68.1 to 97.8, an average reflecting the number of different kitchen and bathroom aerators installed in homes in PY1. PY2 per-unit savings ranged from 155 to 255 kWh.

Water Heater Tank Wrap

The TPA discontinued inclusion of tank wrap measures in PY2, but, simply due to timing, PY2 estimates include a few measures. The Evaluation Team did not spend time on this measure, given the low incidence and very low savings, but applied the same algorithm and inputs as in PY1.

In PY1, the Evaluation Team reviewed algorithms and assumptions for hot water tank wrap from various references, including the 2010 Ohio TRM, the Indiana TRM, and the Mid-Atlantic TRM. The program did not install water heater tank wrap blankets for participants with gas water heaters because of combustion safety concerns. Savings only were calculated for electric water heaters. The same per-unit value applied for all utilities, as the savings calculations derived from an increase in efficiency resulting from the added tank wrap insulation.

Infiltration Reduction

The Evaluation Team used the same algorithms and data inputs for calculating infiltration reduction savings for PY1 and PY2. Specifically, these included data from the program tracking database and engineering algorithms to determine *ex-post* savings from infiltration reduction. The *ex-post*, per-home estimates did not compare well to the TPA per-home estimates, simply due to the method used to categorize each savings estimate. The TPA tracked per-home savings from these measures, based on the space heat type and whether the home had a central air conditioner. This also matched methods for estimating savings. *Ex-ante* estimates, however, appeared low. For PY2, evaluation savings from insulation achieved 208% of the *ex-ante* estimate[16] (i.e., a 368 kWh home for the *ex-post* estimate compared to 177 kWh per home for the *ex-ante* estimate).

[15] Findings from this research, while publicly available, are not available online. If stakeholders wish to obtain this research, the Evaluation Team can provide the documentation.
[16] Based on the location of the insulation and the home's HVAC configuration.

Attic Insulation

As with infiltration reduction, the Evaluation Team used the same algorithms and data inputs for calculating attic insulation savings in PY1 and PY2. Specifically, calculations used data from the program tracking database and engineering algorithms to determine *ex-post* savings from attic insulation. For the first half of the year, the TPA per-home savings from insulation included infiltration reduction, while, in the second half of the year, the TPA included all attic insulation with its own per-home estimate. For PY2, evaluation savings from infiltration reduction were 95% of the *ex-ante* estimate, using per-home estimates across the entire year (i.e., 470 kWh home for the *ex-post* estimate, compared to the 497 kWh per home *ex-ante* estimate). The *ex-ante*, per-unit savings value for insulation in the second half the year (438.6 kWh per home) fell slightly below the Evaluation Team's estimate.

Table 58: PY2 *Ex-Post* Savings (Includes PY1 Carryover)

	Ex-Post kWh	*Ex-Post* kW	*Ex-Post* Therms
Duke	2,721,484	323	186,860
I&M	1,718,316	176	117,695
IPL	1,411,323	205	149,033
IMPA	346,928	40	24,376
NIPSCO	2,654,471	418	250,052
Vectren	1,795,702	512	182,639
Statewide	**10,648,224**	**1,674**	**910,654**

4.6.4 NET SAVINGS

Net savings reflect the application of the program NTG ratio to *ex-post* energy savings. As identified in the Core Evaluation Plan,[17] NTG analysis refers to: "the analytical process associated with isolating the savings that are caused by a program's efforts from the savings that are caused by other market forces." Evaluations of low-income programs typically assume very few, if any, energy-efficiency improvements would be made in the program's absence. This assumes low-income customers generally would not have the discretionary income (and thus have difficulty in securing a loan) to install these measures on their own. Per the evaluation plan developed in December 2011, the Evaluation Team assigned a 1.0 (100%) NTG ratio to all program measures and did not ask freeridership or spillover questions in the participant survey.

Table 59: LIW PY2 Net Energy Savings (Includes PY1 Carryover)

	Net kWh	Net kW	Net Therms
Duke	2,721,484	323	186,860
I&M	1,718,316	176	117,695
IPL	1,411,323	205	149,033
IMPA	346,928	40	24,376
NIPSCO	2,654,471	418	250,052
Vectren	1,795,702	512	182,639
Statewide	**10,648,224**	**1,674**	**910,654**

[17] Submitted to the DSMCC on November 14, 2012.

4.6.5 SUMMARY OF IMPACT ADJUSTMENTS

Table 60 shows all adjustments made to energy savings claimed by the programs. *Ex-post* and Net savings include PY1 carryover.

Table 60: Energy Savings Adjustments (kWh)

	~~Planned~~ kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh(1)	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	3,819,416	3,912,000	4,037,478	3,105,012	79%	2,721,484	2,721,484
I&M	2,115,088	2,115,088	2,079,052	1,748,559	83%	1,718,316	1,718,316
IPL	1,284,440	1,305,304	1,352,993	1,154,136	88%	1,411,323	1,411,323
IMPA	391,200	395,112	381,077	326,832	83%	346,928	346,928
NIPSCO	2,773,608	2,789,256	3,082,239	2,595,228	93%	2,654,471	2,654,471
Vectren	1,609,136	1,624,784	1,787,478	1,531,593	94%	1,795,702	1,795,702
Statewide	**11,992,888**	**12,141,544**	**12,720,318**	**10,461,359**	**86%**	**10,648,224**	**10,648,224**

(1) Verified savings do not include PY1 carryover.

Table 61: Demand Savings Adjustments (kW)

	~~Planned~~ kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	1,649	1,689	1,270	1,017	60%	323	323
I&M	913	913	691	558	61%	176	176
IPL	555	564	447	371	66%	205	205
IMPA	169	171	133	108	63%	40	40
NIPSCO	1,197	1,204	806	672	56%	418	418
Vectren	695	702	504	429	61%	512	512
Statewide	**5,177**	**5,242**	**3,851**	**3,155**	**60%**	**1,674**	**1,674**

Table 62: Therm Savings

	~~Planned~~ Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Therms	Net Therms
Duke	211,176	109,610	224,688	92,634	85%	186,860	186,860
I&M	0	0	110,799	61,325	NA	117,695	117,695
IPL	0	0	144,498	142,973	NA	149,033	149,033
IMPA	0	0	24,264	23,871	NA	24,376	24,376
NIPSCO	267,364	268,872	286,188	282,307	105%	250,052	250,052
Vectren	155,114	156,622	207,970	206,226	132%	182,639	182,639
Statewide	**633,654**	**535,104**	**998,405**	**809,337**	**NA**	**910,654**	**910,654**

Table 63: Lifetime Savings Achieved

Utility	Lifetime *Ex-Post* kWh	~~Lifetime *Ex-Post* kW~~	~~Lifetime *Ex-Post* Therms~~
Duke	32,892,744		
I&M	18,306,585		
IPL	15,656,523		
IMPA	4,039,140		
NIPSCO	23,315,360		
Vectren	20,072,673		
Statewide	114,283,026		

Overall, verified kWh savings were slightly lower than *ex-ante* kWh savings reported by the program. Key changes were made to savings made during this step, including increases in savings due to the measure-by-measure analysis, which more accurately reflected measures installed in the homes. This, however, was reduced by the application of the installation and persistence rates. Additionally, in PY2, the TPA reduced infiltration in electrically space-heated homes for 5% of homes touched by the program, when the original plan anticipated reaching 13%. This reduced savings somewhat. Ultimately, verified savings were 86% of *ex-ante* reported savings.

These verified savings were then reduced during the *ex-post* evaluation, largely due to the reduction of per-unit savings for CFLs and showerheads. Ultimately, *ex-post* net kWh savings were 87% of *ex-ante* reported savings.

Unlike kWh savings, kW savings were much lower than *ex-ante* kW savings reported by the program. Differences in the savings values included: decreases in savings due to the measure-by-measure analysis, which more accurately reflected the measures installed in the homes; and another reduction from the application of the installation and persistence rates. Ultimately, verified kW savings were 60% of *ex-ante* reported savings.

These verified savings were then reduced during the *ex-post* evaluation, primarily due to the reduction of per-unit savings for CFLs and showerheads. Ultimately, *ex-post* kW savings were 32% of *ex-ante* reported savings.

4.7 PROCESS ANALYSIS

The PY2 process analysis for the LIW program drew upon data from: a participant survey (administered in two waves); an online survey of program auditors; ride-alongs with auditors; interviews with the TPA; and a review of program databases. Participant surveys asked questions regarding: how participants learned of the program; awareness of ways to save energy; program satisfaction levels; and the program's participation processes. Auditor interviews and ride-alongs explored: areas of program training; the audit process; participant perceptions; and health and safety issues. The Evaluation Team also interviewed the TPA to discuss program goals, changes from PY1, operations, strengths, and challenges.

4.7.1 PROGRAM MARKETING

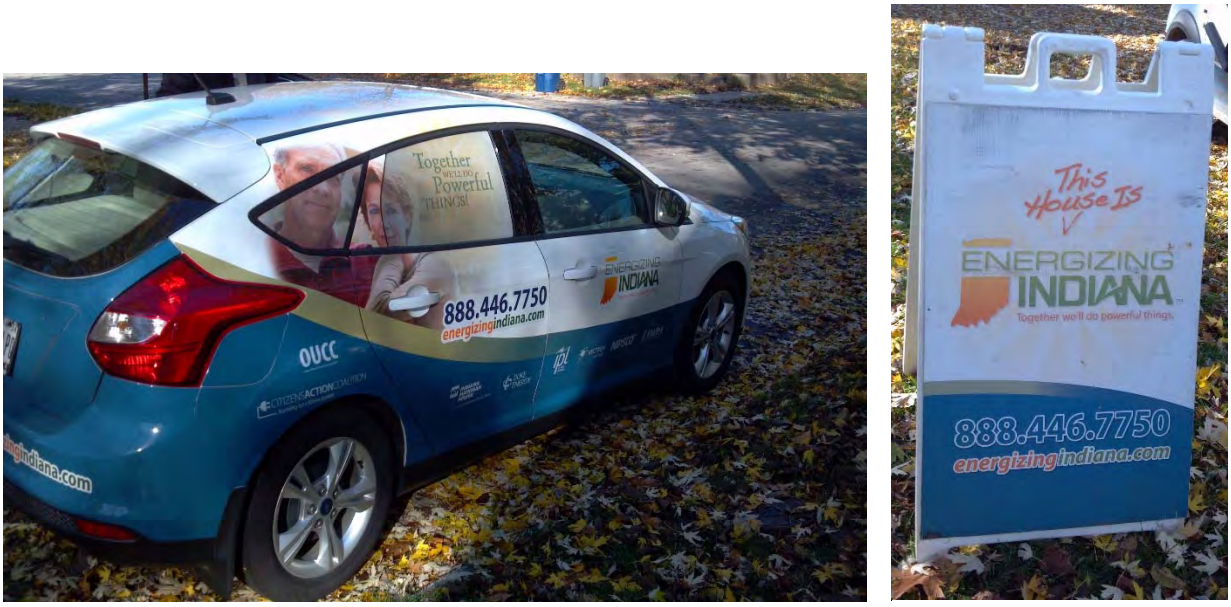
The LIW program targets single-family homeowners or renters with a total household income of up to 200% of the FPL ($47,100 for a family of four), with specific target neighborhoods identified using 2010 U.S. Census block data. All residents, regardless of income, within a qualified census block are eligible for the LIW program. Income qualified homeowners or renters outside of the targeted census blocks may also participate by referral through a CAP agency.

The TPA marketed the program through a number of CAP Agencies, community, and non-profit organizations, with community partners awarded $25 dollars for each recruited participant,[18] and through neighborhood canvassing, bill inserts, and the Internet. The LIW program also utilized street

[18] Organizations may receive up to $25,000 per program year.

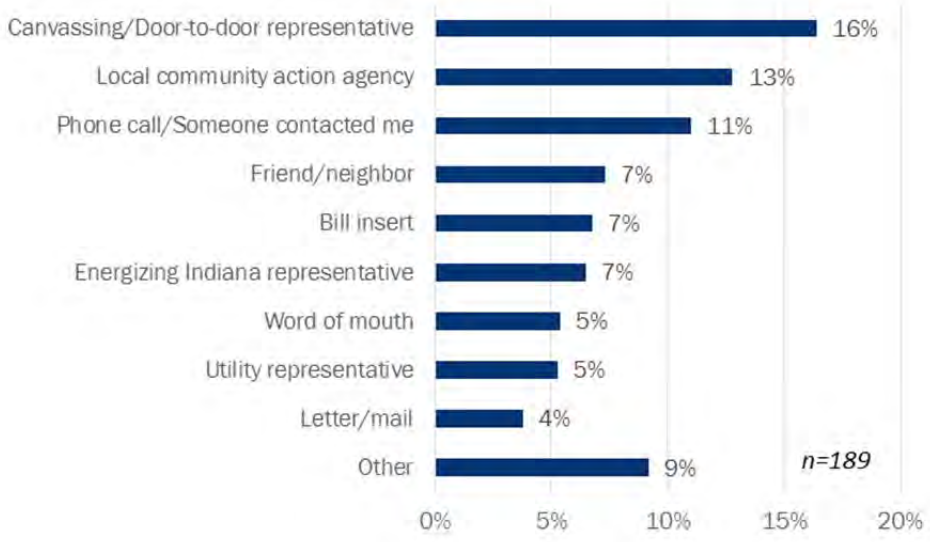
marketing during audit visits: auditors drove program-branded vehicles and placed program-branded sandwich boards in front of homes receiving a program audit. Figure 28 shows on-site branding employed by the LIW program.

Figure 28: Energizing Indiana Branding Used During LIW Audits



LIW participants most often learned of the program through canvassing/door-to-door representatives, local community action agencies, and other contacts from program representatives. Figure 29 shows how survey respondents reported learning of the program.

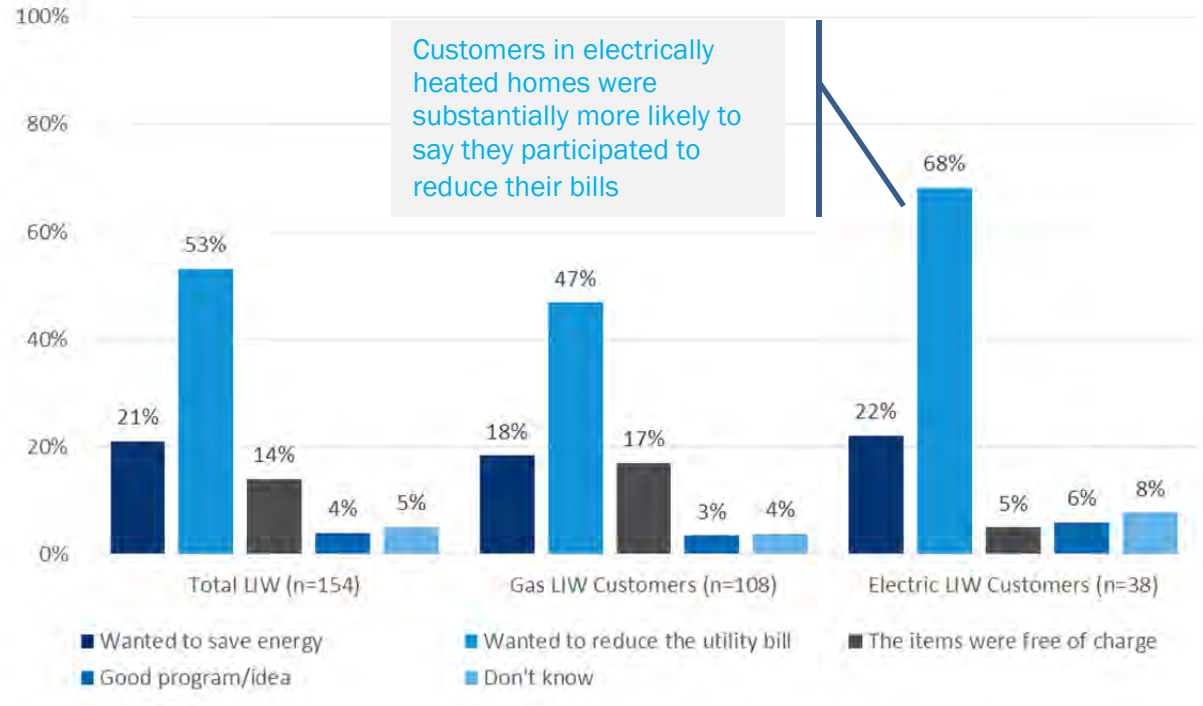
Figure 29: How Customers Heard about the LIW Program (Multiple Responses)



Participants primarily reported participating in the LIW program to reduce utility bills. Participants in the second half of PY2 also reported wanting to save energy and to receive free items as their top reasons

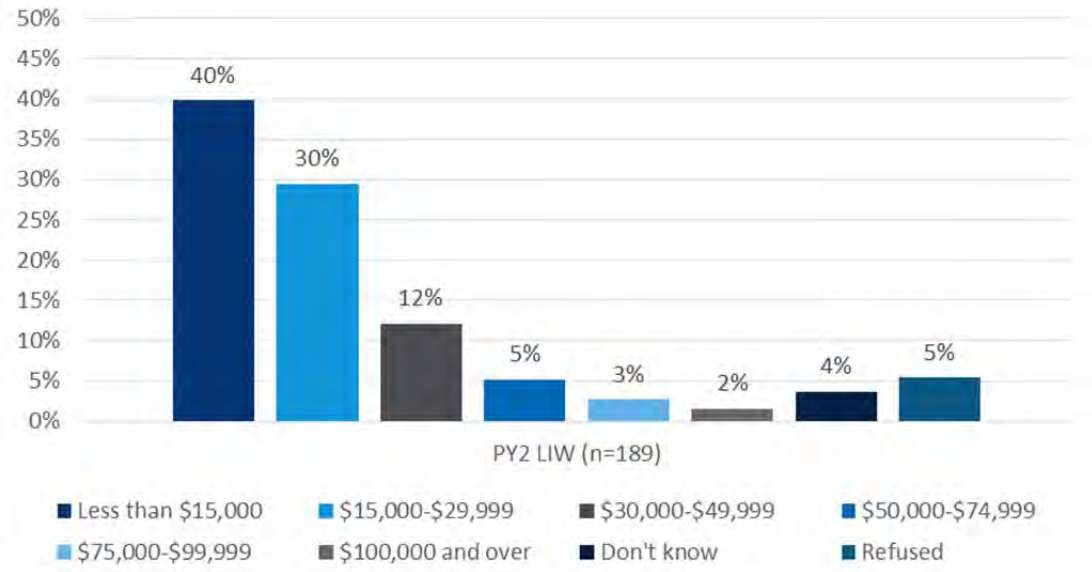
for participating (as shown in Figure 30). Customers with electrically-heated homes appeared to be more motivated to participate by reducing their energy bills than those with gas-heated homes, though the sample size was not large enough to detect a statistically significant difference.

Figure 30 : Reasons for Participating in the LIW Program (Multiple Responses)



The Evaluation Team also collected basic demographic information from survey participants. As shown in Figure 31, some participants receiving LIW audits likely fell outside of the income groups intended for the program, a finding consistent with the planned delivery approach of targeting by community. These percentages were slightly higher in PY2 than in PY1, but remained fairly low overall, indicating the program reached its target audience.

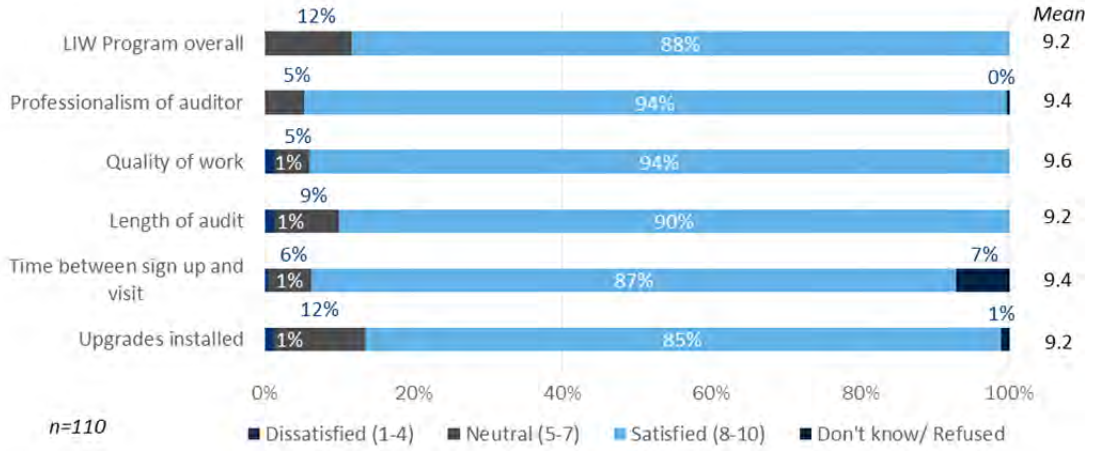
Figure 31: LIW Participant Reported Income Levels



4.7.2 CUSTOMER SATISFACTION

LIW program participants reported very high satisfaction levels, rating the program a 9.2 mean satisfaction score on a scale of 1 to 10. Figure 32 shows participant satisfaction with various program elements. Participants expressed the greatest satisfaction with the auditor's professionalism and the least with measures installed through the audit (although all program elements scored at least a 9.2 mean).

Figure 32: Satisfaction with LIW Program Elements



Note: Questions only asked of respondents during the survey's second wave.

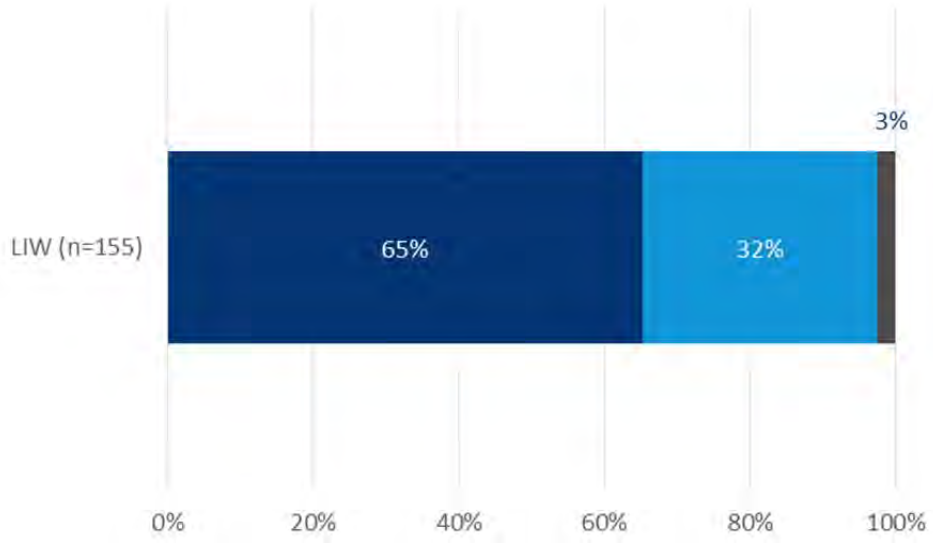
4.7.3 PROGRAM OPERATIONS

As with the HEA program, actual program operations changed little over the course of PY2. LIW audits clearly resembled those conducted for the HEA, except they included a blower door test, air sealing, and, in some cases, attic insulation. If attic insulation was included, following the audit, the auditor scheduled measure installations with the homeowner and a contractor working on the program's behalf. Auditors reported audits took three to four hours to complete, depending on a home's condition. Across the board, LIW auditors reported that inaccessible parts of a home presented the principal barrier in installing measures and completing air-sealing.

Additionally, program staff reported a key challenge in the rate of audit deferrals, which occurred when an audit could not be completed until remediation of a health or safety issue. For example, as the LIW program involved air sealing, auditors deferred this action if a home had high carbon monoxide levels. Gas leaks also often resulted in LIW audit deferrals.

As noted, participants generally expressed strong satisfaction with the program, with 97% of participants reporting the participation clearly explained. Approximately 93% of interviewed LIW participants reported the auditor discussed the assessment findings with them. Figure 33 shows LIW participants generally found the information provided to them during the assessment useful.

Figure 33: Usefulness of Information Provided During Audit



4.7.4 DATA AND TRACKING SYSTEMS

Over the course of PY2, database tracking improved. The TPA initiated more thorough QA/QC procedures for data collection, which markedly reduced data quality issues over the course of 2013. Applied QA/QC procedures included the introduction of regular field observations, where supervisors shadowed auditors during visits, and the addition of post-audit visits, where a field supervisor returned to a home to confirm installation of measures recorded through the Optimizer program-tracking software. The TPA also reported increasing auditor training on use of the Optimizer through weekly check-in meetings, designed to address issues encountered in the field and opportunities for streamlining the program delivery process.

Program delivery changes also affected data collection. The TPA noted that, before July 2013, the program tracking software only required documentation of measures installed at the time of the audit; yet it was confirmed that some measures were left at sites for future installation by customers. From July 2013 forward, auditors received instructions to only install program measures and not to leave them uninstalled with the customer. In this case, measures recorded in the Optimizer represented both those received by the customer and installed during the audit visit.

4.8 INSIGHTS AND RECOMMENDATIONS

The LIW program met its participation and energy savings goals and appears to operate well. The TPA made many improvements in PY2, including enhanced QA/QC processes and improved data tracking. The Evaluation Team found little that the program could improve upon. The following suggestions may prove helpful but not imperative to the program's continued success.

Conclusion 1: The TPA actively worked to increase savings per home in PY2 by increasing the number of bulbs per home and by ensuring (in the second part of the year) installation of measures provided to homes before leaving the site. Through this process, the TPA provided data related to room types in which CFLs were installed, and applied these data to the HOU factor in the savings calculations. Continuing to increase savings per home can help meet overall savings goals.

Recommendation 1: Work to increase savings per home by targeting high usage sockets and homes with electric water heat. The program should continue to target high-usage sockets when installing bulbs. Specifically, based on past research in Indiana, CFLs should be installed in dining rooms (3.08 hours per day), kitchens (2.95 hours), and living spaces (2.60 hours). This would require a small adjustment to the Optimizer to allow inclusion of dining rooms in the list of possible room types. Continuing to reach homes with electric water heating, aiding the program in realizing greater savings from faucet aerators and showerheads, would increase electric savings per home.

Recommendation 2: Continue use of existing planning assumptions, but revisit assumptions (particularly for kW), prior to setting 2015 values. The Evaluation Team does do not recommend changing LIW planning assumptions for PY3. From experience, per-unit savings values may fluctuate as program implementation adjusts to needed changes. For Indiana, where Energizing Indiana is just entering its third year, it may be prudent to wait for the end of the program cycle before making changes. The Evaluation Team recommends, if possible, performing a 2014 mid-year partial evaluation of the LIW measures using the latest program tracking data. This would inform whether differences seen in this year's *ex-post* per-unit savings remain steady. If so, choices could be made to prospectively apply updated values at the beginning of 2015. This would require shifting dollars between programs, as it does not fall within the current LIW evaluation budget.

5. RESIDENTIAL LIGHTING

5.1 PROGRAM DESIGN AND IMPLEMENTATION

Now in its second year of implementation, the Energizing Indiana Residential Lighting program works with retailers and manufacturers to offer CFLs, LEDs, and ENERGY STAR-qualified fixtures at reduced prices. Discounted pricing includes standard and specialty bulbs, across a range of wattages. In PY2, the program addressed residential customers across Indiana.

GoodCents (the TPA) administers the program and Ecova (the Program Implementer) implements it. In PY2, the Implementer worked with 16 retailers across 865 storefronts throughout the state in marketing and delivering the program. Participating retailers included: do-it-yourself (DIY) stores, hardware stores, club stores, and general retailers. The program's marketing and promotional activities included in-store signage, point-of-purchase materials, store events, buy-one-get-one (BOGO) lighting promotions, and customer bill inserts.

5.2 EM&V METHODOLOGY

The PY2 evaluation of the Residential Lighting program included impact and process elements. Table 64 provides an overview of tasks used for evaluating the program.

Table 64: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• Interviewed Administrator and Implementation managers.
Manufacturer Interviews	• Conducted 11 telephone interviews with staff from eight energy-efficient lighting manufacturers participating in the program. The manufacturers served nine out of 16 participating retailers.
Program Database Review/ Verification	• Reviewed the program tracking database.
In-Store Customer Intercept Interviews	• Conducted in-store interviews with 393 customers across 11 retailers in Indiana to support the net impact and process evaluations.
Retailer Mystery Shopper Survey	• Completed a mystery shopper survey with 100 retailers, assessing the availability of 100-watt and 75-watt standard incandescent light bulbs.
Impact Analysis	• Reviewed savings estimates provided by the Implementer. • Verified the reported measure installations in the program database. • Estimated freeridership, based on self-reported data from in-store customer intercept interviews, combined with sales data modeling.

5.3 PROGRAM PERFORMANCE

Table 65 compares reported program performance with goals established in program planning. The program's reported savings do not reflect adjustments made due to the evaluation. As shown, the program achieved 110% of its *ex-ante* goals at the statewide level. All utilities achieved over 100% of their planning goals, with I&M and IPL achieving 122% of their planned goals (both kWh and kW). Over the course of PY2, the program sold nearly 3.5 million lighting products in Indiana.

Table 65: *Ex-Ante* Results by Utility and Statewide

	Number of Bulbs			kWh Savings			kW Savings		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	1,248,719	1,289,078	103%	54,694,000	56,461,616	103%	8,741	9,024	103%
I&M	371,002	453,452	122%	16,250,000	19,861,198	122%	2,598	3,174	122%
IPL	589,814	717,266	122%	25,834,000	31,416,251	122%	4,129	5,021	122%
IMPA	164,062	166,587	102%	7,186,000	7,296,511	102%	1,148	1,166	102%
NIPSCO	496,002	537,800	108%	21,725,000	23,555,640	108%	3,472	3,765	108%
Vectren	316,277	332,890	105%	13,853,000	14,580,582	105%	2,214	2,330	105%
Statewide	**3,185,876**	**3,497,073**	**110%**	**139,542,000**	**153,171,798**	**110%**	**22,302**	**24,480**	**110%**

5.4 PROGRAM BUDGET AND EXPENDITURES

Table 66 shows the original program budgets and expenditures reported at the conclusion of 2013. Overall, the program largely stayed on budget in PY2, expending 101% of its allotted funds.

Table 66: Program-Level Budgets and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$2,860,496	$2,877,187	101%
I&M	$965,770	$968,586	100%
IPL	$1,605,222	$1,606,556	100%
IMPA	$375,109	$382,472	102%
NIPSCO	$1,180,350	$1,183,680	100%
Vectren	$725,897	$744,650	103%
Statewide	**$7,712,844**	**$7,763,131**	**101%**

5.5 EX-ANTE ENERGY SAVINGS

The *ex-ante* savings equaled savings reported by the program, compared to goals set forth in program planning. Table 67 shows the program's statewide and utility-specific *ex-ante* savings.

Table 67: *Ex-Ante* Savings By Utility and Statewide

	2013 kWh Savings Goal	2013 kWh *Ex-Ante* Savings	% of kWh Savings Goals	2013 kW Savings Goal	2013 kW *Ex-Ante* Savings	% of kW Savings Goal
Duke	54,694,000	56,461,616	103%	8,741	9,024	103%
I&M	16,250,000	19,861,198	122%	2,598	3,174	122%
IPL	25,834,000	31,416,251	122%	4,129	5,021	122%
IMPA	7,186,000	7,296,511	102%	1,148	1,166	102%
NIPSCO	21,725,000	23,555,640	108%	3,472	3,765	108%
Vectren	13,853,000	14,580,582	105%	2,214	2,330	105%
Total	**139,542,000**	**153,171,798**	**110%**	**22,302**	**24,480**	**110%**

Table 68 presents per-unit *ex-ante* kWh savings for the program in PY2.

Table 68: *Ex-Ante* Per-Unit Energy (kWh) Savings

	Ex-Ante kWh Savings	Total Number of Bulbs	Per Unit kWh Savings
Lighting	153,171,798	3,497,073	43.80

5.6 IMPACT ANALYSIS

This evaluation included: a quantitative analysis of the program tracking databases; engineering analysis of the tracked savings; application of an in-service rate (ISR), established through the PY1 evaluation; and an in-store survey with customers, combined with sales data modeling from PY1 to estimate freeridership.

5.6.1 AUDITED SAVINGS

In developing audited savings estimates, the Evaluation Team reviewed the program tracking databases and checked savings estimates and calculations against agreed-upon *ex-ante* values (i.e., those from the 2010 Ohio TRM) to confirm accurate application of savings assumptions.[19] Following the review, the Evaluation Team recalculated the savings estimates to account for errors, omissions, and inconsistencies identified in the program tracking data.

At the beginning of the review, the Evaluation Team compared total bulb counts and savings—energy and demand—from the program tracking data files[20] to *ex-ante* values tracked and reported by the TPA. The tracking data contained more bulbs than reported (by 329,258 bulbs), greater kWh savings (11,091,575 more kWh than reported), and less kW savings (3,838 less kW than reported).

After investigating the source for these discrepancies, the Evaluation Team concluded the 2013 tracking data contained bulbs sales occurring in 2012, but invoiced by retailers in 2013. As the 2012 evaluation of bulb counts and savings did not account for such sales, the evaluation included them as part of the 2013 program impacts.

The Evaluation Team audited bulb quantities by comparing the "bulb description data field" to data fields with the "number of packs" and "number of units" to confirm consistency. The evaluation also included validating bulb quantities through analysis of rebate and buy-down dollar amounts. As quantity data appeared to be reported consistently, data adjustments were not necessary. Table 69 summarizes audited bulb counts by bulb type (statewide) and by utility.

Table 69: Audited Bulb Counts by Product Type and Utility

	Total Statewide Audited Number of Bulbs	Total Audited Number of Bulbs by Utility					
		Duke	I&M	IPL	IMPA	NIPSCO	Vectren
Standard CFLs	3,376,325	1,222,734	498,063	650,670	149,518	521,875	333,465
Specialty CFLs	442,359	187,923	57,890	80,900	16,068	60,739	38,839
LEDs	5,762	1,721	846	1,191	231	865	908
Lighting Fixtures[(1)]	1,885	605	279	429	86	300	186
Total	**3,826,331**	**1,412,983**	**557,078**	**733,190**	**165,903**	**583,779**	**373,398**

[19] *Ex-ante* savings for 2013 were estimated using the most recent version of the Ohio TRM. In 2014, *ex-ante* savings will be estimated using the Indiana TRM.

[20] Program tracking data, obtained from the Administrator, represented detailed sales data by retailer, bulb type, and date.

(1) This represents the count of bulbs and not the lighting fixtures (a lighting fixture can have multiple bulbs)

The Evaluation Team then thoroughly investigated energy and demand savings assumptions, and corrected errors or omissions. *Ex-ante* savings assumptions aligned with those set forth in the 2010 Ohio TRM. The energy and demand savings audit identified several issues with program tracking data requiring correction. Table 70 provides an overview of the issues the Evaluation Team encountered and steps taken to address them. As shown, none of these affected more than 14% of all bulbs.

Table 70: Issues Identified During the Savings Auditing Process

Issue Type	Issue Description	Total % of Light Bulbs Affected	Steps Taken
Actual Wattage Mismatch	Reported wattages did not match across data fields for the same product type.	0.1%	Corrected wattage information obtained by looking up accurate wattage values.
Delta Watts Multiplier	Incorrect delta watts multipliers were applied in CFL energy savings calculations.(1)	5%	Corrected delta watts multipliers to align with TRM-prescribed values.
	In calculating demand savings, delta watts multipliers were applied without wattage consideration	14%	
	For fixtures, delta watts multipliers were based on the sum of wattages of all CFLs comprising the fixture and not each individual CFL.	<0.1%	

(1) To account for EISA, the Indiana TRM prescribes different delta watts multipliers by year. The 2012 delta watts multipliers were used to calculate savings (rather than those for 2013).

Table 71 and Table 72 show audited energy and demand savings. Comparing Table 67 (*ex-ante* savings) to Table 71 and Table 72, audited energy savings did not fall by more than 5% and, in some cases, increased up to 18%. Overall, audited energy savings were 5% higher than *ex-ante* savings. Audited demand savings, in turn, fell from 12% to 28%, compared to *ex-ante* savings.

Table 71: Audited Energy Savings (kWh) by Utility and Statewide

	Number of Bulbs in Database	Total Audited kWh Savings
Duke	1,412,983	59,516,162
I&M	557,078	23,380,245
IPL	733,190	30,737,626
IMPA	165,903	7,021,406
NIPSCO	583,779	24,309,190
Vectren	373,398	15,600,281
Statewide	**3,826,331**	**160,564,910**

Table 72: Audited Demand Savings (kW) by Utility and Statewide

	Number of Bulbs in Database	Total Audited kW Savings
Duke	1,412,983	7,119
I&M	557,078	2,796
IPL	733,190	3,676
IMPA	165,903	840
NIPSCO	583,779	2,908

Vectren	373,398	1,866
Statewide	**3,826,331**	**19,205**

5.6.2 VERIFIED SAVINGS

Verified savings for the Residential Lighting program were computed by applying an installation rate to the audited savings, as calculated above. Many programs determine installation rates through primary research with program participants. Given Residential Lighting's structure as an upstream program, the Evaluation Team could not easily contact participants one year after bulb purchases to determine how many bulbs they installed during that time. As such, much like the PY1 evaluation, the evaluation relied on data from the Residential Baseline, performed in 2012, to determine first-year CFL installation rates and the Indiana TRM to determine installation rates for lighting fixtures and LEDs. The following installation rates applied:

- CFLs: 79% (per CFL installation rates found in the Residential Baseline)[21] [22]
- Fixtures: 100% (per the ISR for lighting fixtures outlined in the Indiana TRM)
- LEDs: 100% (per the ISR for LEDs outlined in the Indiana TRM)

The Evaluation Team applied these rates to audited bulb counts and savings to determine verified bulb counts and savings. As the audited savings already factored in an 86% ISR (per the 2010 Ohio TRM), the 79% rate required appropriate adjustment as to not double-discount program savings.

Table 73: Statewide Verified Savings (kW and kWh) by Product Type

	Statewide Verified Number of Bulbs	Statewide Verified kWh Savings	Statewide Verified kW Savings
Standard CFLs	2,667,297	129,848,506	15,531
Specialty CFLs	349,464	17,391,497	2,080
LEDs	5,762	225,949	27
Lighting Fixtures(1)	1,885	97,685	12
Total	**3,024,407**	**147,563,636**	**17,650**

(1) This represents counts of bulbs and not lighting fixtures (as lighting fixtures can use multiple bulbs).

Table 74 shows utility and statewide verified energy savings. After completing an audit of *ex-ante* savings values and applying the installation rate to establish verified savings, the program experienced realization rates of 96% for energy savings and 72% for demand savings at the statewide level. Utility-specific energy savings realization rates varied between 88% and 108%, while demand savings realization rates varied between 66% and 81%.

[21] Opinion Dynamics. *Residential Baseline Report*. November 2, 2012.

[22] During in-store intercept surveys performed in 2013, the Evaluation Team sought to validate the 79% installation rate, asking customers purchasing program-rebated CFLs how many of those CFLs they planned to install within the next week (and not asking customers to predict beyond a week, as most people do not know when they will next replace a light bulb). Customers planned to install 61% of purchased bulbs within the next week. The 79% first-year ISR for CFLs appeared reasonable, given in-store intercept survey question only asked about installation during the narrow time period.

Table 74: Verified Energy Savings (kWh) by Utility and Statewide

	Ex-Ante kWh Savings	Verified kWh Savings	Realization Rate
Duke	56,461,616	54,693,532	97%
I&M	19,861,198	21,487,684	108%
IPL	31,416,251	28,250,432	90%
IMPA	7,296,511	6,452,898	88%
NIPSCO	23,555,640	22,341,169	95%
Vectren	14,580,582	14,337,920	98%
Statewide	**153,171,798**	**147,563,636**	**96%**

Table 75: Verified Demand Savings (kW) by Utility and Statewide

	Ex-Ante kW Savings	Verified kW Savings	Realization Rate
Duke	9,024	6,542	72%
I&M	3,174	2,570	81%
IPL	5,021	3,379	67%
IMPA	1,166	772	66%
NIPSCO	3,765	2,672	71%
Vectren	2,330	1,715	74%
Statewide	**24,480**	**17,650**	**72%**

In PY1 (and for CFLs specifically), the Evaluation Team applied a first-year installation rate of 79%. However, several studies indicate installations of up to 99% of stored bulbs within a few years of purchase, causing savings to occur several years after an initial purchase. The research suggests the program should receive additional credit for bulbs purchased in PY1 but installed in PY2. To determine this portion of savings, the Evaluation Team used the UMP-recommended method.

The evaluation determined that in PY2, the program earned an additional 10% of sales (and subsequently savings) occurring in PY1 ((99%-79%)/2). Table 76 summarizes additional carryover savings from bulbs purchased in PY1, but installed in PY2. As shown, the program received over 28 GWh in energy savings and over 4 MW in demand savings for PY2.

Table 76: Carryover Verified Energy (kWh) and Demand (kW) Savings from PY1

	Carryover Verified PY1 kWh Savings	Carryover Verified PY1 kW Savings
Duke	10,644,166	1,705
I&M	5,130,742	822
IPL	5,011,913	803
IMPA	1,375,122	220
NIPSCO	4,241,582	679
Vectren	2,246,356	360
Statewide	**28,649,881**	**4,589**

5.6.3 *Ex-Post* Savings

Similarly to PY1, the Evaluation Team determined the Residential Lighting program's *ex-post* gross evaluated savings in PY2 through engineering analysis. Adjustments reflected engineering adjustments made to *ex-ante* measure savings claimed by the program.

CFL, LED, and fixtures savings derived from calculating delta watts for each bulb (i.e., the difference between the wattage used by the baseline light bulb [incandescent light bulbs] and the wattage used by the replacement efficient bulb). The evaluation then applied HOU estimates, WHFs, a coincidence factor (for demand savings), and an installation rate to these delta watts.

The Evaluation Team determined equivalent baseline light bulb wattages using the lumen output values, further adjusted for baseline conditions due to EISA legislation, which effectively phases out the manufacturing and import of traditional incandescent light bulbs over a three-year period, beginning in January 2012. The legislation first affected 100-watt incandescent technology (in January 2012), followed by 75-watt incandescents (January 2013), and 60- and 40-watt incandescents (January 2014). Please refer to the EISA section of this report.

The Evaluation Team used a dynamic approach to the baseline adjustment, supported by market data collected through the mystery shopper survey of retailers in Indiana. The mystery shopper study found that, while EISA legislation considerably affected the availability of 100-watt incandescent light bulbs, a sizeable number of stores in Indiana (39%) still carried those bulbs. Given the findings, discounting the baseline wattage for *all* 100-watt CFL equivalents from 100-watts to 72-watts (the halogen equivalent of a 100-watt incandescent) did not prove warranted. As such, the Evaluation Team developed baseline wattages using market data obtained through the survey, adjusting the baseline wattage for 100-watt CFL equivalents to 85-watts.

The Evaluation Team used CFL-specific HOU estimates derived through the 2012–2013 lighting logger study, which measured lighting usage for over 400 sockets containing CFLs in a representative sample of 68 homes across Indiana. The study resulted in a CFL HOU estimate of 2.47 hours a day—a number lower than prescribed in the Indiana TRM (2.85). The number, however, was similar to that used in other jurisdictions. The study report[23] presents a detailed methodology and study results, along with HOU estimates used in other areas of the United States. This evaluation applied the HOU estimate across all lighting products.

CFLs and LEDs emit less heat than incandescents, resulting in increased heating loads (given more energy is needed to supplement heat emitted by incandescent light bulbs). Still, this also decreases the cooling load (as less energy is needed to compensate for heat given off by incandescents). To account for these changes, the Evaluation Team applied the WHF, prescribed in the Indiana TRM (WHF values vary
by utility).

To calculate demand savings, the Evaluation Team applied summer peak coincidence factor of 0.11 (as prescribed by the Indiana TRM).

Finally, the evaluation applied a 79% first-year installation rate to CFL-generated energy savings. As discussed in this report's Verified Savings section, this installation rate derived from the 2012 Baseline Study results. LEDs and fixtures received a 100% installation rate.

Table 77 and Table 78 summarize *ex-post* energy and demand savings per utility and statewide. The engineering analysis resulted in 16% lower *ex-post* kWh savings, compared to the verified savings, and

[23] Opinion Dynamics. *Indiana Hours or Use Study*. The Indiana Statewide Core Program Evaluation Team. July 2013.

3% lower *ex-post* kW savings, compared to the verified savings. As compared to *ex-ante* savings, *ex-post* gross energy savings were 19% lower, and *ex-post* demand savings were 30% lower. Lower *ex-post* savings values largely resulted from lower HOU (2.47 vs. 2.85) and different electric waste heat factor (WHFe) assumptions than those used to calculate *ex-ante* savings.

Table 77: *Ex-Post* Energy (kWh) Savings per Utility and Statewide

	Verified kWh Savings	*Ex-Post* kWh Savings	*Ex-Post* Therm Savings
Duke	54,693,532	46,229,184	-886,182
I&M	21,487,684	17,834,305	-369,120
IPL	28,250,432	23,806,018	-456,345
IMPA	6,452,898	5,379,034	-103,112
NIPSCO	22,341,169	18,759,698	-383,263
Vectren	14,337,920	12,353,128	-217,395
Statewide	**147,563,636**	**124,361,368**	**-2,415,417**

Table 78: *Ex-Post* Demand (kW) Savings per Utility and Statewide

	Verified kW Savings	*Ex-Post* kW Savings
Duke	6,542	6,337
I&M	2,570	2,460
IPL	3,379	3,263
IMPA	772	737
NIPSCO	2,672	2,555
Vectren	1,715	1,704
Statewide	**17,650**	**17,057**

Consistent with the verified savings approach, the Evaluation Team calculated carryover energy and demand savings from PY1 that the program could claim in PY2. As shown in Table 79, the program received over 9 GWh in energy savings and over 1 MW in demand savings. The Evaluation Team used the savings assumptions for the installation year to calculate carryover savings: in this case, using PY2 savings assumptions to calculate savings from PY1 purchases carried over to PY2.

Table 79: Carryover *Ex-Post* Energy (kWh) and Demand (kW) Savings from PY1

	Carryover *Ex-Post* PY1 kWh Savings	Carryover *Ex-Post* PY1 kW Savings	Carryover *Ex-Post* PY1 Therm Savings
Duke	3,534,841	420	-67,569
I&M	1,707,214	203	-32,634
IPL	1,666,775	198	-31,861
IMPA	455,282	54	-8,703
NIPSCO	1,400,474	166	-26,770
Vectren	745,988	89	-14,260
Statewide	**9,510,574**	**1,131**	**-181,795**

5.6.4 NET SAVINGS

Net savings reflect the application of the program NTG ratio to the e*x-post* energy savings. NTG is generally comprised of freeridership, spillover, and market effects. Freeridership represents the portion of savings that would have occurred absent the program. Spillover and market effects represent savings from purchases of additional non-discounted lighting products induced by program activity in the market.

This year's evaluation of the Residential Lighting program's net savings only estimated freeridership. Estimations of spillover and market effects will be captured in 2015, when the Evaluation Team completes the second market baseline study.

Upstream lighting programs such as Energizing Indiana's are designed as market transformation programs that change manufacturer and retailer stocking and sales practices of lighting products. As such, the Evaluation Team expects these programs will have a considerable effect on the market, which in turn will translate into considerable energy savings. Consequently, net impacts presented in this report are likely biased downward.

Estimating lighting program freeridership proved extremely challenging due to the upstream program delivery method, which did not collect information on customers purchasing program-discounted bulbs. Existing evaluation methods are expensive and produce unpredictable results, containing great uncertainty as to their validity. Use of multiple methods can help alleviate some of this uncertainty. Therefore, to calculate PY2 net impact savings, the Evaluation Team relied on the average of the NTG ratios from two sources:

- Sales data modeling results from PY1; and
- In-store customer intercepts performed in PY2.

In PY1, the Evaluation Team used program and non-program pricing as well as program sales data to estimate what program sales would have been at regular retail pricing, absent the program (in essence what preprogram baseline sales would have been). The model operates on the premise that retailers only would participate in a utility-sponsored lighting program if their gross revenues did not fall (i.e., remained at least neutral or increased) due to participation. The PY1 evaluation report provided detailed descriptions of the method and results, which resulted in a 0.57 NTG estimate.

In PY2, the Evaluation Team planned to repeat the sales modeling effort, update the freeridership estimate and perform customer in-store intercept surveys to develop an independent estimate of freeridership, based on customer self-reports. Due to data availability and quality issues, however, the Evaluation Team did not utilize the sales modeling method in PY2, rather relying on PY1 NTG values, as results did not appear to drastically change over the course of the year.[24]

PY1 sales data modeling process was labor intensive and resulted in a match of 74% of all units sold. As part of the PY1 evaluation report, the Evaluation Team outlined data issues and provided recommendations for improvements. The Evaluation Team also completed a follow-up call with the implementation team to discuss data format and quality. As the initial review of the PY2 allocation data files by the Evaluation Team revealed that data quality continued to be an issue, PY2 data were not anticipated to provide more accurate information than that already available from the PY1 analysis. Therefore, the Evaluation Team chose to not expend evaluation resources on repeating the modeling, but rather relied on the PY1 modeling results. To facilitate sales modeling analysis in the future, providing a single allocation data table per utility would prove most advantageous, as would developing a unique identifier to allow the Evaluation Team to link stock keeping units (SKUs) in the allocation and sales data files.

[24] The Evaluation Team plans to work with the implementation team to obtain the necessary data, in the format required to facilitate analysis in PY3.

Regarding the in-store intercept surveys, the Evaluation Team completed over 170 interviews with customers purchasing program-discounted CFLs across 11 stores in Indiana.[25] Part of the surveys asked customers about factors influencing their purchasing decisions, and included counterfactual questions about what purchase they would have made in the program's absence. The freeridership score included the influence that the program discount and program marketing had on customer purchasing decisions. The program also received credit for influencing the quantity of light bulbs purchases and for discouraging customers from purchasing less-efficient light bulbs.

While NTG values across the two program years differed, more likely a result from the method rather than actual changes in customers' purchases, absent the program. As such, the Evaluation Team equally weighted both values and simply averaged them. *Ex-post* savings received a final NTG of 0.49.

Table 80: NTG Ratio

	NTG Ratio
Sales data modeling (PY1)	0.57
In-store customer intercept survey (PY2)	0.40
Final NTG	**0.49**

Note: the Residential Lighting Program Freeridership Algorithm section of Appendix A contains greater detail on how the NTG ratios using both methods were estimated.

The 0.49 NTG ratio resembles that of programs in other regions of the country: Table 81 compares NTG ratios for residential lighting programs in other jurisdictions.

Table 81: NTG Ratios in Other Jurisdictions

	NTG Ratio
Delaware (2010-2011)	0.49
Midwestern Utility (2013)	0.48
Massachusetts ENERGY STAR (2009-2010)	0.45

The Evaluation Team applied a 0.49 NTG ratio across all products;[26] applying the NTG ratios to installed measures produced the net savings shown in Table 82.

[25] Stores included: DIY, big box, and club stores, representing 13% of all program bulbs sold in the state. The Evaluation Team completed over 400 interviews. To support the process evaluation, in addition to over 170 customers purchasing program-discounted CFLs, the Evaluation Team completed interviews with customers purchasing other lighting products, such as incandescent, halogen, and LED light bulbs.

[26] NTG may differ for standard versus specialty CFLs and LEDs. However, sample sizes for estimating separate NTG ratios for specialty CFLs and LEDs using in-store intercepts would be very costly. Consequently, the Evaluation Team applied overall estimates from the PY2 customer intercepts and PY1 sales modeling to all bulb types. Future applications of the sales data modeling method will explore estimating separate NTG ratios by bulb type.

Table 82: Lighting Program Net Energy (kWh) Savings by Utility and Statewide

	Ex-Post kWh Savings	*Ex-Post* Therm Savings	NTG	Net kWh Savings	Net Therm Savings
Duke	46,229,184	-886,182	0.49	22,652,300	-434,229
I&M	17,834,305	-369,120	0.49	8,738,810	-180,869
IPL	23,806,018	-456,345	0.49	11,664,949	-223,609
IMPA	5,379,034	-103,112	0.49	2,635,727	-50,525
NIPSCO	18,759,698	-383,263	0.49	9,192,252	-187,799
Vectren	12,353,128	-217,395	0.49	6,053,033	-106,523
Statewide	124,361,368	-2,415,417	0.49	60,937,070	-1,183,554

Table 83: Net Demand (kW) Savings by Utility and Statewide

	Ex-Post kW Savings	NTG	Net kW Savings
Duke	6,337	0.49	3,105
I&M	2,460	0.49	1,206
IPL	3,263	0.49	1,599
IMPA	737	0.49	361
NIPSCO	2,555	0.49	1,252
Vectren	1,704	0.49	835
Statewide	17,057	0.49	8,358

When developing net PY1 carryover savings, the Evaluation Team applied the NTG ratio from PY1. Table 84 provides net energy and demand carryover savings by utility and statewide.

Table 84: Carryover Net Energy (kWh) and Demand (kW) Savings by Utility and Statewide

	Carryover *Ex-Post* kWh Savings	Carryover *Ex-Post* kW Savings	Carryover *Ex-Post* Therm Savings	NTG	Carryover Net kWh Savings	Carryover Net kW Savings	Carryover Net Therm Savings
Duke	3,534,841	420	-67,569	0.57	2,014,860	240	-38,514
I&M	1,707,214	203	-32,634	0.57	973,112	116	-18,601
IPL	1,666,775	198	-31,861	0.57	950,062	113	-18,160
IMPA	455,282	54	-8,703	0.57	259,511	31	-4,961
NIPSCO	1,400,474	166	-26,770	0.57	798,270	95	-15,259
Vectren	745,988	89	-14,260	0.57	425,213	51	-8,128
Statewide	**9,510,574**	**1,131**	**-181,795**	**0.57**	**5,421,027**	**644**	**-103,623**

5.6.5 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy and demand savings claimed by the programs.

Table 85: PY2 Achieved Energy (kWh) Savings Summary

Utility	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* Gross kWh	~~Ex-Post~~ Net kWh
Duke	54,694,000	56,461,616	59,516,162	54,693,532	97%	46,229,184	22,652,300
I&M	16,250,000	19,861,198	23,380,245	21,487,684	108%	17,834,305	8,738,810
IPL	25,834,000	31,416,251	30,737,626	28,250,432	90%	23,806,018	11,664,949
IMPA	7,186,000	7,296,511	7,021,406	6,452,898	88%	5,379,034	2,635,727
NIPSCO	21,725,000	23,555,640	24,309,190	22,341,169	95%	18,759,698	9,192,252
Vectren	13,853,000	14,580,582	15,600,281	14,337,920	98%	12,353,128	6,053,033
Statewide	**139,542,000**	**153,171,798**	**160,564,910**	**147,563,636**	**96%**	**124,361,368**	**60,937,070**

Table 86: PY2 Achieved Energy (kWh) Savings Summary with Carryover Installations from PY1

Utility	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	54,694,000	56,461,616	59,516,162	65,337,698	116%	49,764,026	24,667,160
I&M	16,250,000	19,861,198	23,380,245	26,618,426	134%	19,541,520	9,711,922
IPL	25,834,000	31,416,251	30,737,626	33,262,345	106%	25,472,793	12,615,011
IMPA	7,186,000	7,296,511	7,021,406	7,828,020	107%	5,834,316	2,895,237
NIPSCO	21,725,000	23,555,640	24,309,190	26,582,751	113%	20,160,172	9,990,522
Vectren	13,853,000	14,580,582	15,600,281	16,584,277	114%	13,099,116	6,478,246
Statewide	**139,542,000**	**153,171,798**	**160,564,910**	**176,213,517**	**115%**	**133,871,942**	**66,358,097**

Table 87: PY2 Achieved Demand (kW) Savings Summary

Utility	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	8,741	9,024	7,119	6,542	72%	6,337	3,105
I&M	2,598	3,174	2,796	2,570	81%	2,460	1,206
IPL	4,129	5,021	3,676	3,379	67%	3,263	1,599
IMPA	1,148	1,166	840	772	66%	737	361
NIPSCO	3,472	3,765	2,908	2,672	71%	2,555	1,252
Vectren	2,214	2,330	1,866	1,715	74%	1,704	835
Statewide	**22,302**	**24,480**	**19,205**	**17,650**	**72%**	**17,057**	**8,358**

Table 88: PY2 Achieved Demand (kW) Savings Summary with Carryover Installations from PY1

Utility	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	8,741	9,024	7,119	8,247	91%	6,758	3,345
I&M	2,598	3,174	2,796	3,392	107%	2,663	1,321
IPL	4,129	5,021	3,676	4,182	83%	3,462	1,712
IMPA	1,148	1,166	840	992	85%	792	392
NIPSCO	3,472	3,765	2,908	3,352	89%	2,721	1,347
Vectren	2,214	2,330	1,866	2,075	89%	1,793	885
Statewide	**22,302**	**24,480**	**19,205**	**22,239**	**91%**	**18,188**	**9,002**

Table 89: Lifetime Savings Achieved

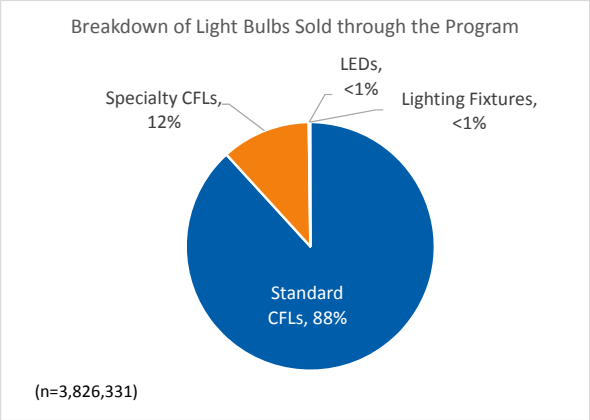
Utility	Lifetime *Ex-Post* kWh	~~Lifetime *Ex-Post* kW~~	~~Lifetime *Ex-Post* Therms~~
Duke	220,570,660		
I&M	86,546,260		
IPL	112,869,659		
IMPA	25,702,116		
NIPSCO	88,896,020		
Vectren	58,034,703		
Statewide	**592,619,418**		

5.7 *PROCESS ANALYSIS*

5.7.1 PROGRAM OPERATIONS

The Residential Lighting program's PY2 design did not change from PY1: the program worked with retailers and manufacturers to offer discounted prices on CFLs, LEDs, bulbs for ceiling fans, and ENERGY STAR-qualified fixtures. PY2 continued the same product mix discounted through the program, with standard CFLs representing the largest share of discounted products (88%), followed by specialty CFLs (12%). LEDs and lighting fixtures represented less than 1% of program bulb sales. In comparison, 76% of all bulbs sold in PY1 were standard CFLs and 23% were specialty CFLs.

Figure 34: Breakdown of Light Bulbs Sold through the Program[(1)(2)]



(1) Base size represents the total number of light bulbs.
(2) These data represent bulb counts reported by the TPA.

To increase the program's footprint in the state over the course of the year, program implementation contractors added Dollar General to the mix of participating stores. The program also added new locations of already participating retailers. Consequently, the total number of participating storefronts across the state increased from 753 in PY1 to 865 in PY2. Table 90 lists participating retailers.

Table 90: PY2 Participating Retailers

Participating Retailers	
Ace Hardware	Meijer
Big Lots	Menards
Costco	Outreach
Dollar General	Sam's Club
Dollar Tree	TechniArt.com
Goodwill	Home Depot
Habitat ReStore	Walgreens
Lowe's	Walmart

Program staff did not identify challenges or issues in servicing participating retail locations, making certain store signage was present and the store staff were trained on the program. In PY2, the program added two field service representatives to ensure timely service of participating retailers.

5.7.2 PROGRAM SATISFACTION

Based on interviews with the program implementation staff, the Lighting program ran fairly smoothly in PY2. Participating manufacturers interviewed as part of the evaluation effort generally expressed satisfaction with the program overall. When asked to rate the program on a 10-point scale, where 1 as very dissatisfied and 10 as very satisfied, the majority of manufacturers (five out of eight) interviewed rated the program either an 8, 9, or 10. The lowest satisfaction rating was 6, provided by only one manufacturer. The average satisfaction rating was 8.4.

Interviews with manufacturers also generally revealed high satisfaction levels with the range of products incented. One recommendation manufacturers voiced for the program moving forward involved incenting more LED bulbs and fixtures. Most manufacturers felt LEDs would rapidly fall in price and the program would see more "bang for the buck" by increasing the rebate amounts on LED products, and expanding the number and types of LEDs incented.

Implementers expressed some concerns regarding program consistency over the course of the year. The Residential Lighting program works toward specific goals, by utility. Program implementers proactively forecast and kept close track of light bulb sales to not exceed the program budget for each utility. This caused the program to slow or even close discounts at stores in utility service territories with goals close to being met.

Though altering promotions was necessary from a budgetary perspective, interviews with participating manufacturers revealed concerns about the levels and consistency of program promotions. Manufacturers expressed dissatisfaction in that program funding could be cut quite suddenly, requiring retail partners to change their signage, marketing, and point-of-sale data systems quickly. With certain retailers (specifically those franchise-owned), communicating and coordinating these changes proved time and labor intensive, and could dissuade certain stores from participating in future years. Manufacturers suggested either making certain funding could be maintained for the entire year, or limiting discounts only to certain times of the year, such as around Earth Day or during the holiday sales period.

5.7.3 PROGRAM INCENTIVES

In PY2, the program discounted a variety of product types and wattages. Product discounts varied from: $0.50 to $3.25 per bulb for standard CFLs; $1.00 to $3.25 per bulb for specialty CFLs; $12 per fixture; and $5.00 or $10.00 per bulb for LEDs. The manufacturer interviews asked respondents to discuss their preferences for the program either offering: (a) a smaller per-unit discount on a broad range of product types (e.g., twist and specialty CFLs, A-line and parabolic aluminized reflector (PAR) LEDs, efficient fixtures and ceiling fans); or (b) fewer types of products (e.g., only twist CFLs) at a higher per-unit discount.

Manufacturer responses varied. Generally, those advocating for option (a) suggested the program would more effectively move efficient lighting into sockets that traditionally have been hard to reach for programs such as this. These manufacturers generally felt that, by providing broader discounts on more product types, programs would appeal to a wider range of potential customers.

Manufacturers supporting option (b) considered the justification in bringing down the price of otherwise expensive bulbs, especially LEDs. Several LED manufacturers cited the $10 price point as particularly important, and, if a program could bring down LED prices below that threshold, LED sales would increase dramatically. This would serve as a feedback loop, increasing orders of LEDs in general, which would make costs fall due to bulk manufacturing effects.

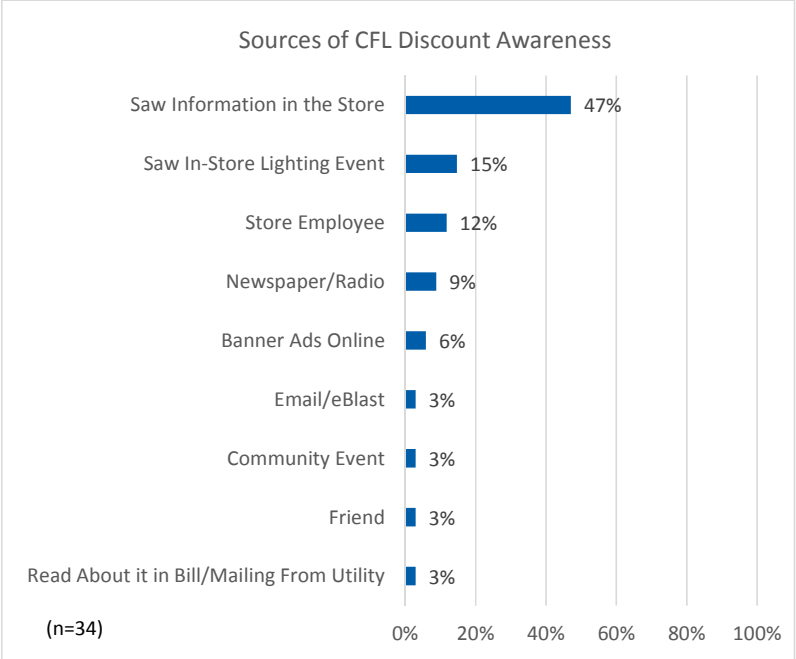
5.7.4 PROGRAM MARKETING AND OUTREACH

In PY2, Residential Lighting program promotion primarily utilized point-of-purchase materials and events at participating stores, including impromptu BOGO events, which targeted high-performing locations on high-traffic days (e.g., Saturdays) to increase lighting sales. The program held two BOGO events in Spring 2013. Some utilities sent bill inserts to promote the program throughout the year. Overall, program staff felt marketing and outreach efforts undertaken in PY2 generally succeeded in educating customers about high-efficiency lighting products and discounts offered through the program, while building the Energizing Indiana brand.[27]

As part of the PY2 evaluation efforts, the Evaluation Team conducted in-store intercept interviews with customers at participating retail stores across Indiana. Only one in five customers purchasing program-discounted bulbs knew of the bulb discounts (18%).[28] Customers aware of the discount reported learning of it in ways consistent with program marketing and outreach. As shown in Figure 35, almost three-quarters (74%) learned of the discounts from a source in the store. Nearly one-half of customers (47%) first learned of the discount from seeing in-store information and displays, while 15% of customers saw an in-store lighting event. A little over one-quarter of customers (27%) first learned of Energizing Indiana's discounts from non-store sources, such as newspapers, radio, and online banner advertisements.

[27] The Evaluation Team plans to examine this area further as part of the Residential Market Study for 2015.
[28] Results should only be used to assess customer awareness of marketing materials and not the impact of discounts on purchasing behavior. Customers not aware of the discount still might not pay full price for the bulbs.

Figure 35: Sources of CFL Discount Awareness



Note: the small sample size possibly introduces uncertainty/high variability in the results.

The customer in-store intercept survey also explored the influence of in-store marketing materials and information on a customer's decision to purchase CFLs. Close to one-half of the customers (42%) purchasing program-discounted CFLs and seeing information in the store reported being highly influenced by the information they saw.[29]

Program staff felt in-store events offered the best way to promote the program and to educate customers. During events, program representatives at the store interacted with customers, educating them about energy-efficient lighting, available lighting options, and program discounts. The Evaluation Team performed interviews during times when in-store events were underway and during non-event times. Comparisons of survey results during these two times indicated in-store events offered a very effective method for promoting energy-efficient lighting sales. The events increased customer awareness of the program and drove purchasing behaviors. While one-quarter of all respondents saw information about CFLs at the store, respondents were more likely to see information during in-store events than periods without events (as shown in Table 91). Furthermore, awareness of sponsorships of the in-store marketing and information ran much higher during in-store events.

[29] Using a scale of 1 to 5, where 1 meant not at all influential and 5 meant extremely influential, respondents were asked how influential the in-store information sponsored by Energizing Indiana was in their decision to buy CFLs. Highly influenced respondents awarded the program a 4 or 5 on that scale.

Table 91: Awareness of In-Store Information about CFLs and Sponsor of the Information

	Total (n=392)	Event (n=66)	No Event (n=326)
Saw Information about CFLs In-Store	26%	70%	17%
	Among Those Who Saw Information about CFLs In-Store		
	Total (n=100)	Event (n=46)	No Event (n=54)
Aware Energizing Indiana is the Sponsor of the In-Store Marketing	32%	59%	9%

Customers purchasing program-discounted CFLs during lighting events also were more likely to know they purchased discounted CFLs (64% compared to 37%), as shown in Table 92. Of those aware of the discount, more customers during an event (63%) knew Energizing Indiana provided the discount than when no event occurred (31%). Overall, slightly less than one-half of customers purchasing discounted CFLs (43%) knew the CFLs were discounted, and, of those, 42% knew Energizing Indiana provided the discount.

Table 92: Awareness of the Lighting Discount

	Total (n=187)	Event (n=42)	No Event (n=145)
Aware that They are Purchasing Discounted CFLs	43%	64%	37%
	Among Those Aware of the Discount		
	Total (n=81)	Event (n=27)*	No Event (n=54)
Aware Energizing Indiana is the Discount Sponsor	42%	63%	31%

Note: Only respondents purchasing program-discounted CFLs were asked this question.
*The small sample sizes introduced possible uncertainty/high variability to the results.

To gain information about barriers to efficient-lighting purchases, the Evaluation Team interviewed customers purchasing all types of lighting and not just program-discounted CFLs. Customers purchasing light bulbs during the event more likely purchased efficient lighting than customers purchasing lighting outside of the event. As shown in Table 93, approximately two-thirds of customers (68%) purchased CFLs during the in-store event, while one-half (49%) purchased CFLs when no event was underway. LEDs also experienced higher sales higher during in-store events (14% of customers compared to 9%).[30] Between CFLs and LEDs, 81% of customers purchased energy-efficient light bulbs (LEDs or CFLs) during events, compared to 58% purchasing efficient bulbs in the absence of events.

[30] As this difference is not statistically significant at 90% percent confidence interval, it should be treated as directional.

Table 93: Types of Bulbs Purchased by Customers

Efficiency	Bulb Type	% of Customers		
		Total (n=393)	Event (n=66)	No Event (n=327)
Higher	LEDs	10%	14%	9%
	CFLs	52%	68%	49%
	Halogen	12%	5%	13%
Lower	Incandescent	33%	15%	36%
Total CFL/LED		**62%**	**81%**	**58%**

Note: Presents the number of customers purchasing at least one bulb of each type. Percentages are greater than 100% as some customers purchased more than one bulb type.

Furthermore, a slightly higher average number of CFLs were purchased during the events than during non-event periods. CFLs customers purchased an average of 6.6 CFLs during an event, compared to 5.5 CFLs during non-event periods.

Table 94: Average Number of Light Bulbs Purchased by Customers

Efficiency	Bulb Type	Average Number of Light Bulbs		
		Total	Event	No Event
Higher	LEDs	3.1 (n=38)*	2.0 (n=9)*	3.5 (n=29)
	CFLs	5.8 (n=206)	6.6 (n=45)	5.5 (n=161)
	Halogen	4.8 (n=46)	14.3 (n=3)*	4.1 (n=43)
Lower	Incandescent	6.2 (n=129)	6.6 (n=10)*	6.2 (n=119)

*Note: the small sample sizes introduced possible uncertainty/high variability to the results.

Finally, customers purchasing program-discounted CFLs during in-store events proved much less likely to purchase those bulbs had a discount not been offered than those purchasing program-discounted CFLs during non-event periods. As shown in Table 95, customers purchasing program-discounted CFLs during program events were more likely to say they would not have purchased CFLs in the rebate's absence.[31]

Table 95: Amount of Program-Discounted CFLs Customers Would Have Purchased Without Discount

	Total (n=176)	Event (n=38)*	No Event (n=138)
All	63%	53%	66%
Some	7%	8%	7%
None	30%	39%	27%

Note: The small sample size possibly introduces uncertainty/high variability to the results.

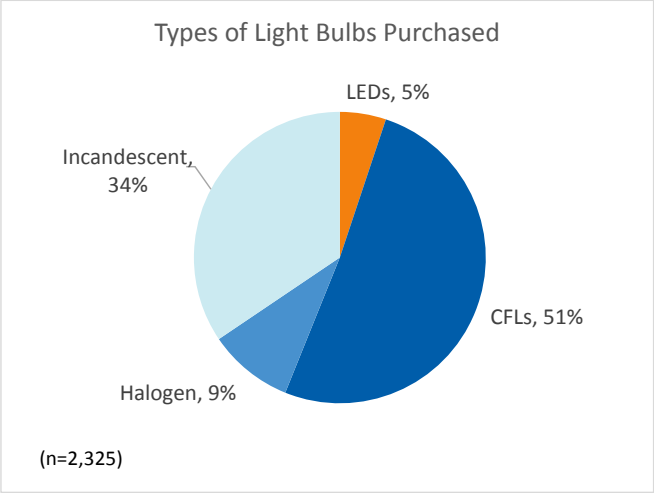
[31] This difference is not statistically significant at 90% percent confidence interval, and therefore should be treated as directional.

Combined, these findings suggest continuing the in-store events, and potentially even increasing their number throughout the year, could effectively increase CFL sales among customers who otherwise would not purchase CFLs without program support.

5.7.5 CUSTOMER LIGHTING PURCHASE BEHAVIORS

The customer in-store intercept survey results indicate customers bought less-efficient light bulbs despite the presence of program-discounted CFLs. Only one-half of all bulbs purchased at participating retailers by survey respondents were CFLs (51%), while one-third of all bulbs purchased were incandescents (34%), as shown in Figure 36. Furthermore, mystery shopper surveys of retailers revealed that incandescent products remained widely available at retail locations. More specifically, the survey found 39% of retailers stocked 100-watt and/or 75-watt incandescent light bulbs, banned from manufacturing due to EISA since January 2012. Consequently, respondents had less-efficient lighting options still available to them for these wattages.

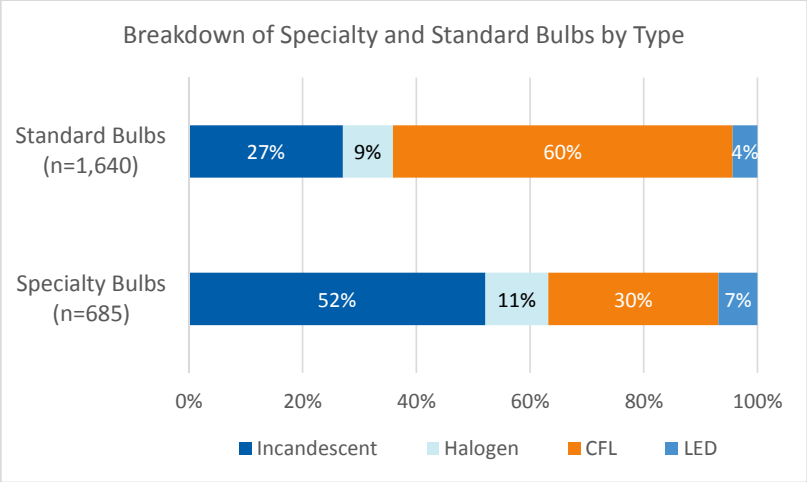
Figure 36. Types of Light Bulbs Purchased[1]



(1) Base size represents the total number of light bulbs.

Less-efficient lighting purchases dominate the specialty bulb category. While, overall, less than one-third (29%) of all bulbs purchased were specialty bulbs, the majority of specialty bulbs purchased (52%) were incandescents. As shown in Figure 37, customers generally bought CFLs for their standard bulb needs and incandescents for their specialty bulb needs. In fact, LEDs show some promise as an efficient specialty bulb alternative to CFLs. This finding suggests opportunity exists to shift the share of program discounted bulb sales into the specialty category, which remains dominated by less-efficient lighting.

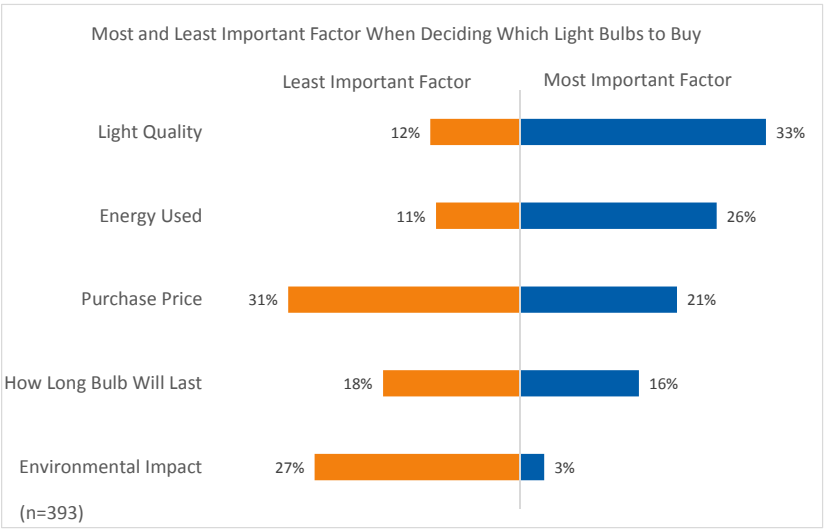
Figure 37: Breakdown of Specialty and Standard Bulbs Purchased by Type



Note: Base sizes represent the total number of bulbs purchased by customers. CFL and LED bulb counts include both those discounted and not discounted by the program.

As shown above, despite Energizing Indiana's CFL discounts, a considerable number of customers still purchased less-efficient lighting options. The Evaluation Team asked respondents what the most-important and least-important factors were when purchasing light bulbs. As shown in Figure 38, the primary drivers were light quality, energy use, and price. One-third rated light quality as the most important factor (33%). This sentiment proved particularly true among customers purchasing less-efficient lighting, where nearly one-half (49%) rated light quality as the most important factor. This finding suggests expanding LED program offerings may offer an effective light quality alternative to incandescents at a more affordable price, thus motivating customers to switch to high-efficiency lighting technologies.

Figure 38: Most and Least Important Factor When Deciding Which Light Bulbs to Buy

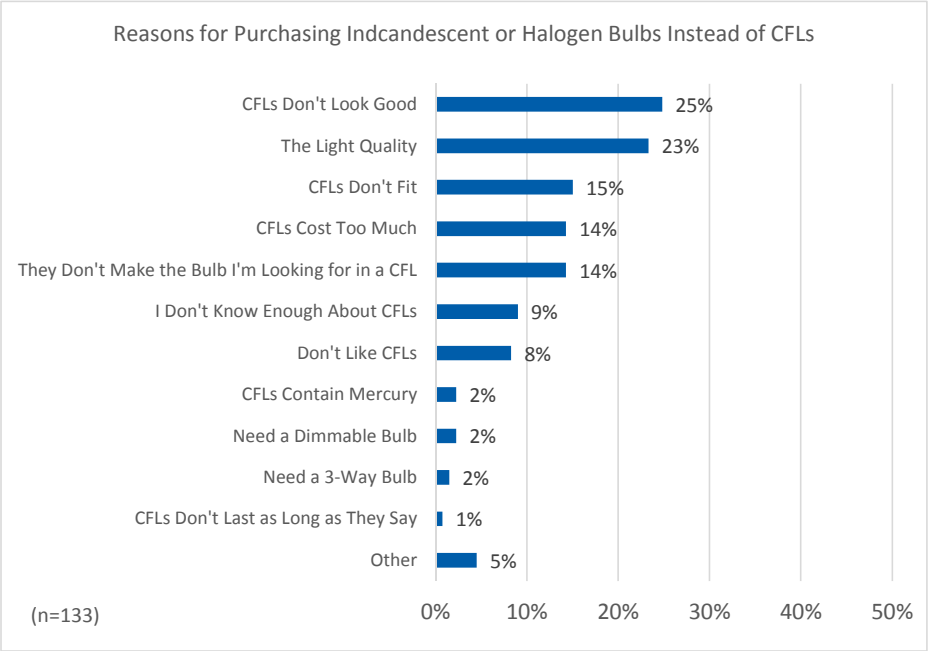


The reasons customers gave for not purchasing CFLs further supported the premise that light quality and cost served as core barriers to CFL sales. The Evaluation Team asked respondents purchasing

incandescents and halogens why they chose those bulbs rather than of CFLs. As shown in Figure 39, 25% of respondents cited light quality and 14% cited cost. The look of CFLs, however, presented a barrier to the technology's adoption among one-quarter of respondents. These customers may not know that, in many cases, a specialty CFL exists, works, and looks attractive in light sockets. For customers stating CFLs do not look good, survey questions followed up by asking if they knew about the availability of covered CFLs (which look more like a traditional light bulb). Two-thirds (69%) said they did not know covered CFLs existed.

These findings suggest increased marketing of specialty CFLs through educating customers about availability of the various specialty CFL alternatives might prove beneficial. Even with increased awareness, some customers will not adopt the bulbs, simply because they do not like them. LEDs may offer a potential solution to this barrier as they continue to drop in price.

Figure 39: Reasons for Purchasing Incandescents or Halogen Bulbs Instead of CFLs



Note: Multiple response question. Percentages sum to more than 100%.

As for other lighting purchase behaviors, on average, customers purchased the same number of CFLs as incandescents and halogens, but purchased fewer LEDs. The high cost of LED technology and few sold in multipacks likely discouraged customers from purchasing greater quantities.

Table 96: Average and Maximum Number of Bulbs Purchased Per Person Buying Each Bulb Type

Bulb Type	Average Number of Bulbs Purchased	Maximum Number of Bulbs Purchased
LEDs	3.1 (n=38)	13 (n=38)
CFLs	5.8 (n=206)	20 (n=206)
Halogen	4.8 (n=46)	29 (n=46)
Incandescent	6.2 (n=129)	64 (n=129)

When purchasing light bulbs, customers generally only purchased one type of bulb, whether incandescents, LEDs, halogens, or CFLs: only 6% of customers purchased multiple types of light bulbs.

Only 5% of all customers purchased an energy-efficient option (CFLs and LEDs) along with a less-efficient option (incandescents and halogens).

Most customers were not first-time buyers of CFLs; the large majority of customers buying CFLs reported already having CFLs installed in their homes (86%).

Customers also did not buy light bulbs on a whim—purchasers were planned decisions. Approximately three-quarters (76%) of customers buying light bulbs already planned on purchasing bulbs when entering the store. The percentage of customers planning on buying light bulbs did not vary significantly during events and non-event periods. Customers generally purchased the same bulb type (e.g., incandescent, CFL, LED) as they planned to do before entering the store, with only 5% of customers purchasing a different bulb type than planned. This suggests the program faces challenges in primarily changing customer purchasing behaviors in the stores.

5.7.6 PROGRAM IMPACTS ON CFL SALES, REVENUES, AND ADVANCING TECHNOLOGY AND INNOVATION

The Evaluation Team used interviews with lighting manufacturers to explore the program's influence on the stocking and sales of efficient lighting and technological innovation.

Nearly all manufacturers said the program increased their sales of CFLs or LEDs. Only five out of 11 manufacturers, however, could provide point estimates of the increase. Responses varied from 15% to 75% for the lift in high-efficiency bulb sales due to the program, though one manufacturer said a particular LED SKUs at Costco had seen a sales lift of nearly 250% since introduction of the program in Indiana.

The study also asked manufacturers about the influence of incentive programs (such as Energizing Indiana), EISA, and state regulations on the development of new lighting products. Only five of 11 manufacturers felt they were sufficiently familiar with EISA and other regulations to answer this question. Most said incentive programs, along with state and national regulations, had a positive impact on driving innovation. Further, most manufacturers attributed at least some of the rise in the wide variety of available efficient lighting to the combined national impact of rebate and incentive programs, such as Energizing Indiana's. Manufacturers noted, however, that the impact resulted from the presence of these programs in many regions across the country and not just a single program.

Manufacturers generally did not offer strong opinions regarding the impact of EISA-compliant halogens on the lighting market. Most manufacturers interviewed did not manufacture the halogens. They largely stated, however, that compliant halogens would take the place of traditional incandescents as the baseline bulb, especially for consumers particularly sensitive to initial price points. Those offering an opinion on the topic thought compliant halogen bulbs would continue to grow as a share of the market during the phase out of traditional incandescents and the clearance of retailer stock, though they also thought CFLs and LEDs remained well placed to compete with these bulbs for the immediate future.

5.8 ~~CONCLUSIONS~~INSIGHTS AND RECOMMENDATIONS

This section presents conclusions and recommendations from the research evaluation efforts.

Conclusion 1: Based on interviews with program staff, the Residential Lighting program ran smoothly in PY2. The program offered incentives for a wide range of energy-efficient lighting products at a variety of

retailers across the state. Manufacturers interviewed through the evaluation generally expressed satisfaction with the program design and implementation. Some, however, voiced concerns regarding program incentives turning on and off quite unexpectedly, citing the difficulties associated with having retailers remove program signage and marketing, and making adjustments to their point-of-sale data systems. Consequently, manufacturers thought retailers might be reluctant to participate in the program in the future.

Recommendation 1: Limit turning off and on program discounts. The program's success and the need to stay within the utility-specific program budgets may require turning program discounts on and off across Indiana, and avoiding this situation may not be possible. However, now that the program has acquired two years of experience and sales data, program implementers may be able to use this information to adjust incentive levels, so the program can run an entire year. If the program cannot be conducted without disruption, it should work closely with retailers, alerting them of program changes, to maintain high satisfaction levels and prevent retailer attrition.

Conclusion 2: In-store lighting demonstrations offer a powerful, highly effective tool to increase customer awareness of program discounts and sales of energy-efficient lighting products over less-efficient options. Moreover, events encourage customers who would not have purchased CFLs at full price to buy program-discounted bulbs.

Recommendation 2: Increase the number of in-store lighting demonstrations. While the relative effectiveness of other marketing strategies (such as bill inserts) could not be assessed as part of this evaluation, in-store customer interviews suggest increasing the number of in-store lighting events could help attract customers who otherwise would not purchase high-efficiency lighting. Therefore, the implementation team should consider increasing the number of in-store events, potentially at the cost of other marketing strategies used by the program.

Conclusion 3: In both PY1 and PY2, the Residential Lighting program emphasized standard CFLs. In PY2, close to 90% of all bulbs sold through the program were standard CFLs. Per the in-store intercept survey results, customers most frequently purchase CFLs as standard bulb types (60% of all standard bulbs purchased are CFLs and 4% are LEDs). Sales of efficient specialty bulbs lag behind (30% are CFLs and 7% are LEDs). In-store customer intercept survey results suggest customer dissatisfaction with specialty CFLs and lack of awareness regarding specialty CFL bulbs present barriers to specialty CFL purchases.

Recommendation 3: Increasingly emphasize specialty bulbs. The program has very successfully promoted purchases of standard CFLs, but the market for efficient lighting for specialty sockets remains largely untouched. The program should consider increasing incentives on specialty CFLs and LEDs to attract more customers and to begin filling these sockets with efficient bulbs. Specialty LEDs hold particular promise for reaching customers dissatisfied with specialty CFLs. To increase incentives on specialty products, the program would likely have to reduce incentives on standard bulbs. Given the program's success in promoting standard CFLs, however, and that many customers purchasing discounted standard CFLs say they would pay full price for them, a shift in program focus may be warranted. In addition, the program should consider additional educational and marketing efforts to make customers aware that efficient lighting options exist for their specialty lighting needs.

6. ENERGY EFFICIENT SCHOOLS

6.1 *PROGRAM DESIGN AND IMPLEMENTATION*

The Energy Efficient Schools (EES) program launched in January 2012, seeking to produce cost-effective electricity savings by influencing school staff, students, and their families to focus on conservation and the efficient use of electricity and gas. The program design helps schools and students identify opportunities to manage their energy consumption by providing zero- or low-cost improvements and tips as well as knowledge and support from conducting larger efficiency projects.

The program consists of two subprograms: the Education program, which targets students and their families through distributions of energy-savings kits; and the School Audit and Direct Install program, which targets school district facility staff by conducting audits, installing free direct-install measures for instant savings, and providing recommendations and rebate options for energy-efficient building improvements to schools.

The TPA manages implementation of both subprograms by tracking overall performance and working with the two subprogram implementers: CLEAResult (the program implementer); and Resource Action Programs (RAP; the implementing subcontractor).

6.1.1 EDUCATION PROGRAM

Program eligibility requirements changed slightly in 2013, primarily targeting teachers with fifth-grade classes (in 2012, both fifth- and sixth-grade teachers were targeted for participation) located within an Energizing Indiana participating utility territory. During 2013, sixth-grade teachers only qualified for participating if their school had not participated in 2012. Once teachers signed up for the program, the implementing subcontractor distributed all kits and curriculum materials to the teachers, who provided each student with a kit containing the following items:

- Three 13-watt CFLs
- Three 23-watt CFLs
- Kitchen Faucet Aerator
- Energy-efficient Showerhead
- LED Night Light
- FilterTone® Alarm
- Flow Rate Test Bag
- Digital Thermometer
- Reminder Sticker and Magnet Pack
- Parent/Guardian Comment Card

Student materials include:

- Student Workbook
- Student Guide
- Scantron Form

Teacher materials include a Teachers Materials Folder, which contains:

- Additional Activities
- Scantron/Letter Postage Paid Return Envelope
- Wristband Flyer
- Teacher Incentive Flyer
- State Education Standards Program Correlation
- Teacher Program Evaluation Survey
- Water Poster
- Energy Poster
- Natural Gas Poster
- Teacher Book

6.1.2 SADI PROGRAM

The Schools Audit and Direct Install (SADI) program makes up the second component of EES. The program seeks to educate school officials and facility staff about the benefits of energy efficiency and the savings associated with installation of recommended energy-saving measures and operational improvements to their schools as well as providing instant savings through direct installations of free energy-saving equipment.

The SADI program provides free walk-through energy audits for K-12 schools more than 10 years old. After the implementation contractor performs the walk-through, an energy specialist presents schools with: a detailed assessment report, outlining a variety of options to increase the school's energy efficiency; and information about available rebates for financial support. The implementation contractor encourages school officials to take advantage of the C&I Prescriptive program or other Core Plus programs that they may qualify for.

In 2013, the program implementer added a direct-install component to the SADI program, requiring participating schools to install a set of direct-install measures within 30 days of the walk-through audit. The set bundle of direct-install measures include:

- Two Vending Machine Timers
- 10 Commercial Smart Strip with Occupancy Sensor
- 10 18-watt CFLs

- 15 Room Occupancy Sensors
- LED Exit Signs (optional)

After receiving the set bundle of measures, schools may opt to choose additional measures to install (up to the value of $4,700). The SADI program reports all savings resulting from direct-install measures and no savings are reported as a direct result of the assessment.

6.2 EM&V METHODOLOGY

The EES program evaluation utilized impact and process elements. Table 97 provides an overview of tasks used for evaluating this program.

Table 97: Program Evaluation Overall Tasks

Action	Details	Education Program	Assessment Program
Implementer Interviews	Interviewed representatives from GoodCents, CLEAResult, and RAP for program progress, successes, and barriers for the 2013 program year.	X	X
Auditor Interviews	Interviewed energy specialists and engineers at CLEAResult to gain knowledge on the assessments and the assessment reports.		X
Student Participant Surveys	Questionnaire distributed in the kits helped determine measures families installed and the persistent of the resulting savings.	X	
Teacher Surveys	Interviewed a sample of teachers to determine their assessment of the program's effectiveness.	X	
Parent/Guardian Survey	Surveyed a sample of parents of students receiving kits to determine freeridership and spillover from the kit measures.	X	
School Facility Staff Participant Surveys	Surveyed a sample of facility staff from a school receiving direct install-measures, and assessed the audit's effectiveness, and the status of energy-efficiency improvements.		X
Program Database Review	Ensured appropriate data were collected to inform the evaluation.	X	X
Ex-Ante Savings Review	Reviewed assumptions and calculations used in the program's *ex-ante* savings assumptions for student kits and school direct-install measures.	X	X

6.2.1 SAMPLE DESIGN AND DATA COLLECTION METHODS

The Evaluation Team developed samples, seeking to achieve precision of ±10% at the 90% confidence level per utility by the end of the three-year evaluation period. Table 98 shows the final sample disposition for various data-collection activities.

Table 98: Sample Disposition for Various Data-Collection Activities

Action	Population(1)	Targeted	Achieved
Implementer Interviews	N/A	2	2
Auditor Interviews	N/A	1	1
Student Participant Surveys(2)	83,222	31,208	34,426
Teacher Surveys	2,554	200	199
Parent/Guardian Survey	398	160	106
School Facility Staff Participant Surveys	93	35	28

(1) All populations listed were available at the time of the survey.
(2) Surveys included in the kits, conducted by GoodCents, with a survey response goal of 37.5%.

The Evaluation Team drew data collection samples using simple or stratified random sampling.[32] The utility-specific Technical Volumes provided achieved surveys per utility.

6.3 PROGRAM PERFORMANCE

Table 99 and Table 100 show reported program performance, compared to statewide and utility-level goals. Reported program savings do not reflect adjustments made for the evaluation.

Table 99: EES *Ex-Ante* Savings (kWh and kW) By Utility

Utility	kWh			kW		
	Goal	*Ex-Ante*	% Goals	Goal	*Ex-Ante*	% Goals
Duke	20,125,953	21,576,001	107%	N/A	80	N/A
I&M	2,293,216	3,968,064	173%	N/A	23	N/A
IPL	5,681,025	6,539,046	115%	N/A	90	N/A
IMPA	1,135,766	1,360,048	120%	N/A	12	N/A
NIPSCO	6,458,237	6,774,683	105%	N/A	30	N/A
Vectren	1,560,295	2,389,131	153%	N/A	50	N/A
Statewide	**37,254,492**	**42,606,973**	**114%**	**N/A**	**286**	**N/A**

Table 100: EES *Ex-Ante* Savings (Therms) By Utility

Utility	Therms		
	Goal	*Ex-Ante*	% Goals
Duke	235,420	252,003	107%
I&M	0	0	N/A
IPL	0	0	N/A
IMPA	0	0	N/A
NIPSCO	152,525	149,450	98%
Vectren	33,289	33,733	101%
Statewide	**421,234**	**435,186**	**103%**

[32] Simple random samples were drawn from the entire population, while stratified random samples were drawn randomly from subpopulations (strata), and then weighted to extrapolate to the greater population.

6.3.1 EDUCATION PROGRAM

Table 101 shows the number of reported kits distributed compared with 2013 program goals per each utility for the Education program.

Table 101: Education Program Participation by Utility and Statewide

Utility	Kits		
	Goal	Reported	% Achieved
Duke	44,402	44,426	100%
I&M	7,928	7,939	100%
IPL	11,592	11,611	100%
IMPA	2,723	2,743	101%
NIPSCO	13,445	13,464	100%
Vectren	2,646	3,039	115%
Statewide	**82,736**	**83,222**	**101%**

Table 102 shows, at the utility level, how reported program performance compared to goals established in program planning. The Education program achieved 105% of its *ex-ante* energy savings goals for electricity and 103% for gas. Savings reported by the program do not reflect adjustments made due to the evaluation.

Table 102: Education Program *Ex-Ante* Savings by Utility and Statewide[1]

Utility	kWh			Therms		
	Goal	*Ex-Ante*	% of Goal	Goal	*Ex-Ante*	% of Goal
Duke	20,103,153	20,114,852	100%	235,420	252,003	107%
I&M	2,054,976	3,521,333	171%	0	0	N/A
IPL	5,037,777	5,047,167	100%	0	0	N/A
IMPA	1,016,646	1,164,761	115%	0	0	N/A
NIPSCO	6,219,997	6,229,158	100%	152,525	149,450	98%
Vectren	1,250,583	1,442,543	115%	33,289	33,733	101%
Statewide	**35,683,132**	**37,519,814**	**105%**	**421,234**	**435,186**	**103%**

(1) The Education program did not report demand savings.

6.3.2 SADI PROGRAM

Tracking SADI program performance included the number of completed audits and closeout meetings performed in each utility's territory as well as savings achieved through the installation of direct-install measures. Table 103 shows how the number of reported assessments compared with 2013 program goals for each utility; Table 104 shows savings goals for direct-install measures and *ex-ante* values achieved.

Table 103: SADI Program Participation by Utility and Statewide

Utility	Audits		
	Goal	Reported	% Achieved
Duke	30	30	100%
I&M	10	10	100%
IPL	27	27	100%
IMPA	3	3	100%
NIPSCO	10	10	100%
Vectren	13	13	100%
Statewide	**93**	**93**	**100%**

Table 104: SADI Program *Ex-Ante* Results by Utility and Statewide[1]

Utility	kWh			kW		
	Goal	*Ex-Ante*	% of Goal	Goal	*Ex-Ante*	% of Goal
Duke[2]	22,800	1,461,149	6409%	0	80	N/A
I&M	238,240	446,731	188%	0	23	N/A
IPL	643,248	1,491,879	232%	0	90	N/A
IMPA	119,120	195,287	164%	0	12	N/A
NIPSCO	238,240	545,525	229%	0	30	N/A
Vectren	309,712	946,588	306%	0	50	N/A
Statewide	**1,571,360**	**5,087,159**	**324%**	**0**	**286**	**N/A**

(1) The SADI program did not report gas savings.

(2) Of the five direct-install measures, Duke originally planned to attribute only savings from the 18-watt CFLs to this SADI program; however, mid-program year the utility decided to capture direct-install savings from all measures through this program. The goals were not updated to reflect this change.

6.4 PROGRAM BUDGET AND EXPENDITURES

Table 105 and Table 106 show original subprogram and program level budgets and expenditures reported at the conclusion of 2013. The TPA reported spending: 101% of the total EES program budget; 101% of the statewide Education program budget; and 105% of the statewide SADI program budget.

Table 105: Subprogram-Level Budget and Expenditures

Utility	Education Program			SADI Program		
	Budget	Reported Expenditures	% of Budget Used	Budget	Reported Expenditures	% of Budget Spent
Duke	$3,765,321	$3,767,512	100%	$391,080	$378,420	97%
I&M	$645,186	$646,165	100%	$130,360	$132,045	101%
IPL	$944,079	$945,839	100%	$351,972	$323,575	92%
IMPA	$216,563	$218,393	101%	$65,180	$38,415	59%
NIPSCO	$1,136,393	$1,138,067	100%	$130,360	$127,095	97%
Vectren	$233,359	$269,179	115%	$169,468	$298,870	176%
Statewide	**$6,940,901**	**$6,985,155**	**101%**	**$1,238,420**	**$1,298,420**	**105%**

Table 106: Program-Level Budget and Expenditures

Utility	EES Program		
	Budget	Reported Expenditures	% of Budget Spent
Duke	$4,156,401	$4,145,932	100%
I&M	$775,546	$778,210	100%
IPL	$1,296,051	$1,269,414	98%
IMPA	$281,743	$256,808	91%
NIPSCO	$1,266,753	$1,265,162	100%
Vectren	$402,827	$568,049	141%
Statewide	**$8,179,321**	**$8,283,575**	**101%**

6.5 *EX-ANTE ENERGY SAVINGS*

*Ex-ant*e savings equal savings reported by the program, compared to goals set forth in program planning.

6.5.1 EDUCATION PROGRAM

The Evaluation Team determined Education program savings by applying a "per-kit" energy savings value to the number of kits distributed through the program. In the spring semester, the TPA, sourcing the Ohio TRM and the initial proposal to Energizing Indiana, designated each kit would save 417 kWh and 11.1 therms annually. In the fall semester, the TPA, with approval by the DSMCC, updated *ex-ante* kit savings to 487 kWh annually, citing the 2012 Evaluation Report. Gas savings per kit remained at the originally designated 11.1 therms per kit. No demand savings were reported for the energy-savings kits.

Table 107 outlines assumptions dictating electricity savings for each measure provided in the energy-savings kit for the 2013 spring semester. The electricity savings per kit were predicated on assumptions about installation rates for each kit measure and saturations of electric- versus gas-sourced water heaters.

Table 107: Spring Semester Planned *Ex-Ante* Energy (kWh) Savings per Kit

Kit Measure	Base *Ex-Ante* kWh Savings (a)	Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total *Ex-Ante* kWh per Kit (a*b*c*d)
CFLs (13 Watt)	44	75%	100%	3	99
CFLs (23 Watt)	78	66%	100%	3	154
Low-Flow Showerhead	608	60%	20%	1	73
Faucet Aerator	158	60%	20%	1	19
LED Night Light	39	80%	100%	1	31
Filter Tone Alarm	90	45%	N/A	1	41
Total				**10**	**417**

Table 108 outlines assumptions dictating electricity savings for each kit measure for the 2013 fall semester. The 2012 EM&V Report adopted these assumptions for the fall semester kits.

Table 108: Fall Semester Planned *Ex-Ante* Energy (kWh) Savings per Kit

Kit Measure	Base *Ex-Ante* kWh Savings (a)	Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total *Ex-Ante* kWh per Kit (a*b*c*d)
CFLs (13 Watt)	57	71%	100%	3	121
CFLs (23 Watt)	58	65%	100%	3	113
Low-Flow Showerhead	603	50%	52%	1	157
Faucet Aerator	243	48%	52%	1	60
LED Night Light	17	88%	100%	1	15
Filter Tone Alarm	46	43%	N/A	1	20
Total				**10**	**487**

For both school semesters, gas savings derived from the ratio of electric savings between the HEA program and the Education program; as these were not determined on a per-measure basis, measure-level assumptions were unavailable.

6.5.2 SADI Program

Table 109 outlines the electricity and demand savings for each direct-install measure.

Table 109: *Ex-Ante* SADI Program Measure-Level Savings

Kit Measure	*Ex-Ante* kWh	*Ex-Ante* kW
18-watt CFL	76	0.0252
LED Exit Sign	83	0.0100
Occupancy Sensor	1,210	0.0788
Smart Strips	169	0.0000
Vending Machine Sensor	1,612	0.0000
Audit	0	0.0000

6.6 *Impact Analysis*

The evaluation effort included multiple data-collection efforts and analysis tasks for each subprogram, and, given the programs' different nature of delivery and performance tracking, the Evaluation Team used unique evaluation methods to conduct the impact analysis for each program.

The Education program's impact analysis included the following:

- A database review of the number of kits distributed;
- An engineering analysis of *ex-ante* energy savings per kit;
- An installation rate analysis (student Scantron survey and parent/guardian survey); and
- NTG analysis (parent/guardian survey).

The SADI program impact analysis included the following:

- A database review of the number of assessments and closeout meetings completed as well as the number of direct-install measures distributed;
- An engineering analysis of *ex-ante* energy savings for the direct-install equipment; and
- Savings attribution analysis (participant facility staff survey and assessment reports).

6.6.1 AUDITED SAVINGS

The impact evaluation process first reviewed the program database to confirm the number of kits distributed and the assessments conducted through the program, and to verify tracking and accurate reporting of program savings.

Education Program

Table 110 presents audited kit quantities, and energy and gas savings.

Table 110: Audited Education Program Demand Savings (kW) by Utility and Statewide

Utility	Number of Reported Kits	Number of Kits in Database	Total *Ex-Ante* kWh Savings	Total Audited kWh Savings	Total *Ex-Ante* Therm Savings	Total *Ex-Ante* Audited Savings
Duke	44,426	44,426	20,114,852	20,114,852	252,003	252,003
I&M	7,939	7,939	3,521,333	3,521,333	0	0
IPL	2,743	2,743	1,164,761	1,164,761	0	0
IMPA	11,611	11,611	5,047,167	5,047,167	0	0
NIPSCO	13,464	13,464	6,229,158	6,229,158	149,450	149,450
Vectren	3,039	3,039	1,442,543	1,442,543	33,733	33,733
Statewide	**83,222**	**83,222**	**37,519,814**	**37,519,814**	**435,186**	**435,186**

As shown, adjustments were not made to the audited number of kits distributed, as the database matched reported kits-per-utility exactly. The Evaluation Team also found correct tracking of the application of electric savings per kit and did not make savings adjustments.

SADI Program

Table 111 and Table 112 show audited measure and audit quantities as well as energy and demand savings. The Evaluation Team reviewed the tracking database for the SADI program's participating schools and did not adjust reported savings per measure or total savings and quantities reported on the TPA's portal.

Table 111: Audited SADI Program Measure-Level Savings and Quantity

Kit Measure	*Ex-Ante* kWh	Audited kWh	*Ex-Ante* kW	Audited kW	*Ex-Ante* Quantity of Measures	Audited Quantity of Measures
18-watt CFL	76	76	0.0252	0.0252	N/A	195
LED Exit Sign	83	83	0.0100	0.0100	N/A	34
Occupancy Sensor	1,210	1210	0.0788	0.0788	N/A	980
Smart Strips	169	169	0.0000	0.0000	N/A	548
Vending Machine Sensor	1,612	1,612	0.0000	0.0000	N/A	121
Audit	0	0	0.0000	0.0000	30	30

Table 112: Audited SADI Program Savings (kWh and kW) by Utility and Statewide

Utility	Total *Ex-Ante* kWh Savings	Total Audited kWh Savings	Total *Ex-Ante* kW Savings	Total Audited kW Savings
Duke	1,461,149	1,461,149	80	80
I&M	446,731	446,731	23	23
IPL	1,491,879	1,491,879	90	90
IMPA	195,287	195,287	12	12
NIPSCO	545,525	545,525	30	30
Vectren	946,588	946,588	50	50
Statewide	**5,087,159**	**5,087,159**	**286**	**286**

6.6.2 VERIFIED SAVINGS

Along with auditing the database, the Evaluation Team used survey data to generate installation and participation rates to verify audited savings for both subprograms.

Education Program

The Evaluation Team used survey data from the student Scantrons and the parent/guardian survey to adjust installation rates of each measure in the kit. The Evaluation Team used the same methods as the 2011 Vectren Core Plus Schools Evaluation, with the addition of the independent data-collection effort with parents and guardians of children receiving kits. Given this extra survey was deployed months after families received the kits, the Evaluation Team could survey families that had significant time to install kit measures and to compare the findings.

Similarly to 2012 findings, the parent/guardian survey produced higher installation rates than the student survey (see Table 113). This finding likely resulted from two factors:

1. Families had the kits for a longer period of time and could install more measures.
2. Parents in the sample likely installed more measures than other parents, as they had to complete the form from the kit and mail it back to the TPA for the Evaluation Team to include their contact information in the sample, thus indicating a “more involved parent,” more likely to engage in their children’s schoolwork.

As often happens (and is extremely difficult to avoid with survey research), student data likely contained biases.

First, students completed the Scantron survey shortly after receiving the kit, which did not allow families sufficient time to install every measure that they would want or plan to, likely causing underreported installation rates.

Some non-response bias also occurred, as 41.4% of Scantron surveys were returned, and installation rates could not be determined for the remaining 58.6%. This non-response bias could indicate an over-reported installation rate (as one cannot know if students not returning surveys installed any measures).

However, results from the participating teacher survey indicated 59% of teachers receiving less than 80% of surveys did not return all surveys received from students. Consequently, the Evaluation Team followed the same methodology in treating student data as that used in the Vectren Core Plus 2011 Evaluation, due to unknowns regarding numbers of surveys completed but not returned.

As no mechanism exists to measure the severity of the various biases, the Evaluation Team considered a straight average of the two survey results as the most appropriate method.

Table 113: Education Program Statewide Verification Adjustments

	Student Data Installation Rate	Parent Data Installation Rate	Statewide Installation Rate
CFLs (13 Watt)	51.4%	87.0%	**69.2%**
CFLs (23 Watt)	40.3%	83.2%	**61.7%**
Low-Flow Showerhead	44.3%	66.0%	**55.2%**
Faucet Aerators	42.8%	50.9%	**46.9%**
LED Night Light	79.3%	88.5%	**83.9%**
Filter Tone Alarm	32.2%	55.8%	**44.0%**

The Evaluation Team compared these results to installation rates reported by similar energy-education kit programs across the Midwest. As shown in Table 114, the Education Program's statewide installation rates aligned with measure installation rates reported by similar school education programs.[33] Two programs included in the comparison (Midwest Utilities A and C) strictly relied on student survey data to determine installation rates.

The remaining program (Midwest Utility B) adjusted reported installation rates, based on a non-response assumption. This program assumed students not responding to the student survey installed kit measures at 50% of those installed by respondents. In other words, the program assumed one-half of non-respondents did not install the measures, and the other half of non-respondents installed the measures at a rate equal to that of respondents.

Table 114. Comparison of Measure Installation Rates

	Energizing Indiana (2013)	Energizing Indiana (2012)	Midwest Utility A (2011)	Midwest Utility B (2011)	Midwest Utility C (2011)
CFLs (13 Watt)	69%	71%	70%	65%	79%
CFLs (23 Watt)	62%	65%	N/A	70%	N/A
Low-Flow Showerhead	55%	50%	52%	32%	53%
Faucet Aerators	47%	48%	54%	N/A	61%

[33] The methodologies used in calculating these installation rates varied by program.

LED Night Light	84%	88%	N/A	N/A	81%

Table 115 and Table 116 show adjustments for installation rates and the effect on audited per-measure savings for the spring and fall semesters.

Table 115: Spring Semester Education Program Statewide Verification Adjustments

Kit Measure	Base *Ex-Ante* Savings (a)	Evaluated Statewide Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total Verified kWh Savings (a*b*c*d)	Total Verified Therm Savings(1)
CFLs (13-watt)	44	69%	100%	3	91	N/A
CFLs (23-watt)	78	62%	100%	3	144	N/A
Low-Flow Showerhead	608	55%	20%	1	67	N/A
Faucet Aerators	158	47%	20%	1	15	N/A
LED Night Light	39	84%	100%	1	33	N/A
Filter Tone Alarm	90	44%	N/A	1	39	N/A
Statewide Total				**10**	**390**	**10.38**

(1) As *ex-ante* savings for gas were generated from a program electric savings ratio to HEA, measure-level verified savings were unavailable.

Table 116: Fall Semester Education Program Statewide Verification Adjustments

Kit Measure	Base *Ex-Ante* Savings (a)	Evaluated Statewide Installation Rate (b)	Electric Saturation Rate (c)	Measures Per Kit (d)	Total Verified kWh Savings (a*b*c*d)	Total Verified Therm Savings(1)
CFLs (13-watt)	57	69%	100%	3	118	N/A
CFLs (23-watt)	58	62%	100%	3	107	N/A
Low-Flow Showerhead	603	55%	52%	1	174	N/A
Faucet Aerators	243	47%	52%	1	60	N/A
LED Night Light	17	84%	100%	1	15	N/A
Filter Tone Alarm	46	44%	N/A	1	20	N/A
Statewide Total				**10**	**494**	**11.25**

(1) As *ex-ante* savings for gas were generated from a program electric savings ratio to HEA, measure-level verified savings were unavailable.

These adjustments occurred at a statewide level rather than at the utility level, as the sample size of survey participants for each utility had to be significant at the statewide level for the first year and at the utility level over the course of the three-year evaluation effort. While data from the student surveys proved statistically significant across the utilities, data from the parent/guardian survey did not.

Table 117 summarizes *ex-ante* and verified energy savings per kit for each semester.

Table 117: Statewide Verified Energy Savings per Kit by Semester

Semester	*Ex-Ante* kWh Savings Per Kit	Verified kWh Savings Per Kit	*Ex-Ante* kW Savings Per Kit	Verified kW Savings Per Kit	*Ex-Ante* Therm Savings Per Kit	Verified Therm Savings Per Kit
Spring	417	390	N/A	N/A	11.10	10.4
Fall	487	494	N/A	N/A	11.10	11.2

Table 118 and Table 119 show utility and statewide verified energy savings for the Education program, including additional electric savings from the 2012 CFLs installed in 2013.

Table 118: Verified Energy Savings (kWh) by Utility and Statewide

Utility	*Ex-Ante* kWh Savings	Verified kWh Savings	Realization Rate (kWh)
Duke	20,114,852	19,676,328	98%
I&M	3,521,333	3,407,782	97%
IPL	5,047,167	4,831,662	96%
IMPA	1,164,761	1,100,593	94%
NIPSCO	6,229,158	6,160,182	99%
Vectren	1,442,543	1,444,533	100%
Statewide	**37,519,814**	**36,621,079**	**98%**

Table 119: Verified Gas Savings (Therms) by Utility and Statewide

Utility	*Ex-Ante* Therm Savings	Verified Therm Savings	Realization Rate (Therms)
Duke	252,003	255,229	101%
I&M	0	0	N/A
IPL	0	0	N/A
IMPA	0	0	N/A
NIPSCO	149,450	147,241	99%
Vectren	33,733	33,694	100%
Statewide	**435,186**	**436,165**	**100%**

CFL Storage to Installation

In addition to adjusting the installation rate for the kits, the Evaluation Team examined verified savings generated from bulbs not installed in 2012, but likely installed in 2013.

For the 2012 evaluation, the Evaluation Team calculated first-year savings from installed 13- and 23-watt bulbs, and did not credit verified savings for any bulb discarded or stored. Several studies, however, have shown that up to 99% of stored bulbs move into sockets within a few years, causing savings to occur several years after the initial purchase. The Evaluation Team calculated the verified savings impacts for the 2012 bulbs installed in 2013, as shown in Table 120.

Table 120. Electric (kWh) Savings from Y1 13- and 23-watt Bulbs Installed in Y2

Utility	Quantity of Bulbs Distributed in Y1	Quantity of Bulbs Installed in Y1	Quantity of Bulbs Installed in Y2	Second Year Savings (kWh)
Duke	236,700	161,389	36,472	2,285,198
I&M	29,616	20,193	4,563	285,925
IPL	59,388	40,493	9,151	573,356
IMPA	15,600	10,637	2,404	150,609
NIPSCO	69,192	47,177	10,661	668,008
Vectren	25,674	17,505	3,956	247,867
Statewide	**436,170**	**297,394**	**67,207**	**4,210,963**

The Evaluation Team used the UMP-recommended method to calculate savings from bulbs initially stored and later installed.

To generate these additional savings, the Evaluation Team applied the 2012 base *ex-ante* per bulb savings to the quantity of bulbs installed in 2013.[34] The Evaluation Team could not account for these additional bulbs in terms of gas savings, given the bundled way gas savings apply to kits and demand savings (as the TPA did not report demand savings for CFLs in 2013). The Summary of Impact Adjustments section, below, captures these additional verified (as well as *ex-post* gross and net) savings.

SADI Program

The Evaluation Team used data from the facility staff surveys to verify the installation and persistence rates of the direct-install measures. For each direct-install measure, surveyed facility members were asked: if all the recorded measures were installed; and if they remained installed at the time of the survey (i.e., if measures had been removed). Responses to the questions produced individual installation and persistent rates for the five direct-install measures. Table 121 shows these rates as applied to *ex-ante* savings to generate verified savings.

Table 121: SADI Program Statewide Verification Adjustments

Measure	Verified Installation Rate	Verified Persistence Rate
18-watt CFL	96.4%	100.0%
LED Exit Sign	87.5%	100.0%
Occupancy Sensor	100.0%	98.4%
Smart Strips	99.3%	99.8%
Vending Machine Sensor	100%	87.9%

Several measures received installation and persistence rates below 100% for the following reasons:

- One facility staff member reported receiving 10 CFLs and only installed four.
- One facility staff member reported receiving 28 LED exit signs and installed only 20.
- One facility staff member reported installing 101 occupancy sensors and removed 16.
- One facility staff member reported receiving 10 Smart Strips and only installed six.

[34] Base *ex-ante* savings in 2012 of 44kWh for 13-watt CFLs and 78 kWh for 23-watt CFLs.

- One facility staff member reported installing 12 Smart Strips and removing one.
- Two facility staff members reported installing all vending machine sensors, but removed some due to technical issues or because the machine vendor requested their removal.

Table 122 shows utility and statewide verified energy savings for the SADI program. Overall, SADI realized 97% of electricity and 98% of demand savings.

Table 122: Verified Energy Savings (kWh and kW) by Utility and Statewide

Utility	*Ex-Ante* kWh Savings	Verified kWh Savings	Realization Rate (kWh)	*Ex-Ante* kW Savings	Verified kW Savings	Realization Rate (kW)
Duke	1,461,149	1,417,615	97%	80	79	98%
I&M	446,731	431,029	96%	23	22	98%
IPL	1,491,879	1,458,606	98%	90	89	98%
IMPA	195,287	191,224	98%	12	12	98%
NIPSCO	545,525	527,021	97%	30	30	98%
Vectren	946,588	927,353	98%	50	49	98%
Statewide	**5,087,159**	**4,952,848**	**97%**	**286**	**281**	**98%**

6.7 *Ex-Post Savings*

Ex-Post savings reflect engineering adjustments made to *ex-ante* measure savings claimed by the program. Due to the varying nature of program delivery between the subprograms, the Evaluation Team conducted *ex-post* reviews separately, using methodologies tailored to each subprogram.

6.7.1 Education Program

The Evaluation Team calculated *ex-post* electric energy, demand, and gas savings for each kit measure using engineering reviews and survey results, and evaluated a statewide per-kit savings value of 466.80 kWh, 0.063 kW, and 13.37 therms.

The evaluated *ex-post* savings shown in Table 123 represent statewide average savings for each measure across all utilities. This statewide average was determined by weighting the calculated, utility-specific savings of each measure by the total number of school kits distributed.

Table 123: Summary Table of Statewide Engineering Review Findings by Measure

Kit Measure	*Ex-Post* Savings Per Measure (kWh)	*Ex-Post* Savings Per Measure (kW)	*Ex-Post* Savings Per Measure (Therms)
3 CFLs (13-watt)	97.28	0.012	(1.49)
3CFLs (23-watt)	83.42	0.011	(1.28)
Low-Flow Showerhead	116.53	0.006	5.20
Faucet Aerator	142.77	0.003	6.36
LED Night Light	6.83	0.000	0.00
Filter Tone Alarm	19.98	0.032	4.58
Kit Total	**466.80**	**0.063**	**13.37**

The engineering team applied the same methodologies to determine school kit savings as in the previous year's evaluation. Student and parent surveys were used to calculate utility-specific inputs, such as: the number of people per home, shower flow rates, and hot water heater fuel saturations. The

Evaluation Team applied these inputs, along with other inputs from the Indiana TRM, to determine savings for each utility for each measure.

Overall, inputs did not change significantly year over year, resulting in similar findings from the previous evaluation. Two water measures in the school kits, however, proved to be notable exceptions: kitchen faucet aerators and showerheads. For these measures, the Evaluation Team adopted inputs from the 2012 Cadmus Michigan water metering study to replace several Indiana TRM inputs, while retaining the same Indiana TRM algorithms. Updated inputs included: length of use, baseline flow rates, point-of-use water temperature, and numbers of shower per day. These updated inputs drove down the *ex-post* base savings for the showerhead measure by approximately 210 kWh per unit and drove up kitchen aerator savings by approximately 350 kWh per unit year-over-year.

Also of note, the Evaluation Team updated the CFL HOUs to be consistent with the Indiana metering study. The Evaluation Team adjusted the metering study HOU to account for the presence of children in the home, which increased the HOU value slightly.

Table 124 and Table 125 provide summary findings for the *ex-post* kit savings review, by utility.

Table 124: *Ex-Post* Education Program Energy (kWh) Savings per Utility and Statewide

Utility	Verified kWh Savings	*Ex-Post* kWh Savings	Verified kW Savings	*Ex-Post* Savings
Duke	19,676,328	22,347,370	N/A	2,884
I&M	3,407,782	3,608,527	N/A	493
IPL	4,831,662	5,430,233	N/A	738
IMPA	1,100,593	1,363,803	N/A	175
NIPSCO	6,160,182	4,768,039	N/A	783
Vectren	1,444,533	1,329,992	N/A	193
Statewide	**36,621,079**	**38,847,964**	**N/A**	**5,266**

Table 125: *Ex-Post* Education Program Gas (Therms) Savings per Utility and Statewide

Utility	Verified Therm Savings	*Ex-Post* Therm Savings
Duke	255,406	706,508
I&M	0	87,824
IPL	0	163,715
IMPA	0	41,067
NIPSCO	147,393	79,563
Vectren	33,723	34,071
Statewide	**436,522**	**1,112,748**

6.7.2 SADI PROGRAM

The Evaluation Team calculated *ex-post* electric energy, demand, and gas savings for each direct-install measure through engineering reviews and survey results.

Evaluated *ex-post* savings shown in Table 126 and Table 127 represent the statewide average savings for each measure across all utilities. This statewide average was determined by weighting the calculated, utility-specific savings of each measure by the total number of measures distributed.

Table 126: Statewide *Ex-Post* Savings (kWh and kW) by Measure

Direct Install Measure	Verified Savings Per Measure (kWh)	Base *Ex-Post* Savings Per Measure (kWh)	Verified Savings Per Measure (kW)	Base *Ex-Post* Savings Per Measure (kW)
18-watt CFL	73	100	0.024	0.033
LED Exit Sign	73	95	0.009	0.012
Occupancy Sensor	1,191	316	0.078	0.022
Smart Strips	168	45	0.000	0.000
Vending Machine Sensor	1,417	1,612	0.000	0.000

Table 127: Statewide *Ex-Post* Savings (Therms) by Measure

Direct Install Measure	Verified Savings Per Measure (Therms)	Base *Ex-Post* Savings Per Measure (Therms)
18-watt CFL	N/A	(0.32)
LED Exit Sign	N/A	(0.32)
Occupancy Sensor	N/A	(1.02)
Smart Strips	N/A	0.00
Vending Machine Sensor	N/A	0.00

The Evaluation Team applied algorithms and inputs from the Indiana TRM to determine evaluated savings. Inputs were refined using primary data sources, such as the facility staff survey and assessment reports when possible and appropriate.

Evaluated savings for three measures resulted in savings very similar to the *ex-ante* savings. These measures included: 18-watt CFLs, LED exit signs, and vending machine sensors. Evaluated savings for the remaining two measures, lighting occupancy sensors and Smart Strips, resulted in reduced savings compared to *ex-ante* savings.

Evaluated savings for the lighting occupancy sensor measure were driven down when the Evaluation Team updated the "watts controlled" input. This input had an evaluated wattage of 434-watts compared to the *ex-ante* value of 1,600-watts. Survey data indicated lighting occupancy sensors overwhelmingly were installed in small rooms, such as closets, offices, and bathrooms. This installation location drove down the wattage amount the sensors controlled, reducing overall savings.

The Evaluation Team revised the occupancy Smart Strip savings, largely due to two findings: facility staff survey data indicated installation of Smart Strips almost entirely in school computer labs; and Smart Strip specifications suggested using devices with computer monitors. *Ex-ante* savings were based on the Indiana TRM calculation, which assumed the device would be used with a "laser printer" and a "multi-function device, laser (scanner, fax)"; Smart Strips product information warns against plugging both devices into Smart Strips.[35] The Evaluation Team's evaluated savings assumed Smart Strips were used with computer monitors and adjusted the HOUs to reflect those of a school.

[35] The specification sheet for occupancy power strip Isolé IDP-3050: "The IDP-3050 is ideal for controlling task lighting and computer monitors. Additional devices for the controlled outlets include space heaters, fans and other equipment that can be turned off during unoccupied periods. Devices such as CPUs and fax machines should be plugged into the uncontrolled outlets."

Table 128 and Table 129 provide summary findings for an *ex-post* savings review by utility. Savings per measure vary by utility as savings calculations use inputs specific to each utility's territory and the participating schools.

Table 128: *Ex-Post* Gross Energy (kWh and kW) Savings per Utility and Statewide

Utility	Verified kWh Savings	Total *Ex-Post* kWh Savings	Verified kW Savings	Total *Ex-Post* kW Savings
Duke	1,417,615	515,244	79	28
I&M	431,029	174,677	22	8
IPL	1,458,606	468,155	89	30
IMPA	191,224	58,578	12	3
NIPSCO	527,021	184,803	30	11
Vectren	927,353	289,530	49	17
Statewide	**4,952,848**	**1,690,987**	**281**	**97**

Table 129: *Ex-Post* Gross Energy (Therms) Savings per Utility and Statewide

Utility	Verified Therm Savings	Total *Ex-Post* Therm Savings
Duke	N/A	(1,033)
I&M	N/A	(354)
IPL	N/A	(1,195)
IMPA	N/A	(162)
NIPSCO	N/A	(340)
Vectren	N/A	(575)
Statewide	**N/A**	**(3,659)**

6.8 *NET SAVINGS*

Net savings reflect the application of the program NTG ratio to *ex-post* energy savings. Freeridership and spillover comprise the two NTG ratio components. Freeridership occurs when participants would have undertaken the same energy-efficient actions in the program's absence.

$$\text{NTG} = 1 - \text{Freeridership} + \text{Spillover}$$

6.8.1 EDUCATION PROGRAM

Table 130 summarizes freeridership, spillover, and NTG estimates for each measure included in the energy-efficiency kit. The overall statewide program NTG estimate derives from weighting each individual measure-level NTG estimate by the total energy savings of each respective measure. A 97% weighted, statewide, electric NTG estimate results for each kit. The subsequent section provides freeridership and spillover methods and results.

Table 130: Education Program Freeridership, Spillover, and NTG Summary[(1)]

Measure	Freeridership	Spillover	NTG
3 CFLs (13-watt)	39%	18%	78%
3CFLs (23-watt)	39%	18%	78%
Low-Flow Showerhead	10%	18%	107%
Faucet Aerator	7%	18%	110%
LED Night Light	18%	18%	100%
Filter Tone Alarm	1%	18%	117%

(1) NTG values were applied by measure and the net savings were rolled up into a kit-level estimate. Differences in the weighting between *ex-post* measure-level values for electricity, demand, and gas savings caused these variations in NTG values across savings type.

Applying measure-level NTG ratios to the utility-level savings per measure resulted in the net savings for the Education program shown in Table 131. NTG ratios varied by utility and by savings type due to different *ex-post* savings values per utility and measure. A detailed summary of the NTG approach and its establishment by measure can be found in Appendix C of the *2012 Energizing Indiana Programs EM&V Report*.

Table 131: Education Program Net Savings by Utility and Statewide

	NTG (kWh)	Net kWh Savings	NTG (kW)	Net kW Savings	NTG (Therms)	Net Therm Savings
Duke	99%	22,047,728	102%	2,944	116%	816,325
I&M	97%	3,484,496	102%	502	125%	109,582
IPL	98%	5,300,004	102%	750	116%	190,678
IMPA	98%	1,331,056	102%	178	116%	47,613
NIPSCO	91%	4,356,224	101%	794	139%	110,232
Vectren	96%	1,283,318	101%	195	117%	40,021
Statewide	**97%**	**37,802,826**	**102%**	**5,363**	**118%**	**1,314,451**

6.8.2 SADI PROGRAM

Due to significant program changes implemented in 2013, the Evaluation Team approached the net savings review differently than in the previous evaluation. As the program did not claim savings in 2012, the Evaluation Team assigned the SADI program a NTG of 100%. However, with the addition of direct-install measures to the program design and the program's growth in 2013, the Evaluation Team collected information from schools during the facility staff surveys to inform the NTG ratio, particularly to discover spillover from the audit recommendations.

Freeridership

As in 2012, the Evaluation Team assumed freeridership did not occur for the energy savings attributed to the SADI program. Since commercial building energy audits preformed on school facilities prove highly expensive and schools tend to have limited budgets, the Evaluation Team assumed the school would not have received an energy audit using its own funds outside of the program. The Evaluation Team also assumed schools would not have installed the direct-install measures without program assistance in 2013.

Spillover

The SADI program design's audit component seeks to funnel schools through other prescriptive programs, which capture savings for all measures implemented that qualify for rebates. However, many recommendations offered in the assessment reports either did not qualify for a rebate or depended on behavioral changes (e.g., thermostat set points) that could be tracked without verification or follow-up. Considering the potential savings accruing through these scenarios, the Evaluation Team conducted surveys with participating facility staff to understand recommendations adopted in 2013 that did not qualify for a rebate.

The Evaluation Team interviewed 28 representatives from participating schools and found, of the total number of recommendations implemented in the first year, 64% did not qualify for a rebate and were not attributed to or tracked by any efficiency program. Therefore, savings from these implemented recommendations could be directly attributable to the SADI program in the form of spillover.

The Evaluation Team used calculated savings values from each school's assessment report to assign spillover savings to any recommendation implemented and not receiving a rebate to calculate a savings-per-school value (discounting for partial implementation). Table 132 summarizes average spillover savings per recommendation type, per school.

Table 132: Spillover Energy (kWh and Therms) Savings by Measure per School

Recommendation Type	kWh Per School	Therms Per School
Lighting	789	-11
Occupancy sensors	2,057	0
Air temperature controls	3,000	201
Heating, Ventilation, Air Conditioning (HVAC)	81	182
Building re-commissioning	42,420	1,059
Grand Total	**48,347**	**1,432**

The Evaluation Team multiplied per-school values by the number of assessments conducted in each utility territory to arrive at the total spillover savings for the SADI program. Table 133 and Table 134 present net savings for the SADI program, including adjustments for freeridership and positive adjustments for spillover.

Table 133: SADI program Net Energy and Demand (kWh and kW) Savings by Utility and Statewide

Utility	*Ex-Post* kWh Savings (a)	Spillover Savings (kWh) (b)	Net kWh Savings (a+b)	*Ex-Post* kW Savings	Net kW Savings
Duke	515,244	1,450,421	1,965,665	28	28
I&M	174,677	483,474	658,151	8	8
IPL	468,155	1,305,379	1,773,534	30	30
IMPA	58,578	145,042	203,621	3	3
NIPSCO	184,803	483,474	668,276	11	11
Vectren	289,530	628,516	918,045	17	17
Statewide	**1,690,987**	**4,496,305**	**6,187,292**	**97**	**97**

Table 134: SADI program Net Gas (Therms) Savings by Utility and Statewide

Utility	*Ex-Post* Therm Savings (a)	Spillover Savings (Therms) (b)	Net Therm Savings (a+b)
Duke	(1,033)	42,961	41,928
I&M	(354)	14,320	13,966
IPL	(1,195)	38,665	37,469
IMPA	(162)	4,296	4,134
NIPSCO	(340)	14,320	13,980
Vectren	(575)	18,616	18,042
Statewide	**(3,659)**	**133,178**	**129,519**

6.9 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy savings claimed by the programs in PY2.

Table 135: PY2 Achieved Savings Summary (kWh)

	Planned kWh	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	20,125,953	21,576,001	21,576,001	21,093,942	98%	22,862,613	24,013,393
I&M	2,293,216	3,968,064	3,968,064	3,838,811	97%	3,783,204	4,142,647
IPL	5,681,025	6,539,046	6,539,046	6,290,268	96%	5,898,388	7,073,538
IMPA	1,135,766	1,360,048	1,360,048	1,291,817	95%	1,422,382	1,534,677
NIPSCO	6,458,237	6,774,683	6,774,683	6,687,203	99%	4,952,841	5,024,500
Vectren	1,560,295	2,389,131	2,389,131	2,371,885	99%	1,619,522	2,201,364
Statewide	**37,254,492**	**42,606,973**	**42,606,973**	**41,573,927**	**98%**	**40,538,951**	**43,990,118**

Table 136: PY2 Achieved Savings Summary (kW)

	Planned kW	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	0	80	80	79	98%	2,912	2,972
I&M	0	23	23	22	98%	501	510
IPL	0	90	90	89	98%	768	780
IMPA	0	12	12	12	98%	179	182
NIPSCO	0	30	30	30	98%	794	805
Vectren	0	50	50	49	98%	210	213
Statewide	**0**	**286**	**286**	**281**	**98%**	**5,363**	**5,461**

Table 137: PY2 Achieved Savings Summary (Therms)

	Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Therms	Net kW Therms
Duke	235,420	252,003	252,003	255,406	101%	705,475	858,253
I&M	0	0	0	0	N/A	87,470	123,548
IPL	0	0	0	0	N/A	162,520	228,147
IMPA	0	0	0	0	N/A	40,905	51,747
NIPSCO	152,525	149,450	149,450	147,393	99%	79,223	124,213
Vectren	33,289	33,733	33,733	33,723	100%	33,497	58,063
Statewide	**421,234**	**435,186**	**435,186**	**436,522**	**100%**	**1,109,089**	**1,443,970**

The following tables show savings achieved in PY2, plus additional savings from delayed installations from PY1: savings generated from some CFLs distributed in kits in PY1 but not installed that year.

Table 138: PY2 Achieved Savings Summary (kWh)

	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	20,125,953	21,576,001	21,576,001	23,379,141	108%	24,462,618	25,515,284
I&M	2,293,216	3,968,064	3,968,064	4,124,736	104%	3,999,228	4,345,424
IPL	5,681,025	6,539,046	6,539,046	6,863,624	105%	6,307,013	7,457,106
IMPA	1,135,766	1,360,048	1,360,048	1,442,426	106%	1,535,482	1,640,842
NIPSCO	6,458,237	6,774,683	6,774,683	7,355,211	109%	5,510,464	5,547,929
Vectren	1,560,295	2,389,131	2,389,131	2,619,753	110%	1,802,446	2,373,071
Statewide	**37,254,492**	**42,606,973**	**42,606,973**	**45,784,890**	**107%**	**43,617,251**	**46,879,657**

Table 139: PY2 Achieved Savings Summary (kW)

	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	0	80	80	79	98%	3,121	3,168
I&M	0	23	23	22	98%	527	535
IPL	0	90	90	89	98%	822	830
IMPA	0	12	12	12	98%	192	195
NIPSCO	0	30	30	30	98%	854	862
Vectren	0	50	50	49	98%	234	235
Statewide	**0**	**286**	**286**	**281**	**98%**	**5,751**	**5,825**

Table 140: PY2 Achieved Savings Summary (Therms)

	Therms Goal	*Ex-Ante* Therms	Audited Therms	Verified Therms	Realization Rate	*Ex-Post* Therms	Net kW Therms
Duke	235,420	252,003	252,003	255,406	101%	685,251	839,269
I&M	0	0	0	0	0%	82,297	118,692
IPL	0	0	0	0	0%	157,322	223,267
IMPA	0	0	0	0	0%	39,542	50,468
NIPSCO	152,525	149,450	149,450	147,393	99%	67,303	113,024
Vectren	33,289	33,733	33,733	33,723	100%	31,285	55,987
Statewide	**421,234**	**435,186**	**435,186**	**436,522**	**100%**	**1,063,000**	**1,400,707**

Table 141: Lifetime Savings Achieved by Schools

Utility	Lifetime *Ex-Post* kWh	~~Lifetime *Ex-Post* kW~~	~~Lifetime *Ex-Post* Therms~~
Duke	162,359,282		
I&M	25,917,264		
IPL	41,213,557		
IMPA	9,857,458		
NIPSCO	32,945,470		
Vectren	11,526,608		
Statewide	**283,819,639**		

6.10 *Process Analysis*

The Education program and the SADI program process analysis detailed in this chapter derived from the following evaluation activities:

- Program implementer interviews (n=2)
    - GoodCents staff
    - CLEAResult staff
- Parent comment cards (n=479)
- Student survey results (n= 34,426)
- Participant teacher surveys (n=199)
- Facility staff participant surveys (n=28)

6.10.1 PROGRAM MARKETING

Education Program

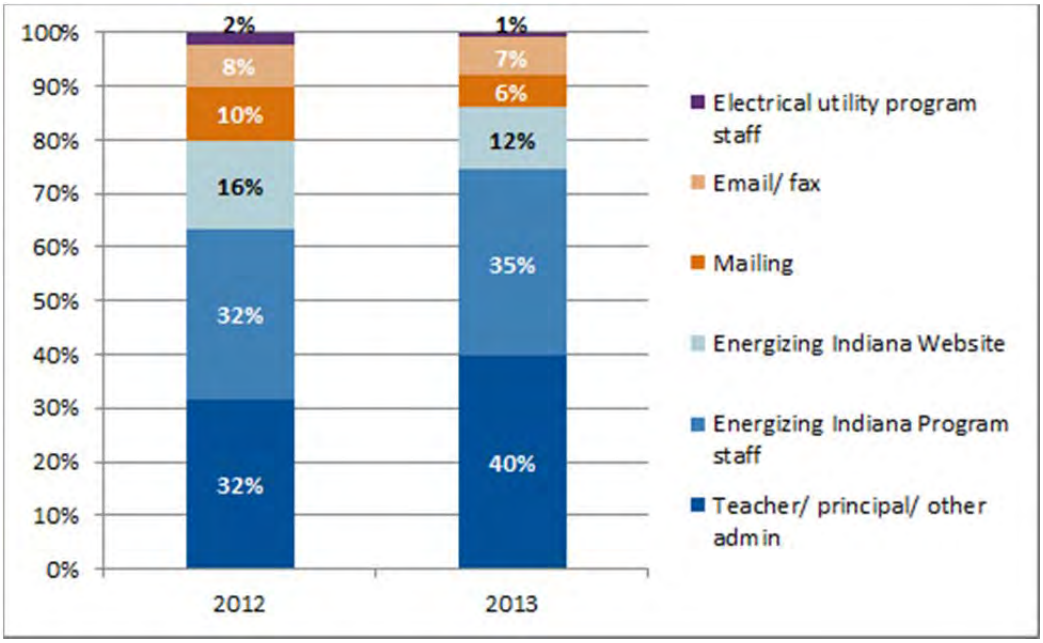
As in PY1, the EES program implementer, CLEAResult, subcontracted with Research Action Programs (the implementing subcontractor) to conduct day-to-day operations for the Education program. The implementing subcontractor managed all program outreach, teacher enrollment, and distributions of program materials.

Using a list of ZIP codes within each participating utility's service territory, the implementing subcontractor generated a potential list of participating teachers for the utilities to approve. Once approved, the implementing subcontractor conducted targeted outreach through a combination of e-mail, fax, and phone calls.

As shown in Figure 40, program awareness in the market increased: the number of participating teachers citing word-of-mouth from teacher/principal/other administrator rose from 32% in 2012 to 40% in 2013.[36] Word-of-mouth generated the greatest program awareness for the Education program in 2013, cited by 40% of surveyed teachers. Participants also cited direct outreach as a common source of program awareness, noted by 35% of teachers (an increase from 32% in 2012).[37]

[36] P-value = 0.00; this difference is statistically significant (α=0.1).
[37] P-value = 0.1; this difference is statistically significant (α=0.1).

Figure 40. How Did You First Learn about the Energizing Indiana Schools Education Program? ~~(2012 n=441, 2013 n=199)~~



2012 n=441, 2013 n=199

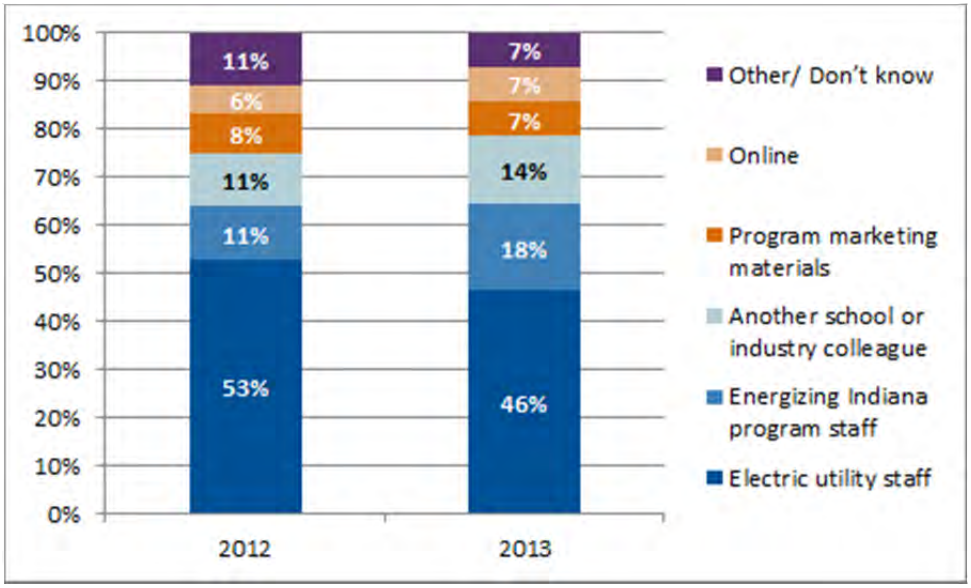
SADI Program

In 2012, the participating utilities primarily conducted their own outreach to schools for the SADI program, with only Duke Energy utilizing the program implementer for school recruitment. In 2013, the program implementer assumed responsibility for all direct outreach to schools. The program implementer reported that each utility provided a list of qualified schools, from which they recruited. The program implementer noted this change improved overall program delivery.

In addition, the TPA added a sign-up form to the Energizing Indiana website for interested schools to enroll in the SADI program. Due to the program's participation limits set by the utilities, the TPA reported schools signing up for the program through the website might not always be chosen to participate during a specific program year. However, all schools signing up through the website enter a wait list, which generates leads for the program implementer to recruit from in future program years.

Despite the outreach changes in 2013, participating facility staff reported similar sources of program awareness as cited in 2012 (see Figure 41). Similarly to 2012, roughly one-half (53% in 2012, compared to 46% in 2013) of participating facility staff reported they first learned about the SADI program through their electric utility. Direct outreach from Energizing Indiana program staff provided the second most common source of program awareness in 2013, cited by 18% of surveyed facility staff.

Figure 41. How Did You First Learn about the SADI Program? ~~(2012 n= 36, 2013 n=28)~~



(2012 n= 36, 2013 n=28)

6.10.2 PARTICIPANT SATISFACTION

Education Program

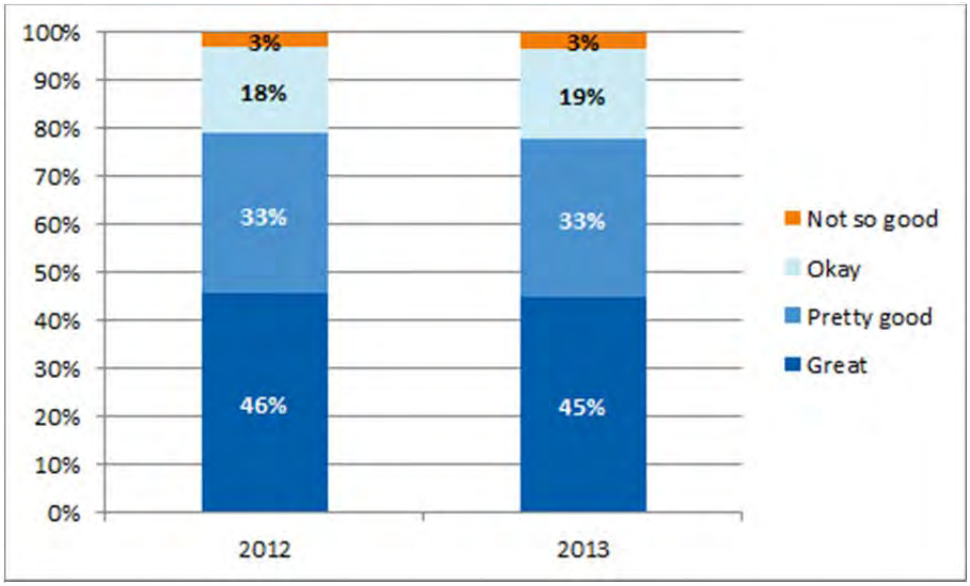
The TPA and program implementer reported high satisfaction levels with the Education program. Both parties reported communications among program stakeholders (e.g., the TPA, program implementer, and the implementing subcontractor) significantly improved in the program's second year. Also notable, funding for the Education program proved sufficient to fully support the program and to meet its goals.

The TPA reported the Education program participants consistently received the program well, specifically noting that students and their families appreciated that the kits provided an activity they could do together as a family. Participants—including students, parents, and teachers—expressed high satisfaction levels with their overall program experience.

Students rated the Education program as part of the student surveys returned by participating teachers. As shown in Figure 42, student satisfaction with the program consistently ran high. The majority of participating students rated the Education program as "great" (a slight decrease from 46% in 2012 to 45% in 2013)[38] or "pretty good" (33% in 2012 and 2013).

[38] P-value = 0.01; this difference is statistically significant (α=0.1).

Figure 42. How would you Rate the Energizing Indiana School Education Program~~? (2012 N= 33,833, 2013 N= 32,100)~~(?)[1]



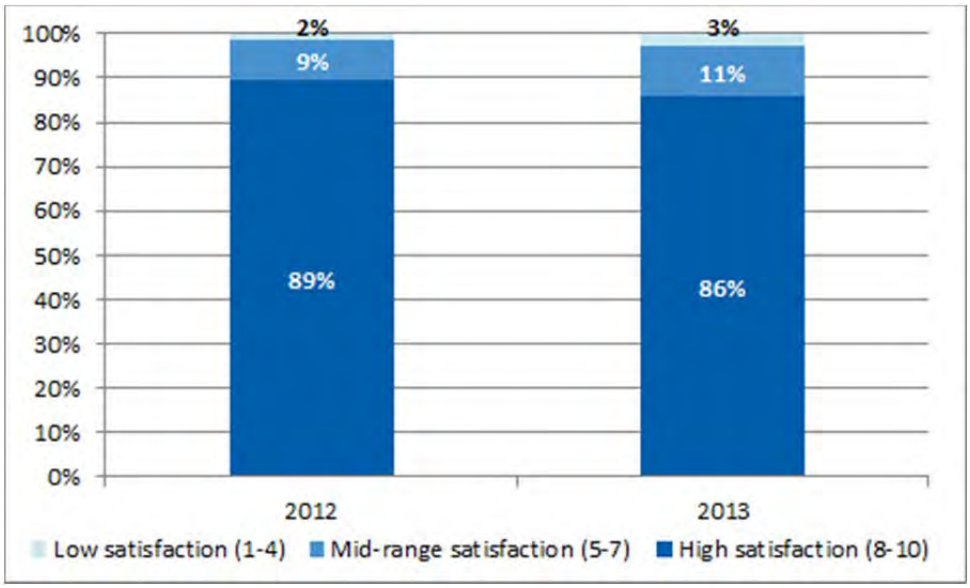
(1) Surveys without a response were removed from the population.
2012 N= 33,833, 2013 N= 32,100

Two-thirds (66%) of parents filling out and returning the parent comment card included in participating students' kits provided commentary on the Education program, with nearly all of it positive. Parents' comments regarding their satisfaction with their program experience included the following:

- *"Wonderful tool and easy instructions. We will definitely save energy and money."*
- *"Now my fifth-grader understands more about saving water when showering and doing dishes. Plus, I couldn't have went out and bought all [the kit equipment] at one time. Thanks again."*
- *"My child was very excited to be able to teach us about saving energy. I believe it is a good program. Thank you!"*
- *"We had a lot of fun setting up and testing. It was fun for the whole family. Plus, we all learned a lot about saving energy and money."*

Participating teacher satisfaction also remained consistently high in 2013. As shown in Figure 43, 86% of surveyed teachers in 2013 reported high satisfaction levels with the Education program overall, compared to 89% of teachers in 2012.

Figure 43. Overall, On a Scale of 1-10 How Satisfied Are You with the Energizing Indiana Schools Education Program? ~~(2012 n= 441, 2013 n=199)~~



2012 n= 441, 2013 n=199

Other indicators of teacher's high satisfaction included:

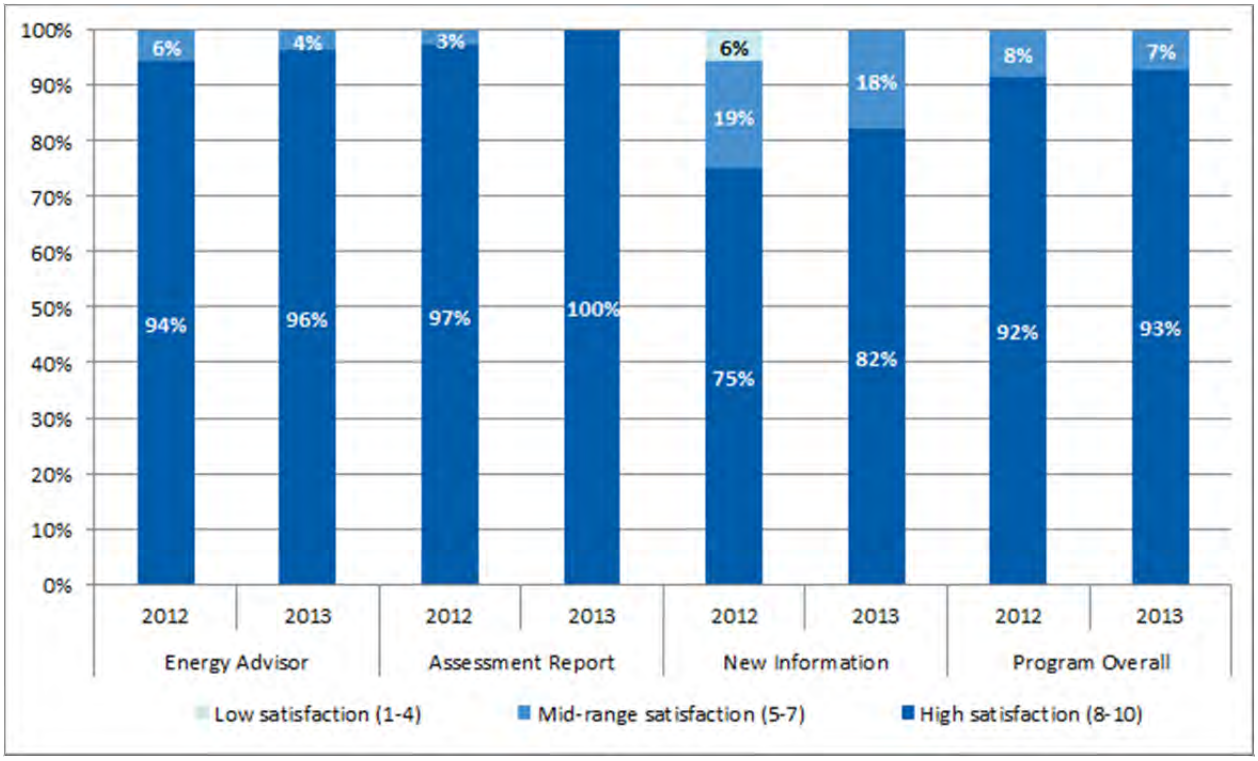
- More than three-quarters (79%) of participants rated the teaching materials they received through the program as highly effective (rated 8 to 10) on a scale of 1 to 10, where 1 is not at all effective and 10 is very effective.
- Nearly two-thirds (65%) of teachers reported the conservation tool kit as the most beneficial aspect of the program overall.
- Almost all (89%) surveyed teachers reported they would likely recommend the program to other teachers (rated 8 to 10) on a scale of 1 to 10, where 1 is not at all likely and 10 is very likely.
- The majority (68%) of teachers agreed (rated 8 to 10) with the statement: "my students understood the lessons/curriculum" on a scale of 1 to 10, where 1 is strongly disagree and 10 is strongly agree.
- Seventy percent of teachers agreed (rated 8 to 10) with the statement: "my students were engaged in the lessons" on a scale of 1 to 10, where 1 is strongly disagree and 10 is strongly agree.

SADI Program

The program implementer reported high satisfaction levels with the SADI program, stating the SADI program delivery ran smoothly during the 2013 program year, despite the addition of the direct-install component to the program offering.

Figure 44 illustrates participating facility staff's satisfaction with: the knowledge and professionalism of the energy advisor who conducted their energy assessment; the energy assessment report; the amount of new information they learned through participation; and their program experience overall. The vast majority of participants reported high satisfaction levels in all four categories, with results similar to those reported in the *2012 Energizing Indiana Programs EM&V Report*.

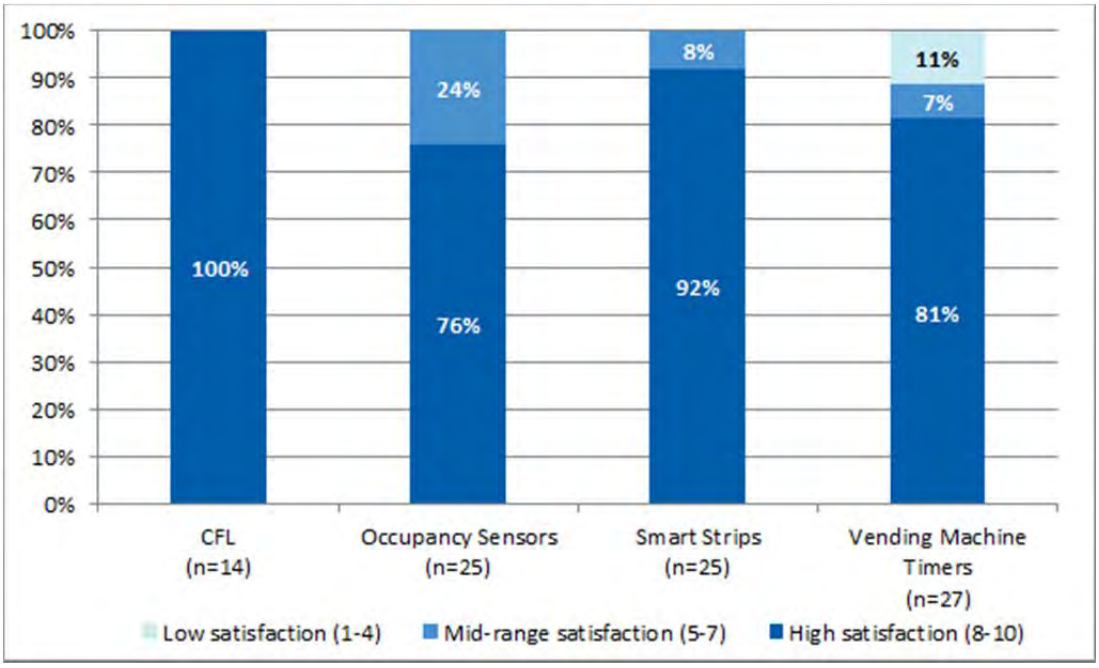
Figure 44. ~~Using a 1-10 Scale, with 1 Being Extremely Dissatisfied and 10 Being Extremely Satisfied,~~ How Would You Rate Your Satisfaction with the… ~~(2012 n=36, 2013 n = 28)~~



1-10 Scale, with 1 Being Extremely Dissatisfied and 10 Being Extremely Satisfied.
2012 n=36, 2013 n = 28

As indicated in Figure 45, surveyed participants also remained highly satisfied with the SADI program's direct-install measures. More than 75% of participants reported high satisfaction (rated 8 to 10) with each of the four measures.

Figure 45. ~~Using a 1-10 scale, with 1 being Extremely Dissatisfied and 10 Being Extremely Satisfied,~~ How Satisfied are You with the…



1-10 scale, with 1 being Extremely Dissatisfied and 10 Being Extremely Satisfied.

As shown above, the only measure receiving low satisfaction ratings (rated 1 to 4) was the vending machine timer. The most common complaint with this measure was the vending machine companies did not want the sensors installed on their machines (over 10% of vending machine sensors were removed after installation due to this issue). One participant specified a vending machine company complained that the quality of products decreased due to the sensors (i.e., customers complained that the beverages dispensed by the machines were not as cold as they preferred). Another teacher suggested the program implementer should contact the vending machine companies directly to discuss the program and the vending machine timers. This participant felt the program implementer may have realized more success implementing the measure using this approach.

The majority (71%) of participant facility staff reported no SADI program aspects that proved challenging. However, the most common (mentioned by four participants) program aspects that participants cited as challenging were: finding a time to schedule the assessment, direct-install, and close-out meeting that proved convenient for the program implementer and the school's staff. Two participants also found the direct-install component challenging, especially finding a time to install the occupancy sensors during school hours.[39]

[39] All direct-install measures installed by Energizing Indiana staff or a third-party vendor were installed during school hours.

6.10.3 PROGRAM OPERATIONS

Education Program

Once a teacher signed up for the Education program, the implementing subcontractor sent the teacher teaching materials and take-home kits for each student. The program's curriculum included several lesson topics (e.g., electricity and water conservation), which could be taught all at once or throughout the semester. The program curriculum aligned with Indiana state education requirements. Teachers had to distribute take-home kits to their students, and students were encouraged to install the measures at home with their families.

Once kit measures had been installed, students and their families completed an at-home student survey. Students completed a Scantron form with their survey answers and returned the form to their teacher. Once a participating teacher sent in at least 80% of their classroom's student survey data, he/she received a $50 stipend.

Delivery Challenges

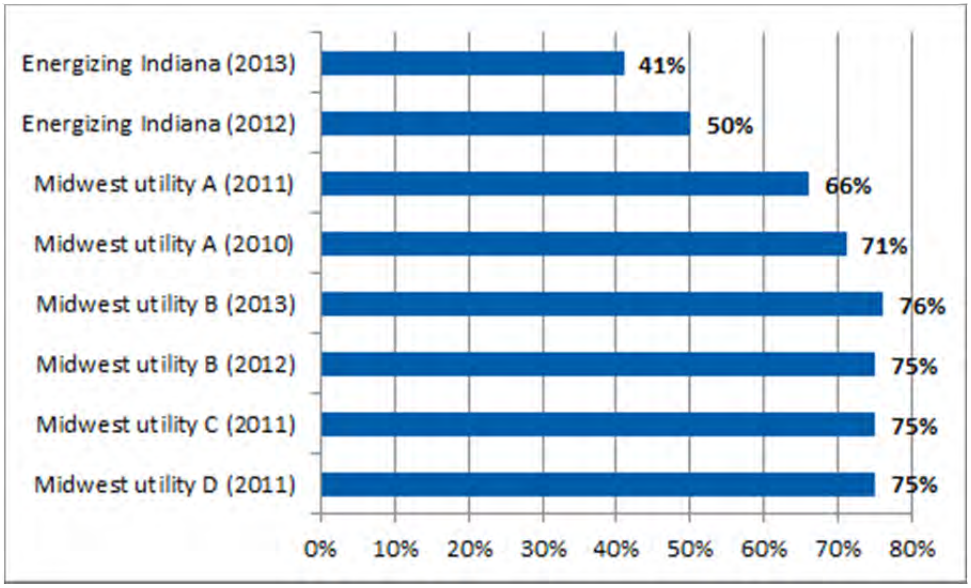
The Education program overcame many of the delivery challenges reported in the *2012 Energizing Indiana Programs EM&V Report*. However, although the TPA and program implementer reported high satisfaction with program delivery, a few challenges arose in 2013, including: student survey data collection, and grade-specific curriculum content.

Student Survey Data Collection

An important program component involved motivating participating teachers to collect student surveys and send them to the implementing subcontractor. Student survey data proved critical to the impact evaluation, as variables such as installation rate, water heater fuel type, and other household characteristics are were directly from these surveys to inform the electric and gas savings for each kit.

The TPA sought to receive 37.5% of overall student surveys from teachers, a goal achieved in 2013: data provided by the TPA indicated a 41% response rate for student surveys. The 2013 response rate, however, decreased in comparison to 2012, when participants returned 50% of the student surveys. The Evaluation Team compared these results to student survey response rates reported by similar energy-education kit programs across the Midwest. As shown in Figure 46, although the Education program exceeded the response goals in 2012 and 2013, it saw the lowest response rates of the other school programs. Student survey response rates among similar school programs ranged from 57% to 76%.

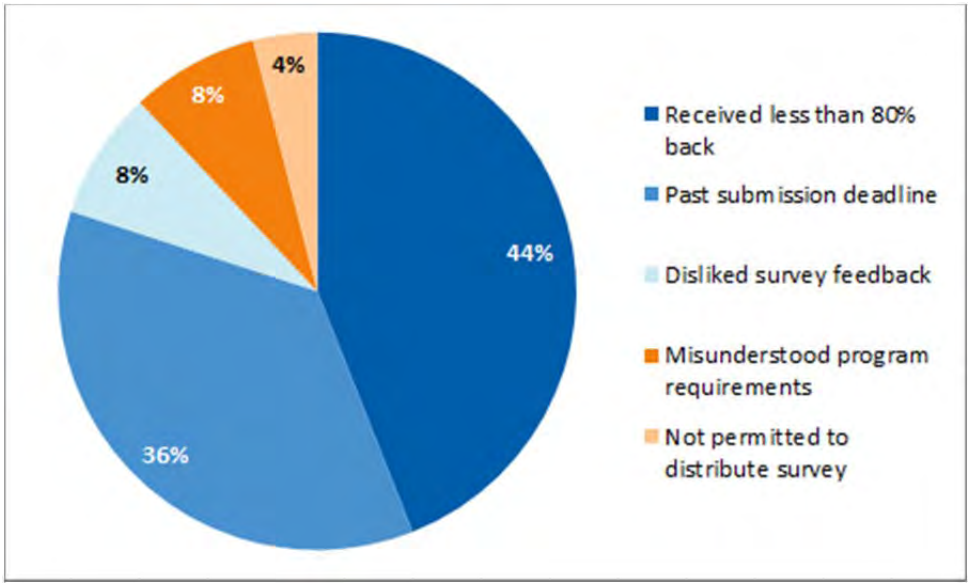
Figure 46. Comparison of Student Survey Response Rate



According to teacher survey results, more than three-quarters (78%) of teachers reported they received 80% or more of the student surveys from their class. Of these teachers, nearly all (95%) mailed all student surveys received. The remaining 5% of teachers reported they did not receive all surveys from their students prior to the submission deadline; so they did not submit the surveys.

Of teachers receiving less than 80% of the surveys from their students, the majority (59%) did not mail all surveys they received. Figure 47 illustrates the reasons teachers provided for not sending in surveys they received. Just under one-half (44%) of these teachers reported they did not send the surveys as they did not receive 80% of the class surveys and could not qualify for the $50 stipend. Nearly one-third (36%) reported they did not mail back the surveys as they received them after the submission deadline.

Figure 47. Why Did You Not Mail Back all of the Surveys You Received? ~~(n=25)~~

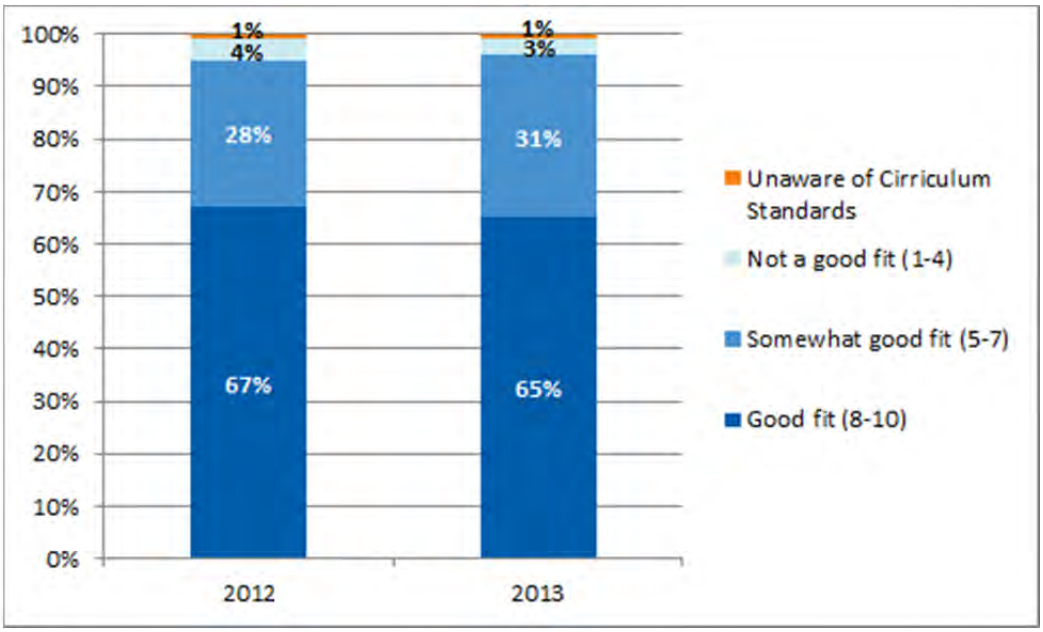


n=25

Grade-Specific Curriculum

The TPA reported slight updates to the Education program lesson plans in 2013, though they remained very similar to lessons included in the 2012 program. As in 2012, the majority of surveyed teachers (67% in 2012 compared to 65% in 2013) felt the program's lesson plans fit well with Indiana's Curriculum Standards (as shown in Figure 48).

Figure 48. ~~On a Scale of 1-10,~~ How Well Do the Program's Lesson Plans Fit with Indiana's Curriculum Standards? ~~(2012 n= 441, 2013 n= 199)~~



On a scale of 1-10. 2012 n= 441, 2013 n= 199

More than one-quarter (28%) of surveyed teachers who provided suggestions for improving the Education program reported the lesson plans could align better to fifth-grade students. Roughly one-half (10 of 18) of the teachers suggesting improvements to program lesson plans reported the material followed the fourth-grade curriculum more closely than fifth-grade standards. The other one-half (eight of 18) of the teachers with curriculum comments found the materials too advanced for their fifth-grade students, noting the workbook language and lesson topics proved challenging for their students to comprehend. The percentage of teachers suggesting the Education program curriculum should better align with the standards for fifth-graders increased from 16% in 2012 to 28% in 2013.[40]

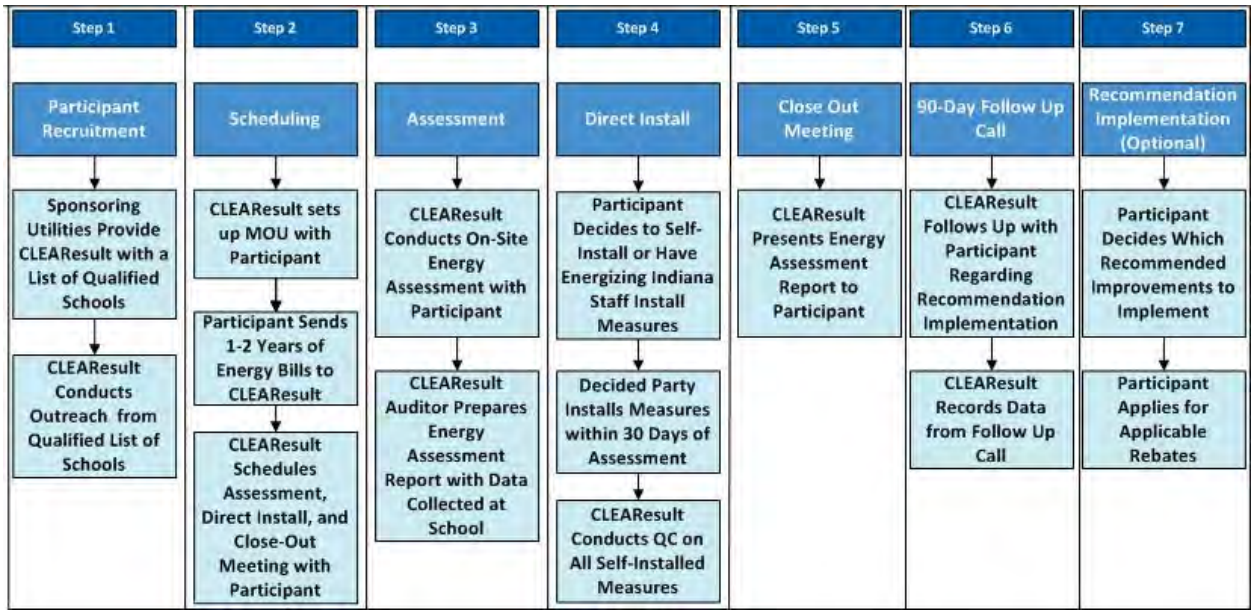
Only one-third (33%) of participating teachers reported including energy conservation content in their lesson plans before participating in the Education program.

[40] P-value = 0.04; this difference is statistically significant (α=0.1).

SADI Program

As discussed previously, the SADI program achieved 100% of its participation goal of 93 school audits statewide through participating utilities. Figure 49 illustrates program operations for the SADI program. As the process flow shows, CLEAResult implemented day-to-day program operations.

Figure 49. SADI Program Operations Process Flow



Participant Recruitment

Beginning in 2013, participant recruitment responsibility shifted from the utilities to the program implementer, which reported each utility took the first two months of the program year to compile a list of qualified schools from which the program implementer could recruit. After the two-month period, the program implementer received control of participant recruitment and conducted outreach from the list of qualified schools provided. The program implementer reported the new recruitment approach vastly improved program delivery, and they expressed satisfaction with the change.

The TPA also added a sign-up form to the Energizing Indiana website for interested schools to enroll in the SADI program. The TPA reported schools signing up for the program through the website either were contacted during the same program year or were placed on a wait list, which generates leads for the program implementer to recruit from in future program years.

The program implementer reported the SADI program's good reputation in the community aided recruitment in 2013. The program implementer could provide past participants as references for schools hesitant to participate.

Scheduling, Assessment, Direct Install, and Closeout Meeting

Upon school recruitment, participants had to submit a completed application and memorandum of understanding to the program implementer, which reviewed this paperwork and confirmed the school's eligibility for participation within two weeks from receipt of the application. Once a school received

confirmation for participation, the program implementer scheduled the assessment, direct-install, and close-out meeting with the participant. The program implementer had to schedule the direct-install and close-out meeting within 30 days of the assessment.

The program implementer had to conduct the on-site energy assessment within 10 days of receiving the participant's application. During the assessment, energy auditors conducted walk-through audits with a facility staff member from the participating school. Energy auditors identified areas for direct-install measures and, in consultations with facility staff members, discussed those most beneficial to the school. After the assessment, the energy auditor used all data collected from the audit as well as the school's utility data to prepare the energy assessment report.

The program implemented the provided direct-install measures at no cost to the participating school, and the measures had to be installed by Energizing Indiana staff (one of two electrical subcontractors hired by the program implementer), the participating school's facility staff, or a third-party vendor. If a school elected to self-install the measures, the program implementer reimbursed facility staff for their labor. The program implementer conducted quality control inspections on all measures self-installed by the participating school's staff. Quality control inspections had to be conducted within 30 days of the assessment.

During the close-out meeting, the program implementer's energy specialist presented an energy assessment report to participating facility staff. This report contained: information about the school's equipment and energy use; the assessment results; and an extensive list of recommended energy-saving building upgrades and behavioral changes. During the close-out meeting, the energy specialist walked the facility staff through the report and discussed all options for school improvements as well as the various rebates available to offset the improvement costs.

90-Day Follow-Up Call

The program implementer had to follow-up with participants 90 days after the closeout meeting. The follow-up call sought to assess whether the energy assessment report influenced the school's decision to implement building upgrades and to provide support regarding the assessment recommendations. The program implementer tracked the data collected during the follow-up call internally. These data were not reported to any other program stakeholders.

Recommendation Implementation

Upon receipt of the energy assessment report at the close-out meeting, participating schools decided which recommendations to implement.

Best Practices and Behavior Changes

The majority (61%) of surveyed facility staff reported their school adopted at least one of the best practice tips and recommendations for behavior changes included in their energy assessment reports. Table 142 lists best practices adopted by these facility staff. Adjusting HVAC equipment, based on the school's occupancy schedule (noted by 65% of facility staff making behavior changes in their schools), was the most commonly adopted best practice.

Table 142. Which Best Practice Tips has Your School Adopted? ~~(n=17, Multiple Responses Allowed)~~

Adopted Best Practice Tips	Adoption Rate
Perform routine reviews of occupancy schedules and adjust HVAC system operations accordingly.	65%
Install additional low-cost measures to save energy (e.g., programmable thermostat, LEDs, hot water tank insulation, exterior lighting controls).	53%
Turn off office equipment when not in use and enable standby or power saving features.	24%
Turn off lights located near windows on sunny days. Consider installing daylighting controls to automatically turn off or dim lights when enough natural daylight is present.	24%
Replace incandescent lamps with CFLs where possible on desks and in overhead lighting.	18%
Adjust window shades to help maintain occupant comfort.	18%
Remove personal plug loads such as refrigerators, space heaters, and personal printers.	18%
Take efforts to conserve water.	18%
Turn off lights when rooms remain unoccupied.	12%
Develop a delamping strategy. Remove or reduce the total number of light bulbs in fixtures throughout the building.	12%

n=17, Multiple Responses Allowed

Recommended Improvements

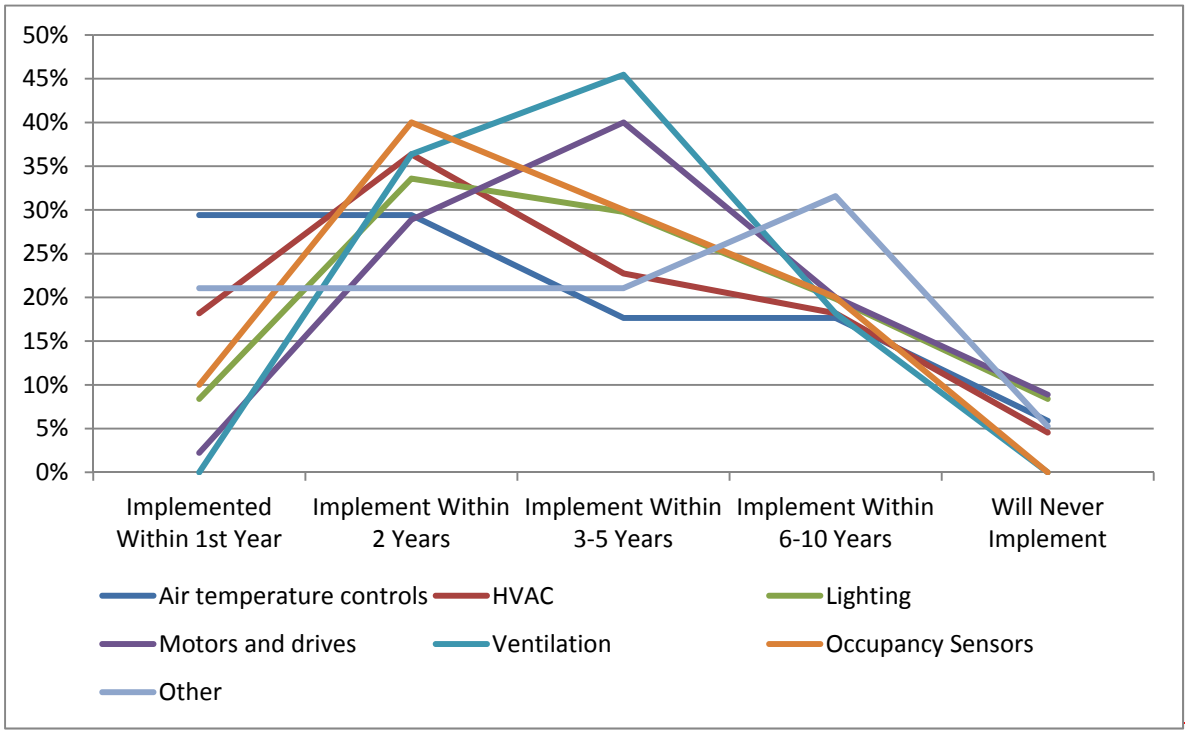
Just under one-half (43%) of surveyed facility staff reported their school installed at least one recommended measure due to participation in the SADI program, a decrease from 69% in 2012.[41] Lighting (42%), air temperature controls (19%), and HVAC (15%) were the recommendations most commonly reported installed in the first year. This mix of measures changed slightly from the 2012 program year, where occupancy sensors ranked in one of the top three most commonly adopted recommendations. Because the program currently offers occupancy sensors as part of the direct-install component, schools need not invest the capital towards those measures. Therefore, the number of recommendations to install occupancy sensors decreased dramatically.

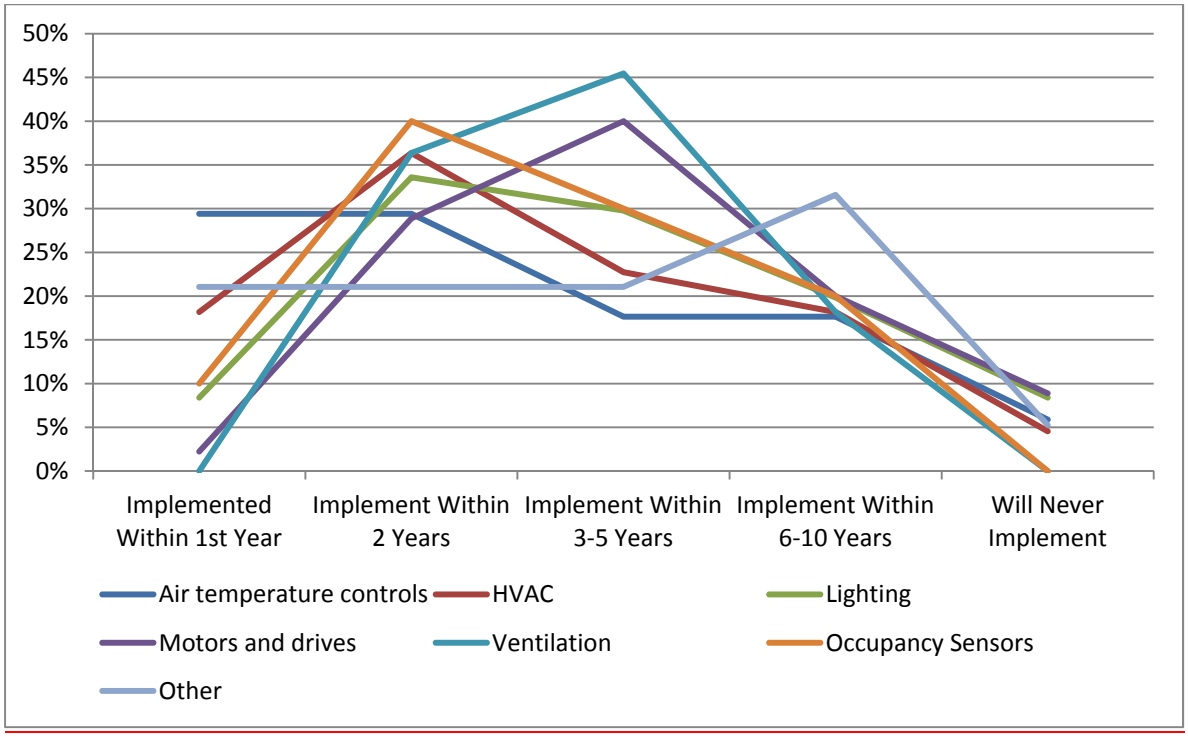
One-half (50%) of surveyed facility staff reported the energy assessment report proved the most influential SADI program component in their school's decision to install recommended equipment. The close-out meeting was noted by 21% of surveyed facility staff as the most influential program component.

Figure 50 shows expected implementation timelines by recommendation type reported by participant facility staff. The surveyed facility staff indicated schools planned to implement over 93% of recommendations within 10 years.

[41] P-value = 0.02; this difference is statistically significant (α=0.1).

Figure 50. SADI Timeline of Recommendation Implementation ~~(n= 28)~~





n=28

All 15 of the participating schools not implementing any recommendations reported lack of funding as their greatest barrier to implementation. Participant facility staff most frequently reported lighting and motors and drives upgrades as the recommended measures their schools never implemented.

6.10.4 PROGRAM IMPROVEMENTS

Education Program

Nearly one-third (32%) of surveyed teachers provided suggestions for improving the Education program. Respondents most commonly suggested (28% of respondents) the program curriculum should better align to serve fifth-grade students (an increase from 16% in 2012).[42]

Similarly to 2012, teachers offered the following suggested improvements:

- Providing videos, experiments, online workbooks, and more hands-on materials for teachers to use in their classrooms.
- Improving the program's timing, with some teachers preferring to teach the program during one semester over another.
- Revamping the student workbooks to make them more "kid-friendly" (e.g., more color, pictures).

SADI program

Just over one-third (39%) of surveyed facility staff provided suggestions for improving the SADI program. Respondents most commonly suggested (six facility staff) providing more support to schools that implemented the recommended improvements. Such support included:

- Providing a more timely response to facility staff questions and concerns regarding the recommended improvements.
- Increasing follow-up with schools to check on the progress of implementation, even after the 90-day follow-up call.
- Adding support to assist with filling out required paperwork and rebate forms when moving forward with recommended improvements.

6.11 *INSIGHTS AND RECOMMENDATIONS*

The TPA changed the 2012 program design, improving overall EES program delivery in 2013. The following sections include the Evaluation Team's recommendations for continued program improvements.

[42] P-value = 0.04; this difference is statistically significant (α=0.1).

6.11.1 EDUCATION PROGRAM

Conclusion 1: Although the TPA updated the 2012 curriculum in 2013, teachers continued to report that program lesson plans better aligned with a fourth-grade curriculum than fifth-grade standards. If the program's lessons better aligned with the curriculum targeted teachers must teach, they would be able to spend more time on the program topics.

Recommendation 1: Review the Indiana Curriculum Standards to ensure current program materials align with the standards established for the target market (e.g., fifth-grade students). If program stakeholders determine the program materials could better align with Indiana's fifth-grade standards, consider the costs and benefits of either redefining the target market (i.e., fourth-grade students) or revising the program's curriculum content to better suit fifth-grade students.

Conclusion 2: The student survey response rate dropped from 2012, falling below rates for similar programs. Impact analysis methodologies for similar programs in other states require evaluators to discount savings based on nonresponse, increasing the student survey response rate's importance in calculating the programs' evaluated savings.

Recommendation 2: Consider tactics to improve student survey response rates to ensure nonresponse minimally affects evaluated savings. Similar school kit programs have succeeded using a tiered incentive approach that encourages teachers to return as many surveys as they receive from students (e.g., a $20 stipend for returning any surveys).

6.11.2 SADI PROGRAM

Conclusion 1: As in 2012, upfront capital costs proved prohibitive to participants, even with rebates and expectations of energy cost savings over time.

Recommendation 1: Consider providing financing mechanisms to implement capital projects. Such a mechanism or a list of available financing options could help schools procure funds for implementing recommendations.

Conclusion 2: The Evaluation Team had to use survey data and information from the TPA to make certain assumptions regarding the location and use of measures installed in schools.

Recommendation 2: Collect and report specific information about the each direct-install measure; access to specific data collected about each direct-measure installed would greatly increase the precision surrounding the *ex-post* savings values. Table 143 lists data that the Evaluation Team recommends collecting for each direct-install measure.

Table 143: SADI Direct-Install Recommended Variables to Collect

Measure	Recommended Variables to Collect

Measure	Recommended Variables to Collect
18-watt CFL	Location (room-type), wattage replaced.
LED Exit Sign	Replaced light type (e.g., incandescent, fluorescent), wattage replaced.
Occupancy Sensor	Location (room-type), number of light fixtures connected to each occupancy sensor, type of lighting connected (e.g., lamp type, lamp quantity per fixture, lamp wattage).
Smart Strips	Location (room-type), description and quantity of appliances plugged into the controlled outlets.

Conclusion 3: During participant surveys, school facility staff reported the majority of occupancy sensors were installed in low-opportunity locations, such as utility closets and offices.

Recommendation 3: Prioritize installing occupancy sensors in locations yielding the greatest savings. Program Implementers can maximize savings by prioritizing measure installations in larger rooms (such as cafeterias and school gyms), where occupancy sensors can control more light fixtures.

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7. COMMERCIAL AND INDUSTRIAL

7.1 PROGRAM DESIGN AND IMPLEMENTATION

The C&I Prescriptive Rebates program seeks to help facility managers and building owners achieve long-term, cost-effective savings in the commercial and industrial market sector. This program primarily relies on a prescriptive rebate structure, which rewards participants with monetary incentives based on their installation of energy-efficiency equipment upgrades. Such upgrades include lighting, variable-frequency drives (VFDs), HVAC, and ENERGY STAR products

7.2 EM&V METHODOLOGY

The PY2 program evaluation incorporated impact and process elements. Table 144 provides an overview of tasks used in the evaluation.

Table 144: Program Evaluation Overall Tasks

Action	Details
Implementer Interviews	• GoodCents staff (June 2013 and February 2014). • GoodCents marketing staff (January 2014).
Trade Ally Surveys	• 18 participating Trade Ally surveys, conducted by the Evaluation Team (December 2013). • Four nonparticipating Trade Ally surveys, conducted by Evaluation Team (December 2013).
Program Database Review/ Verification	• Program tracking data, reviewed and compared to reported values from the implementer portal/program scorecard.
Program Materials Review	• High-level program operations review (January 2014). • Review of messaging, promotions, and marketing materials (January 2014).
Participant Interviews	• 233 participating lighting customers (December 2013). • 49 participating non-lighting customers (December 2013). • 250 participating PY1 bulb drop customers (December 2013). • 101 nonparticipating customers (December 2013).
Impact Analysis	• Review of the savings estimate methodology. • 285 engineering reviews of program measures. • On-site inspection and analysis of 18 program chillers.

The process evaluation assessed customer awareness of (and satisfaction with) the C&I program, assessed factors influencing customers' decision making and purchasing patterns, and gathered data used to determine program freeridership.

The process evaluation assessed Trade Allies' awareness of the program and their satisfaction with the different program components, including program delivery, training, and support. The Evaluation Team also assessed Trade Allies' outreach efforts to customers. Table 145 shows key questions guiding the evaluation.

Table 145: Researchable Questions

Researchable Questions
Are necessary components in place to allow the program's success to be effectively measured and evaluated? (How accurately does the database reflect customer data?)
Is the program meeting its objectives for reducing energy consumption and demand in the C&I market sector?
How effective is the program implementation?
How effective is the marketing process?
Is the program designed effectively?
Is the program encouraging Trade Allies to actively promote and install energy-efficient technologies for their C&I customers?
Which factors influence a customer to install energy-efficient equipment?
How satisfied are customers with the program?
Are there additional barriers to customer participation and savings?

7.2.1 DATA COLLECTION ACTIVITIES

Data collection in PY2 focused on: surveys of participating and nonparticipating customers; and surveys of participating and nonparticipating Trade Allies. The Evaluation Team also interviewed Program Implementer staff.

Customer Surveys

The Evaluation Team stratified participating customers from all participating utilities, based on customer usage, and using a simple random sample. The Team did not receive nonparticipant population data from IMPA. Therefore, the nonparticipant survey did not include customers in IMPA's utility service territory.

Trade Ally Surveys

The TPA provided the Trade Ally database that the Evaluation Team used for conducting the surveys. For participating and nonparticipating surveys, the Evaluation Team used a simple random sample.

The evaluation made 72 attempts to contact nonparticipating Trade Allies throughout Indiana, resulting in four completed surveys. This 6% response rate primarily resulted from the high rate of participating Trade Allies on the nonparticipant call list. Out of four nonparticipating Trade Allies surveyed: two installed HVAC equipment; one manufactured and distributed HVAC controls; and one supplied industries with energy-efficient lighting solutions. Company sizes ranged from one to 37 full-time employees.

Chiller Study On-~~sites~~Sites

For on-site engineering activities, the Evaluation Team recruited customers installing chiller measures from the 2012 and early 2013 program populations. Site visits sought to achieve a better understanding of savings that resulted from these complex measures. Data collection activities targeted the following:

- Verification of measures' installation and current operating status (i.e. functioning properly).
- Changes in planned operating procedure (e.g., after decommissioning an existing chiller, the new program-incented chiller handles more load than originally planned).

- Nameplate data from the installed units and from any relevant existing equipment.
- System set points, including but not limited to:
  - System status (e.g., active or disabled).
  - Staging sequences (controlling criteria, if multiple chillers or compressors are present).
  - Chilled water supply temperature.
  - Chilled water flow (or gallons per minute [GPM]) and condenser water flow (or GPM).
  - Condenser Water Temperature (or condenser entering water temperature).
  - Enable points (e.g., the system is disabled when the outside air temperatures fall below 60 degrees Fahrenheit).
  - Resets (e.g., the chilled water supply temperature set point varies, based on outdoor air or chilled water return conditions).
  - System schedules (e.g., the system shuts off after hours, on weekends, or during warmer months).
- System performance data, including but not limited to:
  - True power demand at five-minute intervals, from a temporary meter installed by the engineering team.
  - Logged power demand from an energy management system (EMS) or existing power metering system.
  - System water temperatures and flows from an EMS or package controls system.
  - Local outdoor ambient conditions from a temporary meter installed by the engineering team.
  - Local outdoor ambient conditions from an EMS or an existing weather logging system.
  - Other relevant parameters affecting the system's loading or performance (e.g., occupancy schedule).

The Evaluation Team collected the above data where possible, and compared them with data from the Implementer tracking database and program application files.

7.3 PROGRAM PERFORMANCE

Table 146 shows how reported program performance compared to the goals established in program planning. Savings reported by the program do not reflect adjustments made as a result of the evaluation. Also, reported savings in Table 146 do not include those attributed to opt-in and bulb drop measures. The tracking database supplied by the Implementer included only ENERGY STAR products, VFD/HVAC and lighting measures; although the Evaluation Team could access other sources of reported savings, the implementer claimed the tracking database provided the most accurate source.

Table 146: *Ex-Ante* Results by Utility and Statewide

	Unit			kWh			kW		
	Goal	Reported	% Achieved	Goal	Reported	% Achieved	Goal	Reported	% Achieved
Duke	1,016,566	111,025	11%	248,465,099	62,529,961	25%	69,618	9,903	14%
I&M	320,530	164,758	51%	65,367,725	89,998,901	138%	22,172	15,585	70%
IPL	345,304	102,095	30%	85,540,216	38,050,097	44%	23,715	5,639	24%
IMPA	211,066	31,703	15%	51,363,415	17,642,220	34%	14,582	2,627	18%
NIPSCO	345,321	62,512	18%	85,778,214	22,670,350	26%	23,712	4,235	18%
Vectren	163,333	28,418	17%	40,158,951	10,509,259	26%	11,239	1,608	14%
Statewide	**2,402,120**	**500,511**	**21%**	**576,673,620**	**241,400,788**	**42%**	**165,038**	**39,597**	**24%**

7.4 PROGRAM BUDGET AND EXPENDITURES

Table 147 shows the original program budgets and the expenditures reported at the conclusion of 2013.

Table 147: Program-Level Budget and Expenditures

	Budget	Reported Expenditures	% of Budget Used
Duke	$25,890,063	$7,670,367	30%
I&M	$6,700,192	$16,330,748	244%
IPL	$8,947,507	$6,221,621	70%
IMPA	$1,850,098	$2,150,358	116%
NIPSCO	$8,800,845	$3,641,363	41%
Vectren	$4,188,579	$1,313,947	31%
Statewide	$56,377,283	$37,328,403	66%

7.5 EX-ANTE SAVINGS

Ex-ante savings equal savings the program reported compared to goals set forth in program planning. Table 148 presents C&I statewide *ex-ante* savings, and Table 149 presents *ex-ante* savings by utility. The TPA's web portal tracking provided goal, kWh and kW, savings. *Ex-ante* savings represent year-to-date values, as of December 31, and resulted from querying the TPA's tracking database for total kWh and kW.

Table 148: *Ex-Ante* Savings Statewide

Program	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal[(1)]	2013 kW *Ex-Ante*	% of kW Goals
C&I	576,673,620	241,400,788	42%	165,038	39,597	24%

Table 149: *Ex-Ante* Savings By Utility

	2013 kWh Goal	2013 kWh *Ex-Ante*	% of kWh Goals	2013 kW Goal	2013 kW *Ex-Ante*	% of kW Goals
Duke	248,465,099	62,529,961	25%	69,618	9,903	14%
I&M	65,367,725	89,998,901	138%	22,172	15,585	70%
IPL	85,540,216	38,050,097	44%	23,715	5,639	24%
IMPA	51,363,415	17,642,220	34%	14,582	2,627	18%
NIPSCO	85,778,214	22,670,350	26%	23,712	4,235	18%
Vectren	40,158,951	10,509,259	26%	11,239	1,608	14%

In reviewing *ex-ante* savings, the Evaluation Team found three sources provided by the TPA (e.g., the TPA web portal, totals queried from the database, and the TPA report to the DSMCC) contained conflicting values. The TPA-maintained database totals supplied the most accurate measurement of *ex-ante* savings; the preceding tables reflect this clarification. However, since the tracking database did not contain the program's opt-in and bulb drop projects, C&I *ex-ante* savings in this report do not reflect savings attributed to these measures. Savings accrued from these alternative databases and savings sources will be rolled up at the end of the program cycle.

The evaluation included an engineering analysis of *ex-ante* energy savings, conducted through a database review of installed measures installed, and a survey of participating customers. Surveys sought to determine behavioral elements related to energy savings (such as removal of measures or installations of measures outside of the program).

7.6 IMPACT ANALYSIS

To determine gross program savings, the Evaluation Team reviewed the TPA tracking database and the web portal tracking totals summarized in Table 148 and Table 149. The database contained year-to-date, *ex-ante* savings records for each utility: a total of 10,675 C&I measures installed across 4,180 projects.

Figure 51: *Ex-Ante* Annual kWh Savings by Measure Type

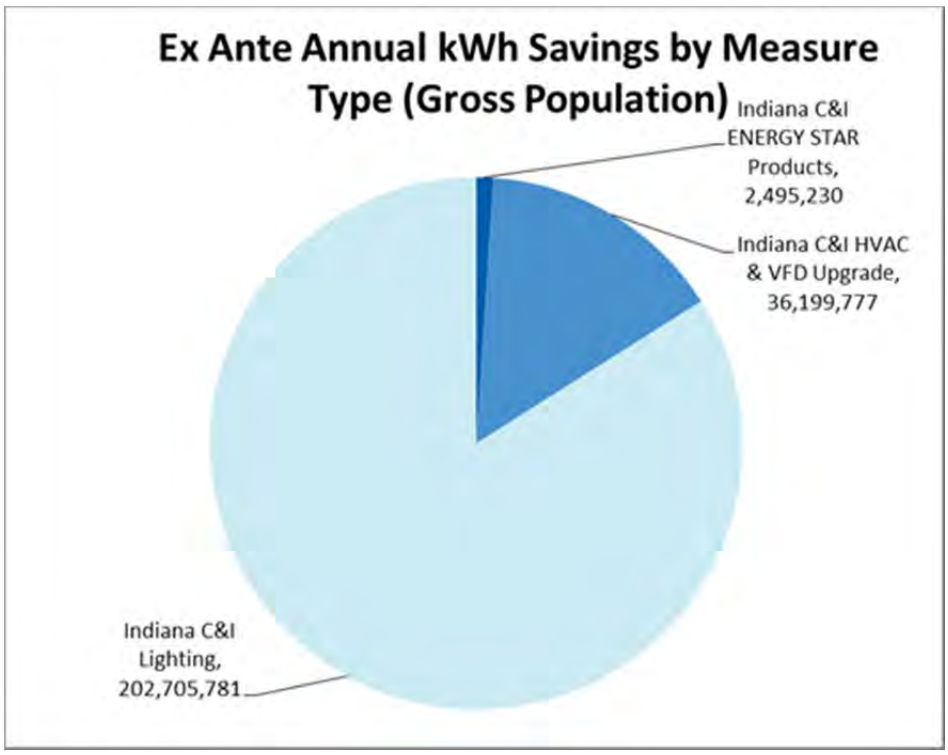


Figure 51 illustrates the distribution of *ex-ante* energy (kWh) savings contained in the database. This distribution occurs statewide and includes all participating utilities. Lighting measures represented 84% of all electric energy savings claimed by the program while HVAC/VFD upgrades and ENERGY STAR products represented 15% and 1%, respectively.

The Evaluation Team performed engineering file reviews on a sample of measures to determine the audited, verified, and *ex-post* savings of the program per utility and at the statewide level. The random sample of measures in the analysis targeted an 80% confidence interval at 10% precision (80/10) per utility to achieve a 90/10 target at the program level.

The Evaluation Team selected the sample of measures from each utility using a systematic approach to probability proportional to size (PPS) sampling. This method proves particularly useful when estimating population totals based on sampled projects. Ultimately, the Evaluation Team sought to calculate audited, verified, and *ex-post* gross savings from the sampled projects, and then use this to estimate the same gross savings in the population of measures. The total gross energy and demand savings were correlated with total reported savings, available in the program database. Therefore, the Evaluation Team sampled the measures using a systematic PPS sampling approach to include measures with greater savings with higher probabilities.

Table 150 compares the distribution, by utility, of the total measure count compared to the evaluation sample. The Evaluation Team oversampled measures for each utility to account for measure diversity and documentation constraints.

Table 150: Distribution of Total Measures vs. Sampled Measures

Utility	Database Measure Count	80/10 Measure Target	Sampled Measure Count
Duke	2,619	40	47
I&M	3,313	40	56
IPL	791	40	43
IMPA	1,828	39	44
NIPSCO	1,669	40	44
Vectren	455	40	51
Statewide	10,675	239	285

7.6.1 AUDITED SAVINGS

The impact evaluation process first required a review of the program database. The Evaluation Team examined the number of applications processed and the number of measures installed. Adjustments made in this evaluation step result from comparing data within the program applications with the claimed *ex-ante* savings at the measure level. The database review indicated all ENERGY STAR products and HVAC/VFD measures consisted of one installed unit; even though multiple measures could have been installed at a site, each of these measures was tracked as a separate line item. Lighting measures, on average, consisted of 80 installed units. Table 151 illustrates the distribution of measure quantities by measure type and the number of installed units for the population and the sample.

Table 151: Number of Installed Measures by Measure Category

Measure Category	Database Program Measure Quantity	Sampled Program Measure Quantity	Unit Quantity	Sampled Unit Quantity
Indiana C&I ENERGY STAR Products	3,068	7	3,068	7
Indiana C&I HVAC & VFD Upgrade	1,185	50	1,185	50
Indiana C&I Lighting	6,422	228	494,826	66,473

The Evaluation Team calculated audited savings for each of the 285 measures in the sample, developing estimates using the following process:

1. **Assess the applied TPA methodology used for energy (kWh)/demand (kW) savings calculations**.
    - Savings algorithms from the TPA's workpapers were examined. Using the applicable algorithm, wherever possible, the Evaluation Team recreated a measure's *ex-ante* savings as presented in the program tracking database. This helped determine assumptions, constants, or lookup values the TPA used in its applied methodology.
2. **Review the claimed TPA methodology for kWh/kW savings calculations.**
    - The Evaluation Team noted any differences between values used by the TPA in its applied methodology and the parameters and algorithms documented in the savings estimate workpapers.
3. **Compare tracking data with the project application file.**
    - Data present in both the database and the project application file often included installed quantity and pre/post equipment specifications. The Evaluation Team noted any discrepancies in values between these sources.
4. **Independently calculate annual energy savings and peak-coincident demand savings using the TPA's claimed methodology and with revised data found in the project application file.**
    - Information gathered from steps 2 and 3 contributed to audited savings calculations for the measure. Using the assumptions, constants, or lookup values outlined in the implementer's workpapers, the Evaluation Team calculated kWh and kW measure savings with data presented in the application file.

The WHF and peak coincidence demand factor (CF) assumptions for lighting measures presented the predominant inconsistencies between applied and claimed methodologies (database values and workpaper values, respectively). Regardless of the space type, the workpaper algorithms maintained a WHFe of 1.095 and a demand waste heat factor (WHFd) of 1.2 for all lighting measures. The Evaluation Team determined that the applied methodology assumed a WHFe and WHFd of 1.0 (i.e., the applied methodology did not account for space cooling savings associated with a lighting upgrade). Similarly, the workpaper algorithm referred to a lookup table to determine the CF based on space type, whereas the applied methodology assumed a CF of 0.68 for all lighting measures.

The Evaluation Team also found inconsistencies in the methodology for VFD measures. The TPA's original source for VFD savings derived from the 2008 Connecticut Program Savings Document, which required the VFD motor's brake horsepower (bhp) rating to calculate savings. The database only tracked the nameplate horsepower (hp) and did not include a motor loading assumption. The application also did not specify bhp. The Evaluation Team determined that the applied methodology for savings used the nameplate hp rather than the bhp, which would consistently overstate savings. The applied methodology also assumed 3,985 runtime hours for process pumps, even though the claimed methodology specified use of hours as listed in the program application.

Inconsistencies did not arise with ENERGY STAR product savings as the claimed and applied methodologies used the same deemed savings values. Unitary HVAC measures also used identical claimed and applied methodologies.

The Evaluation Team then calculated a realization rate of audited savings relative to *ex-ante* savings (audited/*ex-ante*). This number derived from the sample of 271 measures at the utility and statewide levels, which was then applied to the total program population. Table 152 presents these adjustment factors and the resulting total audited savings.

Table 152: Audited Energy Savings (kWh) and Demand (kW) by Utility and Statewide

Utility	Total Audited kWh Savings	kWh Adjustment Factor (Calculated from Sample)	Total Audited kW Savings	kW Adjustment Factor (Calculated from Sample)
Duke	60,012,345	79%	12,046	114%
I&M	86,375,315	97%	18,956	121%
IPL	36,518,103	109%	6,859	142%
IMPA	16,931,899	95%	3,195	106%
NIPSCO	21,747,449	100%	5,149	119%
Vectren	9,152,629	103%	1,596	123%
Statewide	**230,737,740**	**96%**	**47,801**	**122%**

The low adjustment factors for audited kWh savings in the Duke territory (79%) resulted from chiller measures sampled for this utility. Chiller measures accounted for 27% of the total *ex-ante* kWh savings in Duke, yet, in the Evaluation Team's audit analysis, achieved only 7% of chiller *ex-ante* savings.

The reasons for such a large discrepancy remain unclear as the Evaluation Team used implementer methodology and application data to calculate the audited savings. A difference in baselines provides one possible explanation. The Evaluation Team referenced the Indiana TRM assumptions for baseline integrated part load value (IPLV) values as the implementer workpapers or the application files did not outline these assumptions. These assumptions, however, provided reasonable values and did not account for such low adjustment factors. Ultimately, the Evaluation Team could not recreate the claimed savings values for these chiller measures using any combination of methods and factors from the implementer workpapers or the Indiana TRM.

The high adjustment factors for audited kW in all territories were attributed to the lighting measures sampled for both utilities. The engineering analysis discovered that the program applications in these territories were more consistent in listing accurate, ballasted, efficient fixture wattages than in other territories. This accuracy allowed for fewer wattage corrections, limiting the reductions in kW savings. The audit analysis for all utilities also applied a higher WHFd and CF to kW savings than the applied implementer methodology; so this approach served to increase audited demand savings across all utilities.

7.6.2 VERIFIED SAVINGS

The Evaluation Team utilized participant surveys for a sample of customers to assess the numbers of units actually installed, uninstalled, and placed in storage (and therefore not currently achieving savings), and the usage patterns for installed measures. Table 154 shows the utility and statewide verified energy savings and Table 155 shows the same for verified peak-coincident demand savings. This report's appendices provide utility-specific data. The calculation of verified savings resulted from multiplying the audited savings by the ISR. The participant survey data returned a 100% ISR, indicating no quantifiable measure withholding by program participants. The realization rates in the Table 154 and Table 155 provide the ratio of verified to *ex-ante* savings.

Table 153: Key Metrics from Participant Surveys

Metric	Description
Installation Rate	(Units installed)/(Total program-tracked units)
ISR	(Units remaining installed at time of evaluation)/(Total units installed)
HOU	Average number of hours per day a measure is in use

Table 154: Verified Energy Savings (kWh) by Utility and Statewide

	Ex-Ante kWh	Verified kWh Savings	Realization Rate
Duke	62,529,961	60,012,345	96%
I&M	89,998,901	86,375,315	96%
IPL	38,050,097	36,518,103	96%
IMPA	17,642,220	16,931,899	96%
NIPSCO	22,670,350	21,747,449	96%
Vectren	10,509,259	9,152,629	87%
Statewide	**241,400,788**	**230,737,740**	**96%**

Table 155: Verified Peak-Coincident Demand Savings (kW) by Utility and Statewide

	Ex-Ante kW	Verified kW Savings	Realization Rate
Duke	9,903	12,046	122%
I&M	15,585	18,956	122%
IPL	5,639	6,859	122%
IMPA	2,627	3,195	122%
NIPSCO	4,235	5,149	122%
Vectren	1,608	1,596	99%
Statewide	**39,597**	**47,801**	**121%**

7.6.3 *EX-POST* SAVINGS

Ex-post savings reflect all adjustments made to *ex-ante* measure savings claimed by the program. Additional adjustments beyond those discussed above derived from detailed engineering analyses that leveraged actual measurement data and secondary sources deemed most appropriate by the Evaluation Team. The Indiana TRM provided the majority of savings algorithms used in the analysis, with variable inputs relying on the most recent customer-specific data provided by the TPA. Much like the audited savings calculations, the Evaluation Team: determined *ex-post* savings for each of the 285 sampled measures; calculated an adjustment factor compared to the measures' *ex-ante* savings; and applied the rate to total *ex-ante* savings per utility. Table 156 and Table 157 summarize these values. This section discusses specific approaches used to assess ENERGY STAR appliances, HVAC measures, VFDs, lighting, and chillers.

Table 156: *Ex-Post* Energy (kWh) Savings per Utility and Statewide

	Ex-Ante kWh Savings	*Ex-Post* kWh Savings	Adjustment Factor
Duke	62,529,961	62,058,310	99%
I&M	89,998,901	89,320,058	99%
IPL	38,050,097	37,763,093	99%
IMPA	17,642,220	17,509,148	99%
NIPSCO	22,670,350	22,499,352	99%
Vectren	10,509,259	10,429,990	99%
Statewide	**241,400,788**	**239,579,951**	**99%**

Table 157: *Ex-Post* Demand (kW) Savings per Utility and Statewide

	Ex-Ante kW Savings	*Ex-Post* kW Savings	Adjustment Factor
Duke	9,903	14,438	146%
I&M	15,585	22,721	146%
IPL	5,639	8,222	146%
IMPA	2,627	3,830	146%
NIPSCO	4,235	6,172	146%
Vectren	1,608	1,913	119%
Statewide	**39,597**	**57,296**	**145%**

Any adjustments that the Evaluation Team made to TPA methodologies in calculating *ex-post* savings adopted the following hierarchy of sources:

1. Application file.
2. Tracking data.
3. Program-specific data (workpapers from the TPA).
4. Indiana TRM.
5. Secondary sources:
    a. Industry standards, codes, and references (e.g., ASHRAE 90.1).
    b. State- or region-specific studies and evaluations.
    c. Studies and evaluations from outside the area.

The Evaluation Team determined that lighting measures required a more detailed WHF estimation than that described in the workpapers. The claimed methodology in these implementer workpapers applied a WHFe of 1.095 and a WHFd of 1.2 to the savings, regardless of space type, for all measures. The Evaluation Team concluded that better estimates of WHF specific to each measure's space would better represent program savings. As the application file or tracking data did not provide WHF values, the Evaluation Team referred to the Indiana TRM for a better source of WHF.

The Indiana TRM presented a look-up table of variable WHFe estimates, dependent on space type, geographical region, and heating/cooling system type. The table matched the workpaper estimate of 1.2 for WHFd, regardless of space type or region. The Evaluation Team used the table to determine the WHFe for each sampled lighting measure, assuming the space type listed in the program application and a gas heat/electric cooling HVAC system. Using the Indiana TRM's WHF estimates in the *ex-post* calculations resulted in an across-the-board increase of energy and peak coincidence demand realization rates.

The Evaluation Team made one other primary adjustment when calculating *ex-post* savings: a case-by-case correction of baseline and/or efficient fixture wattages. During each measure's file review, the Evaluation Team flagged any instances where the nominal bulb wattage was recorded as a fixture wattage for an externally ballasted fixture. An example would be if the fixture wattage of a four lamp, 25-watt T8 (4LT8-25W) fixture was listed as 100-watts, which would account for the ballast factor adjustment. In such cases, the Evaluation Team referred to the application file for a specification sheet on the fixture's adjusted bulb and ballast configured wattage. If the application file did not include this information, the Evaluation Team examined the tracking database to see if it could provide better estimates.

In most cases, database values for fixture wattages were sourced from the application and proved identical. If so, the Evaluation Team referred to the Indiana TRM, which included tables for estimated fixture wattages for common baseline and efficient fixtures. This case-by-case adjustment did not produce an across-the-board effect, as the efficient and/or baseline wattage could be adjusted down or up depending on the fixture's ballast factor.

The Evaluation Team used its collective knowledge and experience to adjust the methodology for VFD *ex-post* savings. This included adjusting the Energy Savings Factor for three of the eight rebated VFD applications to include updates to the 2013 Connecticut (the 2008 Connecticut PSD 2008 provided the original source of implementer methodology) and to include process pump savings estimations from prior evaluation work. The Evaluation Team also determined that the assumed motor efficiency of 80% in the applied and claimed implementer methodology was incorrect and overstated the savings. The correction adjusted the motor efficiency case-by-case using the nameplate hp rating to determine the EPAct 2001 minimum efficiency level for the motor. Due to these adjustments, the realization rates for VFD measures generally were lower than for lighting measures.

Chiller Study

The Evaluation Team particularly focused on program chiller measures. These measures generally provide a good ratio of savings to incentive dollars, and offer consistent long-term savings with relatively long, industry-accepted useful lives. However, given the prescriptive nature of this program and the varied conditions encountered in a statewide C&I setting, it seemed appropriate to examine these projects further.

At first, the gross population of interest consisted of 23 chiller projects from 2012 and nine projects from 2013 to date.[43] Given the limited population, the Evaluation Team sought to recruit each of the projects in the population. This resulted in successfully recruiting 18 of the total available population (32), aided in part by the concentration of some measures (e.g., some customers had installed multiple chillers across their facilities).

Prior to conducting engineering on-sites, the Evaluation Team requested any pertinent data or documents available from the participants. With all supplemental information available and the program documents (e.g., application file, additional transmitted specifications, invoices), the Evaluation Team reviewed the projects and planned on-site activities.

Wherever possible, engineers and electricians installed temporary metering equipment. Several sites had power logging capabilities. Many sites had data logging capabilities for pertinent parameters (e.g., chiller water supply temperatures, condenser water supply temperatures, chilled water flow) through an EMS. All but two units offered some form of package (manufacturer-supplied) controls with a user-interface that could display some data about the system. Wherever possible, the Evaluation Team installed power logging meters, even if site-provided power data were expected to be available. The Evaluation Team also installed weather logging stations where possible. This served as a measure of good practice and a check against other weather data provided from a site (via EMS) or a national weather station.

[43] For reference, the 2013 measure population closed the year at 24 chiller projects.

Participants proved very cooperative in providing data about their facilities. Of 18 chillers visited, only one project could not be analyzed due to limitations on meter installations and data transmission. Additionally, one chiller project could not be observed in person due to access constraints, but the Evaluation Team could still analyze the project based on meter data derived from its feeder panel (which could be accessed). Table 158 summarizes chiller projects observed through this effort, with some identifying information removed to preserve the customers' privacy.

Table 158: Study Sample Population Details

Unit #	Capacity (Tons)	Power (kW)	Type	Cooling	VSD?
1	750	428	Centrifugal	Water	No
2	2,500	1,468	Centrifugal	Water	No
3	415	251	Centrifugal	Water	Yes
4	300	179	Screw	Water	No
5	400	212	Centrifugal	Water	No
6	500	293	Centrifugal	Water	No
7	500	293	Centrifugal	Water	No
8	125	127	Scroll	Air	No
9	550	303	Screw	Water	Yes
10	550	303	Screw	Water	Yes
11	900	500	Centrifugal	Water	Yes
12	36	39	Scroll	Air	No
13	120	106	Screw	Water	No
14	1,500	864	Centrifugal	Water	Yes
15	440	239	Centrifugal	Water	No
16	380	210	Centrifugal	Water	No
17	125	72	Scroll	Water	No
18	125	72	Scroll	Water	No

The Evaluation Team analyzed collected data and parameters using several differing approaches, depending on available data. These methods included the following:

- **Bin analysis:** Parameters such as outdoor ambient temperatures often are grouped, with averages taken across a group to provide more powerful, less volatile relationships across a range of values. Efforts sometimes used this approach to reduce "signal noise" or volatility for a given calculation.
- **Modeling:** Chiller performance was modeled using curves from ASHRAE and/or eQuest. Metrics such as chiller capacity as a function of temperature, energy input ratio as a function of temperature, and energy input ratio as a function of part load ratio allowed modeling the relationships between chiller power demand and other parameters. Given the Evaluation Team installed or collected power logger data wherever possible, this framework could also be used in "reverse" to solve for chiller loading as a function of observed power, especially for sites without available load parameters.
- **Multivariate Regression:** Chiller power often was related to chiller load or outdoor ambient temperatures (dry bulb or wet bulb) using a multiple regression. Chiller load also often was related to outdoor ambient temperatures (dry bulb or wet bulb). Analysis tools used a least-squares approach to fit a line or curve to the underlying data, with the equation for that line or curve representing a predictive model for the variable, under constrained criteria. This

technique often worked in conjunction with other techniques, such as modeling or bin analysis.[44]

- **Cooling Degree Day scaling:** Some chillers installed through this program utilized an energy logger inherent in their package controls, using this data point to capture total energy expended since installation or the last reset (much like a car odometer). If available, this value or the energy observed during the metering period could be used to estimate annual energy use by relating to cooling degree days (CDDs) during the examined period. The sum of actual CDDs for the observation period was noted, with observed energy scaled to estimated annual energy using the average annual CDDs for the region. Though not an excellent predictor of performance, this estimate provided a good order-of-magnitude accuracy check for other calculation methods.

Figure 52 provides a sample plot from one site in the study. The solid blue and red areas indicate the actual power data collected from temporary meters during the observed period. The blue and red areas represent the newly-installed lead and lag chillers, respectively. The figure also provides good picture of the staging scheme utilized by the site: the lag chiller comes on when the outdoor air temperature approaches 70 degrees Fahrenheit, and then both chillers work to meet the building's load demands.

Figure 54 offers another example plot from the same site, illustrating the relationship between outdoor conditions and chiller demand. The blue line represents the total power demand of the chiller plant (i.e., the sum of demand data from each of the two chillers). The result clearly shows the relationship between outdoor conditions and chiller power consumption. The high coefficient-of-determination (R-squared) provide a good indicator of the fit of the curve to the underlying data. This good curve fit indicates the chiller was used for comfort cooling, with a moderately-static operating approach. If this unit was used for process cooling applications (e.g., cooling a data center), or if the operating profile was adjusted drastically or regularly (e.g., changing the lead/lag configuration), the figure would display a weaker relationship and a lower coefficient of determination.

[44] From a bin analysis, grouped in one-degree intervals of outdoor ambient dry bulb temperatures, and filtered to exclude weekends and unoccupied periods, the Evaluation Team could determine that this chiller's power demand (in kW) related to outdoor dry bulb temperatures (in units of degrees Fahrenheit), per the following equation:
$Power\ [kW] = -0.0524 * (OATDB\ [deg.f])^2 + 5.382 * (OATDB\ [deg.F]) - 13.107$

Figure 52. Chiller Load vs. Power

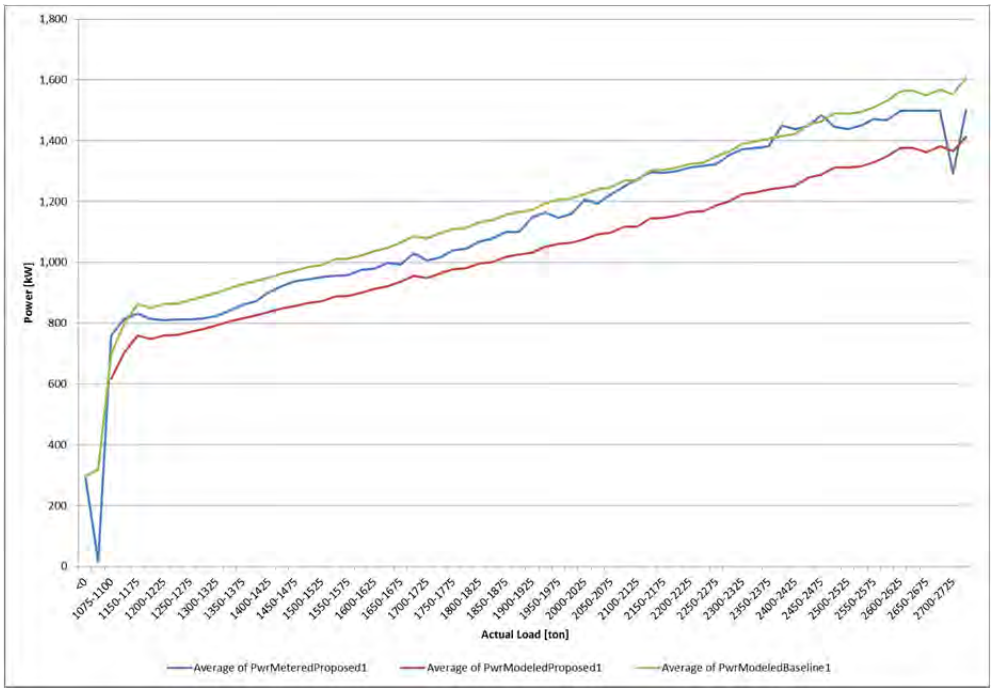


Figure 53: Outdoor Weather and Chiller Power Consumption

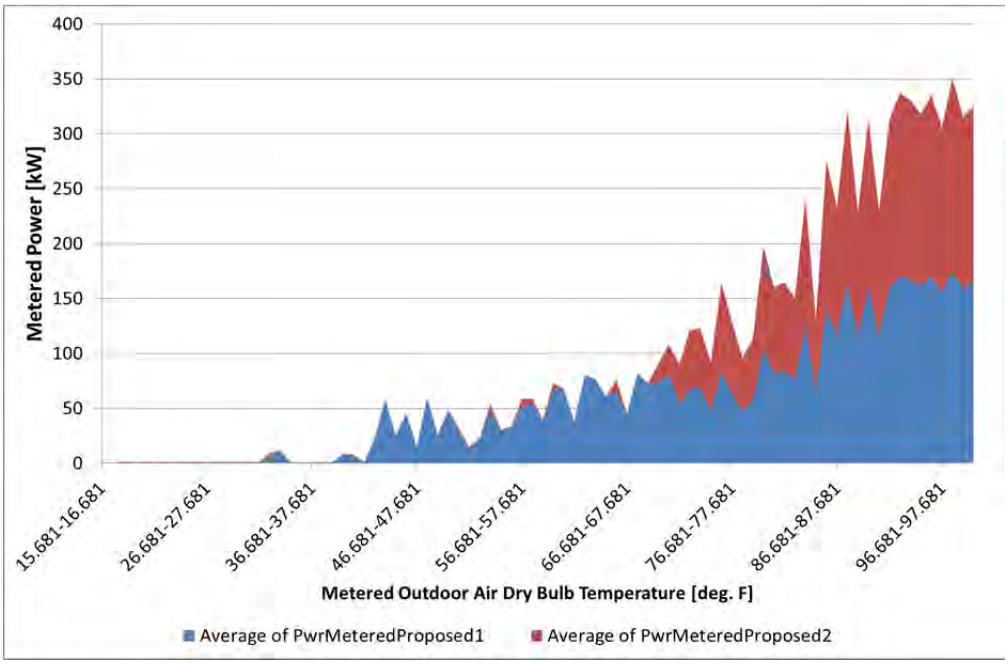
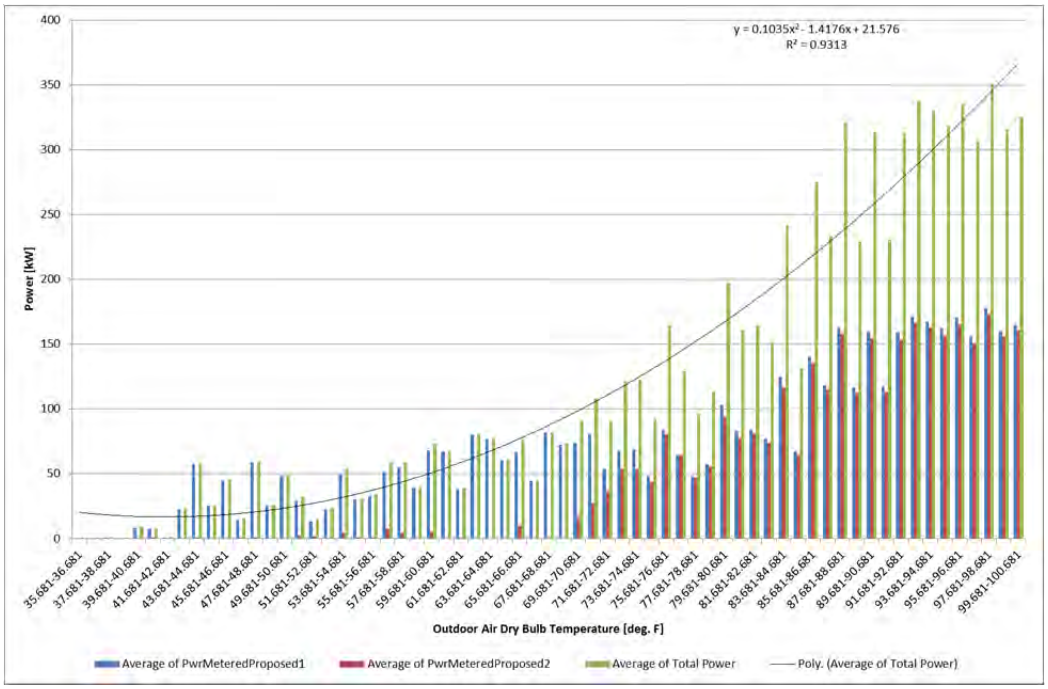


Figure 53 illustrates the strong relationship between observed load data and data collected or generated by the study.

Figure 54, another example plot from the study, illustrates the relationship between outdoor conditions and chiller demand. This particular site used two chillers, staged to meet its load profile: the blue series represents the primary or lead chiller and the red series represents the secondary or lag chiller. The

green data series provides the chiller plant's total power demand—that is, the sum of demand data from each of the two chillers.

Figure 54. Outdoor Air Dry Bulb Temperature vs. Chiller Power



This plot offers an effective picture of the staging scheme utilized by the site: the lag chiller comes on when outdoor air temperatures approach 70 degrees Fahrenheit, and both chillers work together to meet the building's load demands.

Figure 55: Dry Bulb vs. Power Consumption

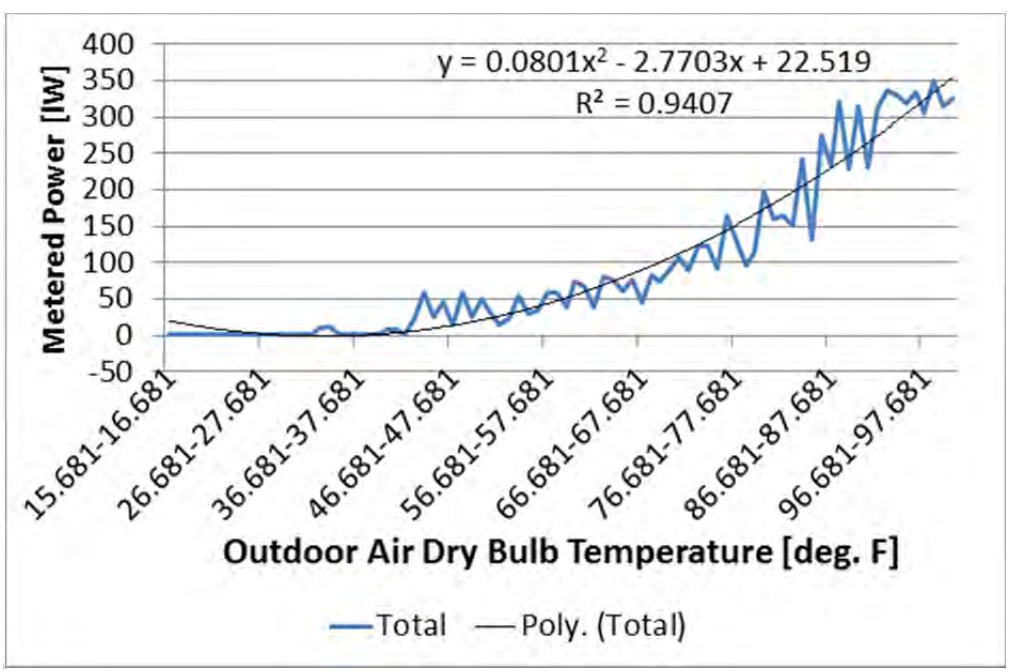


Figure 55 also illustrates the clear relationship between outdoor conditions and chiller power consumption. The high R-squared offers a good indicator of the curve's fit to the underlying data (i.e., as R-squared approaches 1.0, the curve fit approaches exact representation). This fit indicates the chiller was used for comfort cooling, with some moderately static operations. If this unit was used for process cooling applications (e.g., cooling a data center) or if the operating profile was adjusted drastically or regularly (e.g., changing the lead/lag configuration), the relationship would be weaker and the coefficient of determination would be lower.

Savings estimates calculated from this study did not directly factor into *ex-post* gross savings estimates. Rather, sampled chiller projects were evaluated through the discussed engineering reviews, per the same schema as the other projects. This approach prevented unfair weighting or judging of chiller measures, and allowed a uniform methodological approach to be applied across all measures and utilities. This approach also aligned with the calculation methodology for documented implementer savings and/or the Indiana TRM.

The approach offered an added benefit in that the Evaluation Team could contrast a traditional, less-intensive engineering review of these chiller measures with an in depth, intensive analysis benefiting from additional data and resources.

Of a potential match of five, two chiller projects overlapped between efforts (the engineering file review and the on-site engineering measurement and verification). One overlap project displayed some agreement between methods (an 18% difference in energy savings). The other project proved to be an outlier, given its operating practices, and ultimately became a non-qualifying measure. As this unit primarily operated for process load cooling and the program application stated the incentive only applied for comfort cooling chillers, the following findings discussion excludes this unit.

No agreement patterns readily emerged between the study's savings values and the claimed values from program tracking data. Study energy savings consistently averaged lower than *ex-ante* energy savings, but did not exhibit clear relationships or high sample standard deviations. Study peak-coincident demand savings exhibited values higher and lower than *ex-ante* values, again without clear relationships or a high sample standard deviation.

Table 159 summarizes of realization rates for the chiller study relative to *ex-ante* claimed savings. The table presents percentages and not actual savings values to preserve the anonymity of participating customers and because the study served the informative purposes previously detailed. With respect to sample counts, these tables reflect one removed project (a non-qualified measure) and include clustered data due to multiple units installed at some participating sites.

Table 159. Chiller Study Realization Rates

Chiller Site[1]	Study Energy Savings/ Baseline Usage (kWh)	Energy (kWh) Realization Rate (Study/*Ex-Ante*)	Demand (kW) Realization Rate (Study/*Ex-Ante*)	Notes
A	11%	5%	56%	Claimed savings are roughly double the annual total energy usage. Study findings align well with cumulative energy usage from package controls.
B	11%	14%	48%	Claimed savings are more than the annual total energy usage. Study findings align well with cumulative energy usage from package controls.
C	15%	5%	64%	Project had lower-than-expected load and usage.
D	28%	52%	17%	Project had lower-than-expected load and usage.
E	15%	20%	28%	Project had lower-than-expected load and usage. Claimed savings are roughly equal to the annual total energy usage.
F	28%	48%	0%	Claimed savings are roughly equal to the annual total energy usage. Study findings align well with cumulative energy savings from package controls.
G	29%	28%	169%	Cooling hours used do not match Indiana TRM values.
H	7%	29%	49%	Project had lower-than-expected load and usage, along with highly variable building occupancy.
I	7%	59%	28%	Project had highly variable building occupancy.
J	39%	39%	48%	Claimed savings are roughly equal to the annual total energy usage.
K	6%	3%	23%	Claimed savings are more than double the annual total energy usage.
L	27%	30%	14%	Claimed savings are more than the annual total energy usage.
	19%	28%	45%	Sample Mean
	11%	19%	43%	Sample Standard Deviation

(1) May include multiple units.

The disparity between the study findings and the *ex-ante* savings values likely arise from two sources:

1. First, the documented savings calculation methodology published by the implementer did not replicate claimed savings values from the tracking database. The implementer workpaper provides the following energy and demand savings algorithms:

$$\Delta kWh = TONS * ((3.516/IPLVbase) - (3.516/IPLVee)) * EFLH$$

$$\Delta kW = TONS * ((3.516/COPbase) - (3.516/COPee)) * CF$$

The Evaluation Team replicated these calculations, but could not recreate the ex-ante values from the tracking database.

2. The prescriptive nature of the program and Indiana TRM algorithm, which leans heavily on a deemed parameter for equivalent full load cooling hours (EFLH) and CF. The following energy and demand savings algorithms derive from the Indiana TRM, and match the implementer workpaper methodology:

$$\text{Annual kWh Savings} = \text{TONS} * ((3.516/IPLV_{base}) - (3.516/IPLV_{ee})) * \text{EFLH}$$

$$\text{Summer Coincident Peak kW Savings} = \text{TONS} * ((3.516/COP_{base}) - (3.516/COP_{ee})) * \text{CF}$$

It is difficult to formulate deemed parameters for all of the varied conditions a measure could be installed into, but, for a measure as complex as a chiller, it is extremely difficult. Much of the savings generated from a chiller measure is driven by its operating parameters and load profile.

7.7 NET SAVINGS

7.7.1 EVALUATED NET IMPACTS

The Evaluation Team implemented an NTG methodology for evaluating the C&I Prescriptive Rebates program in 2013. This methodology consisted of two components, freeridership and spillover, defined as follows:

- **Freeriders** are participating customers who would have purchased a measure without the program's influence, thereby reducing the savings attributable to the program.
- **Spillover** includes savings achieved through the participating customer's decision to invest in additional efficiency measures or activities due to the influences of program participation, resulting in increased savings attributable to the program and improved program cost-effectiveness.

The following formula provided final NTG ratios for each program:

Net-to-gross ratio = (1 – Freeridership) + Spillover

To determine freeridership, the Evaluation Team drew upon a previously developed approach, which identified freeridership using patterns or responses for a series of 10 simple questions. The questions—which allowed "yes," "no," or "don't know" responses—asked whether participants would have installed the same equipment in the program's absence, at the same time, in the same amount, and at the same efficiency. By assigning freerider scores to certain question response patterns, the Evaluation Team could estimate confidence and precision estimates on score distributions.[45]

[45] This approach follows methods outlined in: Schiller, Steven et. al. "National Action Plan for Energy Efficiency." *Model Energy Efficiency Program Impact Evaluation Guide*. 2007. Available online at: www.epa.gov/eeactionplan. The IPL Oversight Board reviewed and approved the Evaluation Team's NTG questions and question response scoring approach.

The Evaluation Team estimated participant spillover by calculating: (1) savings attributable to additional measures installed; and (2) whether respondents credited the program with influencing their decisions. Measures counted if customers did not request incentives, even though measures qualified for program incentives.

Appendix A provides a detailed explanation of the Evaluation Team's NTG methodology, including descriptions of freeridership and spillover evaluation methodologies, and some of NTG survey questions interviewers asked participants.

After conducting surveys with 233 lighting participants and 49 non-lighting participants, the Evaluation Team converted the resulting responses into a freeridership score for each participant, and then converted the scores using the Excel-based matrix approach, described in Appendix A's freeridership methodology section. Each participant's freerider score, derived from translating responses into a matrix value, used a rules-based calculation to obtain the final score.

The following tables and figures present: all combinations of responses received for the program; and the scores assigned to each combination. Participants' responses rarely reflected each potential combination. Rather, responses tended to group around subsets of common patterns.

Table 160 shows freeridership results for the prescriptive and custom programs. The surveyed lighting participants had a freeridership score of 16%, weighted by evaluated gross measure savings, with an absolute precision of ±3%. The Evaluation Team estimated freeridership for HVAC participants at 50%, weighted by gross evaluated measure savings, with an absolute precision of ±9%.

Table 160: Freeridership Results

Measure	Responses (N)	Freeridership Score	Precision at 90% Confidence
Lighting	233	16%	±3%
Non-Lighting	49	50%	± 9%

A few common patterns appeared in lighting respondents' answers to freeridership questions, representing 168 of the 233 (72%) of lighting participants surveyed. Details from survey responses include the following:

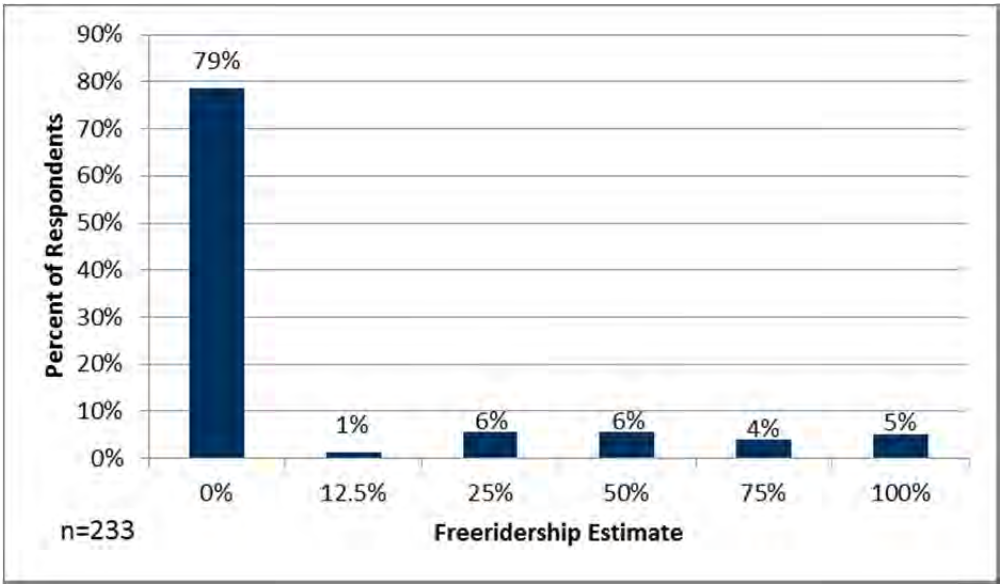
- One-hundred and twenty-two respondents would not have purchased the measures without the incentives. As these respondents said they would not have purchased the measures without the incentive, the Evaluation Team estimated them as 0% freeriders.
- Twenty-four respondents would not have purchased the measures at same efficiency level without the incentives, have been estimated as 0% freeriders.
- Twenty respondents would not have purchased the measures within two years without the incentives, and were considered 0% freeriders
- Twelve respondents planned to purchase the measures before learning about the incentive and had planned the purchase them within their most recent capital budget. They said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. Therefore, the Team considered them as 100% freeriders.

A few common patterns emerged regarding the non-lighting respondents' answers to freeridership questions, representing 39 of the 49 (80%) of non-lighting participants surveyed. Details from the survey responses included the following:

- Twelve respondents planned to purchase the measures before learning of the incentive and planned the purchase these in their most recent capital budgets. They said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. Therefore, the Evaluation Team estimated them as 100% freeriders.
- Eight respondents planned to purchase the measures before learning about the incentive and said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. However, these respondents did not plan for purchases in their most recent capital budgets; therefore, the Evaluation Team estimated them as 50% freeriders.
- Seven respondents planned for purchases in their most recent capital budgets, and said they would have purchased the same efficiency and quantity of the measures at the same time without the incentive. However, these respondents planned to purchase the measures before learning of the incentives; therefore, the Evaluation Team estimated them as 50% freeriders.
- Nine respondents would not have purchased the measures at the same efficiency level without the incentives and were estimated as 0% freeriders.
- Three respondents would not have purchased the measures without the incentives. As these respondents said they would not have purchased the measures at all without the incentive, the Evaluation Team estimated them as 0% freeriders.

The Evaluation Team analyzed individual freeridership scores by examining the distribution of custom respondents' freeridership scores, as shown in Figure 56.

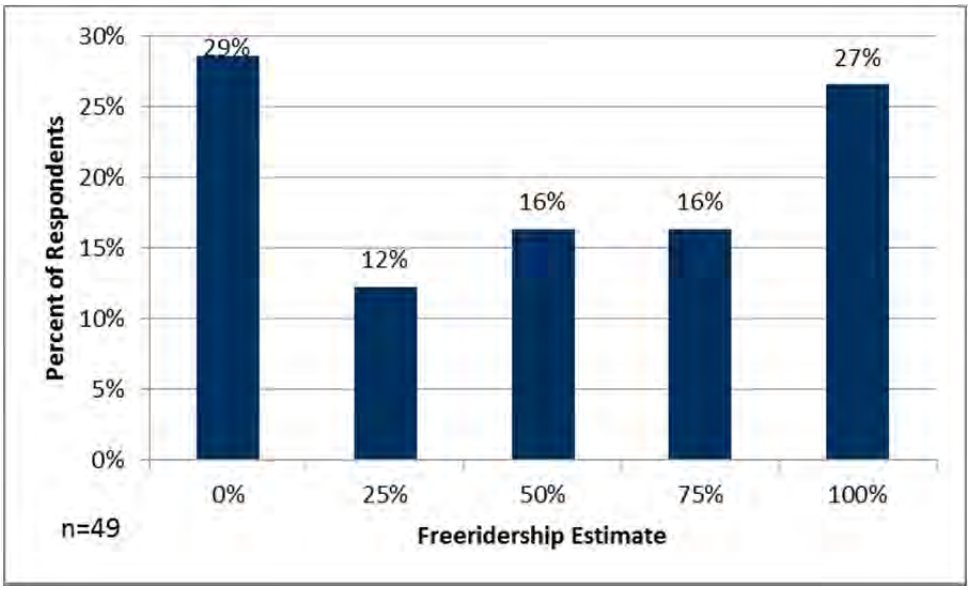
Figure 56: Distribution of Lighting Participants' Freeridership Scores



Though approximately 79% of respondents did not indicate freeridership, the Evaluation Team defined 15% percent of respondents as 50% or higher freeriders.

The Evaluation Team analyzed individual freeridership scores by examining distributions of non-lighting respondents' freeridership scores, as shown in Figure 57.

Figure 57: Distribution of Non-Lighting Participants' Freeridership Scores



Twenty-nine percent of respondents did not indicate freeridership, but the Evaluation Team estimated 59% percent of respondents as 50% or higher freeriders.

Ten lighting participants and three non-lighting participants surveyed purchased energy-efficient measures after participating in the program, where their program experiences proved highly influential on their additional energy-efficient purchases. These 13 surveyed participants cited 14 energy-efficient items with energy savings that should be attributed to the C&I Prescriptive Rebates program.[46]

As few details were collected about the efficiency of the new equipment, quantities of new equipment, and equipment replaced, estimating energy savings for the energy-efficient items cited would prove difficult and would require broad assumptions. The spillover measures discussed ranged from small (CFLs) to potentially very large (compressors or audits). Table 161 list a self-report spillover estimate of 2% for lighting and 1% for non-lighting.

Table 161: Survey Participant Program Savings Analysis

Measure	Spillover Savings (kWh)	Survey Participant Program Savings (kWh)	Spillover %
Lighting	244,350	12,825,326	2%
Non-Lighting	66,641	10,693,296	1%

Table 162 summarizes the percentage of freeridership, spillover, and NTG for the C&I Prescriptive Rebates program. Population *ex-post* net energy kWh savings were calculated by multiplying the population's *ex-post* gross energy kWh savings for each program option by their NTG ratios. The sum of the population *ex-post* net energy kWh savings, divided by the sum of the population *ex-post* gross energy kWh savings, equaled the program option population's 80% weighted NTG ratio for the program.

[46] Eleven items derive from lighting participants, and four items derive from non-lighting participants.

Table 162: Survey Participant Program Savings Analysis

Measure	Responses (n)	Freerider %	Spillover %	NTG Ratio	Population *Ex-Post* Gross Energy kWh Savings	Population *Ex-Post* Net Energy kWh Savings	Population Weighted NTG Ratio
Lighting	233	17%	2%	85%	221,927,278	177,541,822	80%
Non-Lighting	49	50%	1%	51%	19,161,649	15,329,319	

7.8 SUMMARY OF IMPACT ADJUSTMENTS

The following tables show all adjustments made to energy savings claimed by the program.

Table 163: Summary of Energy Savings Adjustments (kWh)

	kWh Goal	*Ex-Ante* kWh	Audited kWh	Verified kWh	Realization Rate	*Ex-Post* kWh	Net kWh
Duke	248,465,099	62,529,961	60,012,345	60,012,345	79%	62,058,310	49,646,648
I&M	65,367,725	89,998,901	86,375,315	86,375,315	82%	89,320,058	71,456,046
IPL	85,540,216	38,050,097	36,518,103	36,518,103	109%	37,763,093	30,210,474
IMPA	51,363,415	17,642,220	16,931,899	16,931,899	95%	17,509,148	14,007,318
NIPSCO	85,778,214	22,670,350	21,747,449	21,747,449	100%	22,499,352	17,999,482
Vectren	40,158,951	10,509,259	9,152,629	9,152,629	103%	10,429,990	8,343,992
Statewide	**576,673,620**	**241,400,788**	**230,737,740**	**230,737,740**	**93%**	**239,579,951**	**191,663,961**
Opt-In		92,834	199,050	199,050	214%	121,245	121,245
Bulb-Drop(1)						117,437,757	125,658,400
Grand Total	**576,673,620**	**241,493,622**	**230,936,790**	**230,936,790**	**96%**	**357,138,953**	**317,443,606**

(1) Bulb drop kWh savings carryover from PY1 distribution, installed in PY2.

Table 164: Summary of Demand Savings Adjustments (kW)

	kW Goal	*Ex-Ante* kW	Audited kW	Verified kW	Realization Rate	*Ex-Post* kW	Net kW
Duke	69,618	9,903	12,046	12,046	114%	14,438	11,550
I&M	22,172	15,585	18,956	18,956	106%	22,721	18,177
IPL	23,715	5,639	6,859	6,859	142%	8,222	6,578
IMPA	14,582	2,627	3,195	3,195	106%	3,830	3,064
NIPSCO	23,712	4,235	5,149	5,149	119%	6,172	4,938
Vectren	11,239	1,608	1,596	1,596	123%	1,913	1,530
Statewide	**165,038**	**39,597**	**47,801**	**47,801**	**119%**	**57,296**	**45,837**
Opt-In		29.43	39.54	39.54	134%	28.58	28.58
Bulb-Drop(1)						30,960	33,127
Grand Total	**165,038**	**39,626**	**47,841**	**47,847**	**121%**	**88,285**	**78,992**

(1) Bulb drop kWh savings carryover from PY1 distribution, installed in PY2.

Table 165: Lifetime Savings Achieved by C&I

Utility	Lifetime *Ex-Post* kWh	~~Lifetime *Ex-Post* kW~~
Duke	1,027,115,604	
I&M	1,238,288,975	
IPL	565,418,421	
IMPA	278,314,903	
NIPSCO	375,092,514	

Utility	Lifetime *Ex-Post* kWh	~~Lifetime *Ex-Post* kW~~
Vectren	164,524,287	
Statewide	**3,648,754,704**	

7.9 PROCESS EVALUATION

The PY2 process evaluation sought to evaluate the program's effectiveness and to identify opportunities for improvements. The evaluation sought to inform and provide context to the impact evaluation results, while helping the TPA better understand: how customers and Trade Allies interact with the program; and any barriers they face.

7.9.1 PROGRAM DESIGN

The C&I Prescriptive program added seven new tracks to enhance program uptake through marketing and promotional efforts. In addition, a personnel change occurred: the TPA designated a new program manager. The program continued to offer the same equipment as in PY1 at the same rebate levels, and then increased its efforts through a double-incentive initiative. The Evaluation Team examined the measure offerings in the C&I Prescriptive program and compared these with the utilities' prescriptive Core Plus programs. While the measures were similar (the Evaluation Team found 4-foot T8 lamps offered by Energizing Indiana and by a utility prescriptive program, though with different wattages), overlap did not occur.

Statewide and utility-specific (Core vs. Core Plus) programs present challenges to customers who must choose a program. They also present challenges to programs that must register customer savings and participation. While the statewide program offers different measures than the utility programs, program managers may find themselves "competing" for savings from a given customer.

In PY2, the C&I Prescriptive program achieved 42% of its energy-saving goals—considerably lower than the 63% of its goals the program achieved in PY1.

7.9.2 PROGRAM MARKETING, OUTREACH, AND ENROLLMENT

Customer Outreach

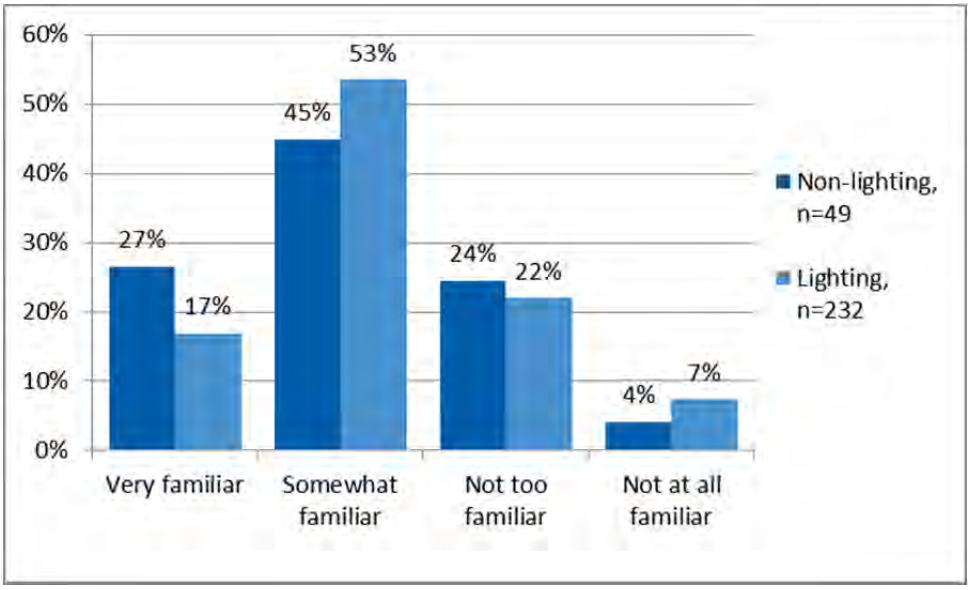
The C&I program relied on its Trade Ally base to promote the program to customers throughout the state. Trade Ally knowledge of the program remained critical to its success. The program used online and print materials, in addition to direct marketing by Trade Allies, to reach customers and to build program awareness. The program's overall PY2 goal was to raise awareness and drive participation in all of the statewide Energizing Indiana programs.

The program began additional marketing and outreach through one of seven tracks added to the program in August 2013. The opt-in track worked with businesses to promote Energizing Indiana through promotional CFL mailers and direct-install mechanisms.

The Evaluation Team surveyed customers to assess their Core C&I Program awareness. Seventy percent of lighting (n=233) and 72% (n=49) of non-lighting customers were somewhat or very familiar with the C&I Prescriptive Program (as shown in Figure 58). These responses represented an increase over the PY1

numbers, when 67% of lighting and non-lighting customers stated they were somewhat or very familiar with the program.[47]

Figure 58. How Familiar are You with the C&I Prescriptive Program?



The TPA staff told the Evaluation Team that early in PY2, customers expressed confusion between the Statewide Core Program and the utility-specific Core Plus programs. They also reported the variety of programs offered made it difficult for customers to determine which program best suited their needs. The Evaluation Team asked lighting and non-lighting customers questions to address this confusion, as shown in Figure 59 (below).

The majority of customers (>80%) reported not confusing the Statewide Core and Core Plus programs. The small percentage of customers expressing confusion cited the following concerns:

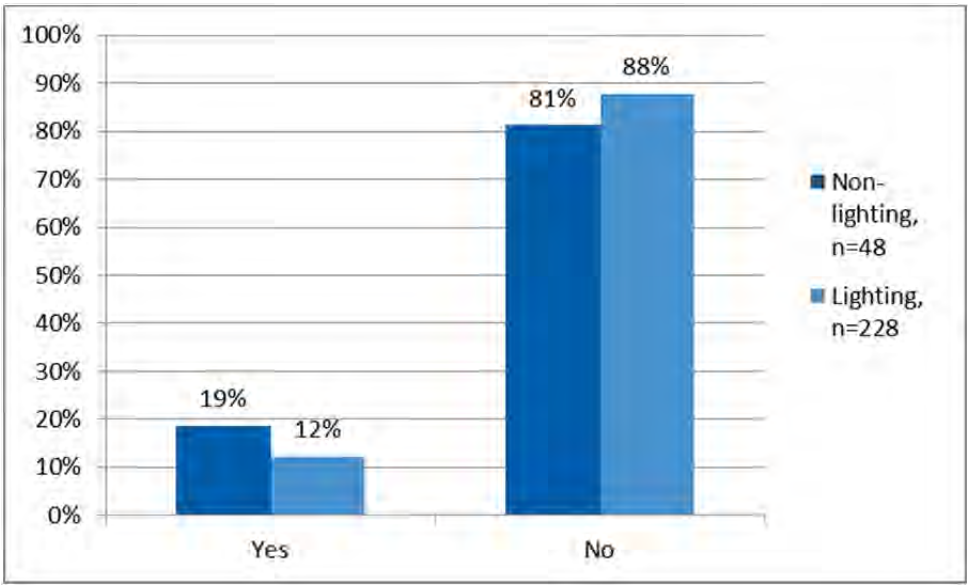
- Understanding how the programs differed across utilities and between Core and Core Plus;
- Understanding which items qualified under each program;
- Understanding how to apply for each program;
- Understanding who to call with questions; and
- Multiple companies offering assessments.

Some customers reported spending a great deal of time to understand the programs and applications. Some customers said the programs would be less confusing if they ran as one statewide program, due to having businesses in various utility territories. They asked for better informed Trade Allies to help them and clearer information on the different utility websites.

[47] Survey populations in PY1 were considerably smaller due to slower program uptake, with 91 lighting participants and 24 non-lighting participants.

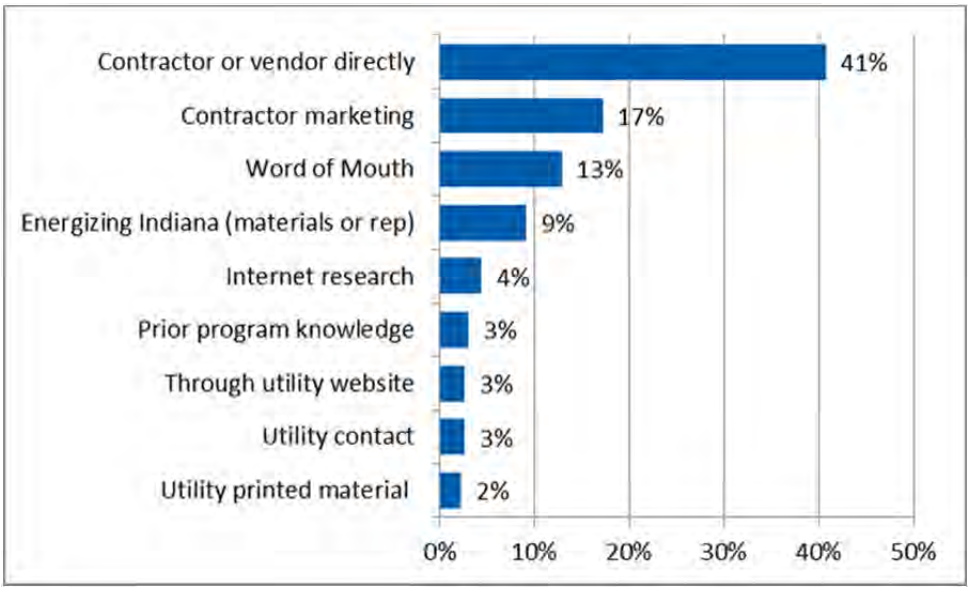
In a follow-up interview, the TPA told the Evaluation Team that they still received anecdotal reports from customers expressing confusion between the offered programs.

Figure 59. Did You Encounter Any Confusion between the Statewide Core Program and Other Utility Run Programs?



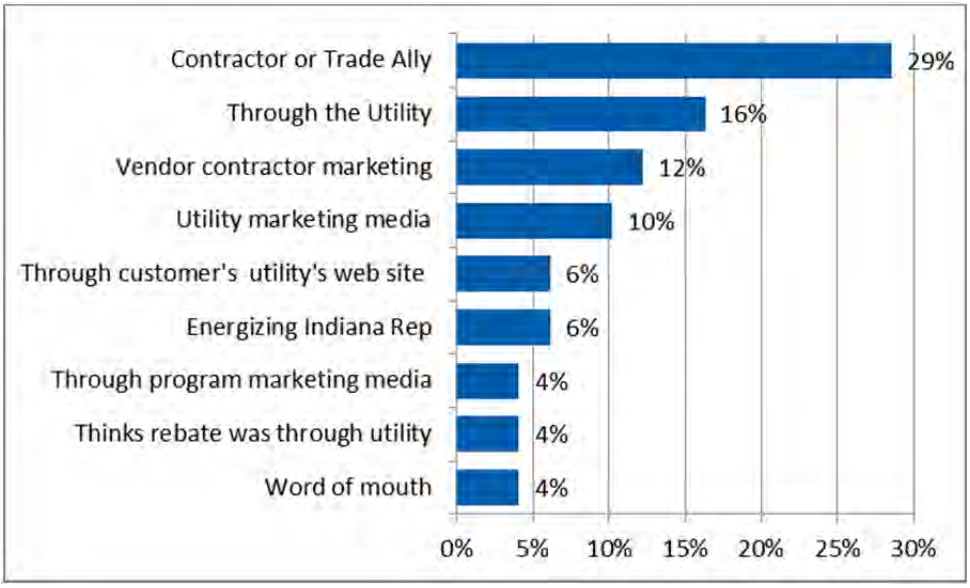
The survey asked customers how they learned of the programs. Both lighting (Figure 60) and non-lighting participants (Figure 61) principally learned of the programs through their Trade Allies.

Figure 60. How Did You Learn About the Energizing Indiana C&I Prescriptive Program~~?~~ ~~(n=233, Lighting Customers only)*~~?(1)



(1) *Due to the large number of respondents, the figure only displays options with five or more responses.
n=233, Lighting Customers only

Figure 61. How Did You Learn About the Energizing Indiana C&I Prescriptive Program?
~~(n=49, Non-Lighting Customers only)~~ (1)



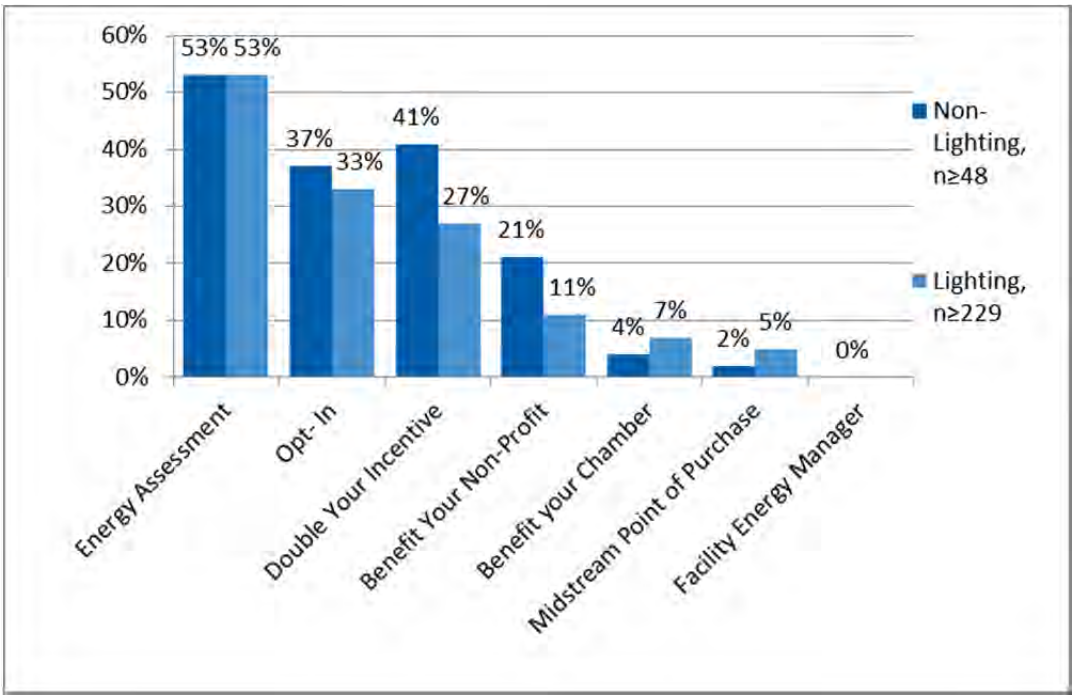
(1) Due to the large number of response categories, the figure only displays options with two or more responses.
n=49, Non-Lighting Customers only

In July 2013, the TPA launched the following seven promotional initiatives to stimulate program participation:

- Energy Assessment (a Trade Ally-generated, on-site efficiency opportunity assessment and report).
- CFL Opt-in (a direct-install program at no-cost to business owners).
- Double Your Incentive (a time-limited doubling of incentives to customers, with a $100 incentive to Trade Allies).
- Benefit Your Non-Profit (a 5% incentive bonus to non-profits).
- Benefit Your Chamber (a 5% incentive bonus to Chambers).
- Midstream Point-of-Purchase (a program promotion partnership with midstream equipment and services suppliers).
- Facility and Energy Manager Training (focusing on incentives and return-on-investments for the hotel industry).

Customers displayed a mixed awareness of these programs, with the Energy Assessment Initiative achieving the highest awareness levels. Figure 62 shows the survey results in greater detail.

Figure 62. Are you Aware of the Following Initiatives?



In a follow-up interview in February 2014, TPA staff told the Evaluation Team that:

- The "Double Your Incentive" promotion proved very successful in Q4 2013; and
- Only one Trade Ally participated in the "Midstream Point-of-Purchase" initiative.

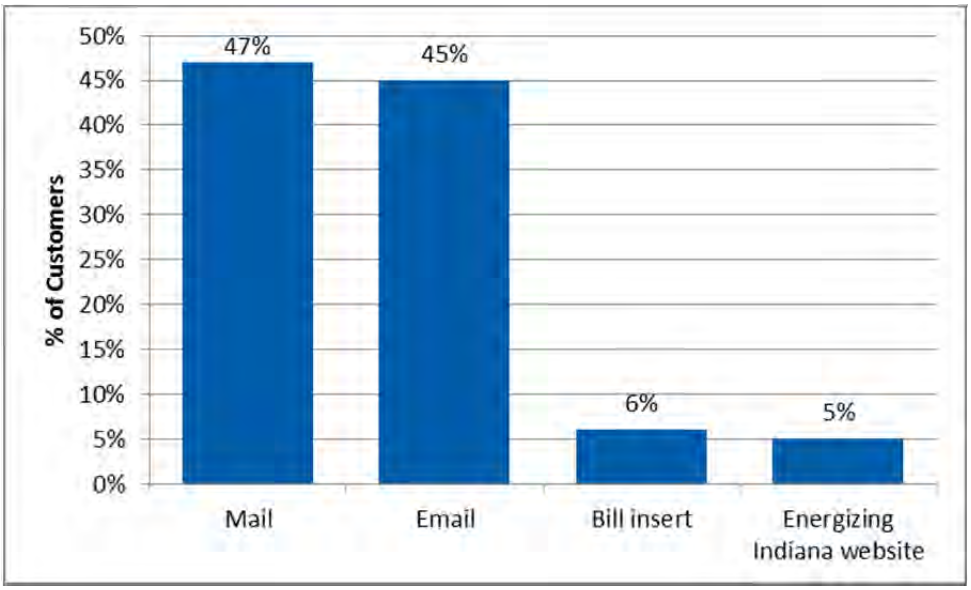
Consequently, the TPA began working with this Trade Ally to improve the sales verification and data tracking processes before expanding the initiative. The Facility and Energy Manager initiative did not acquire participants in PY2. In the follow-up interview, the TPA reported continuing to work with Trade Allies to develop the sales pipeline, and expected the initiative to achieve savings in 2014.

Nonparticipant Customers

The Evaluation Team surveyed 101 nonparticipant customers. Only 26% (n=26) knew of the program. Of that 26%, one-half knew of the ENERGY STAR program and the lighting program, and one-third knew of the non-lighting program.

Nonparticipants primarily learned of the program from printed advertisements, such as mailings or newspapers, or from their Trade Allies. Nonparticipants also asked to be kept informed about the C&I Prescriptive Rebate Program via mail or e-mail (as shown in Figure 63).

Figure 63. Future Communication Preferences ~~(n=88) (Multiple Responses Allowed)~~



n=88 Multiple Responses Allowed

Trade Ally Outreach

Energizing Indiana staff played an important role in Trade Ally outreach, with 10 of the 18 surveyed Trade Allies saying they learned of the program from Energizing Indiana staff. Five Trade Allies learned of the program from a fellow Trade Ally.

Trade allies received brochures, access to the website, and other means of promoting the program. Two Trade Allies said they attended a luncheon hosted by the TPA. Thirteen of the Trade Allies expressed satisfaction with the program's resources. Four Trade Allies stated they had not received training or materials, and the final Trade Ally did not respond. When asked what program elements could be improved, Trade Allies most frequently requested more access to Energizing Indiana staff.

Only one Trade Ally said customers were very familiar with the C&I Prescriptive Program. Ten (56%) said customers were somewhat familiar, and seven (39%) said customers were not too familiar with the program. These responses substantiated the customers' own observations regarding their familiarity with the program.

Fifteen Trade Allies said customer awareness of the program increased in PY2, attributing this to program marketing, advertising, and word-of-mouth. Sixteen Trade Allies cited word-of-mouth as the most effective way to reach their customers. Several told the Evaluation Team that the program had been operating long enough that "word was getting around."

The opt-in direct-install program utilized additional Trade Allies.

1. The Evaluation Team conducted interviews with field technicians and Trade Ally coordinators from the C&I Program implementation team in multiple locations around Indiana. The TPA sent mailers to smaller commercial businesses, describing the project and offering CFLs to replace currently used, less~~-~~-energy-efficient bulbs. Individual customers returned the flyers, ~~filling~~having filled out the number of bulb sockets in their commercial spaces if they chose to

participate, and ~~indicating~~having indicated whether they wanted 13- or 18-watt bulbs. Field technicians received a list of customers in their regions, and took the following actions: if the customers had fewer than 12 sockets in their spaces, they received bulbs via mail; if they had more than 18 bulb retrofits available, technicians called to make appointments, visited stores to install bulbs directly, and removed the replaced bulbs (to ensure the less energy-efficient bulbs would not be used again). While field technicians in some territories visited 30 to 50 stores, others only visited one or two. Indiana Michigan Power ~~only~~ sent mailers only to hotels/motels/lodging and realized very few returns, while other utilities sent mailers to an array of ~~commercial~~ buildings and realized greater returns.

2. Businesses included: hospitals, animal clinics, offices (such as law firms), small restaurants, pubs, gas stations, yoga studios, small town grocers, hotels/motels, nursing homes, smaller private schools, cosmetic stores, strip malls, libraries, ice scream parlors, book shops, beauty salons, barber shops, and churches.
3. Feedback included that the program produced negligible actual savings, realizing greater benefits through the education/awareness component from Trade Allies or field technicians visiting local stores and informing business owners or managers about other programs for which they could qualify. For non-profit businesses, for example, Trade Allies or field technicians informed them of community outreach and provided paperwork for energy upgrades. If business used older machinery, contacts provided paperwork for community programs/rebates. Some businesses could participate in the custom program. Most stores used fluorescent lighting, and some business representatives did not know what CFL bulbs were.
4. Outreach produced very positive interactions with managers and store owners: businesses expressed gratitude for the help, for receiving CFLs, and for learning about other programs. A few customers followed up regarding their interests, mostly in weatherizing homes and arranging energy assessments.

Nonparticipant Trade Allies

The Evaluation Team spoke with four nonparticipating Trade Allies, all of whom knew of the C&I Prescriptive program. None knew of the $100 Trade Ally incentive for accepted program applications. Nonparticipating Trade Allies told the Evaluation Team that they learned of the program from program or utility staff, or from their suppliers. Two Trade Allies expressed interest in working with the program and said they would prefer to receive information about it via e-mail.

Commercial and Industrial Marketing Materials and Messaging

The Evaluation Team reviewed all program marketing materials provided by the TPA. Overall, pieces presented a consistent look and feel, and appeared to closely follow the Energizing Indiana Visual Identity Guide (e.g., fonts, colors, and layout). They typically included the Energizing Indiana logo (appropriately), in conjunction with utility logos (pending the piece of collateral). All pieces included a strong call-to-action, which consistently included the program website, e-mail address, and telephone number. The online advertisements directed customers to the program webpage, which served as a portal for customer engagement, education, and interaction.

The program also employed messaging and matching imagery utilizing a robber or masked light bulb. Energizing Indiana staff reported the imagery anecdotally provided strong brand recognition; the Evaluation Team did not test this hypothesis in the customer surveys. The creative design sought to

illustrate that customers might lose money by not participating in the program. All pieces appeared to deliver a strong, consistent and clear message.

The TPA indicated they closely tracked all marketing and communications initiatives. They provided the Evaluation Team with the response rates that follow, and reported satisfaction with the responses (specifically, that the online advertisements performed above the industry average):

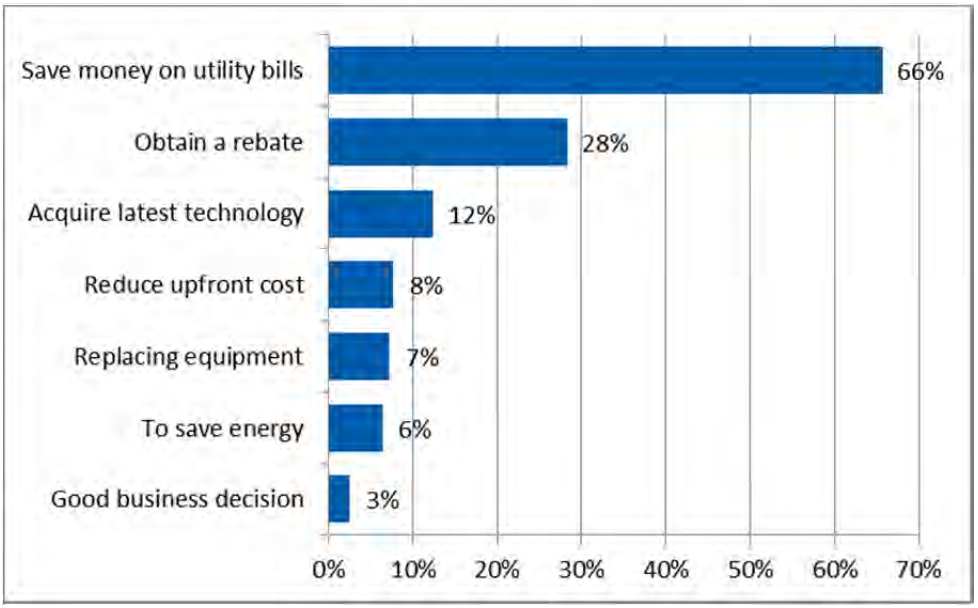
- **CFL Opt-In**: Overall Response rate: 7.4%
- **Facility Assessment Mailing:** Response rate: 1.7%
- **Online Display Campaign:**
  - 64,595,223 impressions
  - 147,201 clicks
  - Click-through Rate (CTR):[48] 0.228%
- **Google AdWords:**
  - 1,522,165 impressions
  - 8,475 clicks
  - CTR: 0.57%

Program Enrollment

Financial motives, including saving money and obtaining a rebate, primarily drove customer participation, as shown in Figure 64 and Figure 65.

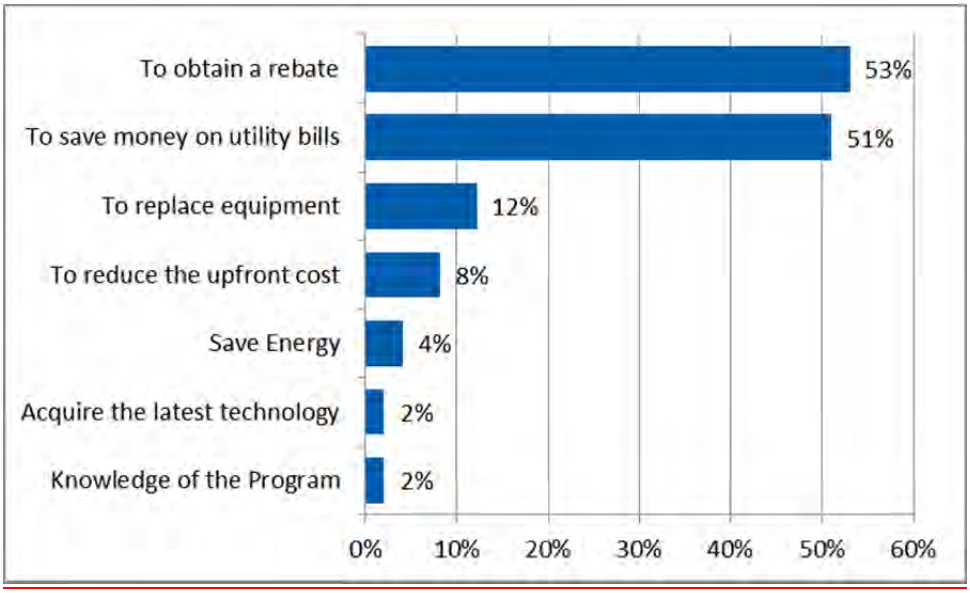
[48] The CTR represents the number of clicks an advertisement receives, divided by the number of times it was shown (impressions).

Figure 64: What Factors were Important in Your Decision to participate?
~~(Lighting customers, n=233, Multiple Responses Allowed)*~~[(1)]

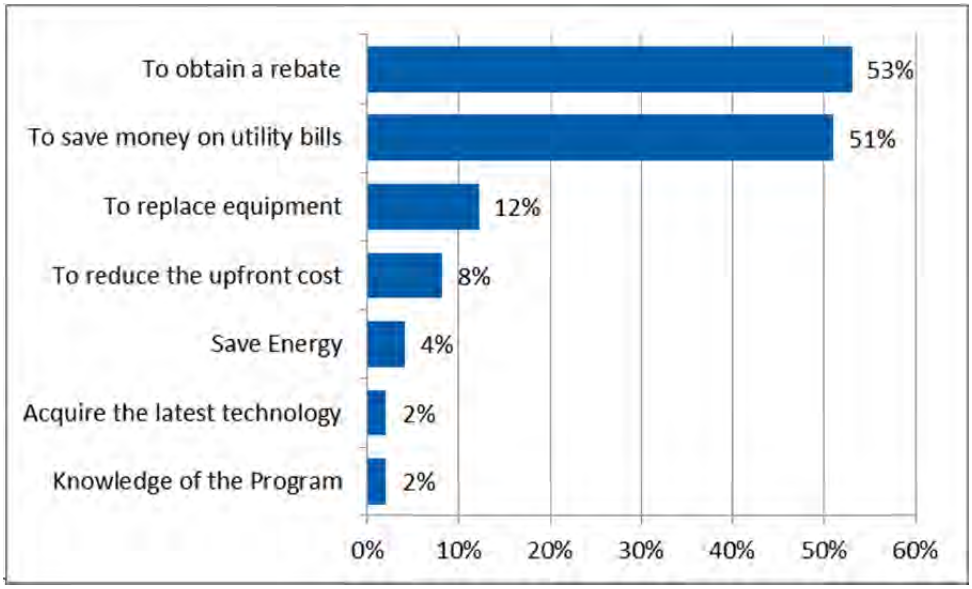


(1) *Options with less than three responses not included.
Lighting customers, n=233, Multiple Responses Allowed

Figure 65: What Factors were Important in Your Decision to Participate?
~~(~~



Lighting customers, n=49, Multiple Responses Allowed~~)~~

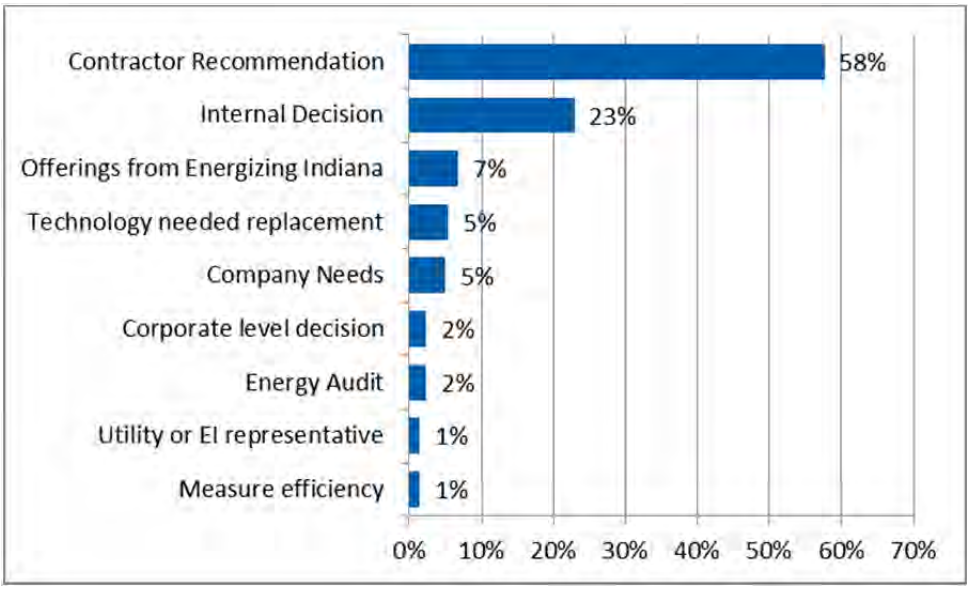


Trade Allies primarily drove the PY2 program. In PY1, TPA staff expressed frustration with their inability to target customers directly; they found it extremely difficult to rely exclusively on the Trade Ally network to deliver a program with high savings goals; therefore, the Trade Allies played a large part in resolving this issue.

- When the Evaluation Team asked participants how they determined which equipment to install, responses confirmed Trade Allies' importance in creating PY2 customer awareness. For lighting customers, more than one-half of respondents relied on a Trade Ally; non-lighting customers split between Trade Allies and internal decision making. Figure 66 and Lighting Customers, n=222, Multiple Responses Allowed

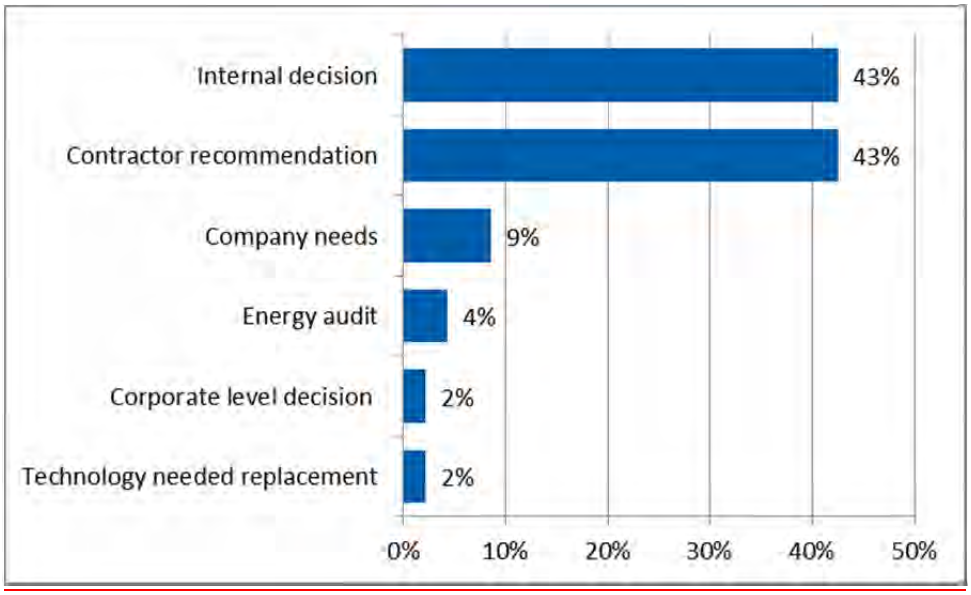
Figure 67 display lighting and non- lighting responses, respectively.

Figure 66: How did you Determine Which Equipment to Install?
~~(Lighting Customers, n=222, Multiple Responses Allowed)~~

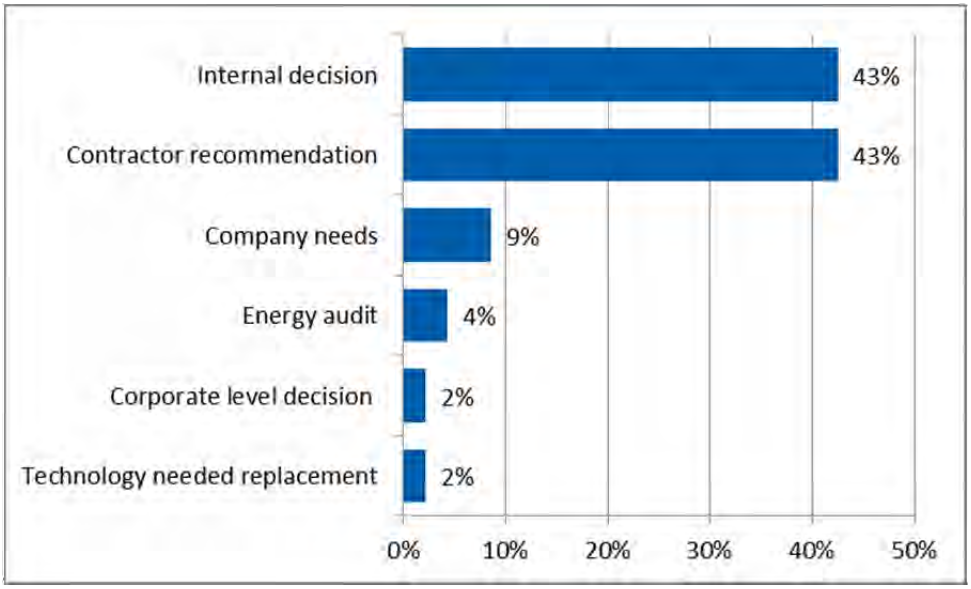


Lighting Customers, n=222, Multiple Responses Allowed

Figure 67: How did you Determine Which Equipment to Install?
~~(~~



Non-Lighting Customers, n=47, Multiple Responses Allowed~~)~~



7.9.3 PROGRAM SATISFACTION

The Evaluation Team examined customer satisfaction with several aspects of the C&I Prescriptive program, including: program materials, contractor (Trade Ally) knowledge, the application process, eligible measures, rebate arrival times, and the program overall. The Evaluation Team used a 10-point scale, where 1 meant very dissatisfied and 10 meant very satisfied. Overall, lighting and non-lighting customers expressed satisfaction with all program features.

Lighting Participants

Figure 68 and Figure 69 show lighting participants' satisfaction rates in PY1 and PY2, respectively.

Figure 68: How Satisfied Are You With… (PY1, Lighting Participants)

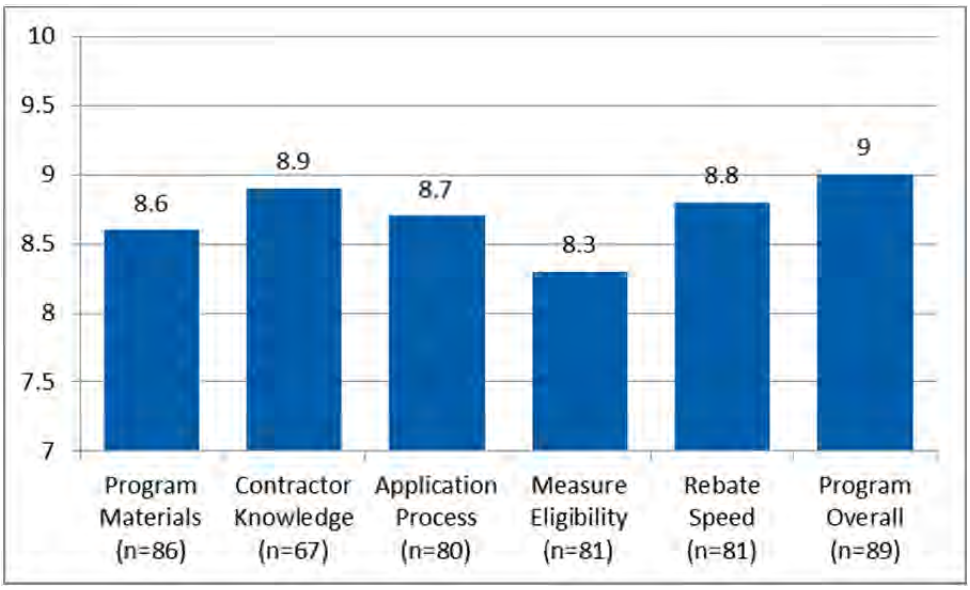
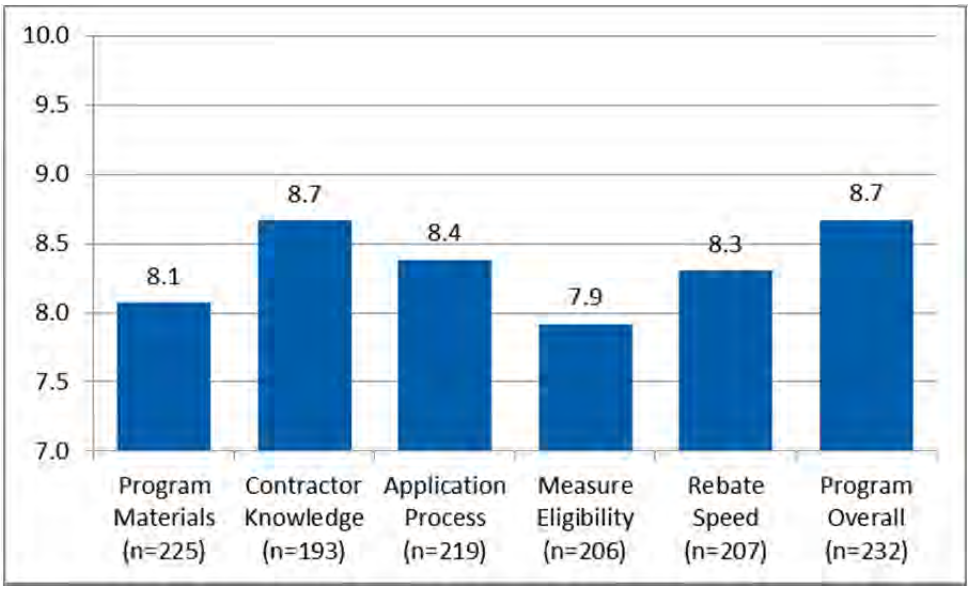


Figure 69: How Satisfied Are You With… (PY2, Lighting Participants)



PY2 customer satisfaction averaged high across all categories, despite a slight drop from PY1 response scores. At least 94% of lighting customers responded with a 5 or higher in every category. The Evaluation Team examined whether any response changes showed statistical significance. While the two years did not display a statistical difference in most categories, customer responses about satisfaction with program materials and rebate speeds proved statistically significant.

Of 1,282 total responses by lighting customers, just 114 rated the program a 5 or below. Those expressing dissatisfaction with program features most commonly cited the following areas:

- Program Materials: Respondents found program materials confusing and did not provide sufficient information. Twenty of 28 PY2 customers expressing dissatisfaction were somewhat or not at all familiar with the program.
- Trade Ally Knowledge: Customers stated the Trade Ally installing the measure did not know of the program.
- Application Process: The application was too long and confusing.
- Measure Eligibility: Measures were too limited (two customers specifically mentioned LEDs, which multiple Trade Allies also mentioned).
- Rebate Speeds: The time it took to receive a rebate was much longer than the customer anticipated.
- Overall: The process was complicated and program staff were not responsive.

Non-~~lighting~~Lighting Participants

Non-lighting customers also expressed satisfaction in all areas, as shown by the responses in Figure 70 and Figure 71.

Figure 70: How Satisfied Are You With… (PY1, Non-Lighting Participants)

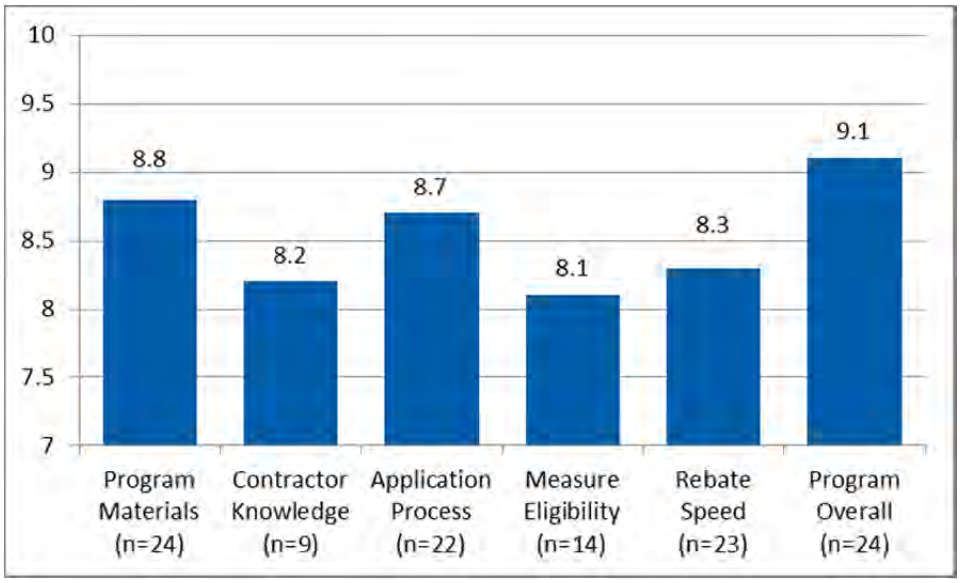
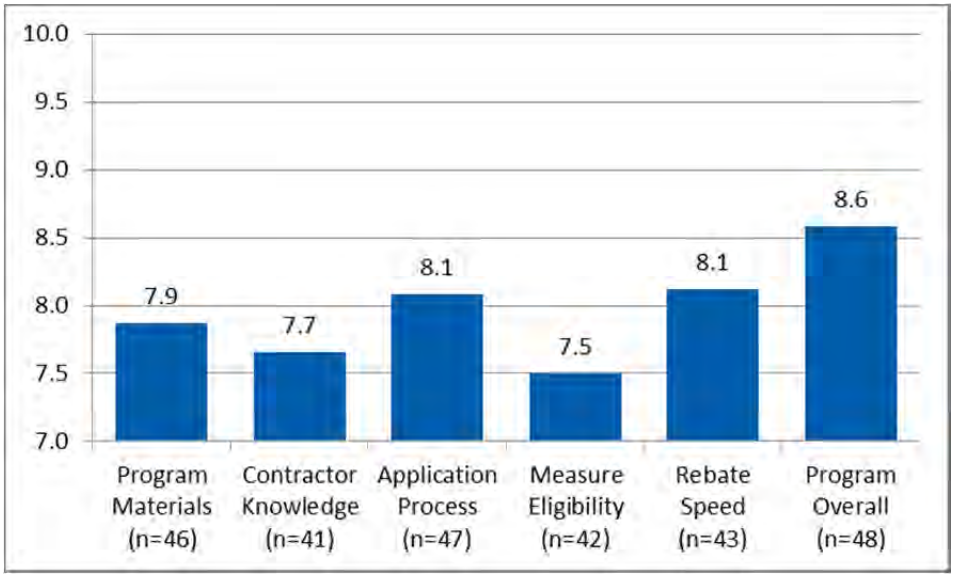


Figure 71: How Satisfied Are You With… (PY2, Non-Lighting Participants)



In all areas except Trade Ally knowledge, at least 98% of respondents awarded a 5 or higher in each category. Eighty-five percent of respondents indicated a 5 or higher when asked about Trade Ally knowledge. As with the lighting respondents, the only two categories exhibiting statistically significant differences between PY1 and PY2 were satisfaction with program materials and the speed with which rebates arrived.

Responses indicated limited dissatisfaction with each program feature, with just 31 of 267 total satisfaction responses below a 5. Customers expressed dissatisfaction for the following reasons:

- Program Materials: Materials were unclear.
- Trade Ally Knowledge: Trade allies were unaware of the program.

- Application Process: The application was too complex.
- Measure Eligibility: The measure selection was too limited.
- Rebate Speed: The rebate did not arrive fast enough.
- Program Overall: No customers ranked the overall program with a 5 or below.

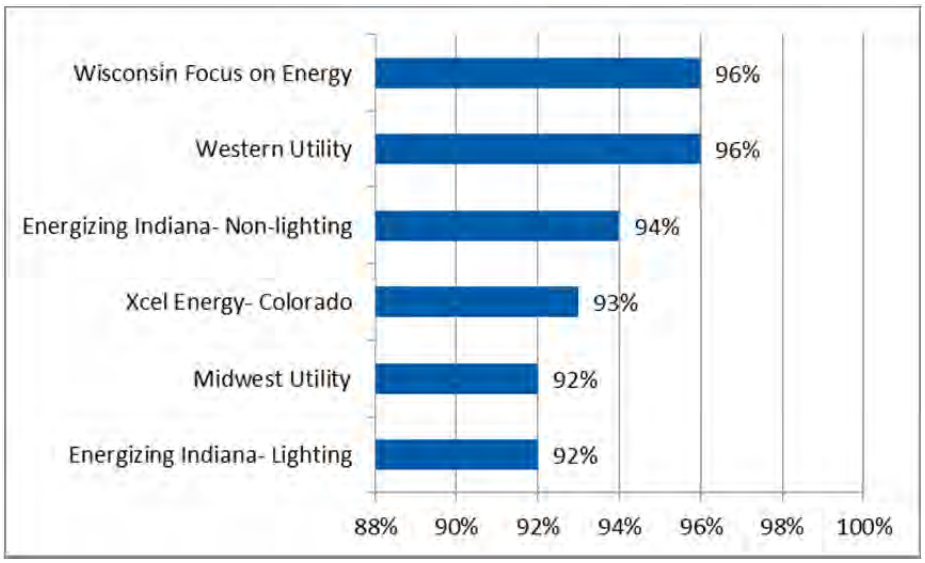
Twenty-five customers offered suggestions for program improvements, with the following ranking as the top three responses:

- Improve program outreach.
- Streamline the application process.
- Expand the measure list.

Customer Satisfaction Benchmarking

The Evaluation Team compared satisfaction levels for lighting and non-lighting customers to customers in several other prescriptive programs in the United States. As shown in Figure 72, program satisfaction,[49] in addition to being quite high, aligned with the other programs.

Figure 72: Satisfaction Benchmarking with Other Utility Programs

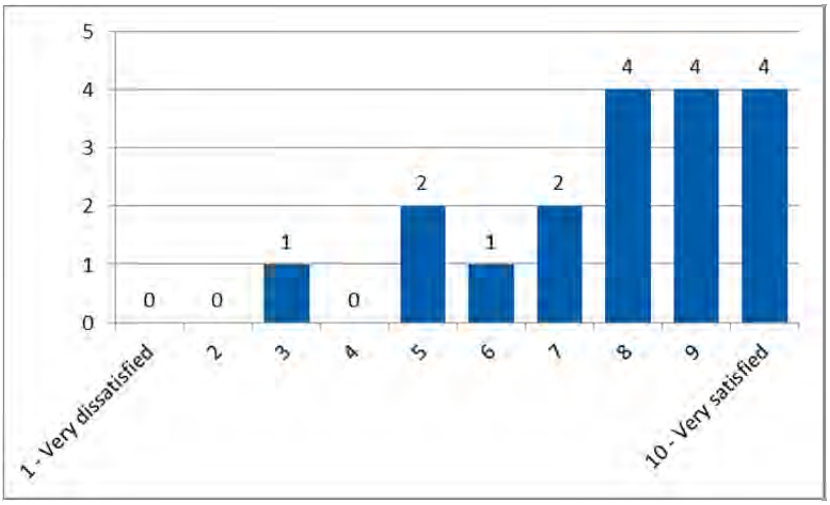


Trade Ally Satisfaction

Trade Allies expressed satisfaction with the program overall, as shown in Figure 73. The single Trade Ally expressing dissatisfaction with the program (rating it a 3) indicated his satisfaction rose to very satisfied (10) when the "Double Your Rebate" initiative took effect.

[49] The team used customers who gave a ranking of "7" or higher.

Figure 73: How Satisfied Were You with the Program Overall? ~~(n=18)~~



n=18

Participation Barriers

The Evaluation Team asked customers what they perceived as the greatest barriers to their participation in the C&I Prescriptive Program. Two customers cited obtaining corporate approval for project funding. Trade Allies also cited financial challenges, specifically the availability of upfront capital to invest in new energy-efficiency measures, as the biggest barriers their customers faced. Trade Allies also said increasing rebates and customer outreach would best improve the program for customers.

Forty-one nonparticipants' stated they encountered barriers when making energy-saving improvements in their facilities. These barriers aligned with those cited by participants and Trade Allies. More than one-half stated that financial limitations, either through initial upgrade costs or through budget limitations, presented their primary participation barriers. Approximately 20% (n=9) also cited building limitations.

Surveys also asked Trade Allies about barriers. Of 18 Trade Allies surveyed, 10 participated in the Core Plus programs and said dealing with different applications, program policies, and measure presented challenges.

7.9.4 DATA AND TRACKING SYSTEMS

Contact Databases

The Evaluation Team used Trade Ally contact information provided by the TPA to craft samples for the Trade Ally surveys. In preparing the samples for use, the Evaluation Team encountered two issues:

- The materials listed many Trade Allies multiple times, based on contact persons and on the spelling of the Trade Ally company name.
- The nonparticipant list missed many phone numbers, and the Evaluation Team found many Trade Allies on that list had, in fact, participated in the program.

Inaccurate project information presented difficulties when conducting the evaluation, and presented problems for the TPA's tracking of Trade Ally enrollment and participation. As this network serves as a primary source of project work, diligence in maintaining accurate Trade Ally project records is important.

7.10 INSIGHTS ~~&~~AND RECOMMENDATIONS

Conclusion 1*:* Trade allies serve a key program component and prove critical to its success. Trade allies provided the primary awareness source for lighting and non-lighting customers and continued to serve as the program's primary delivery vehicle. The "Double Your incentive" initiative successfully drove participation and offered an effective marketing tool for Trade Allies.

Recommendation 1: Continue to leverage Trade Allies as marketing ambassadors, and further develop engagement tactics and support. Increase awareness of marketing initiatives, such as the $100 Trade Ally incentive, to recruit more currently nonparticipating Trade Allies into the program.

Conclusion 2: Customers and Trade Allies expressed less confusion than anticipated regarding differences between the statewide and Core Plus programs. Interviews with program managers indicated customer confusion between the programs, but rates appeared less than expected (though some customers and Trade Allies did express confusion).

Recommendation 2: A website displaying all programs offered, including those run by Energizing Indiana and by the utilities, would help customers better understand offerings and provide an additional resource for Trade Allies promoting the program.

Conclusion 3: Trade ally tracking data contained duplicates and lacked complete information**.** The lists provided by the TPA listed Trade Ally names multiple times (with multiple spellings), and included many entries with missing contact information. Additionally, the materials listed many Trade Allies as having no applications ("nonparticipants"), when they were, in fact, participants.

Recommendation 3: Standardize Trade Ally names to avoid duplicates in different entries and require contact information, such as names, e-mail addresses, and telephone numbers. Consistent name use will allow the TPA to better track projects per Trade Ally, reducing errors regarding participation status. Mandatory contact information also would help the TPA conduct outreach/contacts (such as e-mail blasts and event invitations).

Conclusion 4: Participants are highly satisfied with the program. Both customers and Trade Allies expressed satisfaction with the program overall and with its individual components. Benchmarking analysis indicated customer satisfaction rates aligned with similar programs elsewhere in the United States.

Recommendation 4: Consider conducting routine customer surveys, online or as part of the application process, to monitor performance and satisfaction.

Conclusion 5: The C&I Prescriptive program did not meet its goals in PY1 or PY2, and likely will not meet them in PY3 without increasing customer awareness and understanding of the program. Trade allies told the Evaluation Team that only a small percentage of customers were "very familiar" with the program. Under the program's current design, only Trade Allies can directly access customers.

Recommendation 5: Evaluate Trade Ally participation levels and benchmark these against similar C&I programs to determine if the program maintains participation levels adequate to meet its goals. In addition, utility representatives should consider working with the TPA to allow program managers to access to medium and larger customer accounts, expanding direct contact and increasing customer access to program information.

Recommendation 6: Program data should include the marketing and outreach initiatives that led customers to participate. Including these will help managers track their effectiveness.

Conclusion 7: Chiller measures are highly complex and varied. Existing implementer and Indiana TRM savings estimate methodologies do not accurately reflect achievable savings values.

Recommendation 7: Shift the chiller measure to a custom or hybrid-custom model. Offer (relatively) low prescriptive savings values and incentives under a prescriptive offering, and enable added savings and incentives for conducting a custom energy savings analysis.

Conclusion 8: The three *ex-ante* sources provided by the implementer—the TPA web portal, the totals queried from the database, and the TPA report to the DSMCC—contained conflicting values for installed quantities, kWh savings, and kW savings. The implementer claimed the database was the governing data source; so the Evaluation Team referenced those quantities and savings for the analysis presented in this report. However, the database did not include the program's opt-in and bulb drop measures.

Recommendation 8: Given that the program tracking database provides the best record of implementer data, the web portal and any subsequent reports or scorecards should align with this source. This database should also track all program offerings to produce consolidated, accurate reporting.

8. COST-EFFECTIVENESS

8.1 *INTRODUCTION*

Evaluating the cost-effectiveness of energy efficiency programs for the set of Energizing Indiana energy efficiency programs involves following the procedures specified in the Indiana Evaluation Framework. The cost-effectiveness approaches in the Framework are based, to a large degree, on the California Standard Practice Manual (SPM). However, the Indiana Evaluation Framework takes precedence over the SPM when applicable. Adherence to the procedures in the Framework and the SPM may follow a number of paths; but, two approaches are the most prevalent. One involves evaluating the *ex-ante* cost-effectiveness (i.e., the cost-effectiveness of proposed programs). The second involves evaluating energy efficiency programs on an *ex-post* basis. The *ex-ante* approach uses projected measure impacts, while the *ex-post* approach uses actual results from the EM&V. This latter or *ex-post* approach is utilized for the cost-effectiveness analysis in this report and is consistent with the analysis requirements of the Indiana Evaluation Framework.

This report details the results of the cost-effectiveness analysis for the Statewide Core programs for each utility and the portfolio of programs for the measures implemented in the 2012 and 2013 program years. While this benefit cost analysis is for the second year of the Third Party Administrator's (TPA) operations, the avoided costs and program costs for both program year one (2012) and program year two (2013) are aggregated together for analyzing cost-effectiveness. This aggregation is appropriate for two reasons: (1) it provides results for the full program since inception and (2) it avoids timing issues that occur because there are carry-over load impacts or avoided costs counted in program year two that were associated with expenditures in program year one.

Given the May 9, 2014 Order by the Indiana Utility Regulatory Commission requesting standalone cost-effectiveness scores for just the second program year, those cost-effectiveness results have been prepared. The second program year cost effectiveness scores are provided in Appendix B to this report. However, these scores must be viewed with the caveats previously mentioned.

This report includes the costs associated with the development, start-up, rollout, and operational adjustments associated with the both years. Typically, as programs mature, programs become more cost-effective as the start-up costs and operational inefficiencies are combined with the typically more effective efforts in the years following the start-up year. The benefit cost assessment presented in this report includes the costs of the TPA to implement the program, including their administrative, marketing and overhead costs. It does not include the administrative, monitoring and tracking costs of the utilities overseeing the TPA's efforts. As a result, the benefit cost assessment provided in this report provides a perspective on the cost-effectiveness of the performance of the TPA rather than the cost-effectiveness of the TPA's activities plus the cost of the utility's oversight or management functions.

The benefit cost analysis will be repeated each year of the three year program cycle to reflect the accumulated costs and benefits of the programs as they are implemented. That is, the analysis for year two includes the costs of year one plus year two, and the benefits from year one and year two. The analysis from the third year will include program costs for all cycles (3 years) and all benefits achieved over that three-year cycle. The benefit cost assessments are guided by the Indiana Evaluation Framework of September 2012 as up-dated February 2013Cost-effectiveness analysis is a form of economic analysis that compares the relative costs and benefits from an investment. In the Energy

Efficiency (EE) industry, it is an indicator of the energy supply relative performance or economic attractiveness of any energy efficiency investment or practice when compared to the costs of energy produced and delivered in the absence of such an investment, but without consideration of the value or costs of non-energy benefits or non-included externalities. The typical cost-effectiveness formula provides an economic comparison of costs and benefits.

The cost-effectiveness analysis of energy efficiency and demand-response programs are conducted by relying on the Indiana Evaluation Framework's benefit cost test results for each program as well as for the portfolio level for each utility and the State of Indiana. These tests are not necessarily used to recover costs but to provide information to improve decisions on which program(s) to adjust or continue to offer within the energy efficiency portfolio. The required inputs and assumptions are outlined below. The results of this analysis include the Indiana Framework's primary tests at the program and portfolio level. All of the tests are reported based upon the net-present value (NPV) of the benefits versus the costs. These tests employ the full effective useful life of the measures installed and the utility's cost of capital, as if program funds were acquired via a utility loan from capital supply markets at a rate similar to that which would be borrowed to construct a new generation plant.

8.1.1 COST-EFFECTIVENESS MODEL DESCRIPTION

EM&V and cost-effectiveness modeling are critical to the long-term success of energy efficiency programs. To understand cost-effectiveness, the utility/program administrator should have a model that can evaluate changes to both the individual programs and to the portfolio. This includes but is not limited to the ability to evaluate the impact on cost-effectiveness of changes in numerous factors such as: incentive levels, participant levels, measure savings, measure costs, avoided costs, end-use load shapes, coincident peak factors, net-to-gross factors, administrative costs, and the addition or deletion of measures or programs.

To provide the best and most accurate demand side management (DSM)/demand-response (DR)/energy efficiency portfolio cost-effectiveness modeling, the evaluation team used the DSMore model. DSMore is considered the leading DSM/energy efficiency benefit cost modeling tool in the country. The DSMore tool, developed by Integral Analytics (IA), is currently being used by utilities in approximately 35 states and by numerous state regulatory commissions. Some of the leading users of the tool in the country include Duke Energy, Xcel, and American Electric Power. DSMore is the only tool in the country that captures hourly price and load volatility across multiple years of weather which is needed to assess the true cost-effectiveness of the programs under expected supply and load conditions, even in extreme weather situations.

In its simplest form, energy efficiency cost-effectiveness is measured by comparing the benefits of an investment with the costs. There are five primary cost-effectiveness tests that may be employed in energy efficiency program evaluation. These five cost-effectiveness tests are the participant cost test (PCT), the utility cost test (UCT) sometimes called the program administrator cost test, the ratepayer impact measure test (RIM), the total resource cost test (TRC), and the societal cost test (SCT). However, for purposes of this EM&V analysis, the societal cost test will not be conducted since estimates of environmental and other non-energy costs and benefits will not be available.

Each of the four remaining tests considers the impacts of energy efficiency programs from different points of view in the energy system. Each test provides a single stakeholder perspective; however, taken together the tests can provide a comprehensive view of the program. The tests are also used to help program planners improve the program design by answering questions such as: Is the program cost-

effective overall? Are some costs or incentives too high or too low? What will be the impact on customer rates?

Each cost-effectiveness test shares a common structure. Each test compares the total benefits and the total costs in dollars from a certain point of view to determine whether or not the overall benefits exceed the costs. A test passes cost-effectiveness if the benefit-to-cost ratio is greater than one, and fails if it is less than one.

$$Benefit/Cost\ Ratio = \frac{Benefits}{Costs} = \frac{NPV\ \sum benefits\ (\$)}{NPV\ \sum costs\ (\$)}$$

Table 175 and Table 176 below provide overview information on the four tests utilized in this report.

Table 166: Cost-effectiveness Test Overview

Cost-effectiveness Test	Objective	Comparison
Participant Cost Test (PCT)	Are there positive benefits to the customer?	Costs and Benefits of customer installing measure
Utility/Program Administrator Cost Test (UCT)	Will utility revenues increase?	Program administration cost to achieve supply-side resource cost savings
Ratepayer Impact Measure Test (RIM)	Will utility rates increase?	Program administration cost and utility bill reductions to achieve supply-side resource cost savings
Total Resource Cost Test (TRC)	Will the total cost of energy in the utility service territory decrease?	Program administrator and customer costs to achieve utility resource savings

Table 166: Cost-effectiveness Test Overview

Costs and Benefits	PCT	UCT	RIM	TRC
Avoided energy costs (fuel, O&M of power plants and T&D lines)	-	Benefit	Benefit	Benefit
Avoided capacity costs (constructing power plants, T&D lines, pipelines)	-	Benefit	Benefit	Benefit
Other benefits (fossil fuel savings, water savings, equipment O&M, etc.)	-	-	-	Benefit
Externalities (environmental benefits like emissions reductions)	-	-	-	-
Participants' incremental cost (above baseline) of efficient equipment	Cost	-	-	Cost
Program administration costs (staff, marketing, etc.)	-	Cost	Cost	Cost
Incentives (rebates)	Benefit	Cost	Cost	-
Lost utility revenue / lower energy bills (due to lower sales)	Benefit	-	Cost	-

The cost-effectiveness tests examine the measure from different perspectives. The following formulas describe the tests again using the terminology from DSMore.

$$Utility\ \text{Cost}\ Test = \frac{Avoided\ Costs}{Utility\ Costs}$$

$$TRC\ Test = \frac{Avoided\ Costs + Tax\ Saved}{Utility\ Costs + Participant\ Costs\ Net\ of\ Incentives}$$

$$RIM\ Test = \frac{Avoided\ Costs}{Utility\ Costs + Lost\ Revenue}$$

$$RIM\ (Net\ Fuel)\ Test = \frac{Avoided\ Costs}{Utility\ Costs + Lost\ Revenue\ Net\ of\ Fuel}$$

$$Participant\ Test = \frac{Lost\ Revenue + Incentives + Tax\ Savings}{Participant\ Costs}$$

8.2 OVERVIEW OF DSMORE

DSMore is a financial analysis tool designed to evaluate the costs, benefits, and risks of energy efficiency programs and measures. DSMore estimates the value of an energy efficiency measure at an hourly level across distributions of weather and/or energy costs or prices. By examining energy efficiency

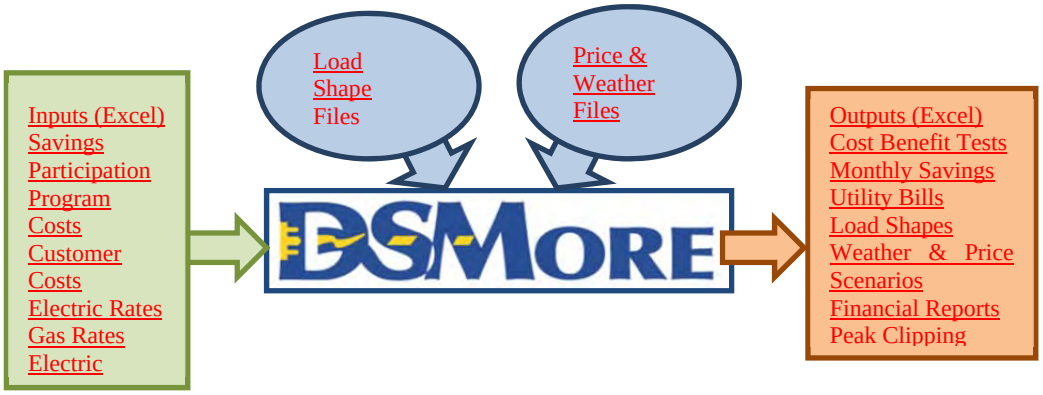
performance and cost-effectiveness over a wide variety of weather and cost conditions, the evaluator is in a better position to measure the risks and benefits of the energy efficiency measures.

The test results are provided for a range of weather conditions, including normal weather, and under various cost and market price conditions. Since DSMore is designed to be able to analyze extreme conditions, one can obtain a distribution of cost-effectiveness outcomes or expectations. Avoided costs for energy efficiency tend to increase with increasing market prices and/or more extreme weather conditions due to the covariance between load and costs/prices. Understanding the manner in which energy efficiency cost-effectiveness varies under these conditions allows a more precise valuation of energy efficiency programs and demand-response programs. Using valuation or modeling methods which use averages (e.g., annual use, monthly use, weather normal load profiles) instead of actual and forecasted hourly usage and avoided costs, by definition, will under-value energy efficiency and DSM programs which tend to exhibit higher savings during times of higher avoided costs (e.g., heating, ventilation, and air conditioning, typically referred to as HVAC, weatherization, demand-response). For programs which exhibit energy savings around-the-clock, averaging type methods yield valuation results that are equivalent to DSMore results; however, that type of program is not prevalent (exceptions include lighting that is on all hours, refrigeration, etc.). In all other cases, averaging based methods will yield cost-effectiveness test results that are lower than their actual value. DSMore methods and algorithms avoid this potential error through its very granular use of hourly energy savings and hourly avoided costs, linked via the same set of actual, local hourly weather histories.

Generally, the DSMore model requires the user to input specific information regarding the energy efficiency measure or program to be analyzed as well as the cost and rate information of the utility. These inputs enable one to then analyze the cost-effectiveness of the measure or program.

DSMore uses a set of program inputs, entered through the first two tabs (worksheets) of an Excel interface, combined with preconfigured load-shape and price data to calculate the cost-effectiveness tests. IA creates a custom set of hourly loads and prices based upon an analysis of over a 30+ year period for each customer. The load files are specific to the customer class served by the energy efficiency program. The user enters the measure information data into Excel, selects the appropriate load file, selects the appropriate price file and executes DSMore. DSMore uses the measure information data, the load file, and the price file to calculate the cost-effectiveness tests, and then exports the results into the same Excel workbook (i.e., worksheet tabs 3 through 8), but within the same Excel file as the measure inputs. The figure below provides an overview of the DSMore application and how the key inputs are related to the application engine.

Figure 74: DSMore Overview



8.2.1 ANALYTICAL APPROACH

Consider two scenarios (See table below): one using the *average* load and average prices and another scenario using *hourly* loads and prices. In both scenarios the average load is the same (2 MW) and the average price is also the same ($50/MWh) over the time period. However, the total value of the hourly analysis is greater ($500 versus $620). The actual value of the program in this example is almost 25% higher when hourly costs are used to estimate benefits compared to the use of average pricing.

Table 16768: Average vs. Hourly Valuation

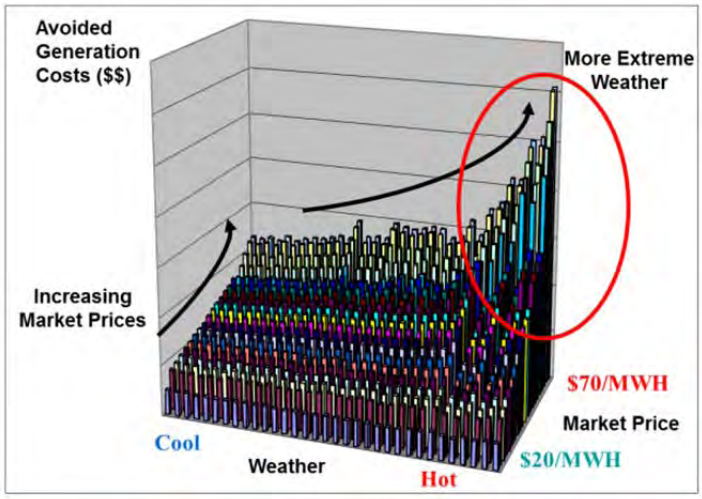
	Average				Hourly		
	Loads and Prices				Loads and Prices		
Hour	MW	$/MWH	Total $		MW	$/MWH	Total $
1	2	$50	$100		1	$20	$20
2	2	$50	$100		1	$20	$20
3	2	$50	$100		2	$50	$100
4	2	$50	$100		3	$80	$240
5	2	$50	$100		3	$80	$240
Average	2	$50			2	$50	
Total			$500				$620

To perform this hourly analysis, DSMore correlates historic loads and prices to actual historic weather. These relationships (along with the covariance) between loads, weather and price, and the probability distributions of these relationships, are used within DSMore to calculate approximately 700 different market/load/price scenarios, each with a unique test result. DSMore reports the endpoints or extremes of this distribution, for convenience, reducing the number of test results reported in the Excel output, to 5 to 9 test results, vs. 700. Of course, the user can simply adhere to one test result, which reflects their preferred set of avoided costs, across weather normal conditions, too.

One of the more versatile functions of DSMore is its ability to simultaneously assess multiple cost-effectiveness assessments over many different avoided cost scenarios. For each of the 30 years of weather scenarios, DSMore assesses 21 different electric market/cost/price scenarios. Typically, DSMore uses 33 years of weather as a default number of weather year scenarios, yielding 693 (33 weather scenarios x 21 market scenarios) cost-effectiveness test results to reflect a full spectrum of possible valuations of a particular program, or about 700 in total.

The figure below shows how the approximately 700 weather/price scenarios capture the extremes, which an averaging type of avoided cost method will ignore.

Figure 75: Weather & Market Scenarios



The average value of these approximately 700 tests represents an average, weather normal expectation across all possible market prices and forward cost scenarios. Selecting one market price scenario (today's value) provides test results for the current market, this year, but across 30+ weather scenarios. Using fewer than 30 years of weather jeopardizes accuracy of the estimation of weather normal and extreme weather effects. DSMore strives to reflect an appropriate range, or distribution of highs to lows, regarding weather. DSMore insures that the appropriately extreme hourly weather patterns are reflected, and valued, given historical observed extreme hourly weather.

With respect to forward market prices, DSMore uses 21 different forward curves. The model develops 21 such that the first set, or column, of avoided costs or prices, reflects traditional cost based avoided costs (i.e., system lambda, avoided production costs), leaving 20 columns for 20 different forward market price curves, ranging from low to high (e.g., $30/MWh to $70/MWh, on average over 8,760 hours). The use of 20 insures that approximately every 5th percentile of increase in the forward curves can be observed. We use 5th percentiles because it is generally safe to interpolate test results between, say, the 45th percentile and the 50th percentile, linearly. However, it is not appropriate to linearly interpolate test results between, for example, the 25th percentile and the 80th percentile. Energy prices are notoriously non-linear (i.e., peak prices are much more volatile than off-peak prices).

The key benefit to valuing energy efficiency across such a wide range of future cost and weather conditions lies in the ability of this approach to quantify not only short run cost-effectiveness, but long term predictions as well. The Option Test result reported by DSMore provides the long run cost-effectiveness perspective. Essentially, the Option Test result values the programs across 21 future possible sets of avoided costs, and across 30 to 40 years of actual hourly weather patterns. Traditionally, utilities only calculated one test result for the current year avoided costs. But, energy prices tend to "boom" and "bust" over time, reaching high price conditions during times of short supply (e.g., 1999, 2000) and low avoided cost conditions during times of excess supply (e.g., 2003, 2009). By valuing the energy efficiency programs across all possible future avoided cost possibilities, we are better able to determine if the programs will be cost-effective in the face of all these future possibilities, instead of just the current year. Both the short term test results and the long run test results are meaningful. But if a utility observes that the short run, current year test result is, say, .9, and the long run Option Test result is 1.3, then one might consider retaining this program for another couple years versus stopping the

program. The reason that the long term test result is called the Option Test is that the energy savings can be viewed as an option (albeit not executable, since, for example, the lighting equipment is already installed and cannot be removed) against having to pay for possible future higher avoided cost conditions.

8.2.2 INPUTS TO COST EFFECTIVENESS ANALYSIS

Best practice cost-effectiveness modeling starts with hourly prices and hourly energy savings from the specific measures/technologies being considered, and then correlates both to weather. In turn, this allows the model to capture the low probability, but high consequence weather events and apply appropriate values to them. Thus, a more accurate view of the value of the efficiency measure can be captured in comparison to other alternative supply options. Additionally, in order to complete the analysis, several inputs are required. These are summarized in the section below.

The foundation of the hourly price analysis used for the study is two years of historic hourly price data, matched with hourly weather to measure the price to weather covariance. The analysis is able to measure the overall variation and that portion attributable to weather, arriving at a weather normal price distribution. Price variation is a result of several uncertain variables, including weather. Using over 30 years of weather data regressed from two years of actual price data allows the analysis to measure the full range of possible outcomes, reflected in the DSMore results as Minimum, Todays (expected) and Maximum test ratios.

8.2.3 PROGRAM RELATED INPUTS

Program inputs into the model include participation rates, incentives paid, load savings of the measure, life of the measure, implementation costs, administrative costs and incremental costs to the participant of the high efficiency measure. These inputs were derived from the EM&V activities and supplied by the EM&V project team to IA for the cost-effectiveness analysis. The measured kWh savings are applied to the appropriate hours for that customer, based on the load curves of that customer group most likely to install the measure. For example, the commercial load curve is used for commercial measures and various commercial load curves may be used depending upon the type of measure installed and its size.

Values of these savings by hour are calculated based on that hour's market value for the life of the measure given the escalation rates assumed. This avoided cost is then present valued to understand the dollar value in today's dollars for those savings. These present values are then used by the model to determine the cost-effectiveness test results.

The EM&V project team also provided the program costs incurred by the third party administrator for each utility by program. The program costs included in the cost-effectiveness analysis presented in this report represents only the costs incurred by the third party administrator.[50] However, cost effectiveness

[50] The cost information employed for each program by utility may be found in the "2012 Energizing Indiana Programs EM&V Report May 3, 2012 Final Report" and the "2013 Energizing Indiana Draft Evaluation Report April 1, 2013." See the specific tables for the Home Energy Audit program, the Low Income Weatherization program, the School Building Assessments and School Energy Efficiency Kit programs, the Residential Lighting program, and for the Commercial & Industrial Incentives program.

assessments, including additional costs incurred by utilities, was provided separately for those utilities requesting that analysis.

8.3 EFFECTIVE USEFUL LIFE

Measures installed via energy efficiency programs shall have the energy savings counted and valued over the full effective useful life (EUL) of the installed measures. In addition, the energy savings will be incorporated into the cost-effectiveness analysis for those technologies with a remaining useful life (RUL). In such situations, the energy savings will reflect a higher impact for the RUL and then step down to a level consistent with that associated with the current baseline for the rest of the EUL.

8.4 SPILLOVER AND FREERIDERS

"Spillover" is the term used in this report to describe the short term energy savings of participants that are caused by the program's activities, but are not captured in the tracking of the program's direct energy savings. An example might be a customer who is influenced by a program and who then buys two units of a qualifying piece of efficient equipment, but obtains a rebate for only one of those units. Another example is a participant who does participate in a program, and obtains a rebate in one location, but then replicates the program induced purchase decision in their building next door, but does not apply for a rebate for that purchase that was caused by the program. In these cases the customer is influenced by the programs to the extent that their short term actions induced by a program can "spillover" into other purchases or behaviors that are not rebated or tracked by a program yet were caused by the program and result in improved efficiency (energy savings). The spillover savings identified in this evaluation effort and included in the benefit cost assessment are those short term actions that were taken between the participation period and the time of the evaluation effort that were documented in the evaluation. As a result, the spillover included in this analysis is only a fraction of the total spillover that may be achieved. The longer term spillover that results from actions taken as a result of the program over many years, and the spillover that is associated with how programs change the way markets operate are not included in this assessment. The longer term market effects will be assessed in 2015 and these savings will be added to the assessment at the end of the 3 year program cycle.

"Freeriders" are people who participate in the program but would have installed the energy efficient piece of equipment without the program. All programs have freeriders as these are often the "early adopters" of a technology and have many different motivations beyond the program. However, program designs strive to increase the number of non-freeriders through several methods. First, incentives may be set at levels high enough to entice those who would not have participated due to financial concerns. And second, some measures are often eliminated that are known to have high freeridership. For example residential ENERGY STAR refrigerators are often eliminated even though they pass the cost benefit analysis because there already is a high adoption rate of these units in the market and other studies have shown high freerider rates. For this report, on the cost-effectiveness ratios, we net the impacts of freedrivers and freeriders.

8.5 UTILITY INPUTS

For utility information, DSMore needs utility rates, escalation rates, discount rates for the utility, society and the participant, and avoided costs. For this report, utilities in the DSMCC supplied the values used

for avoided costs, escalation rates, discount rates, loss ratios, and electric rates. The projection of these values is being kept the same for the three-year cycle of programs.

8.5.1 AVOIDED COSTS

The recommended avoided cost framework develops each hour's electricity valuation using a bottom-up approach to quantify an hourly avoided cost as the sum of elements of forward-looking incremental costs for that hour. The resulting hourly electricity avoided costs are location-specific and vary by hour of day, day of week, and time of year. The results are weather dependent requiring a weather normal outcome and a distribution of outcomes corresponding to the weather related variation in outcomes. The location and time variations by cost component are as follows:

1. Generation Costs – variable by hour and location. The annual forecast of generation costs avoided is allocated according to an hourly price shape obtained from historic participant specific data that reflect a workably competitive market environment and expected weather variation. These hourly costs further vary by location, depending on locational capacity constraints and fuel costs. The average annual prices are provided by each utility with Core programs.

2. Capacity Costs – associated with generation or capacity markets reflect the cost of acquiring that additional capacity. These cost estimates are provided by each utility.

3. Transmission and Distribution (T&D) Costs – variable by hour and location. Non-peak hours have zero avoided T&D capacity costs, reflecting that T&D capacity investments are made to serve peak hours. These cost estimates are also provided by each utility.

8.5.2 NET PRESENT VALUE

Cost-effectiveness of an energy efficiency measure will be calculated based on the net present value of the costs and benefits valued in each test discounted over the effective useful life of the measures installed.

8.5.3 PROGRAMS

Each of the Core programs are evaluated for cost-effectiveness as implemented within each utility service area. The following programs are evaluated for cost-effectiveness:

Residential Programs

- Residential Lighting
- Low Income Weatherization
- Home Energy Audit
- School Energy Efficiency Kit

Non-Residential Program

- School Building Assessments
- Commercial & Industrial Incentives

Information was collected through the EM&V process by utility on the costs and impacts associated with each of the programs.

8.6 RESULTS

As part of the EM&V process, the use of DSMore provides energy efficiency planners with insights on the actual cost-effectiveness of the energy efficiency programs. The following tables provide the results of the cost-effectiveness analyses for each program for the PCT, UCT, RIM, and TRC tests. Results are reported by utility at the program level as well as for the utility portfolio level and an aggregation of all the programs for the State of Indiana. The tables include the results reported for program year one (2012) for comparison to results for the combination of program years one and two (2012 + 2013). In general, the portfolios of programs for the individual utilities and the state are cost-effective. The cost-effectiveness for most programs for the two year period increased, while the cost-effectiveness for others decreased. However, in general, the overall cost-effectiveness of the portfolios increased.

8.6.1 DUKE ENERGY INDIANA

For Duke Energy Indiana, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective except for Low Income Weatherization. The Home Energy Audit program is now cost effective for the two-year cycle. Most of the programs continue to fail the RIM test and the portfolio as a whole fails the RIM test. The Residential Lighting and Commercial and Industrial Incentives programs are narrowly cost-effective under the RIM test.

Note that PCT test results are not available (NA) for the Low Income Weatherization, Home Energy Audit, School Energy Efficiency Kit, and School Building Assessments programs since there are no participant costs involved. This occurs for the results for each utility below as well.

Table 168: Results for Duke Energy Indiana

Cost Effectiveness for Duke Energy Indiana Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	4.10	3.53	0.94	2.94		4.31	3.57	1.03	3.41
Low Income Weatherization	NA	0.64	0.44	0.64		NA	0.81	0.53	0.81
Home Energy Audit	NA	0.55	0.39	0.55		NA	1.26	0.70	1.26
School Energy Efficiency Kit	NA	2.43	0.86	2.43		NA	2.65	0.92	2.65
Non-Residential Programs									
School Building Assessments	NA	1.51	0.63	1.51		NA	1.36	0.59	1.36
Commercial & Industrial Incentives	3.28	2.98	0.99	2.09		7.34	6.21	1.09	5.39
Total Portfolio	5.05	2.20	0.84	1.89		7.68	3.34	0.97	3.17

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.6.2 INDIANA & MICHIGAN POWER

For Indiana & Michigan, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. With regard to the individual programs, the Low Income Weatherization and Home Energy Audit are not cost-effective, though the cost-effectiveness results have improved. All of the other individual programs are cost-effective. However, none of the programs pass the RIM test.

Table 169: Results for Indiana & Michigan

Cost Effectiveness for Indiana & Michigan Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	5.87	3.09	0.58	2.56		6.03	3.10	0.62	2.84
Low Income Weatherization	NA	0.58	0.32	0.58		NA	0.68	0.35	0.68
Home Energy Audit	NA	0.48	0.29	0.48		NA	0.93	0.42	0.93
School Energy Efficiency Kit	NA	1.81	0.54	1.81		NA	1.99	0.55	1.99
Non-Residential Programs									
School Building Assessments	NA	1.20	0.51	1.20		NA	1.03	0.47	1.03
Commercial & Industrial Incentives	3.09	2.49	0.70	1.66		12.89	3.99	0.85	7.59
Total Portfolio	4.89	1.77	0.57	1.45		11.88	3.16	0.77	4.58

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.6.3 INDIANA MUNICIPAL POWER AUTHORITY

For IMPA, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective except for Low Income Weatherization. The Home Energy Audit program is now cost effective for the two-year cycle. The Commercial & Industrial Incentives program is the only one that passes the RIM test.

Table 170: Results for IMPA

Cost Effectiveness for IMPA Programs									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	5.99	2.99	0.57	2.53		6.32	2.54	0.56	2.36
Low Income Weatherization	NA	0.81	0.44	0.81		NA	0.95	0.48	0.95
Home Energy Audit	NA	0.61	0.37	0.61		NA	1.20	0.54	1.20
School Energy Efficiency Kit	NA	2.53	0.70	2.53		NA	2.81	0.73	2.81
Non-Residential Programs									
School Building Assessments	NA	1.55	0.69	1.55		NA	1.40	0.63	1.40
Commercial & Industrial Incentives	3.75	3.65	1.02	2.54		7.12	7.01	1.19	6.28

Total Portfolio	5.42	2.43	0.78	2.00	-	8.37	4.03	0.97	3.80

In general, the cost-effectiveness of the portfolio of programs for the two-year cycle increased somewhat from the first year results, but half of the individual programs declined in cost-effectiveness.

8.6.4 INDIANAPOLIS POWER & LIGHT

For Indianapolis Power & Light, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. Three of the individual programs are cost-effective. The Low Income Weatherization, Home Energy Audit, School Building Assessments programs were not found to be cost-effective. The Residential Lighting and Commercial & Industrial Incentives programs are the only ones that pass the RIM test.

Table 171: Results for IP&L

Cost Effectiveness for Indianapolis Power & Light Programs									
-	2012				-	2012 + 2013			
-	PCT	UCT	RIM	TRC	-	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-	-	-	-	-	-
Residential Lighting	2.38	3.09	1.23	2.56	-	2.56	2.62	1.15	2.44
Low Income Weatherization	NA	0.53	0.40	0.53	-	NA	0.79	0.56	0.79
Home Energy Audit	NA	0.38	0.31	0.38	-	NA	0.84	0.58	0.84
School Energy Efficiency Kit	NA	1.68	0.86	1.68	-	NA	1.81	0.90	1.81
Non-Residential Programs	-	-	-	-	-	-	-	-	-
School Building Assessments	NA	1.22	0.76	1.22	-	NA	0.96	0.62	0.96
Commercial & Industrial Incentives	1.84	2.65	1.15	1.76	-	3.13	3.72	1.39	3.38
Total Portfolio	2.71	1.41	0.82	1.23	-	3.89	1.94	1.00	1.87

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the Residential Lighting and School Building Assessments programs.

8.6.5 NIPSCO

For NIPSCO, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective. None of the programs pass the RIM test.

Table 172: Results for NIPSCO

Cost Effectiveness for NIPSCO Programs									
-	2012				-	2012 + 2013			
-	PCT	UCT	RIM	TRC	-	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-	-	-	-	-	-
Residential Lighting	6.13	4.57	0.78	3.70	-	6.31	4.02	0.79	3.72
Low Income Weatherization	NA	0.68	0.41	0.68	-	NA	1.01	0.54	1.01
Home Energy Audit	NA	0.63	0.38	0.63	-	NA	1.50	0.64	1.50
School Energy Efficiency Kit	NA	2.24	0.70	2.24	-	NA	2.37	0.74	2.37
Non-Residential Programs	-	-	-	-	-	-	-	-	-
School Building Assessments	NA	2.20	0.67	2.20	-	NA	1.76	0.57	1.76

Commercial & Industrial Incentives	4.37	3.77	0.69	2.68	-	7.13	5.93	0.76	5.24
Total Portfolio	6.40	2.27	0.65	1.98	-	8.75	3.09	0.72	2.95

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.6.6 VECTREN

For Vectren, the portfolio of programs for the two-year cycle continues to be cost-effective based upon the TRC and UCT tests. In addition, all of the individual programs are cost-effective except for Home Energy Audit and School Building Assessments. The School Buildings Assessments program is the only program that declined in cost-effectiveness. The extent of the decline has now made the two-year cycle not cost-effective for this program. None of the programs pass the RIM test.

Table 173: Results for Vectren

Cost Effectiveness for Vectren Programs									
-	2012				-	2012 + 2013			
-	PCT	UCT	RIM	TRC	-	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-	-	-	-	-	-
Residential Lighting	8.04	2.49	0.36	1.78	-	8.65	2.52	0.41	2.33
Low Income Weatherization	NA	0.66	0.33	0.66	-	NA	1.14	0.48	1.14
Home Energy Audit	NA	0.54	0.28	0.54	-	NA	0.96	0.37	0.96
School Energy Efficiency Kit	NA	2.08	0.47	2.08	-	NA	2.10	0.47	2.10
Non-Residential Programs	-	-	-	-	-	-	-	-	-
School Building Assessments	NA	1.47	0.61	1.47	-	NA	0.88	0.44	0.88
Commercial & Industrial Incentives	7.56	5.50	0.78	3.63	-	7.57	5.91	0.87	4.77
Total Portfolio	10.28	2.05	0.53	1.77	-	11.43	2.34	0.59	2.20

8.6.7 RESULTS FOR THE STATE OF INDIANA

Looking at the Energizing Indiana programs, the aggregation of the individual utility portfolios of programs for the two-year cycle continues to be cost-effective under the PCT, UCT, and TRC Tests. In addition, all of the individual programs are cost-effective except for Low Income Weatherization. The Home Energy Audit program improved to become cost-effective at the state level.

The benefit cost analysis performed for the six utilities and aggregated for the State of Indiana, indicates that the levelized cost of conserved energy achieved by the portfolio over the two year period (the cost at which the portfolio is acquiring energy resources as additional supply) is 3.0 cents per annual kWh saved.

Table 174: Results for the State of Indiana

State of Indiana Program Cost Effectiveness									
	2012					2012 + 2013			
	PCT	UCT	RIM	TRC		PCT	UCT	RIM	TRC
Residential Programs									
Residential Lighting	4.81	3.42	0.77	2.80		5.02	3.24	0.81	3.03
Low Income Weatherization	NA	0.64	0.39	0.64		NA	0.88	0.49	0.88
Home Energy Audit	NA	0.50	0.33	0.50		NA	1.10	0.57	1.10
School Energy Efficiency Kit	NA	2.24	0.77	2.24		NA	2.42	0.81	2.42
Non-Residential Programs									
School Building Assessments	NA	1.48	0.64	1.48		NA	1.21	0.56	1.21
Commercial & Industrial Incentives	3.51	3.19	0.86	2.19		7.67	5.00	0.97	5.49
Total Portfolio	5.23	2.00	0.71	1.71		8.24	2.94	0.84	3.02

In general, the cost-effectiveness of the programs for the two-year cycle increased somewhat from the first year results, except for the School Building Assessments program.

8.7 CONCLUSIONS

In general, the energy efficiency program portfolios for each of the individual utilities as well as the aggregation to the State of Indiana continue to be cost-effective for the combined 2012 and 2013 program years under the PCT, UCT, and TRC tests. Most of the programs were also found to be cost-effective; however, the Low Income Weatherization did not pass cost-effectiveness for most of the program portfolios. Also, there has been a decline in the level of cost-effectiveness for the School Building Assessments program for all the utilities that deserves further investigation.

The cost-effectiveness analysis of the portfolio, providing new energy resources to the State of Indiana, indicates that the levelized cost for new energy efficiency supplied electric resources acquired via the Statewide Core programs was $0.03 dollars per kWh for the two-year period of program implementation.

A. APPENDIX: OTHER SECTIONS

COMMERCIAL & INDUSTRIAL NTG CALCULATIONS

SURVEY DESIGN

Direct questions (such as "Would you have installed measure X without the program incentive?") tend to result in exaggerated "yes" responses. Participants often provide answers they believe surveyors seek; so a question becomes the equivalent of asking: "Would you have done the right thing on your own?" Effectively avoiding such bias involves asking a question in several different ways, then checking for consistent responses.

The Evaluation Team designed the survey questions to determine why customers installed a given measure, and what influence the program had on their decisions. The survey sought to establish what decision makers might have done in the program's absence, using six freeridership questions to address that issue:

1. Would participants have installed measures without the program?
2. Were participants planning on ordering or installing the measures before learning about the program?
3. Would participants have installed the measures at the same efficiency levels without the program incentive?
4. Would participants have installed the same quantity of measures without the program?
5. In the program's absence, when would respondents have installed the measures?
6. Was the purchase of the measures in the organization's most recent capital budget?

The spillover survey sought to answer three primary questions:

1. Since participating in the evaluated program, did participants install additional energy-efficient equipment or services?
2. How influential was the evaluated program on the participants' decisions to install additional energy-efficient equipment in their facilities?
3. Did customers receive incentives for additional measures installed?

FREERIDERSHIP SURVEY QUESTIONS

The participant survey's freeridership portion included 10 questions, addressing the six freeridership questions. The survey's design included several skip patterns, allowing interviewers to confirm answers previously provided by respondents by asking the same question in a different format. Freeridership questions (as asked in the survey format) included:

1. Without the rebate from Energizing Indiana would you have still purchased [MEASURE]?
2. [Ask if question 1 is Yes] Did your organization have specific plans to install the [MEASURE 1] BEFORE learning about the Energizing Indiana program rebate?
3. [Ask if question 1 is Yes and if question 2 is Yes] Prior to hearing about the rebate program, was the equipment included in the organization's capital budget?
4. [Ask if question 1 is Yes and if measure quantity > 1] And would you have installed the same quantity of high-efficiency equipment without the rebate?
5. [Ask if question 1 is Yes] Without the rebate from Energizing Indiana would you have still purchased [MEASURE1] that was just as efficient, more efficient, or less efficient than the one you purchased?
6. [Ask if question 1 is Yes] When would you have installed this equipment without the program? Would you have installed it … [READ LIST]
7. [Ask if question 1 is No] So, you would not have installed [MEASURE1] at all. Is that correct?
8. [Ask if question 7 is No and if measure quantity > 1] Again, help me understand. Would you have implemented similar but less energy-efficient measures?
9. [Ask if question 7 is No] Would you have installed less equipment without the rebate?
10. [Ask if question 7 is No] In terms of project timing, when would you have completed [MEASURE]?

SPILLOVER SURVEY QUESTIONS

As discussed, spillover questions sought to determine whether program participants installed other energy-saving measures since participating in the program. Savings participants received from additional measures would be considered spillover savings if: (1) the program significantly influenced their decisions to purchase additional measures; and (2) they did not receive additional incentives for those measures.

If the participant installed one or more measures, additional questions addressed the quantity they installed, and how influential (highly influential, somewhat influential, not at all influential) the program was on their purchasing decisions.

The Evaluation Team combined freeridership and spillover questions into the same survey, simultaneously asking the questions via telephone interviews with randomly selected program participants. Before beginning the live participant phone calls, the team worked with the survey company to pretest the survey, ensuring all appropriate prompts and skip patterns would be followed. The team also monitored initial phone calls to verify:

- Survey respondents understood the questions; and
- Adjustments were not required.

FREERIDERSHIP METHODOLOGY

The Evaluation Team developed a transparent, straightforward matrix for assigning scores to participants, based on their objective responses to targeted survey questions. Question response patterns received freeridership scores, with confidence and precision estimates calculated through the distribution of these scores (a specific approach for this technique can be found in the *NAPEE Handbook on DSM Evaluation*, 2007 edition, page 5-1).

Response patterns and scoring weights remained explicit; they could be discussed and changed, with results shown in real time. The approach provided the following important features:

- Derivation of a partial freeridership score, based on the likelihood of a respondent taking similar actions in the incentive's absence.
- Use of a rules-based approach for consistency among multiple respondents.
- Use of open-ended questions to ensure quantitative scores matched respondents' more detailed explanations regarding program attribution.
- The ability to change weightings in a "what if" exercise, thus testing the response set's stability.

The Evaluation Team's method offered a key advantage in introducing the concept of partial freeridership. Experience has shown program participants do not fall neatly into freerider and non-freerider categories. For example, the Evaluation Team assigned partial freeridership scores to participants that planned to install a measure; though the program exerted some influence over their decisions, other market characteristics outside the program also proved influential. Further, the Evaluation Team could assign partial credit to "don't know" and "refused" responses, rather than removing respondents entirely from the analysis.

The study assessed freeridership at three levels:

1. It converted each participant survey response into a freeridership matrix terminology.
2. Each participant's combination of responses received a score from the matrix.
3. All participants were aggregated into an average freeridership score for the entire program category.

CONVERT RESPONSES TO MATRIX TERMINOLOGY

The study independently evaluated each survey question's response, assessing participants' freeridership levels for each question, with each survey response option converted into the following values:

- "Yes" (Indicative of freeridership)
- "No" (Indicative of non-freeridership)
- "Partial" (Partially indicative of freeridership)

PARTICIPANT FREERIDERSHIP SCORING

Following conversion of survey responses into matrix terminology, a freeridership matrix could be created, allowing each participant's combined responses to be assigned a freeridership score. All combinations of survey question responses were considered in creating the matrix, with each combination receiving a freeridership score of 0% to 100%. Using this matrix, every participant's combination of responses could be assigned a score of 0% to 100%.

PROGRAM CATEGORY FREERIDERSHIP SCORING

After assigning a freeridership score to every survey respondent, the Evaluation Team calculated a savings-weighted average freerider score for the program category. Respondents' freerider scores were individually weighted by estimated savings of equipment installed, using the following calculation:

$$\text{SavingsWeightedFreeridership} = \frac{\sum[\text{Respondent Score}] * [\text{Measure kWh Savings}]}{\sum[\text{All Respondents Measure kWh Savings}]}$$

THE FREERIDERSHIP SCORING MODEL

The Evaluation Team developed an Excel-based model to assist with freeridership calculations and to improve the consistency and the quality of results. The model translated raw survey responses into matrix terminology, and then assigned each participant's response pattern a score drawn from the matrix. Program participants in the sample then could be aggregated to calculate average freerider scores.

The model incorporated the following inputs:

- Raw survey responses for each participant, along with their incented measures and energy savings from those measures, if applicable.
- Figures converting raw survey responses into matrix terminologies for each program category.
- Custom freeridership scoring matrices for each unique survey type.

The model used a simple interface, allowing users to quickly reproduce a scoring analysis for any program category. It displayed each participant's combination of responses and corresponding freeridership score, and produced a summary table that provided the average score and precision estimates for the program category. The model used the sample size and a two-tailed test target at the 90% confidence interval to determine the average score's precision. A finite population correction was applied to the precision estimates because the population fell below 300.

Table 175 summarizes the prescriptive program's results, with the final weighted mean freeridership score appearing in the lower right corner. The program example averaged 16% freeridership, meaning 16% of energy savings derived from freeriders and should be removed from gross program savings. Based on a 233-response sample size, the program had an adjusted absolute precision of ±3.0%.

Table 175: Freerider Scoring Model Output

Variable	Value	Variable	Value
Population (P)	5,591	Adjusted Standard Error	0.02
Responses (n)	233	Adjusted Relative Precision	17.49%
Variance Of Mean	0.077	Adjusted Absolute Precision	0.030
Standard Deviation	0.277	Coefficient of Variation	1.623
Standard Error of Mean	0.018	Upper Bound Score	0.20
Relative Precision	17.49%	Weighted Mean Score	0.17
Finite Population Correction	1.000	Lower Bound Score	0.14

SPILLOVER METHODOLOGY

Spillover refers to additional savings program participants generate through their participation, but not captured by program records. Spillover occurs when participants choose to purchase energy-efficient measures or adopt energy-efficient practices due a program's influence, but do not participate (or otherwise cannot participate) in the program. As these customers do not participate, they typically do not appear in program records of savings generated by spillover impacts.

Spillover examples include:

- Program participants adopting additional measures without an incentive.
- Consumers acting on the programs' influence, resulting from changes in available energy-using equipment in the marketplace.
- Changes brought about by more efficient practices employed by architects and engineers, ultimately forcing consumer behaviors into desired patterns.
- Changes in nonparticipants' behaviors, resulting from direct marketing or changes in stocking practices.

The energy-efficiency programs' spillover effect serves as an additional impact, which can be added to the program's direct results.

The Evaluation Team measured spillover by asking a sample of participants purchasing and receiving an incentive for a particular measure if, due to the program, they installed another efficient measure or undertook another energy-efficiency activity. Respondents were asked to rate the program's (and the incentive's) relative influence (either highly, somewhat, or not at all influential) on their decisions to pursue additional savings.

PARTICIPANT SPILLOVER ANALYSIS

Calculating spillover savings used a top-down approach. Analysis began with a subset containing only survey respondents, indicating they installed additional energy-savings measures after participating in the program. From this subset, participants were removed if they indicated the program had little influence on their decisions to purchase additional measures, thus only retaining participants rating the incentive as highly influential.

For remaining participants with spillover savings, energy savings were estimated for additional measures installed. The Evaluation Team's engineers calculated savings values based on average savings per

measure installed in the program, which were matched to additional measures installed by survey participants.

The spillover percentage per program category was calculated by dividing the sum of additional spillover savings reported by respondents for a given program category by total incentivized gross savings achieved by all respondents in the program category:

$$\text{Spillover \%} = \frac{\sum[\text{Spillover Measure kWh Savings for All Suvery Respondents}]}{\sum[\text{Program Measure kWh Savings for All Survey Respondents}]}$$

Net savings reflect the application of the program NTG ratio to the *ex-post* energy savings.

Table 176: Measure-Level NTG Ratios

Measure	NTG
Lighting	85%
Non-Lighting	51%

Applying the NTG ratios to the measures' installed resulted in the following net savings.

Table 177: Net Energy (kWh) Savings by Utility and Statewide

	Ex-Post kWh	NTG	Net kWh Savings
Duke	62,058,310	80%	49,646,648
I&M	89,320,058	80%	71,456,046
IPL	37,763,093	80%	30,210,475
IMPA	17,509,148	80%	14,007,319
NIPSCO	22,499,352	80%	17,999,481
Vectren	10,429,990	80%	8,343,992
Statewide	**239,579,951**	**80%**	**191,663,961**

Table 178: Net Demand (kW) Savings by Utility and Statewide

	Ex-Post kW	NTG	Net kW Savings
Duke	14,438.33	80%	11,550.66
I&M	22,721.32	80%	18,177.06
IPL	8,221.98	80%	6,577.58
IMPA	3,829.73	80%	3,063.78
NIPSCO	6,171.88	80%	4,937.51
Vectren	1,913.25	80%	1,530.60
Statewide	**57,296.50**	**80%**	**45,837.20**

Residential Lighting Program Data Collection Activities

In-Store Intercept Survey

The Evaluation Team conducted interviews with 393 customers purchasing lighting at 11 participating retail locations in Indiana during 2013 and 2014. Interviews took place in two waves. The first wave included six stores and took place in October and November 2013; the second wave included five stores and took place in January and February 2014. The survey used a convenience sample of stores for

budgetary reasons and because not all retailers allowed in-store customer research. Despite these constraints, the selected sample of stores represented a large percentage of program sales across Indiana. The stores visited represented 13% of program bulbs sold and invoiced in 2013.

The Evaluation Team conducted interviews at DIY, big box, and club retailers, prioritizing retail locations that sold the most bulbs through the program and allowed the interviews to be conducted.

To gain entry to the stores, an Evaluation Team member first accompanied a program field representative conducting a lighting event. The program representative helped the interviewer receive permission to return and conduct additional interviews during the following two days. Facilities granted permission in all cases.

The Evaluation Team conducted interviews during various days of the week (Fridays, Saturdays, Sundays, and Mondays) and during different times of the day, seeking to capture a variety of customer types. Interview participants included customers purchasing: CFLs discounted through the program; CFLs not discounted through the program; and incandescent, halogen, and LED light bulbs.

Table 179 shows the number of locations visited for this research, the total number of days spent in-stores, and the total number of interviews completed by retailer type.

Table 179: In-Store Interview Retailer Categories

Store Type	Stores	Days	Interviews
DIY	6	18	224
Big Box	3	8	105
Club	2	6	64
Total	**11**	**32**	**393**

Figure 74 shows intercept store locations, marked by the interview wave.

Figure 74: Map of the Intercept Store Locations

To eliminate measurement and data entry errors, highly trained interviewers administered the surveys, using tablet computers to capture the data. Use of tablet computers allowed streamlining of the data collection process, asking questions only if relevant for each individual respondent. Interviewers positioned themselves in a store's lighting aisle and approached customers after they made their purchase decisions and prepared to leave the aisle. Interviewers asked customers to complete a short survey in exchange for a $5 gift card to that particular retail store (and which they could use that day).

The survey included questions designed to determine customer lighting preferences and purchase behaviors and to estimate program freeridership.

MANUFACTURER INTERVIEWS

Evaluation Team staff interviewed lighting manufacturers participating in Energizing Indiana's Residential Lighting program, conducting 11 telephone interviews with staff from eight lighting manufacturers. Interviews occurred between December 2 and December 10, 2013, and typically lasted 15 to 30 minutes, covering multiple topics (including program interactions, product pricing, and promotion timing).

The interviews also explored manufacturers' satisfaction with the program processes as well as program impacts on retailer revenues and energy-efficient lighting sales. Questions also explored EISA's role in

changing manufacturer product offerings and manufacturers' recommendations for future program improvements.

RESIDENTIAL LIGHTING PROGRAM FREERIDERSHIP ALGORITHM

To develop a freeridership estimate for the Residential Lighting program, Evaluation Team used two methods:

- Sales data modeling results from PY1; and
- In-store customer intercepts performed in PY2.

A discussion of the these approaches follows.

SALES DATA MODELING

As part of the PY2 evaluation, the Evaluation Team performed sales data modeling using the Revenue-Neutral Sales Model, a method of estimating lighting program freeridership based on a theory regarding retailer behavior and decision making. Using program pricing and sales data, the method provided an estimate of what product sales would have been at regular retail pricing, absent the program (in essence, what the pre-program baseline sales would have been). Using this estimate of pre-program sales, the Evaluation Team could back out the numbers of units sold above and beyond the pre-program baseline to estimate program freeridership.

The Revenue-Neutral Sales Model assumes that retailers only participate in a utility-sponsored lighting program if their gross revenues do not drop due to participation: revenues could drop if lighting products sell at a lower price, given the program discount. If retailers do not sell more of the discounted product than they sold prior to the program, their gross revenue falls. Thus, gross revenues depend on sales alone.

Because the program fully reimburses retailers for lighting discounts, retailer profits cannot decline because of program participation. In fact, retailers only need to sell one additional bulb under the program to see an increase in their profits. Program reimbursements for the discounted lighting products, however, cannot count toward retailer gross revenue. By discounting high efficiency lighting products, retailers effectively bring the product price down, thus reducing product gross margins that they are able to report. As a result, if the lighting sales do not increase enough to make up for the lost gross margins, retailers are at risk of having their gross revenues decline. Retailers care about gross revenue because it influences investors, and corporate bonuses are often tied to it.

To ensure their program participation remains, at a minimum, revenue-neutral, retailers avoid participating in utility lighting programs with incentive levels and sales goals that do not stimulate sufficient additional sales to recover lost gross sales revenue. For example, if a retailer seeks to ensure that its gross revenue does not drop from participating in a program that discounts the CFL prices by 50%, the retailer must, at a minimum, double its CFL sales. Retailers have enough information about

product pricing and sales to evaluate program contractual agreements; so they only agree to contracts that allow them to sell at least[51] enough products to prevent a negative impact on their gross revenues.

The Evaluation Team verified this model of retailer behavior through multiple corporate-level retailer interviews, including interviews with most key retailers participating in the Energizing Indiana program.

Using retailer behavior theory as a background, the Evaluation Team used the following program data to estimate what lighting sales would have been at regular retail pricing: the regular retail product price; the program discounted price; the number of units the retailer may sell at program pricing; and the number of units actually sold at program pricing.

In Table 180, the retailer establishes an agreement with the program to sell 100,000 bulbs at $2.00 per bulb (a $3.00 discount). Program revenue will equal the program price per unit multiplied by the number of units a retailer is allowed to sell.

Table 180: Revenue-Neutral Sales Model Example: Program Revenue

	Price	Sales	Revenue
Without Program	$5.00	Unknown	Unknown
With Program	$2.00	100,000	$200,000

To at least remain revenue-neutral, retailers only agree to a program contract if the allocated sales at program pricing can make up for the revenue lost to the discount. Knowing this, the Evaluation Team could set revenue without the program equal to revenue with the program (or units sold in the program's absence).

Table 181: Revenue-Neutral Sales Model Example: Revenue without Program

	Price	Sales	Revenue
Without Program	$5.00	Unknown	$200,000
With Program	$2.00	100,000	$200,000

The Evaluation Team estimated the number of products sold at a regular retail price by setting regular sales revenue equal to program sales revenue, then dividing the estimated sales revenue by the regular retail price. Table 182 illustrates how the estimate of pre-program sales and actual program sales can be used to establish a program's freeridership rate.

Table 182: Revenue-Neutral Sales Model Example: Sales without Program

	Price	Sales	Revenue
Without Program	$5.00	40,000	$200,000
With Program	$2.00	100,000	$200,000

Once the Evaluation Team established the number of products that would have been sold at regular retail pricing to equal the program sales revenue, program freeridership could be estimated as the ratio of estimated sales at the regular retail price to actual program sales:

[51] This model does not assume retailers only want to sell enough to be revenue neutral; retailers prefer growing revenues. But, when agreeing to participate in an upstream lighting program, retailers confirm they will negotiate a contract that will stimulate sufficient sales to prevent a drop in revenues (i.e., they will remain neutral), despite program discounts.

$$Freeridership = Sales\ without\ Program\ /\ Sales\ with\ Program$$
$$0.40 = 40{,}000\ /\ 100{,}000$$

In this example, program freeridership would have been 40%: or 40% of bulbs sold through the program would have sold in program's absence, providing this hypothetical program with an NTG of 0.60.

Analysis results for the Energizing Indiana Residential Lighting program, based on 74% of all units sold, show overall program freeridership of 0.43, meaning that 43% of discounted program bulbs would have been purchased at full price without the program discount.

IN-STORE CUSTOMER INTERCEPT SURVEY

The program encourages customers to purchase energy-efficient lighting by discounting purchase prices, making them closer to less-efficient alternatives. The program also educates consumers about the benefits of efficient lighting. The in-store intercept survey sought to measure the influence of both the discount and information program components.

Each respondent received a freeridership score ranging from 0 to 1, with a score of 0 meaning the participant would not have purchased CFLs without the program, and a score of 1 meaning the participant would have purchased all CFLs without help from the program. The questions and the algorithm allowed the determination of partial freeriders: customers who would have purchased some but not all of the bulbs or were partially influenced by program information. Discussions follow regarding development of these scores and of the methodology used to combine them into an overall freeridership estimate.

Program Discount Score

The study based the program discount score on questions measuring the program discount's impact on the quantity and efficiency of purchased lighting products. Part of the survey asked customers what they would have purchased had the CFLs been more expensive, and referenced the average per-bulb discount as an incremental cost that customers would have to pay in the program's absence.

Two scores made up the discount score: a quantity score and an efficiency score. To determine the effect that the discount had on the quantity of bulbs purchased, the Evaluation Team first asked customers if they would have purchased all, some, or none of the CFLs had they cost more. If customers stated they would have purchased some of the CFLs, the survey asked how many bulbs they would have purchased had they cost more. Using the responses from the two questions and the actual CFL quantity purchased by each customer, the Evaluation Team calculated a quantity score that represented the number of bulbs that the customer would have purchased at full price. Scores ranged from 0 to 1, with 0 representing not a freerider and 1 representing a full freerider. Table 183 further outlines this scoring method.

Table 183: Program Discount Freeridership Score—Quantity

Question	Response	Program Discount Freeridership Score
(QH24/29) I see you are buying X standard/specialty CFLs that are discounted by Energizing Indiana. If the discount had not been offered, and this/these standard/specialty CFLs had instead cost $1.50 more PER BULB, would you still have purchased all of these standard/specialty CFLs, some of them, or none of them?	All	1
	Some	Go onto QH25 (for standard CFLs) or QH30 (for specialty CFLs)
	None	0
(QH25/30) How many of the X standard/specialty CFLs would you have purchased if they had cost $1.50 more per bulb? *(Only for respondents who answered "some" to the question above)*	Record Number	Divide the proportion of bulbs that the customer would have purchased at full price by the total number of discounted bulbs that the customer actually purchased

The efficiency score gave the program additional credit if it prevented the sale of incandescent or halogen bulbs, causing the customer to purchase CFLs instead. Customers who said they would have purchased fewer CFLs could have either: purchased fewer CFLs and no other bulb type; or purchased less-efficient bulbs instead of CFLs. The quantity score (calculated above) already accounted for the discount's impact on the number of CFLs purchased.

The efficiency score assigned the program additional credit for preventing the sale of incandescent light bulbs. Customers received a value of 0 if they would have purchased less-efficient bulbs (incandescent or halogen light bulbs) that cost less than the CFLs. The study did not assign efficiency scores for customers who would not have purchased a less-efficient bulb: their program discount score depended solely on the quantity score. Table 184 further outlines this scoring method.

Table 184: Program Discount Freeridership Score—Efficiency

Question	Response	Program Discount Freeridership Score
(QH26,27/QH31,32) Would you have purchased a different type of light bulb today instead of the standard/specialty CFLs?	Yes	Go to QH28 (for standard CFLs) or QH33 (for specialty CFLs)
	No	1
(QH28/33). What type of light bulbs would you have purchased instead of standard CFLs? Would you have purchased…	Incandescents Halogens	0
	LEDs	1

The study determined an overall program discount score by taking the average of the discount quantity score and the discount efficiency score:

$$Program\ Discount = Average(Discount\ Quantity; Discount\ Efficiency)$$

Program Information Score

To determine the influence of program education and outreach, the Evaluation Team asked customers who recalled seeing in-store information or displays on CFL benefits about the influence of these materials on their purchasing decisions. The survey asked customers to rate the program on a 1 to 5 scale, where 1 means no influence and 5 means an extreme amount of influence. Converting this scale

to range from 0 to 1 and reversing its order (so 0 meant the program information had extreme influence and 1 meant the information had no influence) made the scale consistent with the freeridership score (where 0 meant not a freerider and 1 meant a full freerider). Customers who did not recall seeing program information did not receive a program information score: their overall freeridership score depended solely on their program discount score (calculated above). Table 185 details how the program information score was calculated.

Table 185: Program Information Freeridership Score

Question	Response	Program Information Freeridership Score
(QH36) Using a scale of 1 to 5 where 1 means not at all influential and 5 means extremely influential, how influential was the in-store information sponsored by Energizing Indiana in your decision to buy CFLs today?	1 to 5	1 – ((Response – 1)/4)

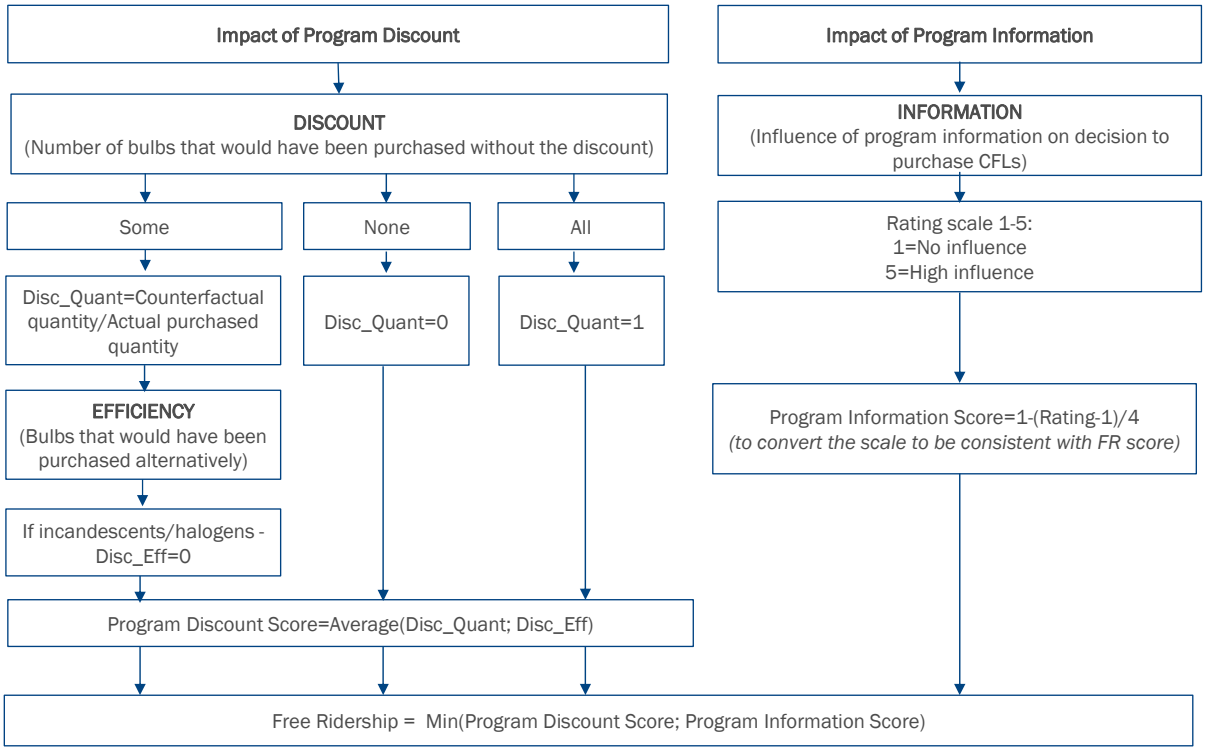
Overall Freeridership Score

The overall freeridership score equaled the minimum of the program discount score and the program information score. Taking the minimum of the two components ensured the program received credit for the avenue that most influenced the customer to purchase CFLs. (Averaging the components would have penalized the program if it did not influence both components equally. For example, a customer might understand CFLs' benefits, but would not buy them at full price. Averaging the two components would reduce the program's overall influence, as it implied the customer said informational materials did not influence their purchases.)

$$Overall\ Freeridership\ Score = Min(Program\ Discount\ Score; Program\ Information\ Score)$$

Figure 75 provides a graphical depiction of the freeridership algorithm.

Figure 75: Freeridership Algorithm



The study calculated an overall freeridership score for each customer and for each bulb type the customer purchased. If the customer purchased both standard and specialty bulbs, the customer received two freeridership scores. These customers' overall freeridership scores derived from a weighted average, based on the number of each type of bulb purchased.

Calculating the final program freeridership score required weighting the sample estimates of standard and specialty freeridership by the number of each type of bulb a customer purchased. The study weighted the overall freeridership scores by the total number of program-discounted CFLs each customer purchased. This method assigned greater weight to customers who purchased more bulbs.

Results

As discussed in the *Residential Lighting Data Collection Activities* section, to gain entry to the stores, the Evaluation Team first accompanied a program field representative conducting a lighting event. Interviews then took place for two additional days at each store (and not during lighting demonstrations). Using the method discussed above, the program received a 0.53 freeridership score. Comparing freeridership estimates for purchases made during event hours to those outside of event hours revealed considerable differences, which proved so large (and the ratio of event hours to non-event hours so small) that the study excluded customers interviewed during event hours from the final freeridership estimate.

Another option would have been to weight those respondents to represent the proportion of shoppers and light bulbs purchased during event hours. However, the exact estimates for developing such weights remain unknown. Based on informal calculations, it appears such a small fraction of store hours,

shoppers, and program-rebated products would leave the 0.60 freeridership score largely unchanged. As such, the program received a final freeridership estimate of 0.60.

Table 186: Program Freeridership

Day Type	Freeridership
All hours (n=177)	0.50
Event hours (n=40)	0.20
Non-event hours (n=137)	0.60

RESIDENTIAL LIGHTING PROGRAM EX-POST SAVINGS ENGINEERING ASSUMPTIONS

Engineering analysis determined *ex-post* gross savings for the PY2 Residential Lighting program. Adjustments reflect engineering adjustments made to *ex-ante* measure savings claimed by the program.

CFLs

CFL savings derived from calculating differences between baseline light[52] bulbs and replacement CFLs. Equivalent baseline incandescent bulbs were chosen depending on how their lumen output compared to a replacement, further adjusted for baseline conditions due to EISA legislation. EISA legislation effectively phases out the manufacturing and import of traditional incandescent light bulbs over a three-year period, beginning in January 2012. The legislation first addressed 100-watt incandescent bulbs in January 2012, followed by 75-watt incandescents in January 2013, and 60- and 40-watt incandescents in January 2014.

To account for EISA, the baseline wattage had to be adjusted downward, but in a manner phased similarly to the legislation's implementation. Adjustments for PY2 only affected baseline wattages for 100-watt incandescent equivalent standard CFLs and LEDs. The Evaluation Team used a dynamic approach to making the baseline adjustment, supported by market data collected through the mystery shopper survey of retailers in Indiana.

The following equations determined CFL energy and demand savings:

$$kWh\ savings = \frac{(W_{baseline} - W_{CFL}) * (Daily\ hours\ of\ use * 365) * ISR * (1 + WHFe)}{1000}$$

$$kW\ savings = \frac{(W_{baseline} - W_{CFL}) * Coincidence\ Factor * ISR * (1 + WHFd)}{1000}$$

$$Therm\ savings = \left(\frac{(W_{baseline} - W_{CFL}) * (Daily\ hours\ of\ use * 365) * ISR * WHFg}{1000}\right) * 10$$

[52] Most often assumed to be incandescent.

Where:

Baseline Wattage ($W_{baseline}$) = Assigned incandescent equivalent wattage of the lamp or bulb replaced with a CFL (see Table 187).

CFL Wattage (W_{CFL}) = The actual wattage of the installed CFL (13W, 19W, or 23W).

ISR = A number less than one, indicating how many lamps actually are in use, and including variables such as: the installation rate (bulbs installed versus placed into storage); bulbs taken outside the program service territory; and persistence (bulbs installed and then removed before end-of-life).

Daily HOU = Average number of hours a day the light remains in use.

WHF_e = WHF for energy use, accounting for the effects of more efficient lighting on cooling energy use.

WHF_d = WHF for demand, accounting for the effects of more-efficient lighting on cooling energy demand.

WHF_g = WHF for gas use, accounting for the effect of more-efficient lighting on heating energy use.

CF = A number between 0 and 1, indicating how many CFLs are expected to remain in use and saving energy during the peak summer demand period.

Table 187 lists the final assumptions used to evaluate and calculate CFL savings and identifies the source of each assumption.

Table 187: CFL *Ex-Post* Energy and Demand Savings Assumptions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Baseline Wattage (W_{base}) – For under 13W CFLs	40	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 13W-18W CFLs	60	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 19W-22W CFLs	75	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 23W-36W, Standard CFLs	85	ENERGY STAR Lighting Calculator values adjusted for Indiana-specific post-EISA market conditions
Baseline Wattage (W_{base}) – For 23W-36W, Specialty CFLs	100	ENERGY STAR Lighting Calculator
Baseline Wattage (W_{base}) – For 37W- 54W CFLs	150	Illinois TRM
Baseline Wattage (W_{base}) – For 55W-67W CFLs	200	Illinois TRM
Baseline Wattage (W_{base}) – For 68W+ CFLs	200	Illinois TRM
CFL Wattage (W_{CFL})	Actual	Actual
Daily HOU	2.47	2012-2013 Indiana Lighting Logger Study

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Energy WHF (WHF_e)	Duke, IMPA, IPL = -0.061 I&M = -0.082 NIPSCO = -0.070 Vectren = -0.034	Indiana TRM
Demand WHF (WHF_d)	Duke, IMPA, IPL = 0.055 I&M, NIPSCO = 0.038 Vectren = 0.092	Indiana TRM
Gas WHF (WHF_g)	Duke, IMPA, IPL = -0.0018 I&M, NIPSCO = -0.0019 Vectren = -0.0017	Indiana TRM
CF	0.11	Indiana TRM
ISR	0.79	2012 Indiana Residential Baseline Study

LEDs

Similarly to CFLs, LED savings derived from calculating differences between baseline light[53] bulbs and replacement LEDs. Equivalent baseline incandescent bulbs were chosen, based on how their lumen output compared to the replacement LEDs, and then further adjusted for baseline conditions resulting from EISA legislation.

The following equations determined LED energy and demand savings:

$$kWh\ savings = \frac{(W_{baseline} - W_{LED}) * (Daily\ hours\ of\ use * 365) * ISR * (1 + WHFe)}{1000}$$

$$kW\ savings = \frac{(W_{baseline} - W_{LED}) * Coincidence\ Factor * ISR * (1 + WHFd)}{1000}$$

$$Therm\ savings = \left(\frac{(W_{baseline} - W_{LED}) * (Daily\ hours\ of\ use * 365) * ISR * WHFg}{1000}\right) * 10$$

Where:

$W_{baseline}$ = The wattage of the lamp or bulb replaced with an LED.

W_{LED} = The wattage of the replacement LED.

ISR = A number less than one indicating how many lamps actually remain in use, and including variables such as: the installation rate (bulbs installed versus placed into storage); bulbs taken

[53] Most often assumed to be incandescent.

outside the program service territory; and persistence (bulbs installed and then removed before end-of-life).

Daily HOU = Average number of hours a day the light remains in use.

WHF_e = WHF for energy use, accounting for the effects of more-efficient lighting on cooling energy use.

WHF_d = WHF for demand, accounting for the effects of more-efficient lighting on cooling energy demand.

WHF_g = WHF for gas use, accounting for the effect of more-efficient lighting on heating energy use.

Coincidence Factor = A number less than one, indicating how many LEDs are expected to remain in use and saving energy during the peak summer demand period.

Table 188: LED *Ex-Post* Energy and Demand Savings Assumptions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Baseline LED Wattage (W_{base}) – For LEDs up to 6W	25	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from>6 to 7W	35	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from>7 to 8.7W	40	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from > 8.7 to 13W	60	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from >13 to 16W	53	Indiana TRM
Baseline LED Wattage (W_{base}) – For LEDs from >16+W	72	Indiana TRM
LED Wattage ($W_{fixture}$)	Actual	Actual
Daily HOU	2.47	2012-2013 Indiana Lighting Logger Study
Energy WHF (WHF_e)	Duke, IMPA, IPL = -0.061 I&M = -0.082 NIPSCO = -0.070 Vectren = -0.034	Indiana TRM
Demand WHF (WHF_d)	Duke, IMPA, IPL = 0.055 I&M, NIPSCO = 0.038 Vectren = 0.092	Indiana TRM
Gas WHF (WHF_g)	Duke, IMPA, IPL = -0.0018 I&M, NIPSCO = -0.0019 Vectren = -0.0017	Indiana TRM
CF	0.11	Indiana TRM
ISR	1	Indiana TRM

FIXTURES

Similarly to CFLs, fixture savings derived from calculating differences between baseline units using incandescent light bulbs and replacement fixtures using pin-based CFLs. Equivalent baseline incandescent bulbs were chosen, based on how their lumen output compared to replacement CFLs included in the fixture, and further adjusted for baseline conditions due to EISA legislation.

The following equations determined fixtures' energy and demand savings:

$$kWh\ savings = \frac{(W_{baseline} - W_{Fixture}) * (Daily\ hours\ of\ use * 365) * ISR * (1 + WHFe)}{1000}$$

$$kW\ savings = \frac{(W_{baseline} - W_{Fixture}) * Coincidence\ Factor * ISR * (1 + WHFd)}{1000}$$

$$Therm\ savings = \left(\frac{(W_{baeline} - W_{Fixture}) * (Daily\ hours\ of\ use * 365) * ISR * WHFg}{1000}\right) * 10$$

Where:

$W_{baseline}$ = The wattage of the lamp or bulb replaced with a CFL pin-based bulb.

$W_{fixture}$ = The wattage of the individual replacement CFL pin-based bulb.

ISR = A number less than one, indicating how many of the lamps actually remain in use and including variables such as: installation rate (bulbs installed versus placed into storage); bulbs taken outside the program service territory; and persistence (bulbs installed and then removed before end of life).

Daily HOU = Average number of hours a day the light remains in use.

WHF_e = WHF for energy use, accounting for the effects of more-efficient lighting on cooling energy use.

WHF_d = WHF for demand, accounting for the effects of more-efficient lighting on cooling energy demand.

WHF_g = WHF for gas use, accounting for the effect of more-efficient lighting on heating energy use.

Coincidence Factor (CF) = A number less than one, indicating how many fixtures are expected to remain in use and saving energy during the peak summer demand period.

Table 189: Fixture *Ex-Post* Energy and Demand Savings Assumptions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Baseline Fixture Wattage (W_{base}) – For 13W CFL	60	ENERGY STAR Lighting Calculator
Baseline Fixture Wattage (W_{base}) – For 23W CFL	85	ENERGY STAR Lighting Calculator values adjusted for Indiana-specific post-EISA market conditions
Baseline Fixture Wattage (W_{base}) – For 27W CFL	85	ENERGY STAR Lighting Calculator values adjusted for Indiana-specific post-EISA market conditions

Variable	*Ex-Post* Savings Assumption	*Ex-Post* Savings Assumption Source
Fixture Wattage ($W_{fixture}$)	Actual	Actual
Daily HOU	2.47	2012-2013 Indiana Lighting Logger Study
Energy WHF (WHF_e)	Duke, IMPA, IPL = -0.061 I&M = -0.082 NIPSCO = -0.070 Vectren = -0.034	Indiana TRM
Demand WHF (WHF_d)	Duke, IMPA, IPL = 0.055 I&M, NIPSCO = 0.038 Vectren = 0.092	Indiana TRM
Gas WHF (WHF_g)	Duke, IMPA, IPL = -0.0018 I&M, NIPSCO = -0.0019 Vectren = -0.0017	Indiana TRM
CF	0.11	Indiana TRM
ISR	1	Indiana TRM

MYSTERY SHOPPER SURVEY RESULTS

MEMORANDUM

TO: **Indiana Demand Side Management Coordination Committee, EM&V Subcommittee**

FROM: **TecMarket Works Evaluation Team**

DATE: **February 7, 2014**

RE: Residential Lighting Program—Mystery Shopper CFL Baseline Real-Time Feedback Memo

This memo presents *real-time* feedback to the EM&V-SC from the mystery shopper survey that assessed the availability of 100- and 75-watt incandescent light bulbs in Indiana.

The Evaluation Team designed and fielded the mystery shopper survey to support the evaluation's dynamic approach for reducing CFL baseline wattages, following implementation of the 2007 EISA. The Evaluation Team presented this approach to the DSMCC EM&V-SC in a document entitled: "EISA Schedule and CFL Baseline." This recommended reducing CFL baselines over time, based on the availability of incandescent light bulbs in the market. Once standard wattage incandescent light bulbs no longer become available, baseline wattages will be EISA-compliant bulbs.

Mystery shopper surveys assessed availability of 100- and 75-watt incandescent light bulbs in Indiana and established CFL savings baselines for the Core Program 2013 and 2014 program years, using empirical data specific to the state.

Method and Sample

This mystery shopper survey took place during the second wave of a longitudinal panel study.[54] The first wave took place in January 2013, among a sample of 101 home and hardware stores as well as general retailers selling light bulbs.[55] Home and hardware stores included: Home Depot, Lowe's, Menard's, True Value and Mister Hardware. General retailers included Wal-Mart, Family Dollar, Meijer, Kroger, Save-A-Lot, Osco, and Walgreens.

Consistent with the panel study design, the phone survey attempted to complete interviews with the same 101 stores as interviewed in 2013. The fielding efforts resulted in completed interviews with 100 retailers, representing an exceptionally low attrition rate (just less than 1%). Interviews occurred between January 14 and January 17, 2014.

[54] A panel study is a type of longitudinal study that uses the same (constant) sample in each consequent wave, allowing for changes in individual responses over time.

[55] The sample for Wave 1 was chosen to include an equal numbers of home and hardware stores (such as Home Depot, Lowes, Menards, Ace, True Value, and Mister Hardware) and general retailers (such as Wal-Mart, Family Dollar, Meijer, Kroger, Save-A-Lot, Osco, and Walgreens). The completion rate for home and hardware stores surveyed was 88.9% (48 completes from a list of 54), and the rate for general retailers was 98.1% (53 completes from a list of 54).

The first wave explored availability of 100- and 95-watt incandescent light bulbs. The second wave explored the presence of 100-, 95-, and 90-watt incandescent light bulbs as well as 75-watt incandescent light bulbs.[56] Survey questions also explored: reasons for incandescent light bulbs not being available; expectations for possible future availability; and retailer-recommended alternatives. EISA affected 100-watt incandescents in 2012 and 75-watts in 2013, and just began affecting 60- and 40-watt incandescent bulbs in January 2014. The study assumed those bulbs remained widely available and did not include them as part of either survey.

Summary of Findings and Conclusions

The mystery shopper survey results indicated that, while EISA considerably affected the availability of 100- and 75-watt incandescent light bulbs, a sizable number of stores in Indiana still carried those bulbs. In addition, and perhaps more importantly, the removal rate of EISA non-compliant bulbs from the market appears to be slowing (rather than increasing), as reflected in the rate at which those bulbs are stocked and sold.

Overall, 39% of retailers still carry 100-watt incandescent bulbs, and the same percentage of retailers carry 75-watt incandescent light bulbs. Availability of 100-watt incandescent light bulbs only decreased by 6% from January 2013 to January 2014. That is, the rate at which 100-watt bulbs become unavailable has slowed at a more gradual pace than expected. However, these bulbs continue to be removed from the market. Of retailers without 100- or 75-watt incandescent light bulbs or with less than 20 bulbs left in stock, very few (less than one in 10) expects to obtain more in the near future. This finding reflects a similar finding from the 2013 study. Most of these retailers cited EISA legislation as the reason for incandescent light bulbs no longer being available.

Based on the relatively small but continued, incremental decline in the percentage of stores selling 100-watt incandescents between 2013 and 2014, and on the varying stocking patterns from year-to-year at individual store levels, EISA's longer-term impact on the availability of incandescent bulbs remains uncertain and unpredictable. Study findings support the stair-step baseline reduction approach adapted by the Evaluation Team; however, the findings also mean the market has not eroded as fast as expected; thus impacts on CFL baselines for 2014 have not been as severe as anticipated.

Given the market conditions and current availability of the phased-out lighting products in Indiana stores, the Evaluation Team will use the baseline adjustments to match market conditions found in this study. Table 190 outlines these adjustments. Numbers in the table have been rounded to the nearest 5%. As part of future evaluation efforts, the Evaluation Team will conduct subsequent studies to develop baseline adjustments for future years (currently marked at TBD in the table).

[56] As EISA affected 75-watt incandescent light bulbs from the beginning of 2013, the study assumed those bulbs were widely available and did not explore them as part of the Wave 1 survey.

Table 190: EISA Compliant Baselines by Year and Wattage

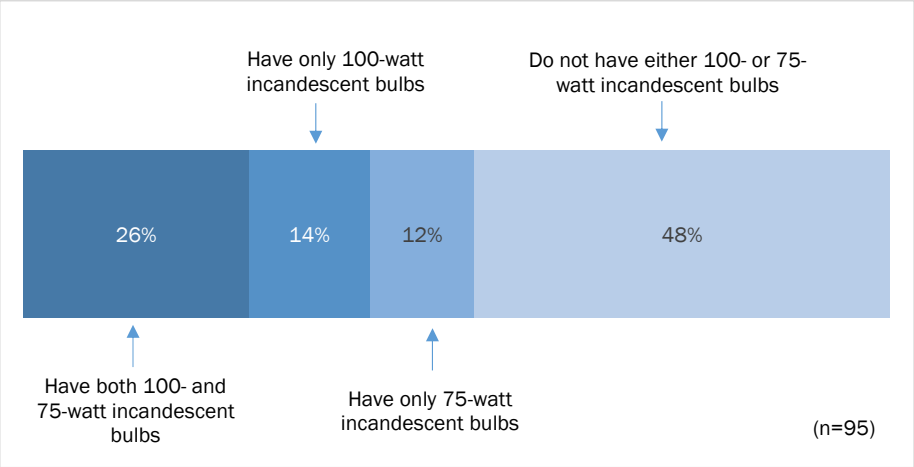
100-watt			75-watt			60-watt			40-watt		
Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)	Year	Phase	Baseline (Watts)
2012	0%	100	2012	0%	75	2012	0%	60	2012	0%	40
2013	55%	85	2013	0%	75	2013	0%	60	2013	0%	40
2014	60%	83	2014	60%	62	2014	0%	60	2014	0%	40
2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD	2015	TBD	TBD
2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD	2016	TBD	TBD
2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD	2017	TBD	TBD

Detailed Results

Current Availability of 100- and 75-watt Incandescent Light Bulbs

Two years after implementation of EISA, 100- and 75-watt incandescent light bulbs remain significantly present and readily available on many Indiana store shelves. Some retailers, however, only had one wattage in stock, though some had both (as shown in Table 191). Just over one-half of retailers included in this study had *either* 100- or 75-watt bulbs in stock (52%). Slightly over one-quarter of retailers (26%) had *both* 100- and 75-watt incandescents.

Table 191: Availability of Incandescent Wattage Combinations



Examining the availability of a single wattage, 100- and 75-watt incandescents remain equally available. That is, 100-watt and 75-watt bulbs have matched market availability. Four in 10 retailers still offer 100-watt incandescents, while the same percentage also offers 75-watt bulbs (39% for each wattage type) (as shown in Table 192).

Despite the continued availability of these bulbs, fewer retailers had large quantities in stock, indicating sales may be slowing. Approximately one-quarter of retailers interviewed had 20 or more bulbs available (26% had 20 or more 100-watt bulbs available, and 22% had 20 or more 75-watt bulbs available).

Though home and hardware stores carried larger stocks of the bulbs, the difference did not prove statistically significant.[57] This could result from a limited stocking capacity of general retailers. Stores such as Walgreens, Family Dollar, and others, often have limited shelf and stocking space dedicated to lighting products and might not be able to stock extensive quantities of given bulb types.

Table 192: Availability of 100- and 75-watt Incandescent Light Bulbs

Bulb Wattage	Home and Hardware Stores	General Retailers	Total*
100-watt Incandescent Light Bulbs			
Have any in stock	**(n=52)**	**(n=48)**	**(n=100)**
	38%	40%	39%
Have 20+ in stock	**(n=52)**	**(n=48)**	**(n=100)**
	31%	21%	26%
75-watt Incandescent Light Bulbs			
Have any in stock	**(n=51)**	**(n=46)**	**(n=97)**
	39%	39%	39%
Have 20+ in stock	**(n=51)**	**(n=44)**	**(n=95)**
	29%	14%	22%

*The total number of respondents does not equal 100. Respondents saying "don't know" were excluded from the valid respondent base.

**Includes high-wattage incandescent bulbs, such as 90-watt bulbs. Only one retailer had 90-watt incandescent light bulbs in stock.

Changes in Incandescent Bulb Availability over Time

Compared to a year ago, slightly fewer stores offer 100-watt incandescent light bulbs for purchase in and in slightly smaller quantities. As shown in Table 193, the percentage of retailers with 100-watt incandescents in stock in 2014, when compared to those in 2013, fell by 6%, as did the percentage of retailers with 20 or more bulbs in stock.[58]

Table 193: Change in 100-watt Incandescent Light Bulb Availability over Time

	Wave 1 (January 2013) (n=101)	Wave 2 (January 2014) (n=100)	*% Drop*
Have any amount of 100-watt incandescent light bulbs	45%	39%	***6%***
Have 20+ 100-watt incandescent light bulbs	32%	26%	***6%***

These relatively small stocking changes at the aggregate level may mask some larger changes happening at individual store levels. EISA allows retailers to continue to sell regulated wattages until they have exhausted their inventory, but retailers cannot legally import additional bulbs. Given this regulation, it remains unclear whether an individual store selling through its inventory would receive additional bulbs, or, upon depleting that inventory, would no longer sell that wattage. Retailers may possibly continue to acquire these bulbs.

[57] Using a Chi-Square test to test the proportions for significance.

[58] Due to the 75-watt incandescent light bulb ban taking place in January 2013, most stores will likely carry 75-watt incandescents; therefore, the study did not explore the availability of those bulbs over time during the survey's first wave.

As the study addressed the same stores in both years, the percentage of stores changing their stocking of 100-watt bulbs from one year to the next can be readily identified. A slight majority (56%) did not change their stocking practices: 36% did not carry the bulbs in 2013 and still did not in 2014; while 20% carried them in 2013 and continued to do so in 2014 (as shown in Table 194). These results were not expected, unless the combined wholesale and retail inventory of bulbs remained greater than the two-year, EISA-impacted demand for those bulbs or the importing of those bulbs continued. The study also found some stocking changes. One in four stores (25%) carried the bulbs in 2013, but did not do so in 2014, a finding consistent with the "sell through and done" concept. The study also found, however, a somewhat lower number (19%) of stores did not stock the bulbs in 2013, but had them in stock in 2014.[59] It appears EISA's implementation at the store level not only took place more slowly than anticipated but may be more complicated than simply selling through a store's existing inventory.

Table 194: Comparison of Stocking of 100-watt Incandescent Bulbs in 2013 and 2014 at Same Stores

	Wave 1 and Wave 2 Respondents (n=100)
Same Stocking	**56%**
Did not sell in either year	36%
Sold in both years	20%
Different Stocking	**44%**
Stocked in 2013 Only	25%
Stocked in 2014 Only	19%

Expectations for Future 100- and 75- Watt Incandescent Bulb Availability

Because it was unclear whether stores without 100- or 75-watt bulbs in stock would receive additional bulbs, the study asked store associates if they expected to obtain more bulbs in the near future (asking this question of retailers with fewer than 20 bulbs in stock and those with none). In 2014, less than one in 10 expected to have their supplies of either wattage replenished in the near future. The results did not vary significantly by general retailers or home and hardware stores.

The percentage of stores not expecting to receive 100-watt incandescent light bulbs in the Wave 2 survey nearly equaled those in Wave 1.

Table 195: Expected 100- and 75-watt Incandescent Bulb Availability

	100-watt Incandescent Light Bulbs		75-watt Incandescent Light Bulbs
	Wave 1 (January 2013) (n=69)	Wave 2 (January 2014) (n=73)	Wave 2 (January 2014) (n=74)*
Expect more bulbs soon	9%	8%	5%
Do not expect any more bulbs	84%	82%	82%
Do not know	7%	10%	12%

*The sum of categories does not equal 100% due to rounding.

[59] To mitigate measurement error, the Evaluation Team thoroughly trained the interviewers. As part of the interview process, interviewers carefully explained to respondents the types of lighting examined, seeking to avoid confusion as much as possible (e.g., confusion between 100-watt equivalent halogen and 100-watt incandescent bulbs).

The overwhelming majority of retailers not expecting to obtain additional 100- or 75-watt incandescent light bulbs soon cited the bulb phase-out due to federal regulations as the reason for not keeping those wattages in their stores. Some, however, did not know why 100- or 75-watt incandescent bulbs would no longer be available. Other responses included: corporate policies/decisions to not stock the bulbs and stores switching to energy-efficient lighting technologies.

Table 196: Reasons for 100- and 75-watt Incandescent Bulbs No Longer Available

	100-watt Incandescents (n=60)	75-watt Incandescents (n=61)
Phasing them out (due to federal regulations)	63%	66%
No consumer demand	5%	8%
Other	15%	13%
Don't know	17%	13%

Retailer Recommendations for Alternative Lighting Technologies

The study asked retailers with fewer than 20 bulbs of 100- or 75-watt incandescent light bulbs or who did not have either wattage in stock to recommend an alternative lighting technology for purchase. Slightly over one-half (56%) recommended energy-efficient lighting options, with CFLs the most frequent response (as shown in Table 197). Fewer recommended halogens or lower-wattage incandescent light bulbs. Some retailers did not offer any suggestions, while a small number provided recommendations of other stores where the bulbs might be available.

Table 197: Recommendation to Replace 100-watt Incandescent Light Bulbs

	Total (n=47)
Energy-efficient light bulbs	***60%****
CFLs	43%
LEDs	13%
Energy saving light bulbs (general)	9%
Halogens	17%
Lower-wattage incandescents	13%
No suggestions	9%
Other stores	4%
Other recommendation	11%

*The categories sum is higher than the total due to multiple responses and retailers providing recommendation for more than one lighting technology (e.g., retailer could recommend CFLs and LEDs).

In summary, the baseline reduction approach the Evaluation Team used operated consistently with the erosion of available EISA non-compliant bulbs; however, the erosion took place more slowly than expected for 100-watt bulbs and was significantly higher for 75-watt bulbs. The Evaluation Team will use findings from this research to adjust the CFL *ex-ante* evaluated baseline calculation approach to match market conditions identified in the study.

B. Appendix: Cost-Effectiveness by Utility

Pursuant to the Indiana Utility Regulatory Commission Order of May 9, 2014, the standalone second year program for PY2, cost-effectiveness results are provided for each program and utility as well as for the State level assessment.

It is incumbent upon the Evaluation Team to caution the reader from over-interpreting or drawing specific conclusions using the PY2 vs. PY1 benefit cost assessment for comparative purposes. There are carryover load impacts or avoided costs counted in PY2 that were associated with expenditures in PY1. As a result, the benefit cost analysis of these two years should not be directly compared. It is recommended that the cost-effectiveness of the Core portfolio be viewed in its entirety for the 3-year goal and contract period.

The following tables provide the individual PY2 cost-effectiveness results.

Table 198: Duke Energy PY2 Cost-Effectiveness

Cost Effectiveness for Duke Energy Indiana Programs	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	4.52	3.6	1.13	3.94
Low Income Weatherization	NA	0.95	0.6	0.95
Home Energy Audit	NA	1.5	0.77	1.5
School Energy Efficiency Kit	NA	2.84	0.97	2.84
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	0.99	0.46	0.99
Commercial & Industrial Incentives	9.84	8.33	1.11	8.58
Total Portfolio	9.69	4.12	1.03	4.21

Table 199: I&M PY2 Cost-Effectiveness

Cost Effectiveness for Indiana & Michigan Programs	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	6.23	3.1	0.67	3.26
Low Income Weatherization	NA	0.78	0.37	0.78
Home Energy Audit	NA	1.26	0.47	1.26
School Energy Efficiency Kit	NA	1.99	0.55	1.99
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	0.81	0.4	0.81
Commercial & Industrial Incentives	19.01	4.23	0.87	11.42
Total Portfolio	17.29	3.61	0.81	6.98

Table 200: IMPA PY2 Cost-Effectiveness

Cost Effectiveness for IMPA Programs	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	6.72	2.16	0.55	2.19
Low Income Weatherization	NA	1.09	0.52	1.09
Home Energy Audit	NA	1.42	0.58	1.42
School Energy Efficiency Kit	NA	3.1	0.75	3.1
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	1.13	0.52	1.13
Commercial & Industrial Incentives	9.02	8.92	1.24	9.53
Total Portfolio	10.37	4.96	1.04	5.12

Table 201: IPL PY2 Cost-Effectiveness

Cost Effectiveness for Indianapolis Power & Light Programs	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	2.73	2.26	1.08	2.33
Low Income Weatherization	NA	1.01	0.67	1.01
Home Energy Audit	NA	1.04	0.67	1.04
School Energy Efficiency Kit	NA	1.92	0.94	1.92
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	0.73	0.48	0.73
Commercial & Industrial Incentives	3.69	4.05	1.45	4.16
Total Portfolio	4.58	2.2	1.08	2.22

Table 202: NIPSCO PY2 Cost-Effectiveness

Cost Effectiveness for NIPSCO Programs	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	6.52	3.56	0.79	3.73
Low Income Weatherization	NA	1.31	0.63	1.31
Home Energy Audit	NA	1.85	0.7	1.85
School Energy Efficiency Kit	NA	2.49	0.77	2.49
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	1.32	0.45	1.32
Commercial & Industrial Incentives	8.92	7.2	0.79	7.46
Total Portfolio	10.61	3.59	0.76	3.65

Table 203: Vectren PY2 Cost-Effectiveness

Cost Effectiveness for Vectren Programs	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	9.17	2.55	0.46	2.97
Low Income Weatherization	NA	1.56	0.57	1.56
Home Energy Audit	NA	1.19	0.4	1.19
School Energy Efficiency Kit	NA	2.13	0.48	2.13
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	0.52	0.3	0.52
Commercial & Industrial Incentives	7.57	6.2	0.93	5.92
Total Portfolio	12.31	2.53	0.62	2.55

Table 204: Statewide PY2 Cost-Effectiveness

State of Indiana Program Cost Effectiveness				
	2013			
	PCT	UCT	RIM	TRC
Residential Programs	-	-	-	-
Residential Lighting	5.25	3.08	0.86	3.3
Low Income Weatherization	NA	1.09	0.56	1.09
Home Energy Audit	NA	1.36	0.64	1.36
School Energy Efficiency Kit	NA	2.57	0.85	2.57
Non-Residential Programs	-	-	-	-
School Building Assessments	NA	0.84	0.43	0.84
Commercial & Industrial Incentives	10.09	5.67	1	8
Total Portfolio	10.43	3.44	0.9	3.97