2015 Comprehensive Evaluation: Home Lighting & Recycling

Recommendations and Responses

February 2016

Executive Summary

The Home Lighting & Recycling product provides resources for customers to purchase energy-efficient light bulbs and dispose of them in an environmentally-friendly manner. Using energy-efficient bulbs is an easy and inexpensive way for customers to save electricity. Public Service motivates customers to purchase CFLs and LEDs by offering in-store retail discounts. The discounts are provided through Company collaboration with bulb manufacturers and retailers.

The full evaluation report, completed by Cadmus, is attached to this summary.

Recommendation	Response
Retailer Engagement Communication within stores from electric department managers to store managers could improve, given the lack of visibility for field staff and services they provide among store managers. Manufacturers also reported high rates of satisfaction, but noted a few areas for improvement including the RFP timeline and the variety of specialty LED bulb models included.	
1. In addition to store signage promoting Xcel Energy as a sponsor for markdowns to customers, **consider opportunities to gain visibility with store staff beyond the lighting department manager. Where not currently the practice, field representatives could incorporate staff such as store managers into in-store trainings** to further engage them with the program and confirm they recognize when field staff have visited. Enhancing store managers engagement and satisfaction with the program will help ensure ongoing retailer program support.	The Company will be refreshing the signage in 2016 and creating additional elements that will call attention to the program and engage store employees and customers. *For store employees:* The Company will develop a kit that will be left with the manager at each visit to the retail store. The kit will include the date/time of store visit, business card of the field representative, lighting training information card and pertinent details about the visit. *For customers:* The Company will add in-store demonstration materials to retail store booths. A sandwich board display, retractable banner, and light box meter comparator are some of the options being considered. The Company will assess the costs of these materials and select the most cost-effective options for engaging customers.

2. **Review the RFP process to determine if any tools or process changes can support or simplify the application process**, making it easier for manufacturers to respond.	The RFP for lighting partners is administered by the Company's third-party implementer. The third-party implementer will discuss opportunities for improving the 2017 bidding process with potential bidders.
3. **Consider increasing the number of field staff** to increase ability to perform regular site visits, conduct promotional events, and provide resources for retailers.	The Company will estimate the cost of adding additional field representation. If the cost is within reason, the program will add another half time field representative.
4. **Ensure retail locations have sufficient signage and education materials**—to the extent allowed by the retailer; it may also be beneficial to **discuss additional resources a store location would like to be provided** while on site, to ensure materials fit within store guidelines.	The Company will work with retailers, in partnership with our third-party implementer, to determine if additional signage would be permissible in the stores. If the opportunity exists, the Company will provide more signage for display at the retail stores.
Program Offerings There is evidence that customers would appreciate a wider selection of Program-discounted bulb models.	
5. **Continue balancing the mix of LEDs and CFLs offered to optimize the program mix.** Clearly, more LEDs would sell with more incentives; however this must be balanced with lower cost measures for cost-effectiveness considerations. **One additional measure to consider is "value" (lower cost) LEDs,** which would help move the measure mix towards LEDs while helping to manage the cost effectiveness of the program.	The Company will focus more on LED bulbs discounts in 2016. The Company issued a 60-Day Notice on January 6, 2016 to add a "Value LED" measure to the product in 2016, effective March 5, 2016. The Company will continue to leverage CFLs as long as they are the most cost effective efficient bulb in the market. The Company will balance the product mix according to budget and demand.
6. **Continue to promote unique features of specialty CFLs, such as dimming and outdoor applications.** As LEDs appear to be competing with specialty CFL sales, customers need to understand how different bulb types compare, the relative value trade-offs and feature capabilities.	The Company will continue to promote energy-efficient specialty bulbs. The Company has a number of educational tools on the Xcel Energy website to help customers differentiate between CFLs and LEDs and determine the benefits of different types of energy-efficient lighting. The Company will also continue to encourage customers to visit the website through advertising and promotions.

7. **Continue to monitor the market to identify other emerging technologies** (e.g., bulbs connecting to home automation or specialty energy-efficient bulbs) which prove popular and could be considered for inclusion in the program.	The Company, in partnership with the third-party administrator, will monitor the market for new, cost-beneficial residential lighting technologies to add to the next DSM Plan or via 60-Day Notice.
Customer Awareness Increased customer awareness that Xcel Energy is behind the lighting discounts may increase customer satisfaction with Xcel Energy and increase program uptake.	
8. Continue to offer promotional activities beyond stores (e.g., radio plugs, bill inserts).	The Company is implementing 50 community lighting events in 2016. Many of the events will be staffed with energy experts who will engage customers and answer questions. Some of the events will include advertising, sweepstakes promotions and/or light bulb giveaways.
9. **Consider working with trade allies to expand program awareness materials** in areas beyond lighting aisles (e.g., check-out lines, store windows).	The Company will work with retailers, in partnership with our third-party implementer, to determine if any new promotional items can be used in the stores. If the opportunity exists, the Company will provide new promotional materials to the retail stores.
10. **Consider expanding the amount and type of POP materials** where possible. Work with retailers to determine if additional or different types of signage can be displayed.	The Company will work with retailers, in partnership with our third-party implementer, to determine if additional signage is possible. If the opportunity exists, the Company will provide more dynamic signage for display at the retail stores.
Technical Assumptions Technical assumptions appear out of range compared to benchmarked programs.	
11. **Review the HOU** used in the technical assumptions to determine if the assumed HOU needs to be updated.	A separate third-party, Michaels Energy, has recommended updating the hours of use (HOU) assumption to 2.56 hours per day. The Company has included this change in a 60-Day Notice.
12. **Cadmus recommends using the calculated NTG of 79% for CFLs and 91% for LEDs** for future program planning.	The Company has included these NTG changes in a 60-Day Notice, to be effective as of January 1, 2016.

Evaluation of Xcel Energy's Home Lighting and Recycling Program

January 13, 2016

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Executive Summary

Cadmus evaluated Xcel Energy Colorado's Home Lighting and Recycling program (Program). Program staff and stakeholders intend to use the findings presented in this report to refine the Home Lighting and Recycling Program.

Program Description

The Home Lighting and Recycling program in Colorado provides upstream rebates for residential customers to purchase energy-efficient lighting products through partnerships with participating retailers and manufacturers. Discounted bulbs include CFLs and LEDs across a range of offerings, such as floods, globes, dimmable, and three-way units. Additionally, customers can recycle CFLs free of charge at Ace Hardware and other home improvement stores. In 2014, 18 retailers participated in the Program,[1] with 525 storefronts offering discounted lighting products.

Xcel Energy contracts with manufacturers to partner with retailers to sell a certain number of energy-efficient bulbs at a discounted price. Retailers sell the program bulbs at the reduced price and report their sales data to the manufacturers, who report the sales to Xcel Energy. Xcel Energy provides the incentive to the manufacturer, and the manufacturer shares the financial benefit with the retailer based on the volume of incented products they sold. Xcel Energy partners with Wisconsin Energy Conservation Corporation (WECC) to implement the program.

In 2014, the program served approximately 358,876 residential customers and sold 4,306,517 bulbs achieving 123,263 MWh in energy savings. As shown in Table 1, the Program surpassed both its units sold and kWh savings target. In terms of energy savings, this is Xcel Energy's largest demand-side management product in Colorado.

Table 1. Program Performance vs. Targets (2010–2014[2])

Year	Unit Target	Total Unit Actual	Net Gen. kWh Target	Net Gen. kWh Actual
2010	1,200,000	1,273,119	55,485,357	63,450,000
2011	1,370,000	1,996,025	55,576,421	96,600,472
2012	2,090,000	3,038,229	95,564,399	132,566,192
2013	2,140,000	2,967,340	82,827,177	117,945,589
2014	3,090,000	4,306,517	76,523,940	123,263,649

[1] Ace Hardware, Batteries Plus, Big Lots, City Market, Costco, Dollar General, Dollar Tree, Family Dollar, Habitat ReStore, Home Depot, King Soopers, Lowes, Safeway, Sam's Club, Sutherlands, True Value, Walgreens, and Walmart.

[2] Provided by Xcel Energy.

Method

Cadmus collected and analyzed primary and secondary data to evaluate the Home Lighting and Recycling program. The evaluation began with a working session designed to discuss and confirm evaluation goals, clarify basic research and analyses methods, identify data required from Xcel Energy, and finalize the project's timeframe. Cadmus collected program data through the following research activities:

- Interviewing Xcel Energy program staff (n=5)
- Interviewing Wisconsin Energy Conservation Corporation (WECC) (i.e., the implementer) program staff (n=4)
- Interviewing retailers and manufacturers (n=27)
- Conducting an in-store intercept survey (n=335)
- Conducting home lighting inventories and surveying residents (n=70)
- Conducting on-line retailer lighting inventories (n=7)
- Benchmarking similar home lighting programs (n=7)
- Performing demand elasticity analysis

Evaluation Objectives

In collaboration with Xcel Energy, Cadmus identified the following process and impact evaluation objectives:

- ***Stakeholder Interviews and Logic Model:*** Understand program operations and delivery protocols, and identify areas of concern that could affect data collection or analysis.
- ***Home Lighting Inventories and Customer Surveys:*** Assess penetration and saturation of energy efficient bulbs. Understand what types of bulbs customers purchase and customers' participation with and perceptions of the Program.
- ***In-Store Intercepts:*** Gather information from customers that purchase light bulbs regarding types and numbers of bulbs purchased, factors influencing purchasing decisions, intended installation use (business vs. home) and program awareness; gather data to inform net-to-gross (NTG) calculations.
- ***Supplier Interviews:*** Collect information from Program trade allies (e.g., corporate retail contacts, store managers, manufacturers), including participant and nonparticipant stores, to

identify trends in pricing and sales, marketing approaches, participation barriers, and opportunities for program improvements.

- ***Program NTG Evaluation:*** Calculate freeridership, spillover, market effects and NTG using data from in-store intercepts, home inventories, supplier interviews, retailer lighting inventories and the demand elasticity model.
- ***Benchmarking:*** Provide context on key performance indicators associated with peer companies' upstream residential lighting programs.

Cadmus also compared the evaluation's results to findings from the 2009 program evaluation. Below are key findings followed by overall conclusions and recommendations.

Summary of Key Findings

This section summarizes key findings for the Home Lighting and Recycling program, based on the above evaluation objectives.

The Program, as designed, is flexible to adjust to the changing lighting market. With several years of success in meeting and exceeding increasing targets, the program has been able to build successful partnerships with manufacturers and expand and adjust the type and quantities of bulbs included in the Program. While challenging, this ability to be flexible has become increasingly important, with a rapid decline in LED prices within the past year.

Most survey participants were not aware of the Program. Based on the home inventory customer survey (n=70), nearly 80% of surveyed customers did not know that Xcel Energy provided discounts on energy-efficient lighting. Intercepts survey results (n=335) found that 61% of customers had not been aware that Xcel Energy offered discounts on energy-efficient bulbs. This implies 20% to 39% of customers were aware of the Program, which is relatively high (other programs recently evaluated by Cadmus have ranged from 12% to 26%). This is not unusual since, even with store program signage, customers may not notice the utility involvement in the reduced pricing.

Customers are more familiar with CFLs than LEDs. Sixty-eight percent of customers reported being "very familiar" with CFLs. In comparison, just over one-quarter of customers (26%) reported being "very familiar" with LEDs.

Overall, customers are satisfied with CFLs and LEDs. Mean satisfaction scores (from the customer survey) of 8.2 and 7.5 (on a scale of 0 to 10), respectively. Customer satisfaction with CFLs (9-10 on a 0-10 scale) has also increased from 37% in 2009 to 55% in 2015. Supplier interviews also found high satisfaction levels with various program elements (which were different for manufacturers and store managers), with overall satisfaction scores ranging from 8.3 (store managers) to 9.1 (manufacturers). Store managers rated the price reductions of select LEDs as the program area they were most satisfied with; manufacturers were most satisfied with the program tracking and verification process, the overall contracting process, the contract duration and the overall RFP process.

Manufacturers were also very satisfied with the program. Manufacturers reported high levels of satisfaction with various program elements. In regards to the "bulb models selected for incentives," a few respondents noted that it would be useful to have more program-qualified bulb types such specialty LEDs (e.g., globes, candles, 3-ways, A19s) and retrofit kits.

Participating retail store managers expressed satisfaction with the Program, but reported less satisfaction with field staff support. Retailers reported more frequent visits and trainings by field staff would be helpful. Upon checking field staff records, implementers had regularly visited the stores from which store managers reported lower satisfaction due to infrequent field staff visits. As store managers are often not the primary contacts for field staff, they are less likely to be aware of times when field staff visit the store.

Retailers are satisfied with the marketing and signage provided by the program, but a few retail store managers (a total of three) suggested that more signage and POP would be useful. On average, store managers reported satisfaction with the marketing and signage provided by the program, and the majority confirmed that they use all the signage provided by Xcel Energy. The only comments related to marketing and signage were requests for more delivery of these materials to the stores.

CFLs and LEDs combined make up the bulk of sales in Colorado, with CFL sales declining and LED sales increasing over the last 5 years. When asked about the bulb types that make up the total number of bulbs that the manufacturer sells in the Xcel Energy territory in Colorado currently, participating manufacturers reported that CFLs made up 30% of the bulbs they sell in the territory on average, while LEDs made up 44%. When asked about and the percentage break-down of bulbs sold by the manufacturers in Colorado in 2010, manufacturers reported that CFL sales declined by an average of 40% between 2010 and 2015, while LED sales increased by 33%.

Energy-efficient bulbs now dominate bulbs produced by participating manufacturers, and are finding increased popularity with customers. Participating manufacturers report that 74% of bulbs they sold within Xcel Energy's service territory were CFLs or LEDs, and also by customers who participated in the in-home lighting inventory choosing energy-efficient bulbs for just over one-half of the bulbs they purchased and stored at home. Additionally, the program appears to be playing a role in increased efficient lighting sales as reported by more than half of store managers attributing the program's marketing and energy-efficient lighting education as an influencing factor in increased sales of efficient non-program bulbs.

Bulb recycling rates increased over time. Forty-one percent of intercept study respondents disposed of a CFL bulb at a recycling center. In 2009, no respondents reported returning bulbs to stores for recycling (although 7% responded to an "other" category).

Emerging technologies and new lighting products present continual opportunities to keep program measure offerings current and appealing to customers. Staying on top of new technologies, as Xcel Energy has done with LEDs, can continue to attract new participants and create opportunities to capture

more energy savings. There are also other LED products discounted through other upstream lighting programs (nightlights, holiday lights, flexible contour lighting strips, etc.) that could be evaluated for cost-effectiveness and customer demand. Options for other technologies include home-automation with lighting, such as Wi-Fi LED bulbs that connect with smart home technologies, like Wink.[3]

Conclusions and Recommendations

In addition to many successes and goal achievements, Cadmus' evaluation revealed a few opportunities for program improvements. This section summarizes conclusions drawn from multiple research activities and provides potential areas that Xcel Energy could explore to further refine program operations or expand program benefits.

***Conclusion*: The Home Lighting and Recycling program has been highly successful, as measured by multiple metrics.** In 2014, despite the substantial increase in program goals since 2010, the Program achieved unit sales and kWh savings targets. The program also successfully addressed market changes through additions of new retailers and products (particularly LEDs) over time. Additionally, program staff reported that marketing efforts and communications between implementation staff have been strong and sufficient to deliver all program activities. Communication within stores from electric department managers to store managers could improve, given the lack of visibility for field staff and services they provide among store managers. Manufacturers also reported high rates of satisfaction, but noted a few areas for improvement including the RFP timeline and the variety of specialty LED bulb models included.

Recommendations:

- In addition to store signage promoting Xcel Energy as a sponsor for markdowns to customers, consider opportunities to gain visibility with store staff beyond the lighting department manager. Where not currently the practice, field representatives could incorporate staff such as store managers into in-store trainings to further engage them with the program and confirm they recognize when field staff have visited. Enhancing store managers engagement and satisfaction with the program will help ensure ongoing retailer program support.

- Review the RFP process to determine if any tools or process changes can support or simplify the application process, making it easier for manufacturers to respond.

***Conclusion:* Retailers would like to receive more marketing and outreach materials and support.** While site visits from field representatives may have been under-reported (since interviewees were not always the lighting department contact), retailers showed room for improvement in satisfaction with the number of site visits and support received from field representatives. This feedback is supported by other upstream lighting programs, that reported larger field staff resources. Retailers also noted that

[3] Wink is a smart home (home automation) platform created in partnership between Quirky and GE to manage and control smart home products made by the partnered companies, such as thermostats and LEDs.

they would like to receive more marketing materials from the program to make sure that customers are educated and aware while in the lighting aisle.

- Consider increasing the number of field staff to increase ability to perform regular site visits, conduct promotional events, and provide resources for retailers.
- Ensure retail locations have sufficient signage and education materials—to the extent allowed by the retailer; it may also be beneficial to discuss additional resources a store location would like to be provided while on site, to ensure materials fit within store guidelines.

***Conclusion*: LEDs are quickly gaining market share in Colorado, competing with CFLs and presenting challenges for pricing and rebate values.** Among participating manufacturers, clear sales trends pointed to a decline of CFL sales and a rise of LED sales over the last five years. Additionally, customer awareness of specialty CFLs did not increase at the same rate over the five years since the last evaluation, as was evident for LEDs. Store intercept survey respondents also found evidence that customers would appreciate a wider selection of Program-discounted bulb models.

Recommendations:

- Continue balancing the mix of LEDs and CFLs offered to optimize the program mix. Clearly, more LEDs would sell with more incentives, however this must be balanced with lower cost measures for cost-effectiveness considerations. One additional measure to consider is "value" (lower cost) LEDs, which would help move the measure mix towards LEDs while helping to manage the cost effectiveness of the program.
- Continue to promote unique features of specialty CFLs, such as dimming and outdoor applications. As LEDs appear to be competing with specialty CFL sales, customers need to understand how different bulb types compare, the relative value trade-offs and feature capabilities.
- Continue to monitor the market to identify other emerging technologies (e.g., bulbs connecting to home automation or specialty energy-efficient bulbs) which prove popular and could be considered for inclusion in the program.

***Conclusion:* Customer awareness of the program remains low.** Research findings indicated customer program awareness levels between 20% and 39%, with customers approached in store lighting aisles reporting higher awareness levels. The 2009 customer survey found that 20% of customers expressed awareness of the Program. Based on these findings, customer awareness of the program has not improved notably over time. Increased customer awareness that Xcel Energy is behind the lighting discounts may increase customer satisfaction with Xcel Energy and increase program uptake. Store managers also reported that they would like to see more marketing and point of purchase (POP) materials that fit with their corporate guidelines.

Recommendations:

- Continue to offer promotional activities beyond stores (e.g., radio plugs, bill inserts).
- Consider working with trade allies to expand program awareness materials in areas beyond lighting aisles (e.g., check-out lines, store windows).
- Consider expanding the amount and type of POP materials where possible. Work with retailers to determine if additional or different types of signage can be displayed.

Conclusion: **Technical assumptions appear out of range compared to benchmarked programs.** As discussed in the benchmarking analysis, the value provided for hours-of-use (HOU) in the technical assumptions for Xcel Energy was 1.9. Since benchmarked values for other upstream programs ranged from 2.2 to 3.0, the HOU may need to be adjusted.

Recommendation:

- Review the HOU used in the technical assumptions to determine if the assumed HOU needs to be updated.

Conclusion: **NTG was calculated to be 79% for CFLs and 91% for LEDs.** The triangulation approach for freeridership, incorporating a demand elasticity model, store intercepts, and supplier interviews, yielded freeridership values of 35% for CFLs and 23% for LEDs. The combined market effects and spillover analysis resulted in 14% lift to the overall NTG.

Recommendation:

- Cadmus recommends using the calculated NTG of 79% for CFLs and 91% for LEDs for future program planning.

Report Overview

The following chapters document the results, methods, and objectives of each research task:

- **Stakeholder Interviews** presents results from Xcel Energy program stakeholders.
- **Customer Surveys** presents results from customers surveyed as part of the home site visit efforts.
- **In-Store Intercept Surveys** provides findings from in-store customer surveys.
- **Supplier Interviews** delivers findings from interviews conducted with program allies (e.g., manufacturers, corporate retail contacts, retail store managers).
- **NTG Evaluation** provides the methodology and results of program freeridership, spillover, and NTG analyses.
- **Benchmarking** presents investigation results for peer residential upstream lighting programs.

Detailed results of the home inventories and the lighting retailer inventory analysis are presented as part of a separate report, the Colorado Lighting Market Study.

Stakeholder Interviews

Interviews with program stakeholders provided the foundation of knowledge for the Home Lighting and Recycling program evaluation. Cadmus gathered data from in-depth interviews with program and account management staff. In accordance with the objectives of this task, this chapter summarizes our interview findings associated with the internal protocols and processes involved in program delivery and administration, as well as with other areas we identified that might inform our data collection efforts for other evaluation tasks.

To evaluate the program's delivery and implementation, and learn about program successes and opportunities, Cadmus conducted several in-depth interviews with program staff. The purpose of this section is to summarize the interview findings associated with internal protocols and processes involved in program delivery and implementation. The interview guides are included in Appendix A for reference. The following program contacts and staff were interviewed as part of Cadmus' evaluation:

- Xcel Energy program staff (May 20 and June 12, 2015)
  - Program Manager
  - Energy Efficiency Engineer (2)
  - Senior Regulatory Analyst
  - Principal Technical Consultant
- Wisconsin Energy Conservation Corporation (WECC) (i.e., the implementer) program staff (June 3, 2015)
  - Program Manager
  - Director of Research and Planning
  - Senior Program Manager for Retail and Energy Star Products
  - Field Manager

Program Description

Xcel Energy's Colorado Home Lighting & Recycling program is intended to achieve cost-effective kWh savings. Through the program Xcel Energy's residential customers can purchase discounted CFL and LEDs through Xcel Energy's partnerships with manufacturers and retailers.

Program History

The program was initiated with a 'soft' launch in 2002 as an extension of an established lighting program in Minnesota. The Colorado program had no budget, was only promoted when free opportunities became available, and offered CFL sales over the web via the Minnesota program. The Colorado program was officially launched in 2006 and was modeled after the Minnesota lighting program, due to economic and demographic similarities between the states. When the program first began in Colorado, Xcel Energy developed individual contracts with retailers and used a coupon-based approach for providing discounts on CFLs. The coupon-based approach was labor and paperwork intensive for both

retailers and Xcel Energy, however, and a significant proportion (i.e., 40%) of the participating retailers dropped out of the program.

In 2007, Xcel Energy moved away from the coupon-based approach (with the exception of Ace Hardware), and towards a buy-down approach. As part of the buy-down approach, Xcel Energy contracted with manufacturers to provide retail stores with a predetermined number of discounted CFLs at an agreed-upon price. Manufacturers shipped the prescribed number and type of CFLs to retailers at the reduced rate, with the agreement that retailers would sell them to customers at the discounted price.

Due to limited ability to track sales with the buy-down approach, Xcel Energy shifted to a mark-down approach in 2008. Under this approach, Xcel Energy contracted with manufacturers to partner with retailers to sell a certain number of energy-efficient bulbs at a discounted price. During the promotional periods, retailers would sell the program bulbs at the reduced price and report back to the manufacturer on their sales, which were then reported back to Xcel Energy. Xcel Energy provided the incentive to the manufacturer, and the manufacturer passed the payment along to the retailer based on the number of bulbs they sold. The mark-down approach was in place with all retailers except Ace Hardware. Ace Hardware was the only retailer still using the coupon-based approach until 2010 when the coupon-based approach was discontinued due to administration cost and complexity.

Current Program Design

Since 2010, Xcel Energy continues to use the mark-down approach, though there have been several key program changes and improvements. These include partnering with WECC to implement the program, eliminating the coupon-based approach altogether, and introducing LEDs to the program. LEDs were first introduced during a market test in 2011 and were formally included in the program portfolio in 2012. Further information on the current program management design is provided below.

Program Goals and Objectives

The objective for the Colorado Home Lighting & Recycling program is to increase energy efficiency in residential homes and achieve energy savings by discounting CFLs and LEDs sold by retailers throughout the state in Xcel Energy's service territory. The primary goals of the program are described below.

Meeting Energy Savings Targets

Xcel Energy's primary goal is to serve as a high-caliber, model program that meets its DSM energy savings targets and contributes significantly to the DSM portfolio energy savings goal. Figure 1 and Figure 2 display the program targets versus actual sales in terms of bulb units and generated energy savings for the 2006 to 2014 period. As shown in the figures below, the targets have been met consistently, despite steady increases each year and the fact that energy savings per energy efficient bulb sold has dropped due to the Energy Independence and Security Act (EISA) which effectively decreased the baseline wattage. According to Xcel Energy staff, program success is built on strong relationships with retailers and manufacturers, effective incentive levels and comprehensive advertising and promotion that drives consumers to stores. When reviewing the cumulative effect, this program

saves customers a significant amount on home energy costs. Part of this success is attributed to the fact that there are minimal barriers to customer participation (i.e., the customer does not need to fill out any paperwork to receive the rebates).

Figure 1. Number of Bulb Units Sold Versus Targets for Program Years 2006 to 2014.

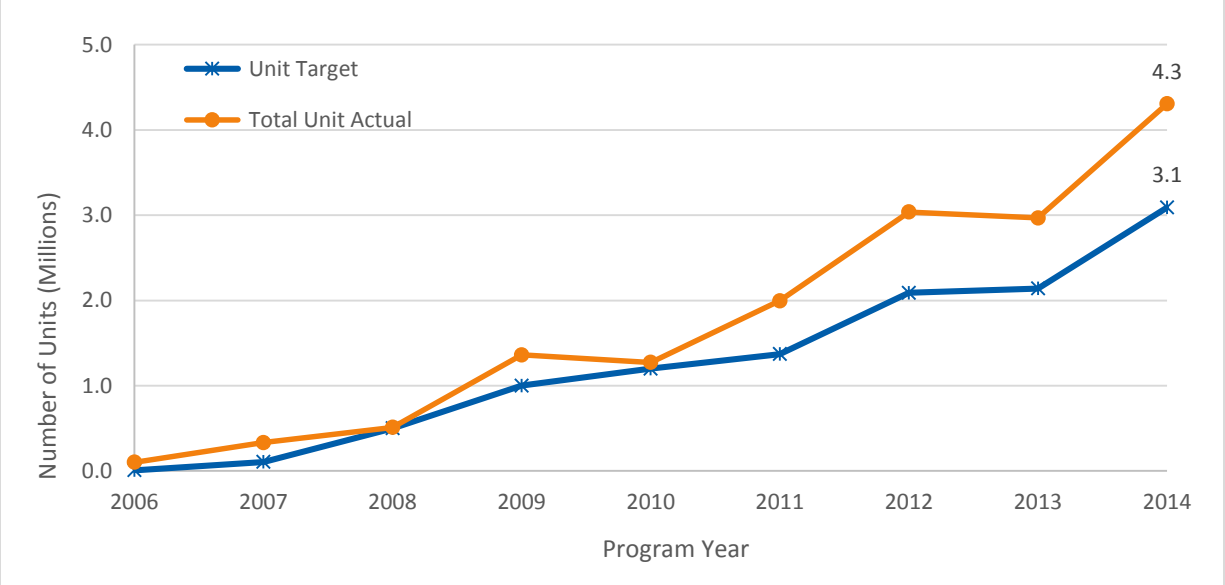
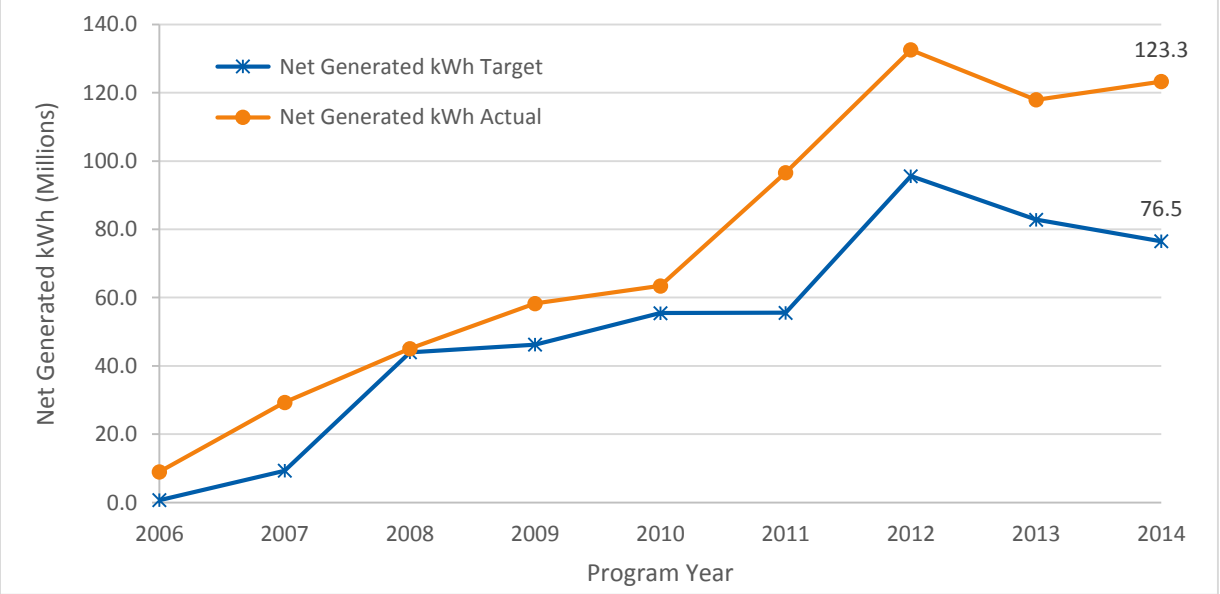


Figure 2. Net Generated kWh Energy Savings Targets Versus Actuals For Program Years 2006 to 2014.



Maintain a Portfolio that Meets Customer Needs and Energy Savings

Xcel Energy and WECC work to create the ideal mix of CFLs and LEDs to ensure that the energy savings targets are met. The program's product mix includes CFLs, LEDs, and specialty CFLs and LEDs. The

proportion of LEDs represented in the portfolio has increased from 1% in 2012, to 3% in 2013, to 16% in 2014. As discussed further in the Market Barriers and Program Challenges section, the program balances bulb type and their associated costs within available program budget.

Program Management and Design

The Home Lighting & Recycling program has been successfully delivering energy savings to Xcel Energy customers since the program was launched in 2006. Since that time, the market for energy-efficient lighting has grown and the program offerings have expanded to include LEDs.

Xcel Energy manages the program's strategic planning and is responsible for the overall success of the program, which includes meeting the energy savings targets. Xcel Energy partners with WECC, a third-party administrator and implementer of the program. WECC manages the program administration, recruiting, field representation, data tracking, and promotional implementation. As the goals and time requirements for the program have increased each year, WECC has taken on increasing levels of responsibility to comprehensively implement the program and assist Xcel Energy with strategic planning.

Each year WECC issues a Request for Proposals (RFP) to manufacturers and retailers to join the program. The RFPs are issued during the fall to allow the incented products to be on store shelves by the following January of each calendar year. The RFP recipients include those that are currently successful partners in the program as well as those that have expressed interest in the program but have not yet been involved. As part of the RFP process, most retailers partner with manufacturers, who submit responses to the RFP on their behalf. To ensure that the retailers on the proposals are interested in the program, the RFP paperwork requires signatures from both the retailers and manufacturers. The proposals include a product list, pricing, and other store-related information to set them apart from other retailers (e.g., commitment to the program, marketing and signage support, wide product selection, competitive pricing, number of storefronts, and storefront geographical and demographic distribution). WECC typically receives between 40 and 60 proposals each year. After receiving all of the proposals, they are initially reviewed by WECC, which makes recommendations to Xcel Energy on the partners that provide the best opportunities for energy savings, offer the products they are promoting through the program, have competitive pricing, and have widespread stores.

Once the participant list has been finalized, WECC creates individual contracts with the retailers, which then follow through on discounting their products. Xcel Energy works with WECC to determine the average price per bulb. WECC then creates a matrix to determine the price for each bulb type to meet that average price and stay within budget. Determining bulb discounts involves front-end research to ensure that the program is not over- or under- incentivizing bulbs.

WECC has one full-time field manager who works directly with retailers. The field manager meets with potential retailers (particularly independent stores) to inform them of the program and get them involved. For participating retailers, the field manager visits the stores, ensures that there is proper signage and marketing near the products, and verifies that the products are listed at the correct prices. Figure 3 shows an example of the Xcel Energy signage on display in the aisles. The field manager also

ensures that the products have the ENERGY STAR logo permanently affixed to the products, and not just on signage. The field manager will visit the stores weekly (or sometimes daily if needed) to ensure that the signage and prices are correct. If the product is supposed to be on mark down and it is not, or if the ENERGY STAR logo is not on the product, the field manager enters that information into Customer Relationship Management (CRM) software on a field laptop computer. That data is immediately sent back to other WECC staff members who contact the store and ensure that the pricing and signage are corrected.

Figure 3. Xcel Energy's Promotional Signage for CFLs and LEDs Participating Retailer in Boulder, Colorado

Role and Impact of Other Programs

In addition to the Home Lighting and Recycling program, lighting measures are offered through several other Xcel Energy programs, including: Home Performance with ENERGY STAR , School Education Kits, and low-income programs including Multifamily Weatherization and Non-Profit. Lighting measures may be offered as incentives for other programs as well. For example, customers working through the Refrigerator & Freezer Recycling or Home Energy Audit programs, ENERGY STAR New Homes, or the Saver's Switch program may receive lighting measures. If lighting measures are provided through another program, the energy savings are attributed to that program. The technical assumptions behind the savings calculations are uniform across programs in Colorado.[4] Xcel Energy works to combine efforts among the programs, particularly for promotional materials or bill inserts, and also for limited-time

[4] The technical assumptions differ if the program involves direct install. For direct installs, Xcel Energy uses the actuals for the baseline rather than a deemed baseline because they know how many bulbs were installed.

promotions or give-away events (see the Program Promotion and Marketing section for more information).

Program Processes

Reporting

Retailers submit monthly reports to WECC[5] containing bulb sales data including the number, Stock Keeping Unit (SKU) codes, the types of bulbs sold at each retail location, and an invoice for the amount of incentives that had been credited to customers during that reporting period. Retailers with multiple store locations submit one sales report to WECC for all stores. Upon receiving the sales reports, WECCs team conducts a quality assurance/quality control (QA/QC) check to ensure that the SKUs, numbers, and prices are accurate and match the information in the original contract with the retailer. If there is an issue with the data, WECC will consult with the retailer and receive a revised report.

After all of the data have gone through the QA/QC process, WECC provides Xcel Energy with a monthly aggregate summary report of the data. Following receipt of the monthly reports, Xcel Energy's Program Manager conducts additional QA/QC prior to entering the data into an Xcel Energy sales tracking database—Salesforce—that other staff members can query. Once or twice per year, Nexant will conduct verification of the reports.

Communication

Xcel Energy staff regularly communicate internally verbally or via email about program achievements and expenditures. Xcel Energy and WECC staff members also regularly communicate about the program. Weekly meetings are held between WECC and Xcel Energy staff to discuss program objectives, goals, opportunities, and budgetary allocation. Monthly sales process meetings are held to learn about any outstanding issues. WECC and Xcel Energy meet quarterly to discuss the budget and communicate savings. If there is ever an issue, WECC will reach out to Xcel Energy and organize a meeting if needed. In addition, WECC has a real-time outreach tool that they use to communicate with Xcel Energy staff. WECC staff (particularly the field manager) is the primary contact for retailers and manufacturers. Overall, WECC feels that the level of communication has been working well.

Data Tracking

Xcel Energy and WECC no longer offer bulb discounts through the use of coupons at any retailer. This approach had previously allowed Xcel Energy to obtain customer information. However, the coupon-approach was resource and labor intensive, and based on retailer feedback, coupons were eliminated from the program entirely. Currently, the extent of data collection includes the number and types of bulbs sold by retailers per location. Customer data, including who bought the bulbs, how many were

[5] According to WECC staff, approximately 85% of retailers submit reports automatically each month. For the remaining 15% of retailers, some may submit reports bi-monthly, though with others, WECC may need to follow up with the stores to ensure that the reports come in.

installed, and the purpose of the bulb purchase, are not collected or tracked due to the nature of this upstream offering.

Program Promotion and Marketing

To promote the program and increase energy savings, Xcel Energy holds give-away promotions throughout the year. Prior to events, Xcel Energy creates flyers and marketing materials to inform customers. The number of events held each year varies depending on how close they are to achieving their energy savings target. If it looks like the savings target may be difficult to reach through sales alone, Xcel Energy may hold more giveaway events. In 2014 there were six events where Xcel Energy gave away a total of 199,129 bulbs. Compared to previous years, Xcel Energy gave away 115,000 bulbs in 2013 and 200,574 bulbs in 2012.

The primary promotional event in 2014 was held at a Colorado Rockies baseball game. During the game there was extensive marketing of the program throughout the stadium, and Xcel Energy gave away approximately 30,000 bulbs to attendees along with literature on LEDs. If attendees installed the bulb at home and it lit up a non-standard color (e.g., red or green), the attendee could win a prize such as a free ticket to a game or a meet-and-greet with a Colorado Rockies player. As shown in Figure 4, Xcel Energy's promotions are also advertised on the Colorado Rockies website.

Figure 4. Screenshot from the Colorado Rockies Website Regarding Upcoming Promotional Events*

*Colorado 2015 Promotions. http://colorado.rockies.mlb.com/schedule/promotions.jsp?c_id=col. Accessed on June 10, 2015.

Market Barriers and Program Challenges

During the stakeholder interviews, staff discussed program barriers and challenges to achieving energy savings.

EISA Legislation and Increased Market Penetration

The Energy Independence and Security Act (EISA) was enacted by Congress in 2007. Under Title III of EISA (Energy Savings through Improved Standards for Appliance and Lighting) light bulbs were required to be 25% more energy efficient by 2014 and 200% more efficient by 2020. Because the legislation changed the maximum wattages allowed, the baseline wattage changed from 60 and 40 watts for incandescent bulbs to the equivalent halogen bulb (43 and 25 watt, respectively), which reduced energy savings by 30%.

Xcel Energy staff noted that since the enactment of EISA, market saturation of energy efficient bulbs has significantly increased, and is approaching 30% penetration. While CFLs and LEDs are now easier to sell

to customers, as saturation increases, the energy savings opportunities for Xcel Energy are potentially reduced due to:

- Fewer available sockets remaining per household needing retrofit, and
- A higher likelihood for freerideship with lower cost bulbs, affecting the net-to-gross (NTG) ratio.

This makes it more challenging for Xcel Energy to achieve their targets. Despite this challenge, however, Xcel Energy and WECC continue to meet their annual energy savings targets, as shown in Figure 1.

Declining Incremental Costs

Since the enactment of the EISA legislation, the halogen bulb is the new baseline. The new baseline bulb also decreased incremental costs (since halogen bulbs are more expensive than standard incandescent bulbs), requiring a reduction in rebate amounts in order to maintain the goal of the incentive being equal to 50% of incremental costs. Xcel Energy staff indicated that this has resulted in Xcel Energy having less influence on customer purchases, since the price difference between program and non-program bulbs has decreased.

According to WECC staff, some retailers will not participate in the program if the incentive is less than one dollar–this is particularly true for deep discount stores and grocers. WECC staff noted the difficulty in justifying higher incentives for CFLs. Therefore, to overcome this barrier, WECC uses lower incentives for large volume retailers.

Meeting LED Demand

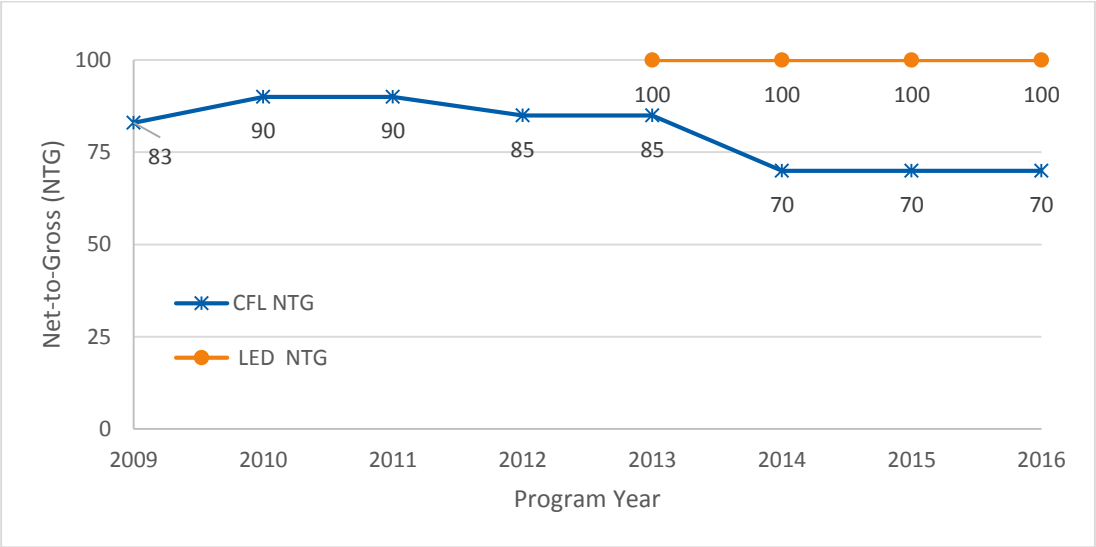
WECC staff noted that a key challenge is matching LED demand with the budget. In 2014 and 2015, retailers in Colorado expanded LED shelf space and displays at the expense of CFLs. This is great for some consumers, though LEDs are still more expensive compared to CFLs and may not be attainable for many customers. In general, WECC has been seeing fewer CFLs on retailer shelves in Colorado. This past year in 2014, Xcel Energy increased LEDs in the portfolio mix to 16%; however, WECC staff members believe that LEDs could comprise an even higher proportion in the mix if meeting demand was the primary consideration.

The challenge in meeting the LED demand is attributed to a limited budget. Xcel Energy works diligently to keep its DSM programs cost-effective. To do this, Xcel Energy selects the most popular and cost-effective bulbs to include in the program. Because of the high cost of LEDs, Xcel Energy has limited its LED incentives.

Estimating NTG

To inform planning efforts, Xcel Energy estimates program energy savings several years out, which is challenging. The NTG for program years 2009 through 2016 are shown in Figure 5.

Figure 5. NTG for Program Years 2009 through 2016*



*2013 is the first year of NTG for LEDs following their introduction to the program.

Retailer Staff Retention

Retailers generally have a higher turnover rate and Xcel Energy staff noted the challenges associated with keeping retailer staff and managers knowledgeable about the program. Having knowledgeable staff in the stores is key to marketing the program, increasing bulb sales, and ensuring that promotional signs are appropriately placed and visible.

Recruiting Independent Retailers

Recruiting and engaging independent retailers to the program is a challenge that was noted by both WECC and Xcel Energy staff. To overcome this barrier, WECC's field manager will visit independent retailers to inform them of the program and its benefits. WECC staff discussed their success in working with an independent retailer in Boulder, Colorado (McGuckin Hardware), in particular (see Figure 3 for signage example). The WECC field manager attributed the program success for this independent retailer to long-term employee retention, knowledgeable retailer staff, and customer engagement.

Customer Surveys

Introduction

The Cadmus team conducted 70 home visits during the summer of 2015 with residential customers in Xcel Energy's territory in order to gather information on the types of lighting installed and to ask customers about their lighting familiarity, satisfaction, and bulb type preferences. The team implemented a recruitment survey, and then scheduled participants for the home inventory study, with the following objectives:[6]

- Estimate the saturation and penetration of efficient and non-efficient bulb types in the Xcel Energy service territory, by home and room type;
- Estimate program participation and the participants' distribution of bulb packs purchased in past 12 months;
- Assess what types of bulb customers say they would purchase if LEDs were unavailable;
- Compare 2015 saturation and penetration results to the 2009 inventory results; and
- Evaluate program awareness and familiarity with different bulb types.

To achieve these objectives, the Cadmus team designed three data collection efforts: 1) a survey implemented as part of recruitment efforts, 2) an on-site survey, and 3) an on-site home lighting inventory. We used the surveys to collect data on awareness and level of familiarity with efficient lighting products, satisfaction, and lighting preferences. During the home inventory, we documented specific identifying information for each lamp in the home, including those in storage.

This memo provides an analysis of the results from the customer surveys and home inventories as they inform the program evaluation. Detailed information on the home inventory results are presented in the Colorado Lighting Market Study.

Methodology

Sampling

The Cadmus team recruited participants for an on-site inventory by telephone using a random sample of customers provided by Xcel Energy. We set recruitment targets for single-family and multifamily homes to ensure that the sample is representative of the ratio of these home types in Xcel Energy's customer population. Based on a recent Xcel Energy telephone survey, the team identified that 80% of the Xcel Energy customer base live in a single-family home, and 20% live in a multifamily home; thus, the team targeted 56 single-family and 14 multifamily site visits for the home inventory study (see Table 2).

[6] Customer surveys and Home Inventory tasks also provided inputs for the Colorado Lighting Market Study (separate from this report).

Table 2. Sample for Home Inventory Site Visits

Home Type	Target	Complete
Single-Family	56	56
Multifamily	14	14
Total	**70**	**70**

The Cadmus team requested a representative sample of 7,000 residential customers from Xcel Energy. We analyzed the geographic locations of that sample across the state to optimize the cost-efficiency of on-site inventory data-gathering activities. Since 95% of Xcel Energy customers are located in the Colorado Front Range region, we focused site visits in that area.

Data Collection

The Cadmus team used two survey tools, outlined below, to collect data, in addition to the bulb inventory data collected on site, also outlined below.

Recruitment Survey

While recruiting for the on-site surveys, the team asked a few preliminary questions to gather information about customer familiarity with different lighting technologies and their program awareness.

On-Site Interview

The on-site team administered additional survey questions of inventory participants during the home site visits. We asked these questions as the first task performed on-site to familiarize customers with the purpose of the site visit. These questions included information on participant familiarity with different lighting technologies, lighting purchases in the last year, disposal of efficient lighting technologies since 2009, satisfaction with various lighting technologies, and demographic information. The field technicians recorded survey responses in Cadmus' proprietary iPad data collection tool.

Overarching Findings

Below are some key findings from the home inventory site visits surveys:

- **Nearly 80% of surveyed customers did not know that Xcel Energy provides discounts on energy-efficient lighting.** This implies that 20% of customers are aware of Xcel Energy's Home Lighting & Recycling program. This is the same rate of program awareness found in the 2009 study (20% of customers were aware of the Home Lighting & Recycling program).
- **The majority (68%) of customers reported being "very familiar" with CFLs**. In comparison, just over one-quarter of customers (26%) reported being "very familiar" with LEDs.
- **Overall satisfaction with CFLs and LEDs tended to be high**, with mean satisfaction scores of 8.2 and 7.5 (on a scale of 0 to 10), respectively.
- **In the past 12 months, 73% of surveyed customers reported purchasing CFL lamps, and 35% reported purchasing LED lamps**, while only 33% reported purchasing incandescent or halogen

lamps. Across the 70 sites, the average household purchased 4.2 CFLs in the past year, and 3.3 LEDs. The average number of LEDs purchased is largely driven by three sites; excluding these early adopters, the average household purchased 1.4 LEDs in the past 12 months.

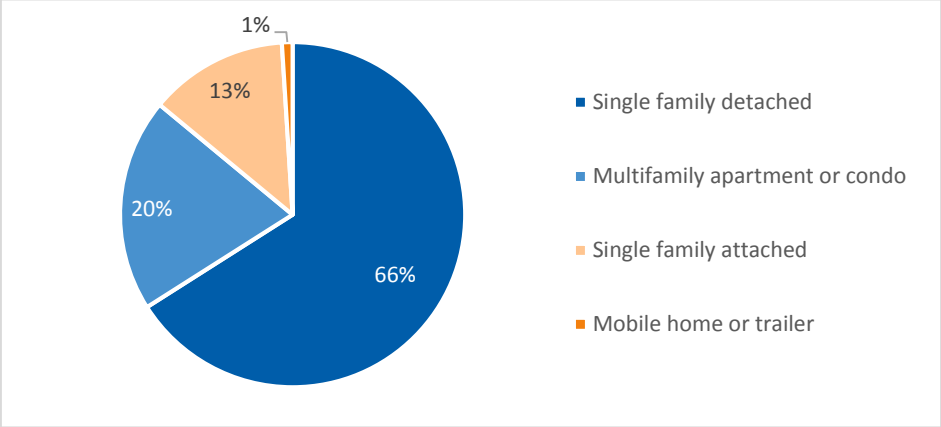
- **In 2014, 88% of customers reported purchasing lamps at a big-box store** (such as Home Depot, Wal-Mart, or Lowes).

Survey Results

Home Type and Size

The majority of residential customers who participated in the home inventory site visits own their own home (61%), with 39% renting. As shown in Figure 6, two-thirds of respondents live in a single-family detached home.[7]

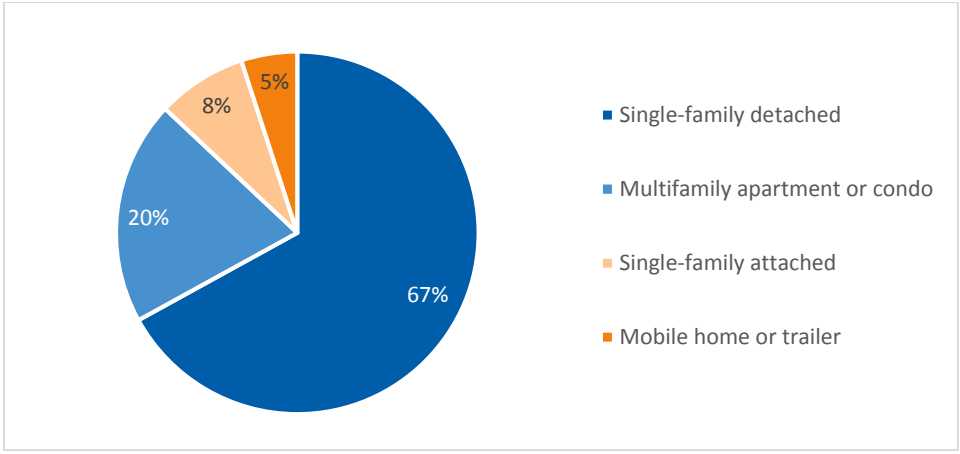
Figure 6. Site Visit Homes by Type



The site visit sample was highly representative of Xcel Energy customers overall as compared to an Xcel Energy's customer survey (see Figure 7), showing that 67% of respondents live in single-family detached housing, and 20% live in multifamily housing.

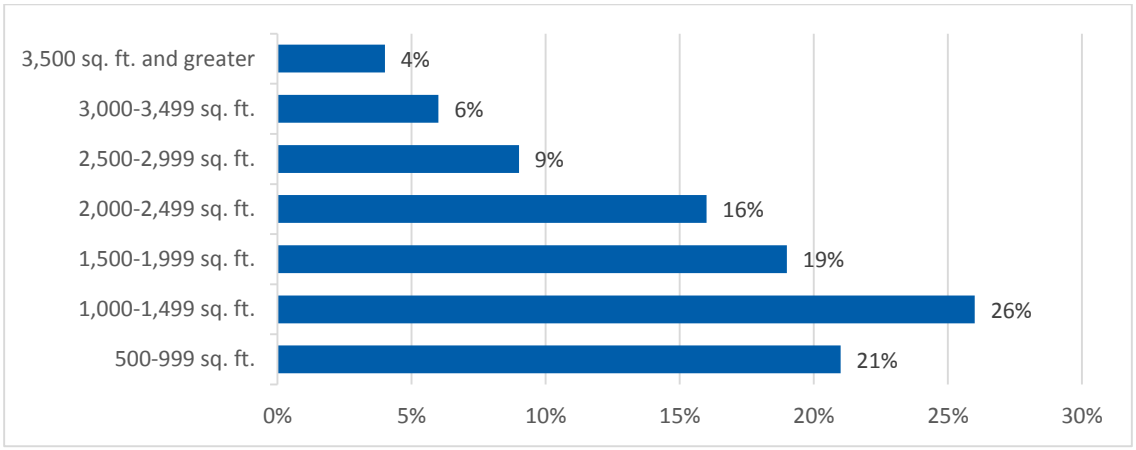
[7] Single-family attached and mobile homes were included in the single-family home type in Table 2.

Figure 7. Customer Home Type (from Xcel Energy Customer Survey)



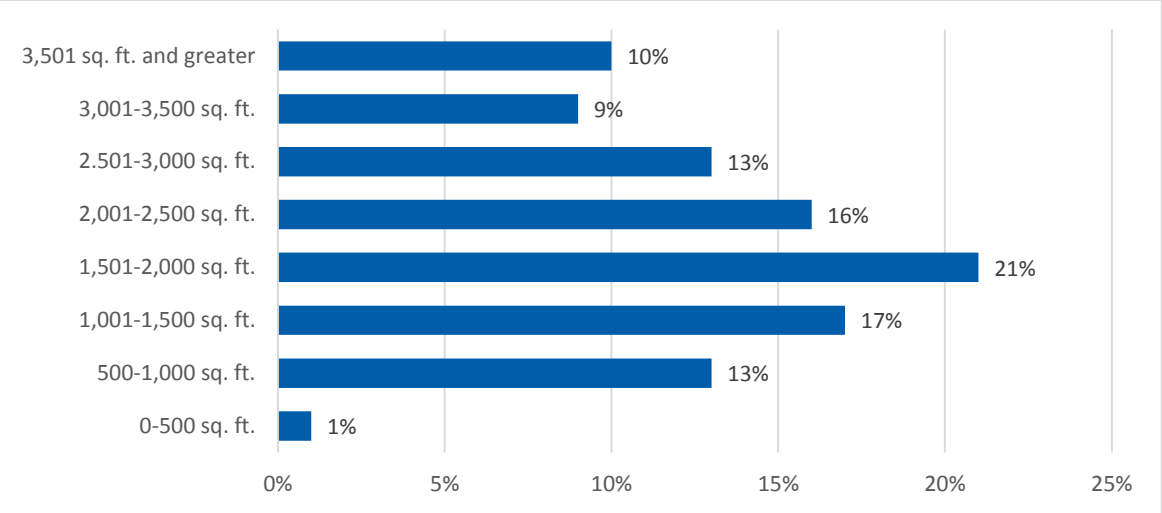
As shown in Figure 8, nearly half (47%) of site visit participants live in homes with less than 1,500 square feet of conditioned living space. Four percent live in a home with 3,500 square feet or more of conditioned living space.

Figure 8. Site Visit Home Square Footage (n=70, Home Inventory Survey)



Results from a recent Home Use Study (conducted in 2014 surveying Xcel Energy customers in Colorado) indicate that 21% of the general population of Xcel Energy customers lived in homes of 1,501 square feet to 2,000 square feet, as shown in Figure 9; and 48% of customers lived in homes over 2,000 square feet.

Figure 9. Xcel Energy Home Square Footage (n=751)*

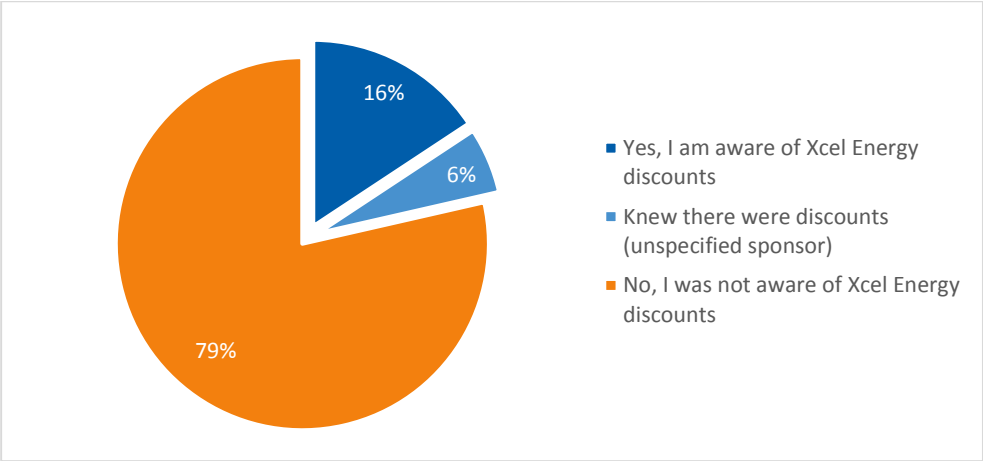


*From Xcel Energy 2014 Home Use Study.

Program Awareness

As with any upstream program, Xcel Energy's role in the Home Lighting & Recycling program is not highly visible to individual customers in the retail market. Among all customers recruited for a site visit, 79% indicated they were not aware of Xcel Energy sponsoring discounts on CFLs and LEDs (see Figure 10), while another 6% were aware that bulbs are discounted, but did not know they are sponsored by Xcel Energy. The remaining 16% were aware of the discounts and knew they are offered by Xcel Energy; this compares to 20% of 2009 survey respondents reporting being aware of the Home Lighting & Recycling program.

Figure 10. Awareness of Xcel Energy Role in Bulb Discounts (n=70)

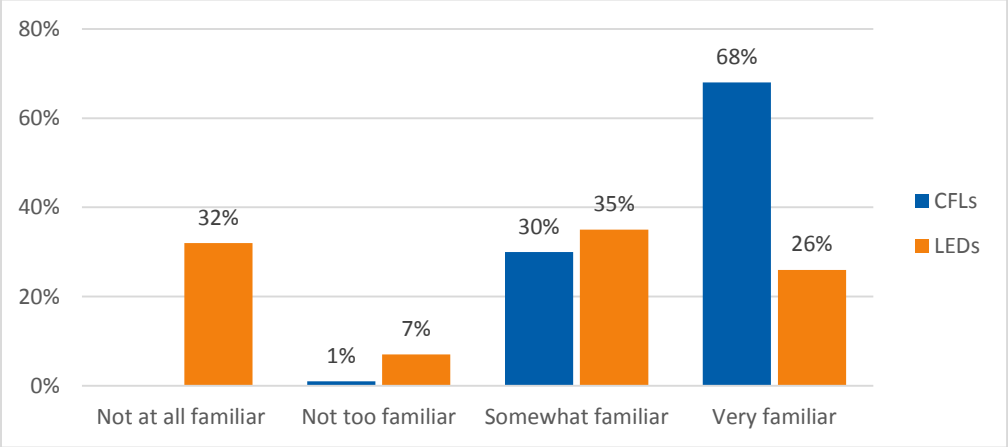


Of those who were aware of the Xcel Energy discounts, five first became aware of these discounts through a general Xcel Energy communication. Others became aware through a newspaper ad, TV ad, store signage, or the Xcel Energy website.

Bulb Familiarity and Satisfaction

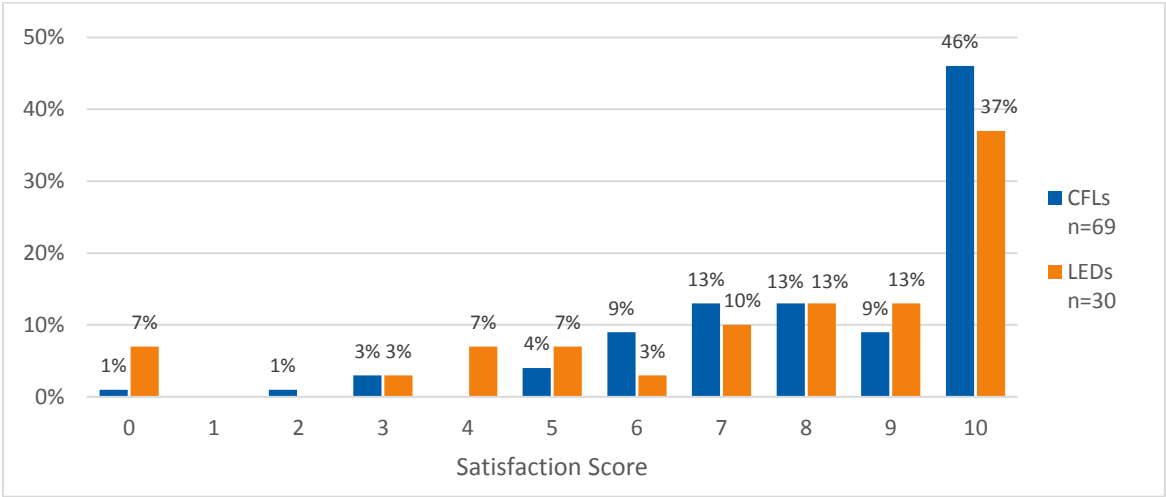
As part of each site visit, the team collected data on participant awareness of different energy-efficient bulb types. As shown in Figure 11, 26% of customers reported being "very familiar" with LEDs, compared to 68% being "very familiar" with CFLs. Results from the 2009 survey for CFL bulb awareness (only CFLs were reported on for the previous evaluation), found that 93% of randomly surveyed respondents were familiar with CFLs, with 43% rating themselves "very familiar."

Figure 11. Customer Familiarity with Energy-Efficient Bulb Types (n=69)



The team also investigated participants' satisfaction with the program measures on an 11-point scale, with 0 representing extreme dissatisfaction and 10 representing extreme satisfaction. As shown in Figure 12, more respondents reported the highest satisfaction scores with CFLs than with LEDs. The mean satisfaction scores were 8.23 for CFLs and 7.53 for LEDs.

Figure 12. Energy-Efficient Bulb Satisfaction Scores



In the 2009 survey, satisfaction for CFLs was also investigated (using a four-point scale) with 74% of randomly sampled respondents indicting that they were highly satisfied with CFLs.

Those who gave low satisfaction scores cited dissatisfaction with the bulbs' light quality, features, and safe usage, as evidenced by the following comments:

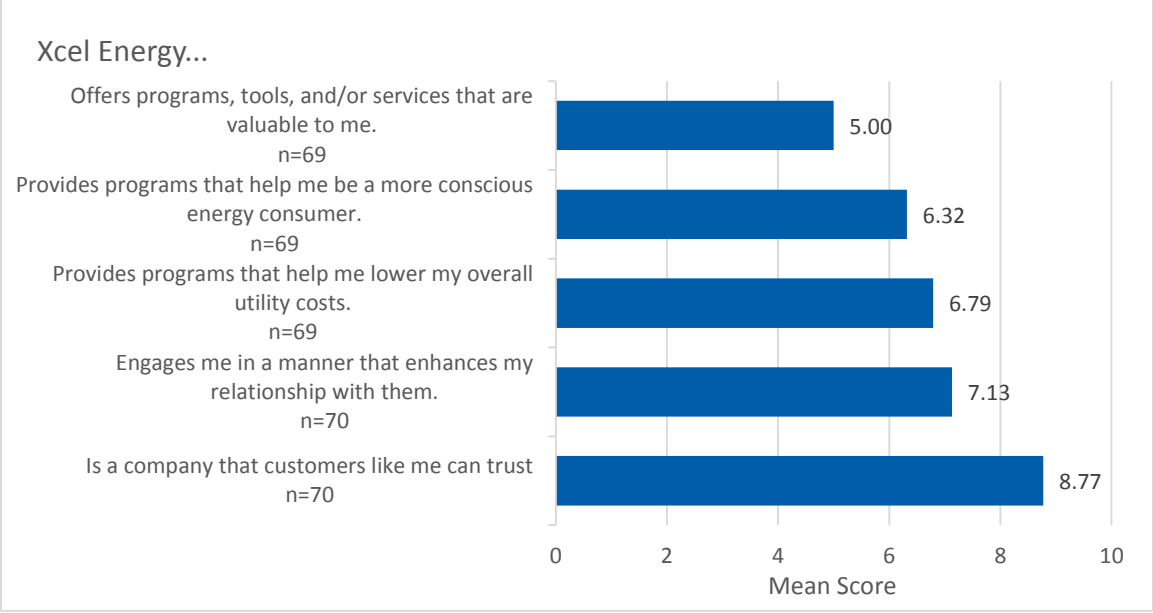
- "Don't think they [energy-efficient bulbs] are safe. I got burned taking one out."
- "I don't have any CFLs. I used them in past, and was unhappy with them."
- "Don't have soft yellowing light. We want to have more natural lighting if it's LEDs."
- "The CFLs didn't dim and would brighten slowly. They don't fit in everything [every type of socket]."
- "LEDs are not bright enough."

Satisfaction with Xcel Energy

The Cadmus team asked participants about their satisfaction regarding customer engagement with Xcel Energy. We asked respondents to rate their agreement with statements about Xcel Energy on a 0 to 10 point scale, with 0 indicating they completely disagree and 10 indicating they completely agree.

Figure 13 shows the mean scores for the different aspects investigated through the surveys. Customers agreed most with the statement that Xcel Energy is a trustworthy company, while they agreed least with the statement that the utility offers programs and services that provided value to them as a customer.

Figure 13. Satisfaction with Various Aspects of Xcel Energy Customer Engagement

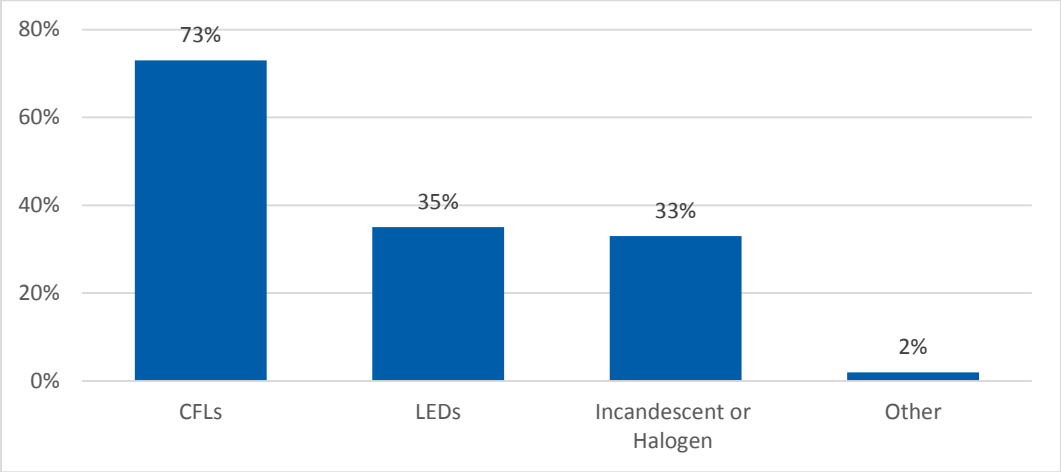


Purchasing Trends

Participants reported that in the past 12 months, the bulbs they most commonly purchased were CFLs (see Figure 14). Nearly three-quarters of respondents reported purchasing CFLs in the past year, with 35% reporting having purchased LEDs and 33% having purchased incandescent or halogen bulbs. In the

2009 evaluation, surveys found that 44% of respondents had purchased at least one CFL in 2008, and 39% in 2009.

Figure 14. Bulb Types Purchased in Past 12 Months (n=60)*

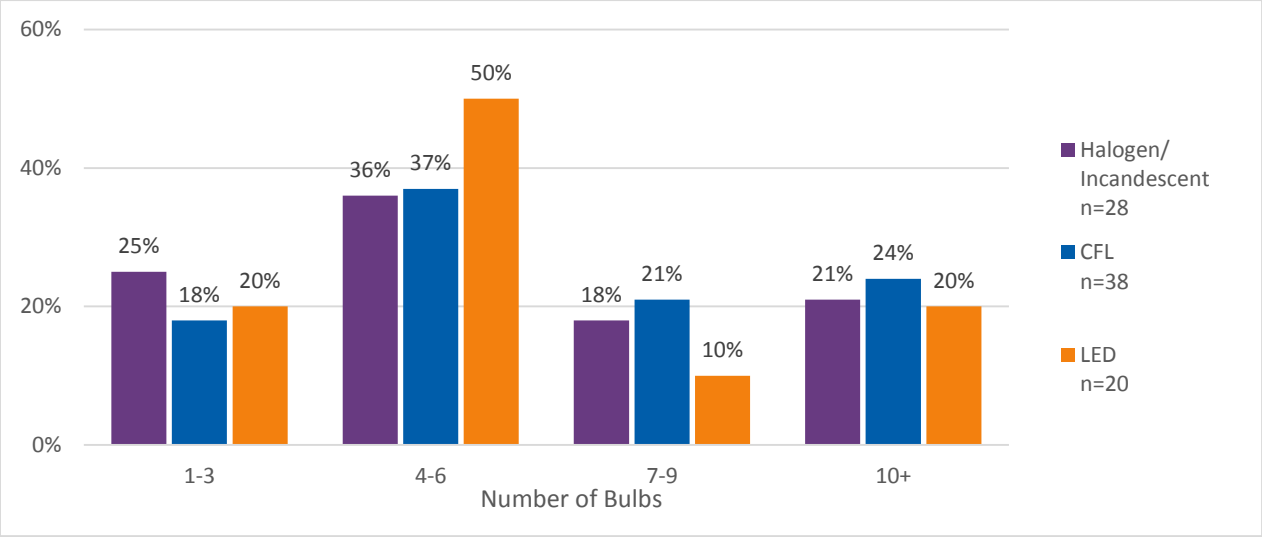


*Percentages do not sum to 100% since customers reported purchasing multiple bulb type over the past 12 months.

The Cadmus team asked respondents who had purchased LEDs in the past 12 months what they would have selected if LEDs were not available. The majority (44%; n=9) said they would have purchased CFLs, while 11% would have purchased halogens. Another 33% of respondents had been specifically interested in LEDs, and said they would have kept looking for LEDs in other stores instead of purchasing another bulb type. One respondent said they look for specific features regardless of bulb type.

As shown in Figure 15, customers most commonly purchased between four and six bulbs in the past 12 months. Of energy-efficient bulb purchases, 45% of customers purchased more than six CFLs compared to 30% who purchased more than six LEDs. Only 14% of participants (n=70) reported purchasing no lightbulbs over the past 12 months.

Figure 15. Number of Bulbs Purchased in Past 12 Months by Bulb Type



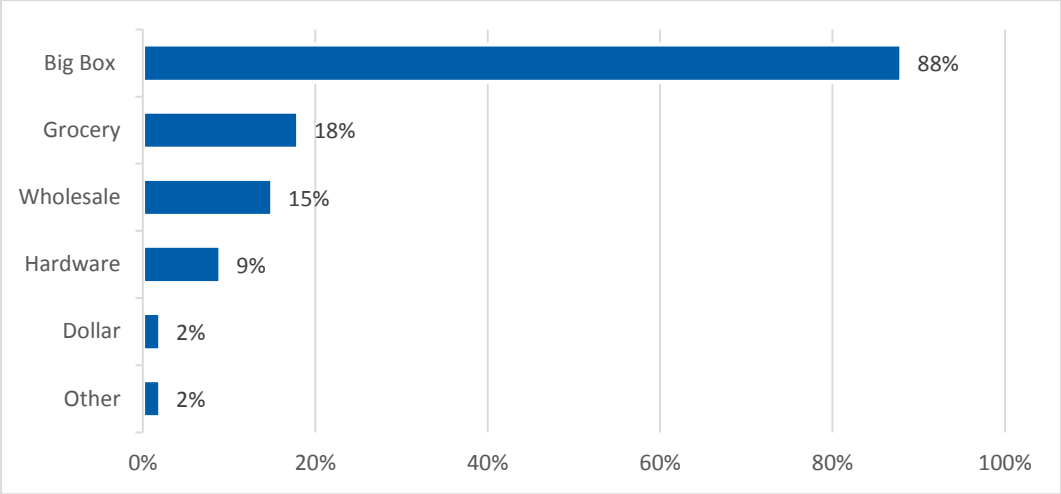
As shown in Table 3, customers most commonly purchased single bulbs for all bulb types. As the most common bulb type purchased, CFLs had the highest number of single and multipack bulbs purchased.

Table 3. Single and Multipack Bulb Purchases in the Past 12 Months by Bulb Type

	Incandescents/Halogens		CFLs		LEDs	
	Single	Multipack	Single	Multipack	Single	Multipack
Customers	20	8	25	16	14	6
Packs	N/A	27	N/A	33	N/A	20
Bulbs	117	70	185	112	159	72
% of Total		**26%**		**42%**		**32%**

As shown in Figure 16, customers most often purchased bulbs from big-box stores, at 88%. Eighteen percent of respondents had purchased bulbs from a grocery store, 15% had purchased from a wholesale store, 9% from a hardware store, and 2% from a dollar store.

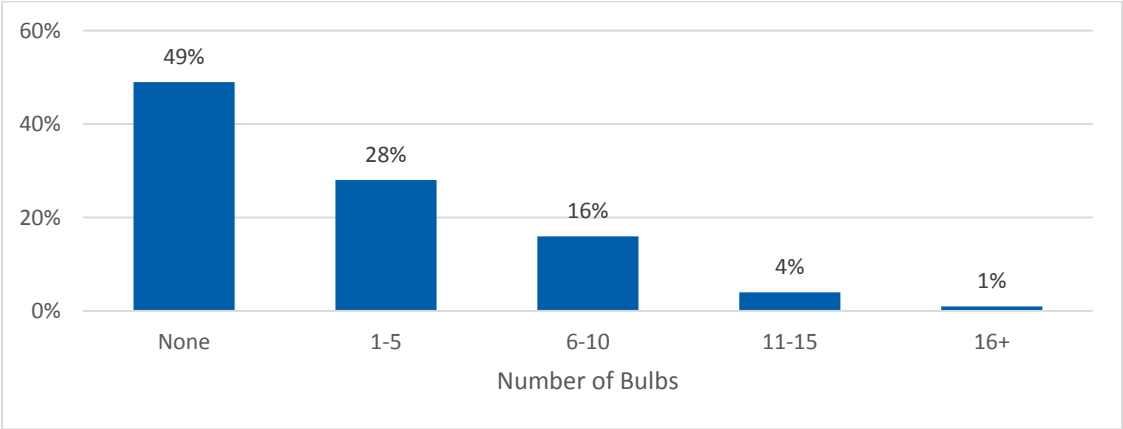
Figure 16. Respondent Purchases of Energy-Efficient Bulbs by Store Type*(n=56)



*Percentages do not sum to 100% since customers reported purchasing bulbs from multiple store types over the past 12 months

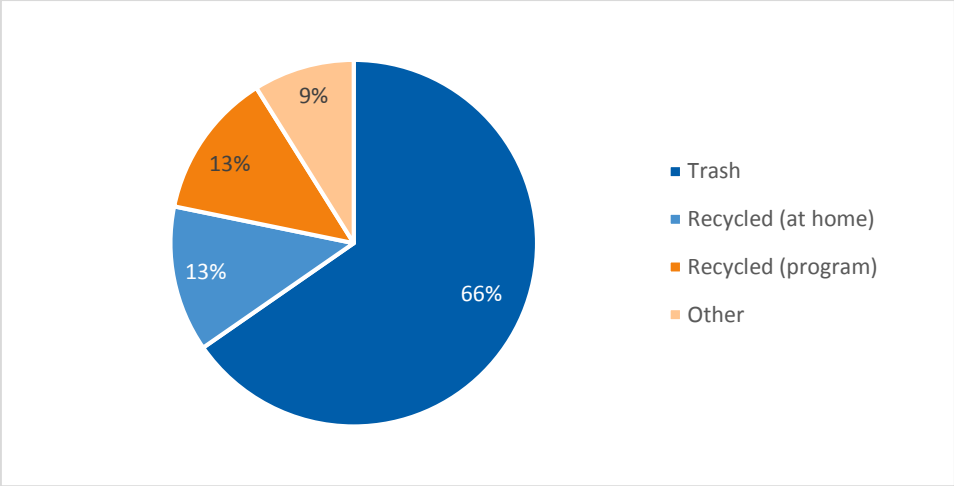
The team asked participants how many CFLs and LEDs they had disposed of or recycled since 2010. As show in Figure 17, nearly half (49%) of participants said they had not disposed of any CFLs or LEDs in the past five years, while 28% had disposed of between one and five. Only 1% of respondents had disposed of more than 15 bulbs.

Figure 17. Number of CFLs and LEDs Disposed of Since 2010 (n=67)



As shown in Figure 18, participants most commonly disposed of energy-efficient bulbs in the trash. Another 13% said they recycled bulbs through the program, and 13% said they put bulbs in their own recycle bin.

Figure 18. Energy-Efficient Bulb Disposal Method* (n=32)



*The team only asked this question of participants who reported disposed of CFLs or LEDs in the past five years.

In-Store Intercepts

Introduction

The Cadmus team conducted 335 in-store intercepts in fall 2015, at 14 store locations.

The team implemented the intercept surveys with the following objectives:

- Document type and count of bulbs purchased;
- Identify factors influencing customer purchases and their importance;
- Measure customers' level of program awareness;
- Measure residential versus nonresidential split of where bulbs will be installed, and
- Gather data to inform NTG calculations.

To achieve these objectives, the Cadmus team designed and implemented a short survey to collect data in-store from lighting customers. This memo provides the findings from this survey and a comparison to data collected in the 2009 evaluation.[8]

Methodology

Sampling

The Cadmus team worked with the program implementer, WECC, to identify participating stores, within a reasonable travel distance for intercept staff, that had sufficient bulb sales to ensure customer foot traffic. As stores gave approval, WECC contacted Cadmus with approved dates and times, which were then used to schedule intercept field staff.

The original target was to collect 20 responses from 20 stores, totaling 400 intercepts. However, after substantial outreach efforts, two large chain stores clearly stated their unwillingness to allow intercept staff on site out of concern for their customers' shopping experience.[9] Initially, few stores provided approval to allow intercept staff to conduct research on site, but by leveraging WECC's store relationships and significant effort from its field staff, the team was able to schedule site visits at 14 stores. Cadmus increased the target of 20 surveys per store to 30 surveys per store for an updated target of 350 surveys. In total, the Cadmus team completed 335 surveys; 96% of the revised intercept target (see Table 4). The team conducted most store visits on Saturdays to ensure enough shopper traffic would be available to meet the targets. As shown in Table 4, we achieved at least 20 responses at all sites except for one that took place on a Friday when shopping traffic was slower.

[8] The 2009 evaluation did not include intercept surveys; however, the customer survey did cover several of the same topics.

[9] A third large chain store was also initially unwilling to participate, but the field representative was able to get cooperation from two locations.

Table 4. Store Intercepts Schedule

City	Date	Target	Collected
Denver	Saturday 10/3	20	20
Lakewood	Saturday 10/3	20	20
Littleton	Saturday 10/17	20	20
Boulder	Saturday 10/17	20	20
Westminster (1)	Friday 10/23	20	20
Westminster (2)	Friday 10/23	20	10
Arvada	Saturday 10/24	30	30
Lakewood	Saturday 10/24	30	30
Greenwood Village	Saturday 10/31	30	30
Parker	Saturday 10/31	25	25
Northglenn	Saturday 10/31	25	25
Thornton	Saturday 11/7	30	30
Westminster	Saturday 11/7	30	30
Denver	Saturday 11/7	30	25
Total		**350**	**335**

Data Collection

The Cadmus team developed the intercept survey to gather information on three categories of bulbs: discounted program bulbs, non-program energy-efficient bulbs (CFLs and LEDs), and non-efficient bulbs (halogens and incandescent bulbs).

Cadmus scheduled customer intercepts to coincide with high-traffic days (most often on Saturdays). We worked with WECC to get approval from store managers for intercept staff to be on site for four-hour blocks of time.

Field staff were stationed in the lighting aisle of the stores and approached customers once they made their selection. In order to meet the targeted number of intercepts, Cadmus arranged for $10 gift cards to be provided as an incentive for customers to participate in the survey, which customers could use the day of receipt toward their in-store purchases.

While we did not factor this into the analysis, it should be noted that at some of the locations, field staff conducted the intercept surveys while Xcel Energy's field staff conducted in-store promotional events,[10] which may have increased customer awareness of the program and associated incentives.

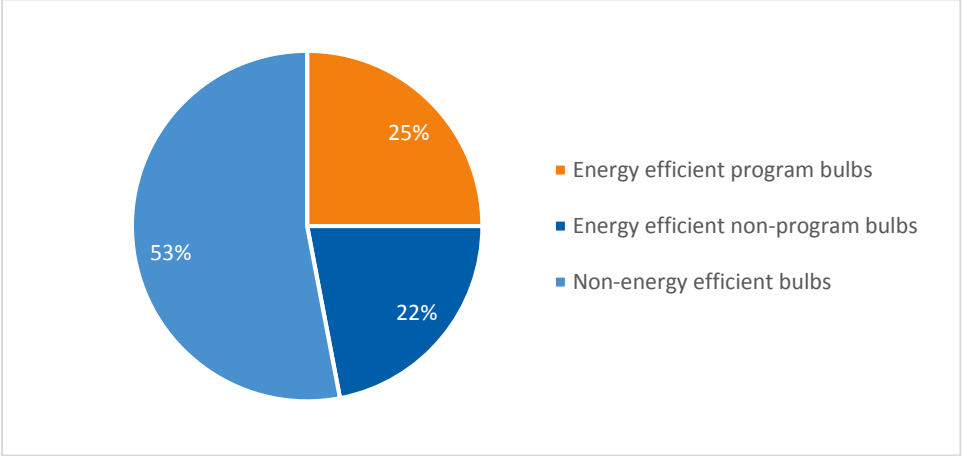
[10] Radio Remote events at three stores overlapped with intercept data gathering activities.

Key Findings

Bulb Sales

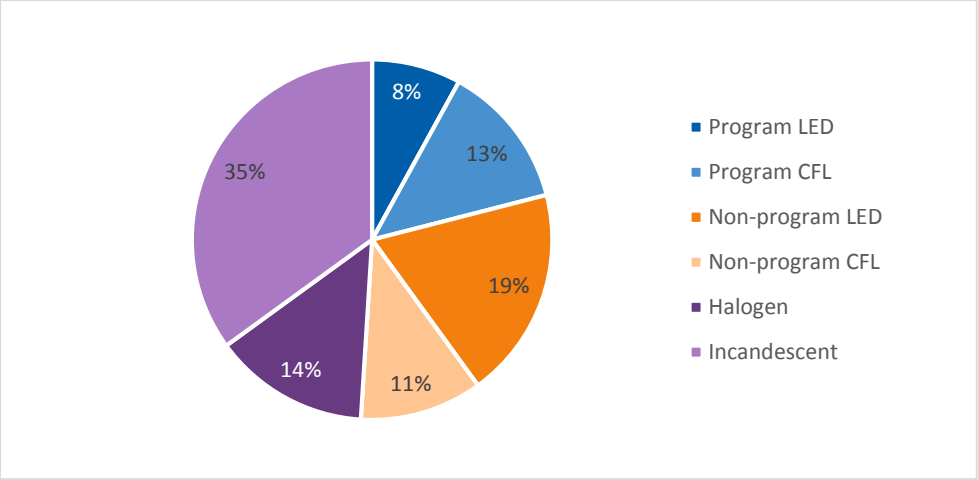
Based on the bulb labeling (the on-shelf stickers identifying discounted bulbs) and assistance from WECC field staff, intercepts field staff assessed whether the bulbs customers selected included energy-efficient program bulbs, non-program energy-efficient bulbs, or standard bulbs (incandescent and halogen bulbs). As shown in Figure 19, one quarter (25%) of the survey participants purchased bulbs identified as program bulbs.

Figure 19. Distribution of Customers by Bulbs Purchased (n=314)



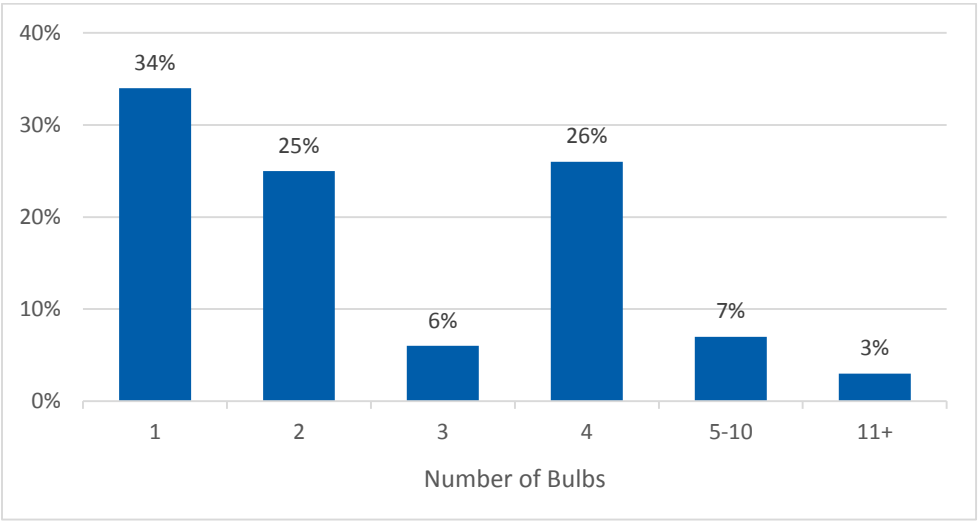
Cadmus analyzed the intercepts data to assess purchase rates of all bulbs, energy-efficient bulbs, and program incented bulbs. Of the 1,097 bulbs purchased during the intercept visits, 541 (49%) were non-energy-efficient and 563 (51%) were energy efficient. Of the purchased non-energy-efficient bulbs, 72% were incandescent and 28% were halogens. Of the 563 energy-efficient bulbs purchased, 53% were LEDs and 47% were CFLs. Of all the efficient bulbs purchased (CFLs and LEDs), 40% of the bulbs were discounted program bulbs. Overall, 51% of bulbs purchased by survey participants (n=1,104) were CFLs or LEDs, and 21% of all bulbs purchased were discounted by Xcel Energy (see Figure 20).

Figure 20. Distribution of Bulbs Purchased by Customers (n=1,104)



Most of the bulbs purchased by survey participants were in a pack of one or two (59%) with an additional 26% in packs of four (see Figure 21); only 10% of bulbs purchased were in packs greater than four. On average, for one shopping trip, all surveyed customers purchased 3.5 bulbs. Those purchasing energy-efficient bulbs also purchased about 3.5 bulbs. Those purchasing program bulbs, purchased 2.9 bulbs per customer.

Figure 21. Number of Bulbs per Pack (r=345, n=331)



The Cadmus team also asked survey participants purchasing program bulbs if they intended to install the bulbs at a residence or business. Data from the intercepts found that 3% of bulbs purchased were intended for non-residential installation. Since the sample of respondents for this question was small, to provide a more robust evaluation Cadmus pulled data from its proprietary benchmarking database to evaluate both the current Xcel Energy estimate for non-residential installations (6%) and the value identified through intercepts (3%). As shown in Table 5, intercept studies for a variety of utilities show a spread from zero to 9% of sales of program-incented bulbs are intended for non-residential use. This

indicates that the current estimate of 6% is comfortably within that range, and Cadmus supports retaining this assumption.

Table 5. Residential vs. Nonresidential Split

Utility	Percentage for Business Use
Xcel Energy (current)	6%
Xcel Energy (intercept data)	3%
Ameren Missouri (2014)	9%
Entergy Arkansas (2013)	5%
ComEd (2014)	3%
Pacific Gas & Electric (2010)	7%
Southern California Edison (2010)	6%
San Diego Gas & Electric (2010)	0%
Average	**5%**

Customers' Reasons for Bulb Selection

Program Awareness

Cadmus also explored the factors that influenced participant customers' purchasing decisions. Thirty-nine percent of the survey participants (n=329) reported that they had been aware of the program's existence (that Xcel Energy was offering discounts on energy-efficient bulbs) before entering the store; 61% reported that they had not been aware. In the 2009 report, 20% of randomly selected sample (RSS) respondents reported being aware of the program.

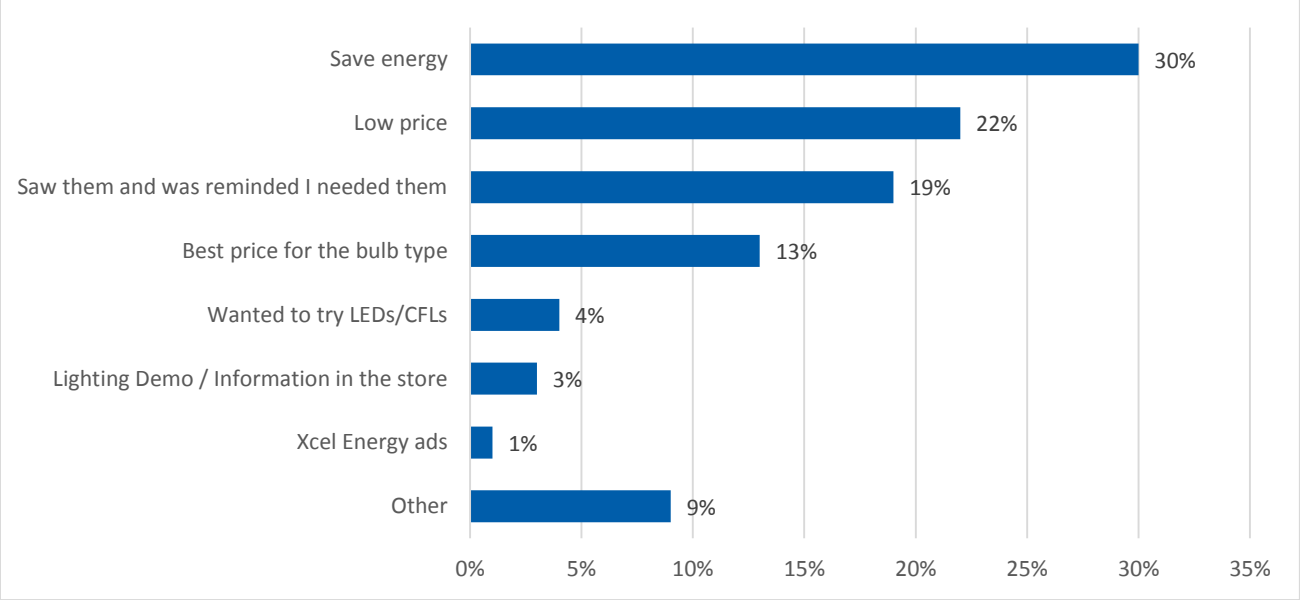
The Cadmus team also asked survey participants purchasing program bulbs if they were aware that the bulbs they purchased were discounted by Xcel Energy; 64% reported that they were aware, and 36% reported that they were not aware.

Factors for Program Bulbs

For survey participants purchasing program bulbs, we asked respondents the following question: "Did you come into the store today specifically to buy energy-efficient bulbs discounted by Xcel Energy"? Slightly over half (56%) answered "yes".

The Cadmus team asked customers purchasing program bulbs what had prompted them to purchase Xcel Energy discounted bulbs that day. As shown in Figure 22, nearly a third (30%, n=79) were motivated to purchase the bulbs in order to save energy. Other common reasons given were the affordability of the bulbs (22%), impulse (saw the display and remembered that they needed new bulbs; 19%), and to take advantage of the lowest price available on energy-efficient bulbs (13%). "Other" responses included matching bulbs already in the home, the color of the bulbs, and selecting bulbs to go with newly purchased fixtures.

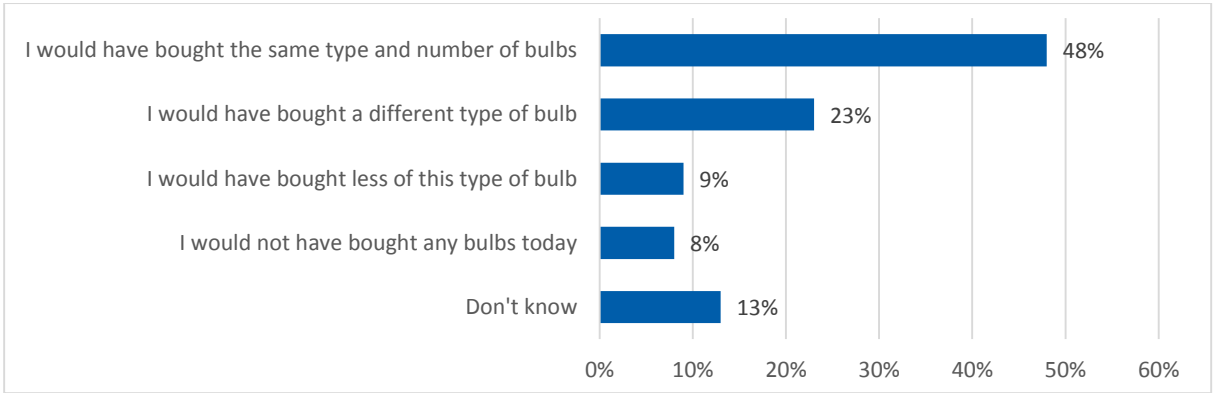
Figure 22. Customer Reasons for Purchasing Program Bulbs (n=79)



For the 2009 evaluation, when asked what factors first motivated respondents to purchase CFLs (the only bulbs offered through the program at the time), the most common response was also to save energy (36%), followed by reducing energy costs[11] (19%) and the bulbs' longer lifespan (17%).

For those purchasing program bulbs, field staff asked participants what they would have done if the discount for those bulbs had not been available. As shown in Figure 23, nearly a half (48%) of the survey participants said their purchase decisions would not have been affected. Just under a quarter reported that they would have bought a different bulb, and 9% reported that they would have bought less of the same type of bulb. A total of 8% of the survey participants reported that they would not have purchased any bulbs at all.

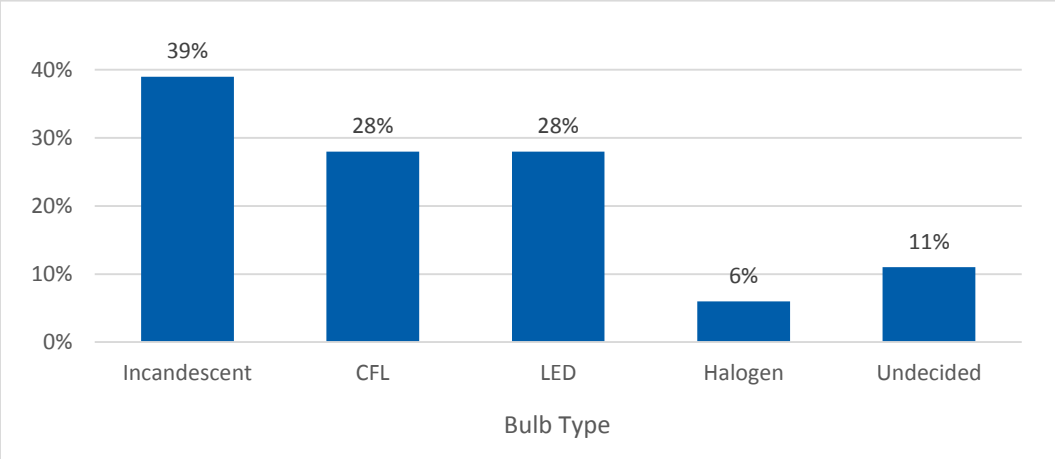
Figure 23. Effect on Purchase Decisions if Discount Had Not Been Available (n=79)



[11] Not offered as an option in 2015.

For those respondents who would have purchased a different bulb type, 39% said they would have purchased incandescent bulbs if the discounted bulbs had not been available.[12] For both LEDs and CFLs, 28% of respondents indicated they would have purchased different efficient bulbs. Six percent of the survey participants said they would have selected halogens, and 11% were not sure what they would have purchased.

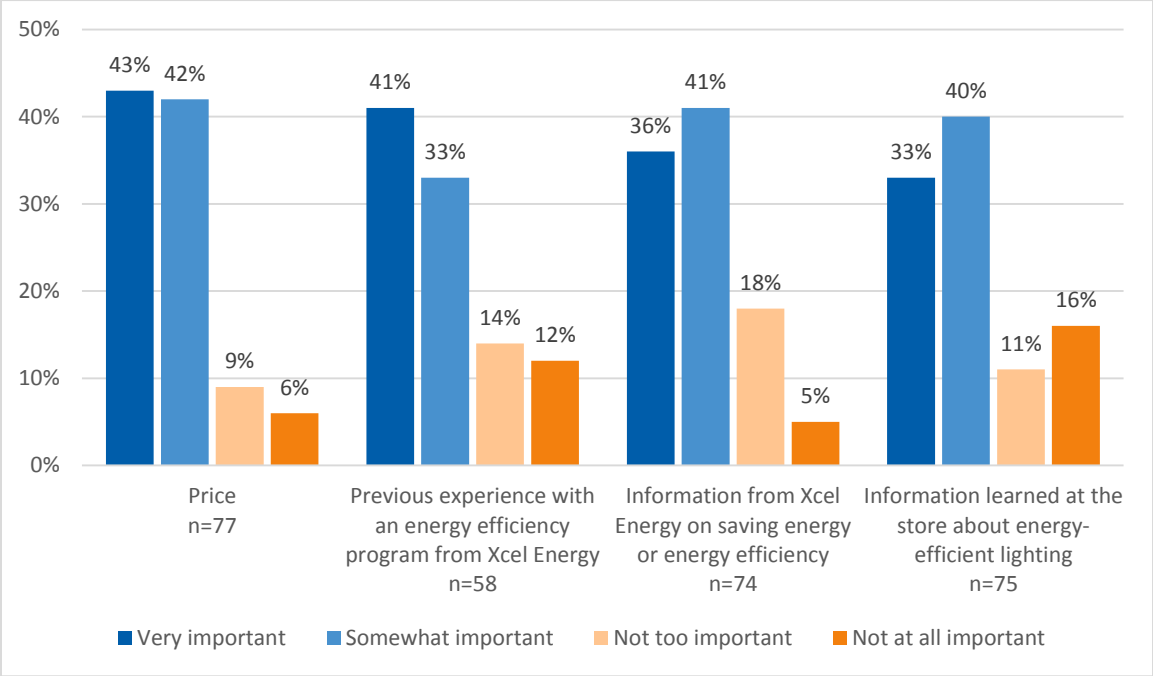
Figure 24. Type of Bulb Customer Would Have Purchased Instead (n=18, r=20)



In identifying what factors influenced bulb selection, the Cadmus team asked survey participants purchasing program bulbs a series of questions to determine the importance of several factors they may have considered. Respondents identified price as the most important of the factors investigated, with 85% of respondents identifying it as somewhat or very important, with 6% rating it not at all important (see Figure 25). The factor rated least important was information learned at the store about energy-efficient lighting, with 73% of survey participants rating this as somewhat or very important and 16% rating it not at all important.

[12] Note that in our experience customers often do not understand the difference between halogen and incandescent bulbs. Further, through the shelf surveys described in the Lighting Market Report, we found that standard incandescent bulbs are no longer widely available.

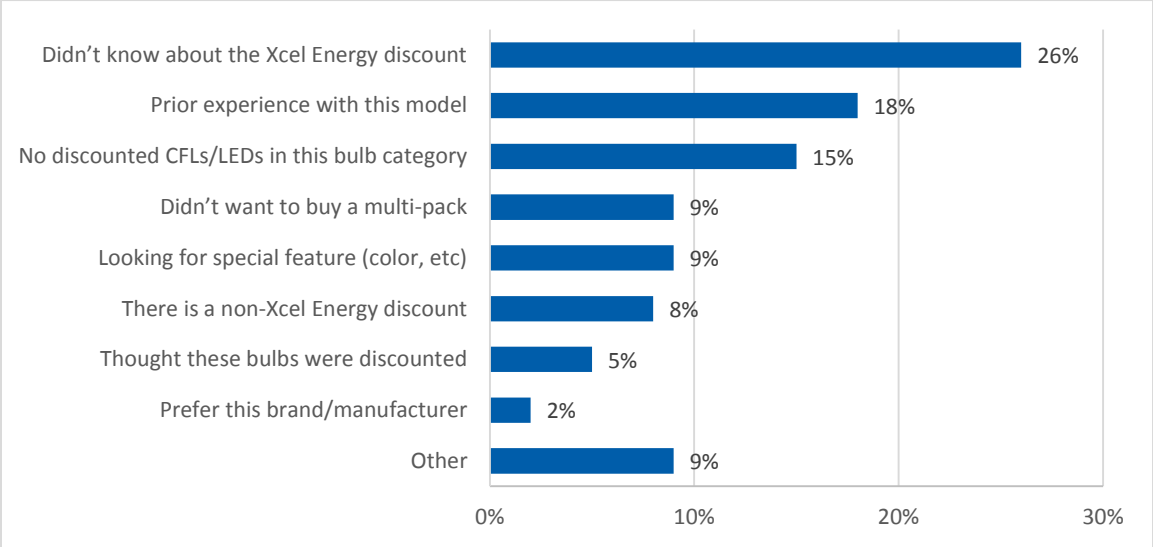
Figure 25. Factors Considered when Selecting Discounted Bulbs



Factors for Nonprogram Bulbs

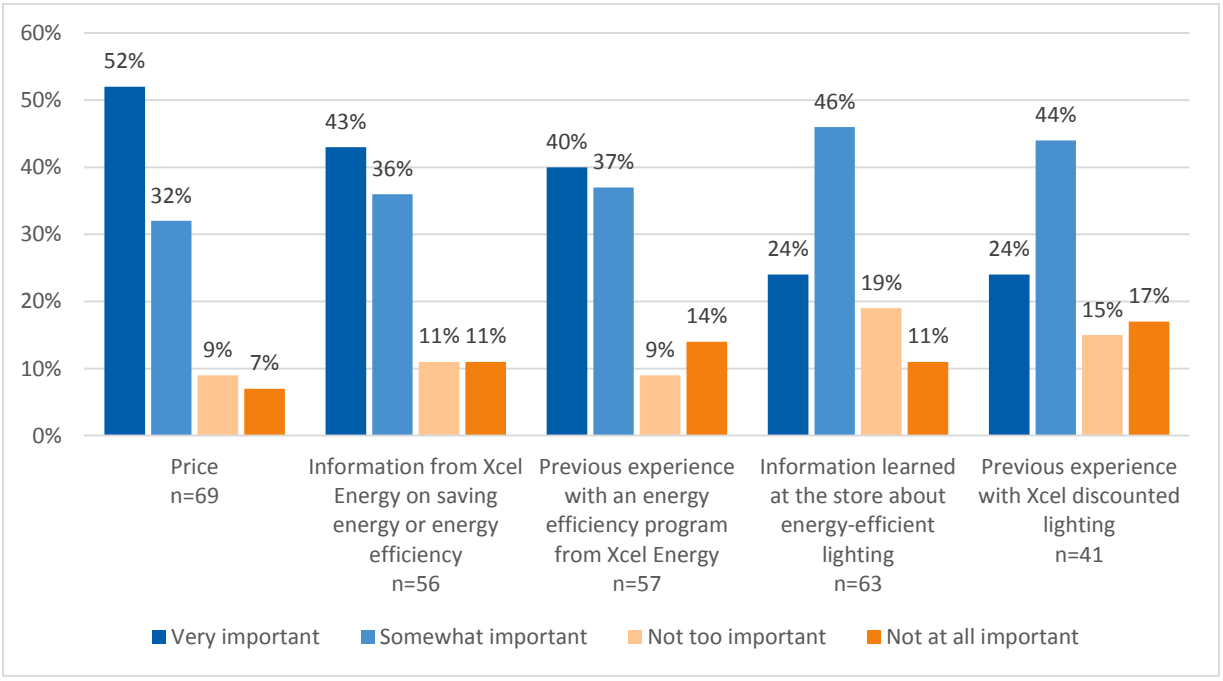
The Cadmus team asked survey participants purchasing non-program bulbs to identify why that had chosen those bulbs. Over a quarter (26%) of respondents reported being unaware of the Xcel Energy discounts. Other common responses were that the respondents had prior experience with the model they were purchasing (18%) and that there were no discounted options in the bulb category they needed (15%).

Figure 26. Customer Reasons for Choosing Non-program Bulbs (n=66)



In identifying what factors influenced bulb selection, the Cadmus team also asked survey participants purchasing non-program bulbs a series of questions to determine the importance of factors customer may have considered. As with respondents purchasing program bulbs, price continued to be the most important factor for respondents purchasing non-program energy-efficient bulbs (see Figure 27), with 84% of respondents rating it as somewhat or very important. These respondents ranked previous experience with Xcel Energy's discounted lighting as the least important factor; in total, 68% of respondents rated it somewhat or very important, and 17% rated it as not at all important.

Figure 27. Factors Considered when Selecting Non-program Bulbs

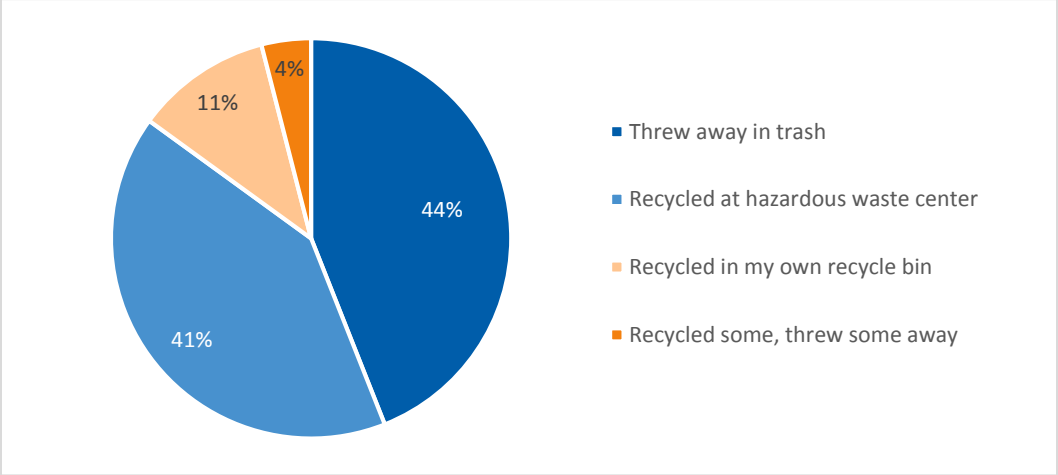


Bulb Disposal

Cadmus also investigated bulb disposal for CFLs. Since these bulbs contain a small amount of mercury, the EPA recommends recycling them.

In total, nearly half of the respondents (48%; n=335) had disposed of a CFL bulb (see Figure 28). Of those who had disposed of a CFL, 44% threw the bulbs in the trash, and 11% recycled the bulb in a home recycling bin. Forty-one percent of respondents had recycled the bulbs at a recycling center for hazardous waste (such as Home Depot or Ace Hardware), and the remainder (4%) recycled some and threw some away. As compared to the 2009 evaluation results, recycling rates are increasing. As reported in the 2009 evaluation, 74% of RSS respondents disposed of CFLs by throwing them in the trash, 19% recycled bulbs, and no respondent reported returning bulbs to stores for recycling (7% responded to an "other" category).

Figure 28. How Participants Disposed of CFLs (n=160)



Supplier Interviews

Introduction

Between October 20, 2015 and November 20, 2015, Cadmus interviewed 27 lighting suppliers working with the Xcel Energy Home Lighting and Recycling program. We also requested that these suppliers fill out a table (or matrix)—which included questions on market trends, sales, and the influence of the program on sales—and send it back via email. With the interviews and data collection matrices, Cadmus aimed to achieve the following objectives:

- Identify the most popular lighting products;
- Evaluate trends in the pricing and sales of lighting products;
- Determine the impact of the program on sales and trends of lighting products;
- Evaluate program satisfaction; and
- Identify opportunities for improving the Home Lighting and Recycling program.

Methodology

This section describes the sampling and data collection methodology that Cadmus employed for the supplier interviews.

Sampling

Of the 27 suppliers Cadmus interviewed, 10 were lighting manufacturers, three corporate retailer staff, 10 retail store managers, and four nonparticipant retailers. Cadmus received contact information for these staff members from the program implementer, Wisconsin Energy Conservation Corporation (WECC). WECC contacted the manufacturers and corporate retailer staff in advance to inform them about the evaluation and that Cadmus would be reaching out for interviews. The store managers and non-participant retailers were not contacted in advance.

Data Collection

Cadmus created surveys for each group of interviewees (store managers, corporate retailers and manufacturers), that consisted of questions regarding the impact of the program on sales, customer awareness, and decisions to purchase certain bulbs; respondents' satisfaction with the program; and suggested areas of improvement. The matrix consisted of questions about suppliers' market share of bulbs and sales trends. Not all interviewees provided the matrix (or completed all parts of the matrix), as they did not have access to some of the information on sales and market shares that were requested. Cadmus made efforts to contact interviewees via phone and email to remind and request them to return the files. Table 6 lists the interview participants by category, and indicates which interviewees provided matrix data.

Table 6. Interviews Conducted and Matrices Received

	Interviewed	Matrices Received
Manufacturers		
Earthtronics	1	1
Feit	1	1
GE Lighting	3	3
Greenlite	1	1
Maxlite	1	1
Osram Sylvania	1	0
Philips	1	0
TCP Lighting	1	1
Corporate Retailers		
Batteries Plus	1	1
Costco	1	1
Sam's Club	1	1
Store Managers		
Batteries Plus	3	0
Home Depot	3	0
Lowe's	3	0
McGuckin's True Value	1	0
Nonparticipant Stores		
Ace Hardware	1	1
Farm & Home Hardware	1	0
True Value	2	0
Total	**27**	**12**

Findings

This section summarizes results from manufacturer, corporate retailer, store manager, and nonparticipant retailer interviews focused on identifying the program impacts on sales, customers' awareness and decision to purchase, respondent satisfaction with the program, and areas for improvement.

CFL and LED Manufacturing Trends and Estimated Price Changes

All 10 of the manufacturers interviewed were selling CFLs in Colorado prior to their participation in the program. However, the majority (seven of 10) were not selling LEDs prior to participation, because LEDs were not prevalent in the residential lighting market and were prohibitively expensive until the last two to three years.

When we asked manufacturers to estimate the average retail price changes for various light bulbs over the past five years, they reported that prices for CFLs had decreased by about 31% (on average) and prices for LEDs had decreased by about 67%. However, most manufacturers cited no change in prices for

halogens or said their company does not carry this bulb type. Of the three respondents that provided a numerical response related to halogens, two perceived that prices had decreased (by 25% and 20%), while the third said prices had increased by 20%. For incandescent bulbs, six of 10 respondents noted that their company does not manufacturer this bulb type or that they could not gauge the price change, while four respondents said prices have stayed the same.

Program Influence on Bulb Sales

Interviews included several questions to understand suppliers' perceptions of Xcel Energy's Home Lighting and Recycling program role in affecting change in the market.

Manufacturer Sales

When asked about the influence of the program on CFL sales in Colorado over the past five years, all manufacturers stated that the program was *somewhat* or *very important* in increasing sales. Cadmus also asked about the influence of the program on LED sales in Colorado in the past five years; manufacturers unanimously noted that the program was *very important* in increasing sales. As one manufacturer said, "LEDs were initially expensive when first introduced, so without the help of the utility program, the sales would have been lower." When asked about how sales of CFLs and LEDs in Colorado would have been impacted over the last year without the Xcel Energy Home Lighting and Recycling program, manufacturers expected that CFL sales would have been an average of 54% lower while LED sales would have been an average of 60% lower.

When asked about the bulb types that make up the total number of bulbs that the manufacturer sells in the Xcel Energy territory in Colorado, manufacturers most frequently cited high percentages of CFLs and LEDs. On average, manufacturers reported that CFLs made up 30% of the bulbs they sell in the territory, while LEDs made up 44%.[13] On average, halogens made up 13%[14] and incandescents made up 9%[15] of the bulbs sold by manufactures in the Xcel Energy territory in Colorado.

Among manufacturers, there were clear trends pointing to the decline of CFL sales and rise of LEDs sales in the last 5 years. When asked about and the percentage break-down of bulbs sold by the manufacturer in Colorado in 2014 and 2010, manufacturers reported that CFLs declined by an average of 40%, while LEDs increased by an average of 33% (See Figure 29).[16]

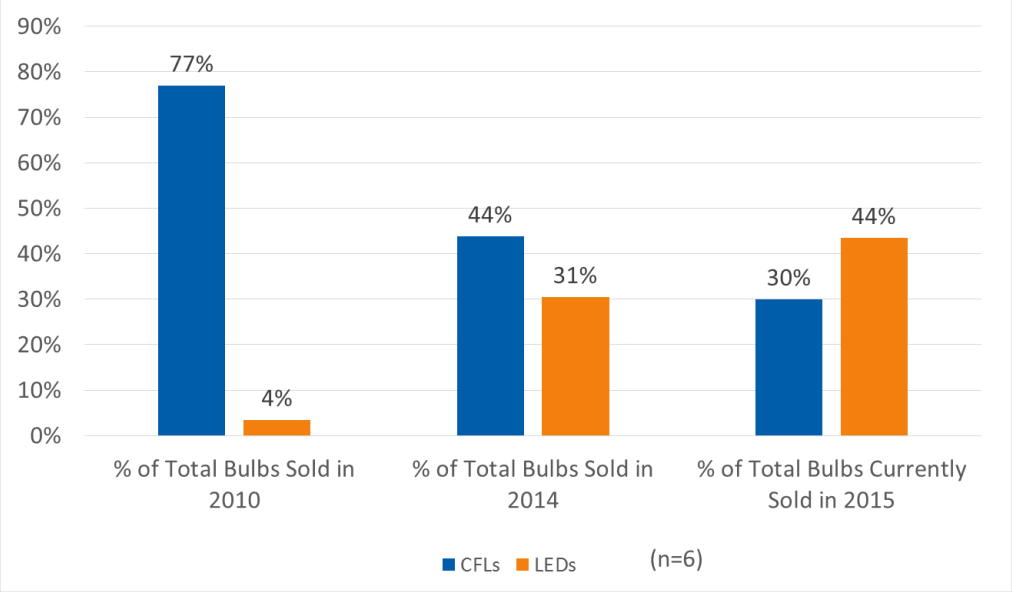
[13] Sample size of six manufacturers.

[14] Sample size of six manufacturers.

[15] Sample size of seven manufacturers.

[16] Sample size of six manufacturers.

Figure 29. Percentages of Bulb Types Making up Total Sales of Manufacturers in Colorado



*What percentage of the following bulb types makes up the total bulbs that your company currently manufactures and sells in Xcel Energy territory Colorado? Approximately what were the percentages of these bulb types 1 year ago? Approximately what were the percentages of these bulb types 5 years ago?

When asked what percent of the bulbs models that the manufacture sells are part of the Xcel Colorado Home Lighting and Recycling program, there were a range of responses. One respondent cited that about 8% of its CFL models were part of the program, while a second mentioned that 100% of the CFLs models it manufacturers are part of the program. For LEDs, the first respondent noted about 2% of the LED models it manufacturers is part of the program; two others stated that 60% and 65% of the LED models they manufacture are part of the program, respectively.

Retailer Sales

Two corporate retailers, provided detailed information on bulb sales and the program's influence on sales.[17]

When asked about the impact of program participation on the number of CFL and LED models offered in participating stores, both retailers noted that program participation led to an increase in bulb models carried in participating stores. One respondent noted that the number of CFL models available in their stores increased by 10% and LED models by 20%, while the other noted that the number of CFL models

[17] Cadmus was provided the contact information for six participating retailer representatives and contacted all of them via phone and email. Of these, three agreed to provide an interview and two returned sales information via the matrices. Retailer names are withheld to maintain confidentiality. Of the three representatives who did not provide an interview, one did not respond, one moved to another department of the company, and one noted that he could not provide time to discuss the program until the end of the year. It may be useful to require the sharing of feedback as a component of program participation in future evaluations to gather more comprehensive data from corporate retailers.

offered increased by 75% and LED models by 65% since it began participating. One retailer anecdotally noted that the number of models had gone up since participating, but could not provide specific percentages.

When asked about the percentage of CFLs sales purchased through the program between 2015 and 2014, one retailer noted a slight decline (5%); for LEDs, it noted an increase of 6% between the two years. The other retailer noted decreases in sales from bulbs purchased through the program for both CFLs and LEDs.

Table 7. Sales of CFLs and LEDs by Participating Retailers[18]

Sales Information	Box Store	Specialty Store
CFLs		
Total CFL sales in the Xcel Energy's Colorado service territory in 2015	297,700 bulbs	3,970 bulbs
Percentage of CFL sales from CFLs purchased through the Xcel Energy Home Lighting and Recycling program **in 2015**	95%	32%
Percentage of CFL sales from CFLs purchased through the Xcel Energy Home Lighting and Recycling program **in 2014**	100%	53%
Estimated impact on CFL sales if Xcel Energy Home Lighting and Recycling program did not exist	70% Lower	10% Lower
LEDs		
Total LED sales in the Xcel Energy's Colorado service territory in 2015	45,400 bulbs	13,864 bulbs
Percentage of LED sales from LEDs purchased through the Xcel Energy Home Lighting and Recycling program **in 2015**	70%	38%
Percentage of LED sales from LEDs purchased through the Xcel Energy Home Lighting and Recycling program **in 2014**	64%	51%
Estimated impact on LED sales if Xcel Energy Home Lighting and Recycling program did not exist	60% Lower	55% Lower

Customer Awareness and Decision to Purchase

When we asked the 10 participating store managers about the importance of the program in creating increased awareness of energy-efficient light bulbs, they cited that the program was *somewhat important* for CFLs (average of 6.7/10) and *very important* for LEDs (average of 8.5/10). When Cadmus asked the three corporate retailer staff this same question, they exhibited a higher average score for CFLs—at 8.3/10—and a similar score for LEDs, at 8.0/10.

Cadmus asked store managers to estimate how influential the program was on customers' decision to purchase energy-efficient light bulbs, and they cited the program as *important* for CFLs (average of

[18] Store names not included to maintain confidentiality

7.2/10) and *very important* for LEDs and LED downlights (average of 8.9/10 and 8.0/10, respectively). When we asked the three corporate retailer staff this same question, they exhibited a higher average score for CFLs—at 9.0/10, and similar scores for LEDs and LED downlights—at 8.7/10 and 8.0/10, respectively.

Influence on Non-program Energy-Efficient Lighting

Cadmus also asked store managers and corporate retailers if the program had influenced them to lower pricing on non-program CFLs or LEDs. Respondents unanimously replied that they had never lowered the price of non-Xcel Energy discounted program light bulbs to better compete with Xcel Energy discounted bulbs. However, when asked, more than half said they perceived an increase in the sales of energy-efficient bulbs that are not offered through the program as a result of the program and associated marketing and energy-efficient lighting education. Three out of six respondents could not provide an estimated value for the percentage increase in sales of non-Xcel Energy discounted bulbs as a result of the program, but three respondents provided values ranging from 10% to 15%.

Satisfaction

This section describes manufacturers' and retailers' response to interview questions regarding program satisfaction.

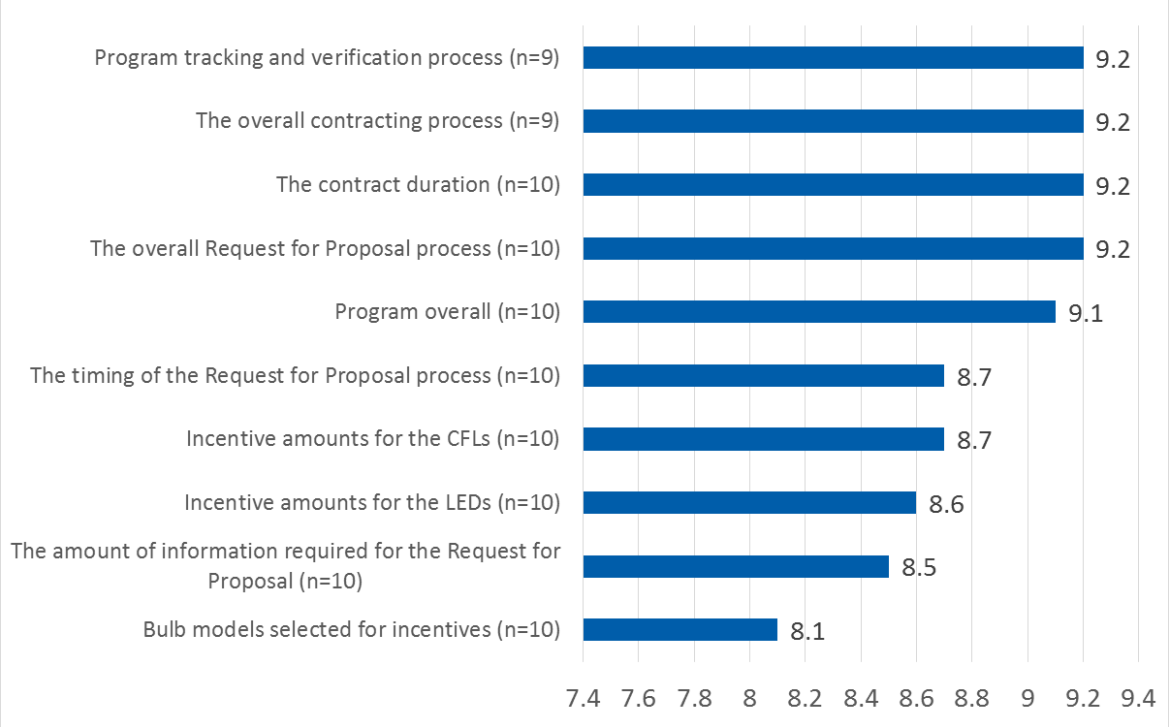
Manufacturers

When asked about their satisfaction with the program and program elements, overall manufacturers reported very high levels of satisfaction. Average scores ranged from 8.1 to 9.2 (out of 10) for various program elements (see Figure 30). Several manufacturers commented that the program was implemented effectively and that Xcel Energy has been easy to work with.

The program area with the lowest satisfaction score was "bulb models selected for incentives." A few respondents noted that it would be useful to have more program-qualified bulb types, such specialty LEDS (e.g., globes, candles, 3-ways, A19s) and retrofit kits.

In regards to the timing of the RFP, one manufacturer strongly recommended that Xcel Energy consider shifting the program year from a calendar year to July 1 through June 30 and shifting the RFP deadline from the end of the year to the middle of the year. He mentioned that lighting sales are highest from September through March, and it can be burdensome to work on an RFP to submit at the end of the year during the holidays when lighting sales are busy.

Figure 30. Manufacturer Satisfaction with Various Program Areas*

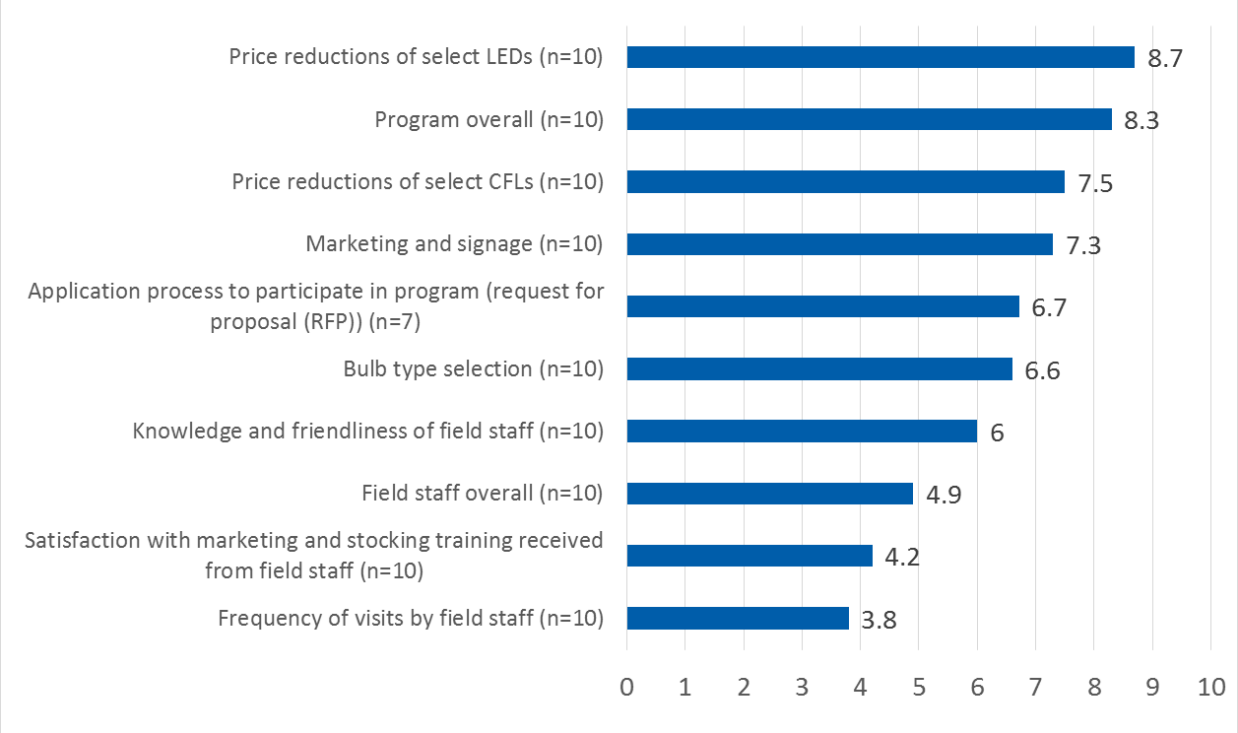


*On a scale of 0 to 10, where 0 is not at all satisfied and 10 is completely satisfied, how satisfied are you with the following aspects of the Xcel Energy Home Lighting and Recycling program?

Retail Store Managers

When asked, retail store managers exhibited high levels of overall satisfaction with the program, the price reductions of select CFLs and LEDs, and the program marketing and signage. However, they had low levels of satisfaction with the field staff and the training received from field staff (see Figure 31).

Figure 31. Retail Store Manager Satisfaction with Various Program Areas*



*Ibid.

Field Staff Visits and Training

Cadmus asked the 10 store managers about their satisfaction with the frequency of field staff visits and the associated trainings. Half of the respondents commented that field staff had done a poor job of making regular store visits to provide information on the bulbs and program. One respondent noted that field staff had never visited her store, while another noted that field staff had not visited his store in several years. Several managers noted that their store had not received any trainings for employees. After these interviews were conducted, Cadmus worked with the program implementer to assess whether these specific stores had in fact not received any visits throughout the year based on field visit records. We found surprising results; the stores that claimed to have received little to no visits throughout the year had in fact received between two and 25 visits throughout the year. It is likely that the staff interviewed—primarily store managers—may not have been aware of these visits, as field representatives often interact more specifically with electrical department managers. [19]

Marketing and Signage

On average, store managers reported satisfaction with the marketing and signage provided by the program (average of 7.3/10). When we asked, nine out of 10 managers confirmed that they use all the signage provided by Xcel Energy to promote the discounted bulbs, and that they use these signs for the entire duration of promotion periods. All store managers who received the signage noted it as *very* or

[19] In future evaluations, Cadmus will work to communicate directly with electrical department managers.

somewhat useful. The only comments related to marketing and signage were requests for more delivery of these materials to the stores. One manager commented that his store was "only given a couple stickers and would like to see more and better signage to highlight the price reductions and educate customers." Another respondent echoed that his store had not received sufficient point-of-purchase and signage materials. [20]

Customer Motivators and Barriers

When Cadmus asked store managers whether customer demand for CFLs had increased or decreased in the last three years, nine of 10 respondents noted it had decreased. Meanwhile, store managers unanimously noted that demand for LEDs had increased.

When asked about what they perceived to be the biggest motivator for customers to purchase energy-efficient lighting, most store managers (six of 10) mentioned price. They felt that if these bulbs were priced competitively with less efficient bulbs, customers would be more likely to choose them. Half of the store managers (five of 10) also cited energy savings as a likely motivator, and two cited bulb longevity as a likely motivator for purchase.

Cadmus also asked about the biggest barriers customers face when purchasing CFLs. Seven respondents commented on barriers around customers' perceptions of CFLs' lighting quality (e.g., flickering light, lack of instant brightness, light color). Five respondents referenced customers' concerns with the mercury in CFL bulbs and the special disposal process required. When asked if Xcel Energy played a role in reducing some of these barriers, half of the respondents said yes, that Xcel Energy had helped reduce these barriers through education of customers on the benefits of CFLs, the CFL disposal processes, and of the increase in CFL bulb options so that customers can find ones with color and brightness they seek.

When asked about the biggest barriers to purchasing LEDs that customers face, nine respondents cited the relatively high price. When asked if Xcel Energy had a role in reducing this barrier, all respondents said yes—by making the bulbs more affordable through the program.

Non-participant Retailers

All four interviewed non-participant retailers said they were aware of the program. Cadmus asked if they were interested in participating, and two stated they were *somewhat interested*, while two were *not at all interested*. When we asked the latter two why they were not interested, one responded that the program hurt their sales of non-discounted bulbs, while the other commented that his store had recently revamped its lighting sales display and inventory, and wanted to see how it performed before getting involved with the program.

[20] One factor to note on signage is that many corporate retailers have guidelines on the size and location of signage in stores which may be incompatible with Xcel Energy brand guidelines. This makes it difficult to place Xcel Energy signage in certain stores.

Net-to-Gross Evaluation

Introduction

To measure program impacts, Cadmus used a triangulation of methods for determining the level of freeridership: (1) a demand elasticity model, (2) store-intercept surveys, and (3) supplier interviews. For spillover and market effects, we used results from the 2009 and 2015 home inventories[21], which we deemed to be the most objective and complete assessment of spillover and market effects. We also qualitatively observed supplier interviews and customer intercepts to support the analysis.

For this evaluation methodology Cadmus used analytical approaches consistent with the State of California Public Utilities Commission *Energy Efficiency Evaluation Protocols and Uniform Methods Project for Determining Energy Efficiency Savings for Specific Measures*.[22,23]

Cadmus calculated NTG using the following formula:

$$NTG = 1 - Freeridership + Spillover + Market\ Effects$$

Home Lighting NTG Definitions

Three primary factors differentiate net savings from gross savings: freeridership, spillover, and market effects. We used the following definition for each factor:

- **Freeridership** refers to participants who would have purchased the same type of light bulbs absent the program.
- **Like Spillover** refers to additional energy-efficient, but non-program lighting products, sold due to program education and advertising efforts during the 2014 program year.
- **Non-Like Spillover** represents the additional energy savings from non-lighting measures that occur when a participant—as a result of the program's influence—installs other efficient measures or changes energy use behavior. Due to the small size of typical lighting purchases and upstream nature of the program, this spillover is typically insignificant and, therefore, we did not attempt to measure it.
- **Market Effects** are non-program efficient bulb purchases due to structural changes in the market that result from program offerings over a long period of time. For the Home Lighting and

[21] Cadmus performed home lighting inventories in late 2015, which are being compared to a previous study performed in 2009. The Cadmus Group and Nexus Market Research. *Colorado Home Lighting Program Process and Impact Evaluation Report*. January 22, 2010.

[22] State of California Public Utilities Commission. *California Energy Efficiency Evaluation Protocols.* 2006. Available online: https://www.energycodes.gov/california-energy-efficiency-evaluation-protocols

[23] U.S. Department of Energy. *Uniform Methods Project for Determining Energy Efficiency Savings for Specific Measures.* 2013. Available online: http://energy.gov/eere/about-us/ump-home

Recycling Program, we measured changes in efficient lighting saturations among a randomly selected sample of Xcel Energy residential customers and apportioned the increased nonprogram efficient bulb purchases among naturally occurring conservation, like spillover, and market effects.

- **Market Transformation Indicators** refers to evidence of the structural changes in the market that create market effects. Structural changes are those that persist even after the program ends. These include changes in awareness among customers, changes in practices among contractors, and changes in stocking of energy-efficient products among retailers. (Market transformation indicators provide evidence that savings attributed to market effects are appropriate.)

Though related, spillover and market effects differ by time horizons; spillover impacts occur during program delivery, while market effects generally take place over a long period of time. In addition, while spillover may be traced to a customer's decision to purchase an energy-efficient product due to a current year's program, market effects occur outside of a customer's day-to-day awareness and decision-making.

Freeridership Methodology

Determining freeridership for upstream programs is challenging because a typical list of participants is not available and, furthermore, customers may not even be aware they have participated in a program. For this reason, Cadmus is using a triangulation method to gather perspectives of freeridership from different groups and with different analysis methodologies, as described below.

Demand Elasticity Modeling

Lighting products that incur price changes and promotion over the program period provide valuable information regarding the correlation between sales and prices. Cadmus has developed a modeling approach to estimate freeridership for upstream lighting programs and can estimate separate effects for price, promotion, and product placement. The model is based on the same economic principle that drives program design: *a change in price and promotion generates a change in quantities sold*. Demand elasticity modeling uses sales and promotion information for the following:

- Quantifying the relationship of price, product placement, and promotion to sales;
- Determining the likely sales level without the program's intervention (baseline sales); and
- Estimating freeridership by comparing modeled baseline sales with actual sales. The difference between baseline and actual divided by actual is the net of freeridership (1-freeridership).

After estimating variable coefficients, we used the resulting model to predict two scenarios: (1) program bulb sales that occurred *without* the program's price impact and promotional activity, and (2) sales that occurred *with* the program (which should approximate actual sales with a representative model). Using model-predicted results instead of the actual sales for the "with the program" scenario, mitigates

possible bias from not having actual non-program sales data since the same bias is present in both the program and non-program sales estimates.[24]

We then calculate a ratio net of freeridership using this formula (net of freeridership is similar to NTG but does not include spillover or market effects; it is defined as 100% freeridership):

$$Net\ of\ FR\ Ratio = \left(\frac{Sales\ with\ Program - Sales\ without\ Program}{Sales\ with\ Program}\right)$$

Promotions were incorporated into the modeling based on the assumption that sales are reported one month after they occur. Aligning the timing of promotions and merchandising with sales is particularly important as product placement can have a more pronounced impact on sales than price changes.

In addition to merchandising and product placement we also incorporated mass marketing such as radio advertisements into the modeling. However, our ability to estimate separate effects for mass marketing is limited by the degree to which marketing activity coincides with other program activity or seasonal variations in sales.

To calculate elasticity associated with each independent variable affecting program sales, we created a model using available data such as program prices, non-program prices, program promotions, and program period sales. The model applies the relationships within these data to estimate elasticity associated with the independent variables.

This model (which relies on available program sales and promotional data) uses the following equation (for bulb *i*, in period *t*):

$$\ln(Q_{it}) = \sum_{\pi}(\beta_{\pi} ID_{\pi,\mathrm{i}}) + \beta_1 + \beta_2 \ln(P_{it}) * Retail_{\theta,\mathrm{i}} * Tech_k + \beta_3 Merch_i + \beta_4 Retail_{\theta,\mathrm{i}} * Radio\ Remote_t + \beta_6 Retail_{\theta,\mathrm{i}} * M_t + \beta_7 MultiSub_{it} + \alpha Time\ Trend_t + \varepsilon_i + \gamma_t$$

Where:

ln	=	Natural log
ID	=	Unique cross section ID for each combined product/retail location
Q	=	Quantity of bulbs sold through the program at the specific retail location
P	=	Retail price (after markdown)
Retail	=	Retail channel (Do-It-Yourself stores (DIY), Membership Club Stores (Club), and Mass Market retailers)
Radio	=	A dummy variable indicating

[24] As all statistical model will under-predict or over-predict, it is important to mitigate bias by using predictions for both sales with and without the program.

M	=	Marketing events (such as in store educational promotions), s
Merch	=	A dummy variable indicating if a product was featured in an off-shelf display
MultiSub	=	A flag for a single product during months which sales declined sharply after a three-pack for the same product was being sold for the same price as the single pack
Time	=	Quantitative trend representing the impact of secular trends not related to the program[25]

Our team checked the model using these three criteria:

- Data adequacy (the number of sample points);
- Data representativeness (an appropriate mix of bulb types and retailers); and
- Model accuracy (mapping actual values to model predicted values).

This methodology produces stable, reliable estimates with little chance for measurement error from customer recall issues that can occur in customer self-report approaches. It also allows for estimating individual program impacts from price, advertising, and product placement, which Xcel Energy can use to improve program design.

For instance, we were able to assess the response in sales to radio remotes targeted to specific retailers, retailer-specific promotions, and off-shelf merchandising[26], all of which were statistically significant and had a pronounced impact on sales.

It is important to note that one of the retailer-specific promotions that had a large impact on the program, much larger than the other promotions in this analysis and larger than what is typically observed in other evaluations, and was driven by one product[27] at one location and sold for only two months. This product experienced a large jump in sales that coincided with a specific promotion. However, because of the limited number of observations it is likely that the estimated impact for this particular event is not very precise and may not be representative of future activities. This was included in our analysis as a program effect, however because of this uncertainty the demand elasticity approach received a lower weighting score for sample representativeness in the final triangulation of freeridership (discussed below).

Store Intercept Surveys

We interviewed 336 customers who purchased lighting at 20 participating big-box retail locations. The sample of stores represented a large percentage of program sales and customers across Xcel Energy's

[25] The time trend for this analysis represents shifts in sales due to non-program-related seasonality, calculated using normalized sales of program bulbs in the previous year without in-store promotions or price changes.

[26] Off shelf merchandising captures various displays such as end caps, pallet displays, side caps, etc., that increase the prominence of various products.

[27] The outlier is SKU 1000-003-071 at a Denver store and sales go from 146 in January to 100276 in March.

territory. We asked customers to complete a short, in-person survey in exchange for a $10 gift card to that particular retail store, which they could use that day. Interviewers documented the type and count of bulbs purchased, whether or not they are program bulbs, if the customers planned to install the bulbs in a home or at a business,[28] if customers had planned in advance to purchase the bulbs, what factors influenced the purchase, and the importance of program factors in their decision to purchase.

In this NTG method, we asked customers who purchased program bulbs a series of questions and then scored the responses in two categories to estimate freeridership: a program influence score and an intention score. The *program influence score* captures the maximum level of influence the residential lighting program had on a survey respondent's decision to purchase program bulbs on the day of the survey, according to the respondent. This program influence can take a number of forms such as the price discount, program-sponsored educational materials that explain the benefits of efficient lighting, in-store product placement of efficient bulbs, and program bulb recommendations provided by retail store personnel. We used the *intention score* to estimate how many program bulbs survey respondents would have purchased in the absence of the program, if they would have purchased different types of bulbs, or if they would not have purchased bulbs at that time. We calculated freeridership by averaging the two scores.

Supplier Interviews

Cadmus performed eight interviews with representatives of national chains. We interviewed corporate retailers and manufacturer representatives instead of individual store managers because, in our experience, we have found that many of the decisions and specific data regarding program impacts are tracked at the corporate level and unknown by individual store managers.

To estimate NTG ratios, the supplier self-report method relies on the corporate retailer's feedback to the following key questions:

- Considering how the lighting market has changed since Xcel Energy first began offering lighting discounts, do you think your total CFL and LED sales would be about the same, lower, or higher had the program not existed?
- [If higher or lower] By what percentage do you estimate your company's CFL and LED sales would be [higher/lower] if the program had not been available?

[28] Due to smaller proportions of customers buying program bulbs (eligible for the question) and a survey programming error, we did not collect this information from a sufficiently large sample. To provide a more robust estimate, we used the number Cadmus verified for the California Public Utility Commission evaluation in 2009, which is also Xcel Energy's existing assumption (6% bulbs purchased go to businesses). This number is also within range of assumptions used by utilities in the benchmarking data collection section.

Xcel Energy provided 2014 program bulb sales data. To calculate the NTG, Cadmus used the following equation using supplier estimates for what sales would have been without the program:

$$NTG = \left(\frac{Sales\ with\ Program\ -Sales\ without\ Program}{Program\ Sales}\right)$$

Freeridership Results and Aggregation

Cadmus calculated freeridership for CFLs and LEDs using each of the three analysis methodologies. Table 8 provides the freeridership results for each of the three methods and bulb types.

Table 8. Freeridership Scores

Bulb Type	Demand Elasticity	Intercepts	Supplier Interviews
CFL	42%	29%	32%
LED	14%	40%	22%

Because each method exhibits strengths and weakness, Cadmus created a weighting scheme based on three analysis criteria: 1) how likely is the approach to provide a reliable view of freeridership, 2) how valid is the data collected and the analysis, and 3) how representative is the sample. Table 9 shows the unweighted freeridership score, along with the weighted results based on the scores for CFLs and Table 10 shows the same information for LEDs. The demand elasticity model received the highest weights of the total for both bulb types. Between bulb types, the weighting scoring is nearly the same except for the sample representativeness for supplier interviews. The resulting weighted freeridership is 35% for CFLs and 23% for LEDs

Table 9. Weighted Freeridership Results CFLs

NTG Triangulation Data and Analysis Scores	Demand Elasticity	Intercepts	Supplier Interviews
Analysis Scores			
How likely is this approach to provide a reliable view of freeridership?	100	66	33
How valid is the data collected/analysis?	100	66	66
Sample Representativeness	66	33	100
Average Scores	**88.7**	**55.0**	**66.3**
Weight (percentages sum to 100%)	42%	26%	32%
Freeridership	42%	29%	32%
Weighted Freeridership			***35%***

Table 10. Weighted Freeridership Results LEDs

NTG Triangulation Data	Demand Elasticity	Intercepts	Supplier Interviews
Analysis Scores			
How likely is this approach to provide a reliable view of freeridership?	100	66	33
How valid is the data collected/analysis?	100	66	66
Is the sample representative?	66	33	33
Average Scores	**88.7**	**55.0**	**44.0**
Weight (percentages sum to 100%)	47%	29%	23%
Freeridership	14%	40%	22%
Weighted Freeridership			***23%***

Table 11, Table 12, and Table 13 list the rationale we used for the weighting of each component of the analysis criteria, along with our scores and rationale for the weightings. Cadmus utilized a four-point scale to score the criteria:

- "*Very*" received a top score of 100;
- "*Somewhat*" received a score of 66;
- "*Not too*" received a score of 33; and
- "*Not at all*" received a score of 0.

Table 11. Demand Elasticity Intercepts Scoring Rationale

Triangulation Question	Score	Response and Rationale
How likely is this approach to provide a reliable view of freeridership?	100	Very Likely. The method is considered one of the best practices approaches for estimating freeridership. It is based on empirical data showing customers' actual buying habits in response to changes in pricing and promotion without customer self-report bias or relying on responses to hypothetical survey questions.
How valid is the data collected/analysis?	100	Very Valid. The program data shows actual program sales, promotions, and prices. The model produced 90/9 confidence and precision.
How representative is the sample?	66	Somewhat representative. We were not able to utilize all of the available data in the model. Some lighting products were not included in the model because of too few observations. We excluded sales from lighting products with large gaps in reporting or where the number of months observed was equal to the length of the gap. This primarily affected lighting products for smaller retailers that accounted for a small portion of program sales, such as Target or Batteries Plus. Additionally, we excluded lighting products with no price variation or any promotional or merchandising activities, as there was no variation in program activity to explain variations in sales.

Table 12. Intercepts Scoring Rationale

Triangulation Question	Score	Response and Rationale
How likely is this approach to provide a reliable view of freeridership?	66	Somewhat Likely. The method is considered one of the best practice approaches for estimating freeridership. It is not scored at the highest level because it is based on customers' answers to hypothetical questions about what they would have done absent the program and is subject to self-report bias.
How valid is the data collected/analysis?	66	Somewhat Valid. Surveys were conducted with customers detained in the lighting aisle and they may not have been providing the most thoughtful answers if they had other distractions competing for their attention. Some observations had missing responses to some questions.
How representative is the sample?	33	Not too representative. Some key store chains did not allow for any intercepts in their stores. Data collection periods were not random, but only on weekends to ensure high store traffic. Of the over 300 intercepts, only 69 customers purchased participating bulbs and could be asked freeridership questions. Additionally, customers did not answer some questions. The analysis was based on 28 CFL responses and 33 LED responses.

Table 13. Supplier Interviews Scoring Rationale

Triangulation Question	Score	Response and Rationale
How likely is this approach to provide a reliable view of freeridership?	33	Not Too Likely. The approach relies on suppliers to provide sales data on program impacts specific to the Xcel Energy territory, involving hypothetical questions about what would have happened absent the program. We attempt to obtain the highest integrity data by providing key questions in writing prior to allow the representative to research specific sales data to inform the analysis, however we have no way of verifying the robustness of the responses.
How valid is the data collected/analysis?	66	Somewhat Valid. Suppliers often see the data requested as proprietary since it involves sales data and refuse to answer certain questions. Since corporate retailers have stores in multiple jurisdictions it may be difficult for them to isolate program effects for Xcel Energy stores.
How representative is the sample?	CFLs – 100 LEDs – 33	Very representative (CFLs). Suppliers interviewed represent almost all of the CFLs sold through the program. Not too representative (LEDs). Suppliers interviewed represent less than 20% of LEDs sold through the program.

Like Spillover and Market Effects Methodology

Xcel Energy's Home Lighting and Recycling program creates spillover and market effects by increasing the availability and stocking of energy-efficient light bulbs among retailers and by educating customers about the benefits of using efficient lighting. For this evaluation, Cadmus defined spillover as the energy savings attributed to program activity (for actions that were not incented through the program) during a program's implementation cycle. Spillover may occur due to nonparticipants purchasing lighting products (e.g., a customer purchasing a non-incented specialty CFL after experiencing satisfaction with the performance of a three-pack of incented, standard CFLs). Per industry standard practice, we quantified and applied spillover to program NTG ratios.

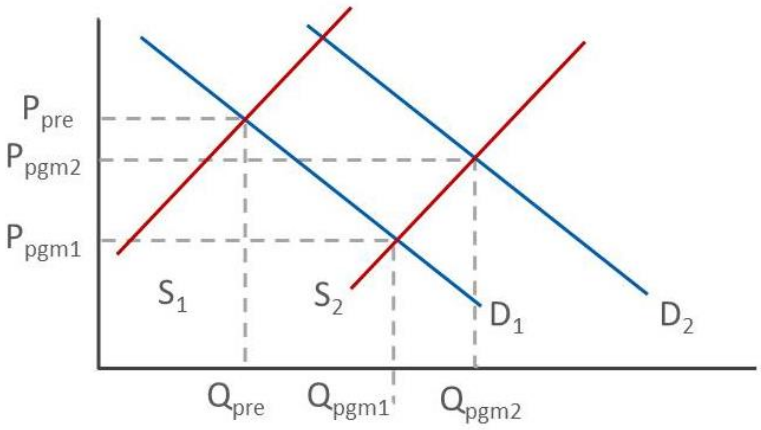
Generally, market effects are systemic changes to standard business practices, resulting from program activities. These effects tend to persist long after the close of program interventions. The potential for demand-side management (DSM) programs to cause structural changes when intervening in a given market has become increasingly apparent as the following has occurred:

- Program delivery models have evolved (e.g., more upstream-focused programs);
- Energy efficiency investments have grown dramatically; and
- Programs have established long-term relationships with key market actors and trade allies.

Specifically, program staff work closely with retailers and manufacturers to increase the availability and dedicated shelf space for energy-efficient lighting products, and to offer education to help retail staff communicate the value of energy-efficient purchasing decisions to local consumers.

Figure 32 illustrates the theory behind DSM intervention in the market.

Figure 32. Short- and Long-Term DSM Program Impacts



Upfront prices most often limit or slow adoption of energy-efficient technologies. Through use of rebates or buy-downs, DSM programs lower prices from those charged before intervention (P_{pre}) to levels presumed acceptable to consumers (P_{pgm}). At the same time, DSM programs work directly with manufacturers and retailers to increase the supply of energy-efficient technologies.

In theory, lowering the price should, in the short run, increase the quantity demanded from Q_{pre} to Q_{Pgm1}.[29] If a program does not affect the market, its price returns to P_{pre} and the quantity demanded returns to Q_{pre} upon the intervention's close.

The more successfully a program raises consumer awareness of the benefits of energy efficiency (as shown through increasing shelf space dedicated to energy-efficient products, engaging trade allies, or similar activities), the more the program will likely shift the demand curve from D_1 to D_2. Concurrently, the more successfully a program increases shelf space dedicated to energy-efficient products, engages trade allies, or accomplishes similar activities, the more likely the supply curve will shift from S_1 to S_2. If permanent, these shifts in supply and demand curves indicate market transformation and indicate market effects. At the new demand curve, customers will purchase more CFLs *at all price levels*, and more CFLs will become available for purchase. If market effects are ignored, this would show up as increased freeridership over time.

In other words, the program's direct like spillover impact can be measured as $Q_{pgm1} - Q_{pre}$, but its market effects can be measured as $Q_{pgm2} - Q_{pgm1}$ (as shown in Figure 32, above).

Like Spillover and Market Effects Results

Using the methods described above, Cadmus estimated spillover and market effects by analyzing CFL and LED home saturations in 2015 and comparing those saturation levels to levels observed in 2009,

[29] Economists call this "movement along the demand curve."

which included a sample of 70 customers. Using the saturation of energy-efficient bulbs from the sample, we estimated total energy-efficient bulbs purchased during the period between the last inventory study and this study. From that total, we subtracted the count of all bulbs sold through the program over the same period. We attributed the remainder of non-program energy-efficient bulbs to either naturally occurring conservation, like spillover, or market effects. Table 14 shows the specific inputs and sources Cadmus used to estimate spillover and market effects. Overall, we estimated spillover to be 8% and market effects as 6%.

Table 14. Spillover and Market Effects Calculations

Line	Inputs	Value	Data Source
3	No. Sockets Per Household	48.3	2015 home Inventory
4	**Baseline Saturation**		
5	No. of Households	1,147,914	October 2009, elec and elec+gas accounts, excluding vacant properties
6	Baseline Saturation CFLs and LEDs	16%	2009 Home Inventory
7	Storage CFLs &LEDs	1.3	2009 Home Inventory
8	No. of CFLs & LEDs (Baseline)	10,317,451	Calculated line 5 x (line 3 x line 6 + line 7)
9	**Current Saturation**		
10	No. of Households	1,228,940	From August 2015 elec and elec_gas accounts, excluding vacant properties
11	Post Saturation CFLs & LEDS	37.5%	2015 Home Inventory
12	Storage CFLs & LEDs	4.1	2015 Home Inventory
13	Other CFLs and LEDs purchased plus disposed	2.91	2015 Home Inventory
14	Non-residential Lighting Bulbs	445,563	Provided by Xcel Energy
15	Post CFL and LEDs without Other Programs	30,428,482	Calculated Line 10 x (line 3 x line 11 + line 12 + line 13)
16	Increase in CFLs & LEDs	20,111,031	Calculated line 15-line 8
17	Total Program Tracking CFLs & LEDs	17,359,801	Program Tracking (Oct 2009- July 2015)
18	Non-residential bulbs—6%	1,041,588	Calculated line 17*6% from DSM plan assumptions
19	Residential Program CFLs & LEDs	16,318,213	line 17—line 18
20	Non-program CFLs & LEDs	3,792,818	Calculated Line 16—Line 19
21	**Freeridership**		
22	Freeridership Rate	34%	Weighted CFL and LED freeridership
23	Freerider CFLs & LEDs	5,902,332	Calculated Line 22 x Line 17
24	Non Freerider CFLs & LEDs	11,457,469	Calculated (1-Line 22) x Line 17
25	Naturally Occurring Rate	34%	Assumed = Line 22
26	Naturally Occurring Sales	1,289,558	Calculated Line 20 x Line 25
27	**Spillover and Market Effects Proportions**		
28	Energy-Efficient Proportion	44%	Online Lighting Inventory EE Share

Line	Inputs	Value	Data Source
29	Spillover	1,444,305	Calculated (1-Line 28) x (Line 20-Line 26)
30	Market Effects	1,134,811	Calculated (Line 28) x (Line 20-Line 26)
31	Total Pgm Induced (w Spillover)	13,248,970	Calculated (Line 24 + Line 29)
32	Total Pgm Induced (w Spillover and Market Effects)	14,383,781	Calculated (Line 24 + Line 29 + Line 30)
33	Results		
34	NTG (w Spillover)	74%	Calculated (Line 31/Line 17)
35	NTG (w/Spillover and Market Effects)	80%	Calculated (Line 32/Line 17)
36	Freeridership	34%	Summarized
37	Spillover	8%	Summarized
38	Market Effects	6%	Summarized

To estimate the number of non-program bulbs sold, we subtracted from the "Increase in CFLs & LEDs" (Line 16) (as estimated through the home inventories) from the "Total Program Tracking CFLs & LEDs" (from October 2009 through July 2015, Line 17). We then subtract the assumed proportion of program bulbs going to non-residential establishments (Line 18) resulting in estimated total of "Non-program CFLs and LEDs" (Line 20).

To attribute the non-program purchased bulbs among the categories of naturally occurring like spillover and market effects, we first made the assumption that naturally occurring sales of energy-efficient bulbs occurred in the same proportion in non-program bulbs that freeriders occurred in program bulbs. We applied the freeridership rate to the estimated non-program bulb purchases between the two inventories (See lines 22-26) to estimate Naturally Occurring Sales. The remaining count of non-program CFLs & LEDs (from Line20) is split between Spillover and Market Effects by applying a market indicator to determine the split. While we note a number of market transformation indicators support the presence of market effects in the lighting market study, we used the average proportion of retail store energy-efficient lighting stock to apportion the remainder between spillover and market effects (Line 28). Our analysis of on-line big box store inventories found that approximately 44% of lighting bulbs stocked are energy efficient (CFLs or LEDs). To approximate the difference between spillover and market effects, we used this key market indicator as shown in lines 29 and 30. Lines 31 through 38 summarize the results.

Market Effects Preponderance of Evidence

To support the market effects estimate, Cadmus researched other metrics, tracked since 2009, that are indicative of market effects. Table 15 provides a summary of key market effects indicators, comparing 2009 with 2015. Specifically, we looked for increased CFL awareness, increased retail store program participation, and increased stocking of non-program bulbs among retailers. Another indicator is the amount of spillover detected from the intercept study where we found that 11% of non-program energy-efficient bulbs purchased were very influenced by the program, and 6% were somewhat influenced.

Table 15. Home Lighting Market Effects Indicators

Indicator	2009	2015
Customers very familiar with CFLs	43%	68%
CFL penetration (at least one CFL installed)	65%	99%
CFL saturation (% of all sockets with CFLs)	16%	31%
Recent CFL purchases	45%	73%
Satisfaction with CFLs (9-10 on 0-10 scale)	37%	55%
Total program bulbs incented	1,361,798	4,306,517 (in 2014)

Based on the data provided above, the following market effects indicators were observed.

- **Customer familiarity with CFLs is increasing.** In 2009, 43% of consumers reported they were "very familiar" with CFL technologies. In 2015, 68% were "very familiar."[30]
- **CFL penetration and saturation is increasing**. In 2009, 65% had at least one CFL installed, while in 2015, 99% had at least one CFL installed. Of all sockets inventoried in 2015, 31% had a CFL installed, compared to 16% in 2009.
- **Customer purchase rates are increasing**. In 2009, 45% of survey respondents had purchased at least one CFL within the past year;[31] in 2015, 73% had purchased at least one CFL within the past 12 months.
- **Satisfaction with CFLs is increasing**. In 2009, 37% of randomly sampled customers reported being highly satisfied with CFLs, compared to the 2015 survey, where customers reported a mean satisfaction score of 8.2, with 55% of respondents rating their satisfaction with CFLs as 9 or higher on a scale of 0 to 10.
- **Colorado sales of CFLs and LEDs has out-paced the nation and neighboring states.** Based on point-of-sale data excluding large home improvement retailers, the national market share of CFLs and LEDs held relatively steady, as a percentage of total U.S. retailer sales of lightbulbs from 2009 to 2014.

Calculated Net-To-Gross

Table 16 and Table 17 show the weighted freeridership, spillover, and market effects percentages, along with the resulting NTG for the Colorado Home Lighting Program for CFLs and LEDs, separately. We calculated the NTG percentage by subtracting freeridership from 100% and adding spillover and market effects.

$$NTG = (1 - Freeridership) + Spillover + Market\ Effects$$

[30] Based on findings from residential customer home visit survey findings.

[31] 2009 surveys asked about lighting purchases made within the past calendar year (about nine months) and 2015 surveys asked about purchases with in the past 12 months.

The resulting overall NTG is 79% for CFLs, and 91% for LEDs.

Table 16. Calculated NTG for Home Lighting and Recycling Program—CFLs

NTG Component	Value
Freeridership	35%
Spillover	8%
Market Effects	6%
Total	**79%**

Table 17. Calculated NTG for Home Lighting and Recycling Program—LEDs

NTG Component	Value
Freeridership	23%
Spillover	8%
Market Effects	6%
Total	**91%**

Program Benchmarking

Introduction

Cadmus conducted a benchmarking study to compare elements of Xcel Energy's Home Lighting and Recycling program with other upstream lighting programs across the country. We reviewed programs similar in design to the Home Lighting and Recycling Program that also had publically available and relevant information, as well as programs identified by program staff.

Methodology

To provide information on the design and performance of the Home Lighting and Recycling program, Cadmus reviewed and compared up to six other upstream lighting programs operating throughout the United States. For this study, we focused on investigating program design and evaluating measurement metrics from Xcel Energy and the benchmarked utilities. In addition to published reports from other utilities, we used Cadmus' proprietary benchmarking database to identify upstream lighting programs and to pull reports and findings for the evaluation.

Table 18 lists the programs included in the benchmarking study.

Table 18. Programs Included in Benchmarking Study

Program Sponsor	Program Name	Program Year	State
Xcel Energy	Home Lighting and Recycling Program	2014	Colorado
Ameren Missouri	Lighting Program	2014	Missouri
Energizing Indiana*	Residential Lighting Program	2012	Indiana
Entergy Arkansas	Lighting and Appliance Program	2013	Arkansas
Public Service Company of New Mexico (PNM)	Residential Lighting Program	2014	New Mexico
Rocky Mountain Power (PacifiCorp)	Home Energy Savings Program	2012	Utah
South Carolina Electric & Gas (SCE&G)	Residential ENERGY STAR® Lighting Program	2012	South Carolina

*Duke, Indiana Michigan, Indianapolis Power & Light Company, Indiana Municipal Power Agency, NIPSCO, and Vectren.

Although upstream lighting programs are often similar in design, with most focusing on reducing the cost of CFLs and LEDs, they frequently feature nuanced differences in the measures and price reductions offered as well as implementation and delivery practices. Some programs may include a coupon component to cover retailers that do not have systems to support the discount scheme, and others may include special program aspects targeting low-income customers. To compare differences and similarities among the benchmarked programs, Cadmus reviewed program materials for the following key elements:

- Program design
- Measures offered
- NTG and freeridership
- Hours of use
- Retailer participation and data
- Marketing
- Performance

Findings

Program Design

Xcel Energy Home Lighting and Recycling Program

The Colorado Home Lighting and Recycling program was officially launched in 2006. Xcel Energy partners with WECC, a third-party administrator, to implement the Colorado program. The Company's implementer, with approval and oversight from Xcel Energy manages program recruiting, field representation, data tracking, and implementation of promotions.

The program provides upstream rebates for residential customers to purchase energy-efficient lighting products through partnerships with participating retailers and manufacturers. Discounted bulbs include CFLs and LEDs across a range of offerings such as flood, globe, dimmable, and three-way bulbs. Additionally, customers can recycle CFLs free of charge at Ace Hardware stores. WECC has one full-time field manager who works directly with retailers, as well as one part-time field staff member to assist the Field Manager during busy seasons. For participating retailers, the field manager visits the stores, ensures that there is proper signage and marketing near the products, and verifies that the products are listed at the correct prices.

Each year, the Company's third-party implementer, with approval and oversight from Xcel Energy issues a request for proposals to manufacturers and retailers to participate in the program. The bidding process during the fall to allow enough time for products covered by program incentives to be on store shelves by the following January of each calendar year. After receiving all of the proposals, WECC compiles them and makes recommendations to Xcel Energy on the partners that provide products with the best opportunities for energy savings, have competitive pricing, offer the products being promoted, and are distributed broadly within the region. Xcel Energy can change the product offerings and discounts as often as two weeks which allows for continual monitoring of budget and goals.

Ameren Missouri Lighting Program

The Ameren Missouri Lighting Program launched in 2008. Ameren contracts with CLEAResult (formerly Applied Proactive Technologies) and Energy Federation Incorporated to implement the program for the 2013, 2014, and 2015 program years.

Ameren Missouri works with CLEAResult to provide a per-unit discount for eligible CFLs and LEDs and lighting occupancy sensors. The program also uses a social marketing distribution channel in which Ameren provided CFLs at no charge to income-eligible customers through partnerships with community organizations (which was discontinued in 2014). Ameren also offers an online store to ensure availability of incentivized bulbs to customers who are unable to access a retail partner, although participation is minimal.

In 2014, each participating retailer signed a six-month Memorandum of Understanding (MOU) that specified details such as the participation period, discounted products, and discount levels. CLEAResult negotiated six-month MOUs, rather than MOUs covering the entire program year (as it had done in the past). The shorter agreement periods offered Ameren the flexibility to make mid-year adjustments to both incentive levels and incentivized bulb models, and also to change manufacturing and retail partners as needed. CLEAResult's nine field representatives visited stores to ensure placement of in-store materials.

Energizing Indiana Residential Lighting Program

Energizing Indiana, a group of six utilities in Indiana (Duke Energy, Indian Michigan, Indianapolis Power & Light Company, Indiana Municipal Power Agency, NIPSCO, and Vectren) offers reduced prices on a variety of bulb types and wattages. In 2012, the program was administered by GoodCents and implemented by a third party, Ecova.

GoodCents used seven field representatives to conduct regular store visits. These visits were designed to increase interactions with customers and answer questions about the program, efficient products, and the correct application of the products. Field representatives also hosted regular ENERGY STAR outreach events during peak program times at participating retail stores throughout Indiana. These outreach events often included a booth or kiosk, educational materials, and hands-on activities.

To recruit retailers, Ecova solicited retailer and manufacturer partnerships through a bid process that resulted in 753 unique storefronts from 14 participating retailers, which included big box stores, hardware stores, and dollar stores.

Entergy Arkansas Residential Lighting and Appliances Program

The Residential Lighting and Appliance Program was based on Entergy Arkansas' 2007 CFL QuickStart Program. Since its launch, the program phased out coupons and expanded the list of participating retailers, manufacturers and the measures offered through the program. In the 2013 program year, the program offered ENERGY STAR CFLs, LEDs and light fixtures incentivized through a retail price markdown.

The Residential Lighting and Appliances program was implemented by CLEAResult, who was responsible for recruiting retail and manufacturer partners, and tracking and reporting data. Retail partners' responsibilities were outlined in the Memorandums of Understanding (MOUs) that were signed with CLEAResult. The implementer was also responsible for organizing in-store promotional events, press

releases and all other communication activities used to educate partners and the community about the program.

Public Service Company of New Mexico Residential Lighting Program

In 2014, PNM's Residential Lighting Program offered upstream rebates to residential customers in its service territory at 11 retail chains (all 11 store chains offered rebates on CFLs, and two stores offered LEDs at markdown) and coupons to 24 retailers. PNM also offered discounted CFLs and LEDs through the Energy Federation Incorporated online store for its residential electric customers. Participating retailers included large home improvement stores, warehouse clubs, discount retailers, drug stores, and independent hardware stores throughout PNM's service territory. While there was not a recycling component to the program, the website did provide resources to help customers identify locations to safely recycle CFL bulbs.

Field representatives from PMN provided participating stores with collateral and point-of-sale materials, organized retailer training sessions, and conducted 48 events throughout the year, including several school and community events.

Rocky Mountain Power Home Energy Savings Program

The Rocky Mountain Power Home Energy Savings (HES) Program provided discounts on energy efficiency measures in four categories: appliances, HVAC equipment, weatherization, and lighting. Savings from the lighting measures (CFLs and LEDs) accounted for over 93% of total program savings. Portland Energy Conservation, Inc., (PECI) (which has now been purchased by CLEAResult) is the program administrator who has overseen the HES Program in five PacifiCorp service territory states (Rocky Mountain Power a regional PacifiCorp utility for Idaho, Utah, and Wyoming) since 2006.

Rocky Mountain Power subsidized the cost of CFLs throughout its service territory as part of the HES Program. PECI used proprietary software to screen store locations and only targeted stores where 90% or more of CFL purchases can be attributed to Rocky Mountain Power customers.

The HES Program marketing strategy focuses on engaging trade allies as marketing partners. Customer-facing marketing tactics included print, direct mail, and online advertising. PECI also worked directly with retailers and trade allies to provide them with promotional materials. Retailers and trade allies, in turn, promoted the program to customers to increase sales of high-efficiency equipment and products. This included on-boarding/training, program marketing materials, newsletters, site visits, and point-of-purchase materials. Rocky Mountain Power also provided information about CFL recycling and has CFL recycling boxes set up in retail stores.

South Carolina Electric & Gas Company Residential ENERGY STAR Lighting Program

The Residential ENERGY STAR Lighting Program provided upstream price reductions for purchasing and installing high-efficiency and ENERGY STAR-qualified lighting. Beginning in the first quarter of 2011, all SCE&G customers were eligible to participate.

The program targeted residential electric customers within SCE&G's service territory, specifically focusing on single-family homeowners and renters. Through discounted pricing as well as customer education and outreach about the benefits of CFLs and LEDs, the program encouraged customers to purchase CFLs. To minimize freeridership, they used GIS and in-store intercepts to determine the likely number of non-SCE&G electric customers in a store's territory (leakage rate).The program offered consumers discounts of up to $3 per bulb at participating retailers throughout SCE&G's service territory to increase sales of efficient lighting.

Measures and Costs

All of the benchmarked programs include the same core measures: CFLs and LEDs. However, a few programs include unique or non-bulb offerings such as lighting fixtures, occupancy sensors, and holiday LED strings.

Table 19 lists the different components of each program.

Table 19. Benchmarked Program Components

Program	CFLs Component	LEDs Component	Fixtures Component	Recycling Component	Other Lighting Components
Xcel Energy Home Lighting and Recycling Program	✓	✓	✓	✓	
Ameren Missouri Lighting Program	✓	✓			Occupancy sensors
Energizing Indiana Residential Lighting Program	✓	✓	✓		Ceiling fans
Entergy Arkansas Residential Lighting and Appliances Program	✓	✓	✓		Ceiling fans*
PNM Residential Lighting Program	✓	✓			
Rocky Mountain Power HES Program (Lighting)	✓	✓		✓	
SCE&G Residential ENERGY STAR Lighting Program	✓	✓	✓		LED holiday lights

*This program, as a lighting and appliance program, offers some non-lighting-related incentives not included here.

There is a range of incentive levels for the different measures and lighting options offered through the benchmarked programs. CFL incentives ranged from less than a dollar to $3.97 per bulb. LED incentives, targeting more expensive bulbs, ranged from $2.62 to $10 per bulb. Cadmus found that the incentives offered for CFLs and LEDs through Xcel Energy's Home Lighting and Recycling program were comparable to those offered by the benchmarked programs.

Table 20 summarizes a comparison of benchmarked program measures and incentives.

Table 20. Benchmarked Program Measures

Program	Measures	Incentive Range Per Bulb
Xcel Energy Home Lighting and Recycling Program*	• CFL standard bulbs • CFL specialty bulbs • CFL high wattage bulbs • LED standard bulbs • LED specialty bulbs • LED fixtures (Downlight only)	CFL: $0.50-$1.50 LED: $3.00-$10.00
Ameren Missouri Lighting Program	• CFL standard bulbs • CFL specialty bulbs • CFL reflectors and high wattage bulbs • LED specialty bulbs (globes, dimmable, downlight) • Occupancy sensors	CFL: $1.05-$1.86 LED: $5.17-$7.43 Occupancy sensor: $5.00
Energizing Indiana Residential Lighting Program	• CFL standard bulbs • CFL specialty bulbs • LED bulbs (unspecified) • ENERGY STAR qualified fixtures • Ceiling fans	CFL: $0.50-$3.25 LED: $5.00-$10.00 Fixture: $12 Ceiling fans: $15
Entergy Arkansas Residential Lighting and Appliances Program	• CFL standard bulbs • CFL specialty bulbs • CFL fixtures • LED fixtures • LED bulbs (unspecified) • Ceiling fans	CFLs: $1.00-$3.00 LEDs: $4.00-$8.00 CFL fixtures: $10.00-15.00 LED fixtures: $10.00
PNM Residential Lighting Program	• CFL standard bulbs • CFL specialty bulbs • LED bulbs	CFL: $0.91-$1.50 LED:$2.62-$4.11
Rocky Mountain Power HES Program	• CFL standard • CFL specialty • LED bulbs (unspecified)	CFL standard: $0.75-$1.02 CFL specialty: $1.41-$3.97 LED: Not available
SCE&G Residential ENERGY STAR Lighting Program	• CFL standard bulbs • CFL specialty bulbs • CFL fixtures • LED reflector bulbs • LED nightlights • LED holiday strings	Not available

*Numbers calculated from "Xcel CO Retail Pricing 2014v2"; by 2015 LED incentives had decreased as retail prices declined.

Net-to-Gross

Cadmus reviewed the benchmarked programs to identify NTG and freeridership values as available (Table 21). The NTG of 0.79 for CFLs and 0.91 for LEDS, and freeridership of 0.35 and 0.23 respectively for the Xcel Energy Home Lighting and Recycling program falls within the range of NTG and freeridership values found for other programs through this study.

Table 21. Comparison of NTG and Freeridership Across Programs

Program	Calculated Measures	NTG***	Freeridership
Xcel Energy Home Lighting and Recycling Program	CFLs/LEDs	0.79/0.91	0.35/0.23
Energizing Indiana Residential Lighting Program	All measures	0.57	0.43
Ameren Missouri Lighting Program*	All measures	0.99	0.26
Entergy Arkansas Residential Lighting and Appliances Program	All measures	0.50	-
PNM Residential Lighting Program**	CFLs only	0.73	0.38
Rocky Mountain Power HES Program	CFLs only	0.73	0.27
SCE&G Residential ENERGY STAR Lighting Program	All measures	0.83	0.17

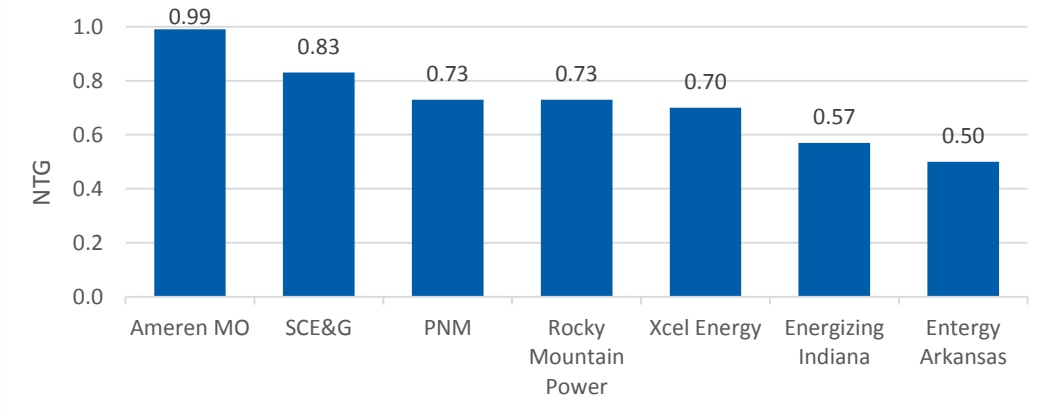
*Ameren Missouri's NTG ratio includes market effects and spillover. Separated by bulb type the NTG is 1.01 for standard CFLs, 0.84 for specialty CFLs, and 0.96 for LEDs.

**2012 numbers; most recent data publically available.

***Most programs do not differentiate between LEDs and CFLs because LEDs have been a small portion of the program.

As shown in Figure 33, Xcel Energy's NTG of 0.70, while higher than two of the benchmarked programs, was lower than the SCE&G, Ameren Missouri, PNM and Rocky Mountain Power programs. The highest NTG scores coincide with lower levels of freeridership.

Figure 33. Comparison of NTG Values



Hours of Use

Cadmus also benchmarked hours-of-use (HOU) values across programs where information was available. This provides information on the average time each individual light was on each day. These values ranged from 2.04 to 3.00 across the benchmarked programs.

As shown in Table 22, Xcel Energy's estimated HOU for the Home Lighting and Recycling program (based on the technical reference manual data provided in the 2015/2016 Demand-Side Management Plan) is much lower than the range found for other upstream lighting programs. Ameren Missouri, Energizing Indiana, and Efficiency Maine all utilized metering to establish their HOU (Rocky Mountain Power's value was based off of a model, and SCE&G did not specify how it determined HOU). Generally, it is a best practice to determine HOU through metering for an accurate value.

Table 22. Hours of Use for Benchmarked Programs

Program	Launch Year	All Socket CFL Saturation	Med. Screw Base CFL Saturation	HOU (hours/day)
Xcel Energy Home Lighting and Recycling Program	2006	31%	-	1.90*
Ameren Missouri Lighting Program	2008	17.7%	31.0%	2.20
Energizing Indiana Residential Lighting Program	2012	18.0%	-	2.40
Entergy Arkansas Residential Lighting and Appliances Program	2007	21.6%	33.2%	2.58
Rocky Mountain Power HES Program	2006	28.0%	-	2.27
SCE&G Residential ENERGY STAR Lighting Program	2011	-	-	3.00

*Based on technical assumptions.

Installation Rates

To track the Home Lighting and Recycling program's performance against the benchmarked programs' performance, Cadmus also reviewed installation rates (the percentage of lighting measures for which customers received incentives and installed). We found that most programs had eventual CFL installation rates of 99% (Table 23). Xcel Energy's installation rate for the Home Lighting and Recycling program as stipulated in the technical assumptions is 99%, which is similar to rates for other evaluated programs.

Table 23. First-Year Installation Rates for Program Bulbs

Program	Lifetime Installation Rate (CFL)	Lifetime Installation Rate (LED)
Xcel Energy Home Lighting and Recycling Program		99%*
Ameren Missouri Lighting Program		96.5%
Energizing Indiana Residential Lighting Program	97%	100%
Entergy Arkansas Residential Lighting and Appliances Program	99%	99%
Rocky Mountain Power HES Program	99%	N/A
SCE&G Residential ENERGY STAR Lighting Program	98%	N/A

*Based on technical assumptions.

**2013 value; only cumulative installation rate available for 2014.

According to the National Renewable Energy Laboratory's Uniform Methods Project, for upstream programs, it is recommended to use an in-home audit to establish first-year installation rates. While first-year installation rates are often well below 100%, studies have shown that consumers plan to install most of the incentivized bulbs they purchase.[32] Thus, over time, installation rates increase as bulbs are removed from storage to replace burned out bulbs.

Baseline Bulbs

Over the past few years, EISA lighting standard changes have meant that lighting baselines have started moving away from incandescent bulbs to EISA-compliant lightbulbs. This affects the difference in wattage between the baseline bulb and the efficient bulb. For example when a 13 W CFL replaces a standard incandescent, savings are based on the difference between 60W and 13 W or 47W. Since EISA disallowed standard incandescent manufacturing, the new baseline is 43W and savings are based upon a difference of 30W. Use of an updated baseline is not standard practice across all programs because since EISA disallowed manufacturing, but did not disallow sales of standard incandescents. Shelf surveys in other jurisdictions have confirmed that while standard incandescent bulbs were available for some time post-EISA implementation, they are nearly non-existent as of late 2015. Table 24 shows a comparison of different utilities' baseline assumptions across 2012 to 2014.

[32] http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter21-residential-lighting-evaluation-protocol.pdf

Table 24. Program Baseline Bulb Type

Program	Eval. Year	Baseline Bulb
Xcel Energy Home Lighting and Recycling Program	2014	EISA-compliant halogen
Ameren Missouri Lighting Program	2014	Mix of Incandescent & EISA-compliant *
Energizing Indiana Residential Lighting Program	2012	Not available
Entergy Arkansas Residential Lighting and Appliances Program	2013	Incandescent
PNM Residential Lighting Program	2014	EISA-compliant halogen
Rocky Mountain Power HES Program	2012	EISA-compliant halogen
SCE&G Residential ENERGY STAR Lighting Program	2012	Not available

*2013 evaluation—6 month lag to change to halogen after EISA implementation; 2014 evaluation: sales-weighted average based on incandescent availability in stores.

Contractor and Partner Networks

Cadmus reviewed the benchmarked programs' implementation and retailer networks. Most of the programs used an implementer or several implementers for delivery. Two programs used two implementation partners. Energizing Indiana used an administration partner and an implementation partner; the administrator (GoodCents) was involved with program planning and launching and was responsible for tracking and reporting. The implementer (Ecova) solicited trade ally partnerships, performed field inspections, and worked with retailers to promote program measures. As discussed in program design, the implementers were generally used for managing participating retailer partnerships, overseeing field staff (where utilized), and educating retail staff.

Table 25 shows the implementation method for the benchmarked programs.

Table 25. Implementer, Contractor, and Partner Relationships

Program	Implementation
Xcel Energy Home Lighting and Recycling Program	Wisconsin Energy Conservation Corporation
Ameren Missouri Lighting Program	CLEAResult and Energy Federation Incorporated
Energizing Indiana Residential Lighting Program	Administered by GoodCents Implemented by Ecova
Entergy Arkansas Residential Lighting and Appliances Program	CLEAResult.
PNM Residential Lighting Program	Self-implemented
Rocky Mountain Power HES Program	Portland Energy Conservation, Inc.
SCE&G Residential ENERGY STAR Lighting Program	Self-implemented

Cadmus also investigated retail channels for the discounted bulbs. All of the benchmarked upstream lighting programs included big box and club, deep discount, grocery and drug, and home improvement stores among their retailer partners. Two programs identified specialty stores, and two programs included an online store option.

While most programs have between 10 and 18 participating retail chains (with Rocky Mountain Power being the notable exception with 38 retailer partners), the number of storefronts reported ranged from 166 (PNM and Entergy Arkansas) to 476 (Ameren Missouri). Energizing Indiana reported a total of 753 storefronts, but that number is cumulative across their six participating utilities. In addition to storefronts, two program sponsors also included a dedicated online program store in order to offer all of their rate-payers with at least one way of participating in the program. Xcel Energy offers online discounts through Costco.

Table 26 shows the number of participating retailers and number of storefronts for benchmarked programs based on available data.

Table 26. Number of Participating Retailers and Storefronts

Program	Participating Retailers	Storefronts	Online Retailer	Field Reps
Xcel Energy Home Lighting and Recycling Program	18	525		1.5
Ameren Missouri Lighting Program	17	476	✓	9
Energizing Indiana Residential Lighting Program	14	753		7
Entergy Arkansas Residential Lighting and Appliances Program	9	166		N/A
PNM Residential Lighting Program	11	166	✓	Unknown*
Rocky Mountain Power HES Program	38	294		Unknown*
SCE&G Residential ENERGY STAR Lighting Program	11	N/A		N/A

*Report verifies use of field representatives, but no number provided.

As shown above, most programs use field representatives to check in on storefronts to make sure products and marketing materials are properly displayed. While we were not able to find information on all programs, the available data suggests that Xcel Energy uses few field staff (just the one plus a part-time contractor) compared to other programs.

While data on customers per storefront were not provided in reports, Cadmus was able to use reported number of storefronts and public data on residential customers served by various utilities to provide some information on the average number of residential customers per participating storefront for several utilities.

As shown in Table 27, Xcel Energy's customers per store fell within the range demonstrated by the benchmarked programs.

Table 27. Residential Customers Per Storefront

Program	Customers / Storefront
Xcel Energy Home Lighting and Recycling Program	2,667
Ameren Missouri Lighting Program	2,187
Energizing Indiana Residential Lighting Program	2,727
Entergy Arkansas Residential Lighting and Appliances Program	3,526
PNM Residential Lighting Program	2,722
Rocky Mountain Power HES Program	2,496
SCE&G Residential ENERGY STAR Lighting Program	2,917

Program Performance

Table 28 shows a comparison of the benchmarked programs' net annual savings (MWh), participation, and bulbs sold (as found in regulatory filings and evaluation reports). Units of light bulbs provided through the program ranged from 1 million to 4.3 million bulbs provided through the programs. Savings ranged from 22,932 to 155,780 MWh annually. Compared to other benchmarked programs, Xcel Energy has sold more bulbs per year; the Home Lighting and Recycling program also achieved higher annual MWh savings than all but Ameren Missouri.

Table 28. Net Annual Savings (MWh) and Participation

Program	Program Year	Net Annual Savings (MWh)	Number of Bulbs Incentivized
Xcel Energy Home Lighting and Recycling Program*	2014	141,257	4,306,517
Ameren Missouri Lighting Program	2014	155,780	3,984,029
Energizing Indiana Residential Lighting Program	2012	117,806	2,689,634
Entergy Arkansas Residential Lighting and Appliances Program**	2013	32,032	1,404,805
PNM Residential Lighting Program	2014	22,932	1,030,935
Rocky Mountain Power HES Program	2012	44,403	2,204,258
SCE&G Residential ENERGY STAR Lighting Program	2012	65,919	2,654,041

*Numbers for Xcel Energy from "Xcel CO Res Lighting program Sales 2014"

**Includes lighting and non-lighting measures; CFLs account for 97% of program savings.

Cadmus also compared number of bulbs sold to number of residential customers. As shown in Table 29, the number of bulbs sold per residential customer ranged from 1.31 to 4.57. Xcel Energy sold 3.66 bulbs per residential customer, which was higher than all other benchmarked programs with the exception of Ameren Missouri, which sold 4.0 bulbs per customer, and SCE&G, who sold 4.57 bulbs per customer. However, SCE&G only started offering programs in October 2010, and bulb sales tend to be higher in the first few years after program launch, which should be taken into consideration.

Table 29. Number of Bulbs per Customer

Program	Bulbs per Customer
Xcel Energy Home Lighting and Recycling Program	3.66
Ameren Missouri Lighting Program	4.00
Energizing Indiana Residential Lighting Program	1.31
PNM Residential Lighting Program	2.28
Rocky Mountain Power HES Program	3.00
SCE&G Residential ENERGY STAR Lighting Program	4.57

In terms of distribution of sales, the Home Lighting and Recycling program showed a higher percentage of LEDs sold as a percentage of lighting sales for all programs, except for SCE&G (Table 30). This suggests that Xcel Energy is successfully creating awareness (compared to other programs) and that the bulbs included in the program are appealing to its customer base.

Table 30. Percentage of Program Lighting Sales

Program	CFL	LED	Other
Xcel Energy Home Lighting and Recycling Program	86%	13%	1%
Ameren Missouri Lighting Program	93%	7%	<1%
Energizing Indiana Residential Lighting Program	99%	<1%	<1%
Entergy Arkansas Residential Lighting and Appliances Program	97%	1%	2%
PNM Residential Lighting Program	93%	7%	-
SCE&G Residential ENERGY STAR Lighting Program	80%	20%	-

Cadmus also investigated the percentage of bulbs sold to residential customers versus business customers. Since all of the benchmarked programs target residential customers, not all of the program sponsors investigated if the bulbs purchased with their program incentives were for use in nonresidential facilities. However, Ameren Missouri estimated that 91% of its program bulbs were installed in residential homes and 9% of its program bulbs were used in business facilities. Entergy Arkansas estimated that 5% of their bulbs were installed in nonresidential facilities. Xcel Energy uses a deemed 6% value to calculate bulbs assumed to be sold to commercial customers.

Marketing and Promotion

Sponsors of the upstream lighting programs reported that they generally relied on point-of-sale marketing to raise awareness of the program and encourage participation through purchase of bulbs and other program measures. This took the form of in-store signage and flyers, store events where customers were educated about the program and could ask questions, training of store sales associates, and leveraging retailer relationships to ensure prominent display of discounted lighting products.

Several programs also utilized marketing tactics that were not as widely utilized, although many were also utilized by Xcel Energy. For instance, Energizing Indiana offered several buy-one-get-one events, targeting high-performing locations on high-traffic days to boost sales lighting sales. Entergy Arkansas uses radio interviews, ads at local High School sporting events (including lead cards that attendees could

fill out to indicate interest and capture contact information) the, and direct mail campaigns for LEDs (to increase non-CFL measure awareness) in addition to in-store promotional events and displays. Other programs included non-store marketing included bill inserts (Energizing Indiana and Rocky Mountain Power) and social media (Rocky Mountain Power). Even without some of the additional marketing tactics, Xcel Energy's bulb purchases per customer were among the highest of the benchmarked customers.

Appendix A. Interview Guides

Appendix B. Survey Frequencies