Notification Date: April 12, 2022

➢ Summary of 60-Day Notice: Home Lighting and Recycling

Public Service Company of Colorado ("the Company") posts this 60-Day Notice to make changes to the Home Lighting and Recycling product in response to the 2021 Comprehensive Evaluation.

The evaluation provided key findings in the areas of Net-to-Gross Ratios ("NTGR") by bulb type, user experience with both our bulb finder site and our online marketplace, participating store locations, retail store employee knowledge of program and future lighting opportunities. The Company will implement the following recommendations in 2022:

- Update the NTGR using the NTGR formula as outlined in the evaluation report;
- Phase out reflector bulbs no later than the schedule outlined in the CO Appliance Bill;
- Update our Home Lighting web pages so that they provide information on our online marketplace and will add a link to our bulb finder site on the online marketplace so customers have more purchasing options;
- Determine if there are additional stores we can partner with in the zip codes identified in the report;
- Create a plan to increase awareness and training among participating providers; and
- Increase visibility of the marketplace on search engines.

Table 1: Summary of Forecasted Impacts: Home Lighting and Recycling

	2022	
	As Filed	*Revised per 60-day*
Electric Savings (kWh)	62,405,952	44,175,156
Electric Demand Reduction (kW)	8,928	6,313
Budget*	$2,807,282	$2,802,239
MTRC Test Ratio	3.44	3.18

*Rebates only. While the anticipated expenditure impacts are forecasted, the Company acknowledges that this Notice does not change the filed budget.

Detailed responses to each of the Comprehensive Evaluation recommendations can be found in the matrix included with the report.

Included with this Notice are the following documents:

- Redlined Deemed Savings worksheet;
- Redlined Technical Assumptions worksheet; and
- Updated cost-benefit analyses.

These documents can be found on our website at the following link:
http://www.xcelenergy.com/Company/Rates_&_Regulations/Filings/Colorado_Demand-Side_Management

January 25, 2022

Xcel Energy

Colorado Home Lighting Product Impact & Process Evaluation:

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EXECUTIVE SUMMARY

2021 Colorado Home Lighting Evaluation

Introduction

Xcel Energy contracted with TRC Companies (TRC) to evaluate the 2020 Home Lighting Product in Colorado. The product offers instant rebates, through retailers, to Xcel Energy customers who purchase qualifying lighting products. The product is designed to streamline the process for residential customers to purchase discounted LED bulbs, but it is understood that smaller and medium business customers may use these pathways as well.

As part of the process evaluation, TRC and its subcontractor Apex Analytics, LLC (Apex) investigated customer experiences with the product tools and assessed the geographical coverage of the retail outlets where discounted lighting products are sold. TRC Companies and Apex also assessed corporate trade partner experience with the product. For the impact evaluation, TRC Companies assessed the net-to-gross ratio (NTGR) for the Home Lighting Product as well as the impact of the Colorado Appliance Bill on sales of affected lighting products. This summary includes the key findings and recommendations from our evaluation.

Methods

Customer Interviews (n=10 bulb finder and purchase experience; n=8 product website; n=6 digital marketplace)

GIS Mapping

Corporate Trade Partner Interviews (n=5)

Peer Benchmarking Interviews (n=6)

Fielding:
July 2021 – September 2021

Summary of Findings

The evaluation team estimated a **retrospective NTGR of 0.49 and a prospective NTGR based on a formula tied to bulb type.** The evaluation team found that NTGR results vary significantly by bulb type and are expected to continue declining in in each year as LED market shares increase. These results are based on a sales data analysis, trend analysis, and corporate trade partner responses and include an adjustment to account for claimed savings reductions from the Colorado Appliance Bill.

The customer digital experience had some successes and challenges for both the bulb finder website and digital marketplace. Customers were appreciative of the discounts and found it easy to enter their zip code in the bulb finder but would have liked a radius selection for their search of stores. After struggling to find the digital marketplace during the interviews, customers reported that the website was appealing, but then had difficulty creating a new account and paying $5 shipping.

The density of participating retailers roughly aligns with the density of the population; areas with larger populations have more participating retailers. There are less dense areas with lower/medium median income that have no participating retailers selling discounted light bulbs. These few areas are mostly found in the more rural areas of south-central Colorado.

Store clerks were mostly helpful in terms of purchasing light bulbs in store. The customers that were asked to go to the physical store had pleasant interactions with store clerks. In three of the nine stores that participants visited, the store clerks with whom they interacted did not know of the Xcel Energy discounted light bulbs program (which may be due to suspension of training during the COVID-19 pandemic).

Product Influence – Prospective NTGR

2022 47.9% x gross kWh A-lamps + 71.8% gross kWh 3-way lamps + 47.9% x gross kWh candelabras and globes + 22.2% x gross kWh reflectors + Midstream NTG% x gross kWh TLEDS, retrofit kits, and PLs/moguls)/total program gross kWh

2023 44.7% x gross kWh A-lamps + 100% gross kWh 3-way lamps + 89.6% x gross kWh candelabras and globes + 41.5% x gross kWh reflectors + Midstream NTG% x gross kWh TLEDS, retrofit kits, and PLs/moguls)/total program gross kWh

NTGR for reflectors, 3-way, candelabras and globes have been adjusted to account for reduction in claimed savings legislated by Colorado Appliance Bill.

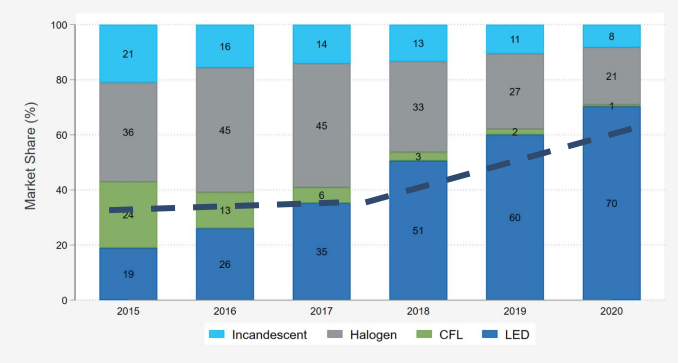
EXECUTIVE SUMMARY

2021 Colorado Home Lighting Evaluation

Product Influence

Market Trends

Nationwide and in Colorado, LED market shares continue to increase.



Product Influence – Retrospective NTGR

Sales Data Analysis

LED Market Shares in Xcel Energy Colorado service territory is 79.2% compared to estimated 67.6% without program which leads to a retrospective NTGR calculation of 35%.

4 of 5

Corporate trade partners believe the collective effect of all programs across the nation affected LED sales in non-program areas, leading to adjustment of the "without program" LED market shares to 62.9% and retrospective NTGR of 49%.

Peer Benchmarking

NTG results vary due to differences in timing and methods among peer utilities, however Xcel Energy Colorado results fall within the range of these peers.

	Utility A	Utility B	Utility C	Utility D	Utility E	Utility F
NTG	0.65	0.20	0.56	0.35	0.24	0.36
Year Applied/ Year Data	2020/2019	2020/2020	2021/2018	2022/2020	2020/2020	2020/2019

Plans if EISA Tier 2 Standards are Implemented

Peer Utility Recent Program Adjustments

3 out of 6

Expanded efforts low-income incentives for lighting

2 out of 6

Have made no recent program changes

1 out of 6

Planning to retire reflector lamps in 2022 and place emphasis on globe/candelabra lamps

EXECUTIVE SUMMARY

2021 Colorado Home Lighting Evaluation

Corporate Partner Ideas For Future Products

Niche Lighting Products

Outdoor lighting, edge-lit fixtures, strip tape lights, products relating to health, wellness, safety and security. Integrated and connected lighting.

Heat Pumps and Insulation

Products for other end-uses

Opportunities to Improve Cost-Effectiveness

Peer Utility Comparisons

2 out of 7

Ranked #2 in terms of lowest $/customer spending, most lamps sold per customer, TRC ratio (with the #1 ranked utility varying by metric)

1 out of 7

Lowest incentive cost per bulb for general service A-lamps, and in lower half for other bulb types.

Based on peer utility comparisons, Xcel Energy Home Lighting program is already **one of the most cost-effective** among its peers. Corporate partners had no suggestions for improvements.

Feedback and Barriers Customers Using Product Tools

Product Website And Digital Marketplace

What is working

- Easy to input zip codes
- Simple website layout
- Lots of helpful information
- Some customers thought the digital marketplace website looked appealing
- Many customers appreciate the bulb discounts

What is challenging

- Finding correct website
- Unaware of program
- Store list confusion
- For some customers, too much information
- Gaps in stores with discounts in south-central Colorado
- Making a separate account for digital marketplace
- $5 shipping for one item at digital marketplace

Experience With Store Clerks

4.8

Friendliness

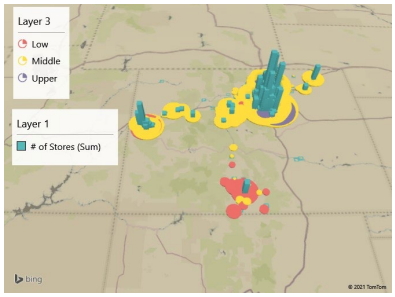
(1 = not friendly, 5 = very friendly)

3.2

Knowledgeable

(1 = not knowledgeable, 5 = very knowledgeable)

Store Availability



Zip Codes having no stores within 10 miles

81144	80438
81132	81148
81120	81136
81152	80018
81133	80516
81149	

Conclusions & Recommendations

The Home Lighting Product **remains influential in encouraging customers to adopt LEDs, however the level of influence varies by bulb type**.

> The evaluation team recommends using formulas (which account for adjustments based on the Colorado Appliance Bill) to calculate the **prospective NTGRs. The evaluation team recommends p**hasing out reflector bulbs no later than the schedule established by the Colorado Appliance Bill, balancing the need for most cost-effective savings with retailer and manufacturer participant relationships.

Both finding and using the Bulb Finder website presented barriers for customers. Once at the correct website, some customers were 1) wanting a map radius choice in their store search, 2) confused by the way the store search results populate (not in the order of proximity), and 3) overwhelmed by the "Find 2021 Deals" dropdown menu (although some customers found it helpful).

> When updating Bulb Finder website, consider these recommendations:
> • Add links to highly visited Xcel Energy web pages including digital marketplace
> • Examine the algorithm for store search results as they do not necessarily show the closest in proximity store to zip codes entered
> • Add a map radius function to the search field
> • Simplify the "Find 2021 Deals" dropdown menu to key features customers need

The density of participating retailers roughly aligns with the density of the population; areas with larger populations have more participating retailers, however some rural areas have no participating retailers selling discounted light bulbs. The implementer has searched for rural and independent retailers in the past, however sometimes LEDs are not offered.

> Continue searching for potential retailers, who carry LEDs or can be encouraged to carry LEDs, in the identified zip codes without participating retailers.

Store clerks were mostly helpful to customers purchasing light bulbs in stores.

> When possible, increase awareness and training among participating retailers. More frequent training can assist when there is staff turnover – so new clerks can receive training and better inform customers of the program.

Both finding and using the digital marketplace to purchase light bulbs presented barriers to customers. Interviewed customers struggled in finding the digital marketplace website (only one customer out of six succeeded in finding the website). Once at the correct website, customers were not able to log in easily (customers wanted to use their Xcel Energy login) and were discouraged by the $5 shipping for a single purchase.

> When updating digital marketplace website, consider these recommendations:
> • Add links to highly visited Xcel Energy web pages and Bulb Finder website
> • Increase visibility of the digital marketplace on search engines
> • Consider allowing customers to sign in as a "guest" and verify their Xcel Energy customer address
> • Consider free shipping for some or all types of purchases

No peer utilities have plans for a full replacement of home lighting program savings if standards are enacted. Other utilities have expanded income-qualified offerings and are also considering heat pumps and expanding commercial programs. Corporate trade partners suggested niche lighting products such as smart lighting, edge lighting, and health and wellness products (e.g., lighting with varying color or intensity to match circadian rhythms)

> Look to multiple types of products and niche technologies to help compensate for expected declines in future residential lighting savings. This approach mirrors how peers are handling the issue and also reduce the risks of relying on one technology to fill the gap in meeting future goals.

1 Introduction

Xcel Energy offers a comprehensive array of energy services and products to its customers, including demand side management (DSM). For its 2021 product evaluations, Xcel Energy sought to understand the role each evaluated product plays in changing the marketplace, to analyze that influence on customer choices, and to use the findings to improve customer experience and ensure industry-leading product performance. To accomplish these goals, Xcel Energy contracted with TRC to evaluate 11 products offered in Colorado and Minnesota in 2021,[1] including the Colorado Home Lighting Product discussed in this report. This introduction includes an overview of the product and the evaluation approach and describes the organization of the report.

1.1 Product Overview

The Colorado Home Lighting Product provides instant rebates for a variety of residential lighting measures. The product is designed to streamline the process for residential customers to purchase discounted LED bulbs. To achieve this objective, product staff use Slipstream as their implementer, who works with lighting manufacturers and their participating retailers to provide discounted bulbs at stores in Xcel Energy territory across the state. The product primarily serves residential customers, but it is understood that smaller business customers may use these pathways as well, and these assumptions are integrated in Xcel Energy's savings calculations by bulb type.

To participate in the product, manufacturers must respond to an annual request for proposals (RFP), meet eligibility criteria, and provide a product workbook of all products for which they wish to receive incentives and a list of all participating retailers. Manufacturers may choose to provide additional discounts for their products in addition to the incentive amount. Slipstream then creates contracts between the parties (the manufacturer, Slipstream, and sometimes the retailer), and Slipstream can ask the retailers to sign a letter of authorization for placing promotional materials near the product. Incentive amounts can be negotiated but are typically 60% to 75% of the incremental cost. Once the contracts are completed, Slipstream staff visit each retailer location to put up point-of-purchase (POP) displays and educational breakroom posters, and to train store staff as needed. Slipstream conducts random quality assurance checks in stores to ensure quantity limits are enforced, prices ring up correctly, and POP displays are visible. Retailers send sales data to manufacturers on a weekly to monthly basis, and manufacturers provide those data to Slipstream to track bulb sales and savings over time.

The product has undergone several changes in the past year. In 2020, the United States experienced an unprecedented pandemic from COVID-19, and Xcel Energy expanded some products to its customers during this time. One of these products was a partnership with their Income Qualified (IQ) weatherization product, where they worked with food banks to give away LED bulbs. Xcel Energy wants to continue finding opportunities to expand lighting opportunities

[1] The products selected for evaluation include: ENERGY STAR New Homes (CO), C&I New Construction (CO), High Efficiency AC (CO), Home Lighting (CO), Compressed Air (CO), Compressed Air (MN), Commercial Efficiency (MN), Process Efficiency (MN), Low-Income Home Energy Squad (LIHES), Home Energy Savings Program (HESP), and Multi-Family Energy Savings Program (MESP).

to IQ customers. Xcel Energy also added TLEDs, PL lamps, and moguls to their measure offerings for the Home Lighting Product in 2020. These measures are mostly purchased by business customers through the Home Lighting Product distribution channels of home improvement outlets. In 2021, Xcel Energy updated and re-launched their website to combine the bulb finder site with the program page. Table 1 summarizes the major measure groups, quantities, and savings from the Home Lighting Product.

Table 1. Colorado Home Lighting, January 2020–December 2020

Measure	kWh		kW		Units	
	Quantity	% of Total	Quantity	% of Total	Quantity	% of Total
A-lamp LEDs	89,393,261	75.05%	12,581	74.91%	3,327,630	82.36%
Specialty LEDs	28,628,060	24.04%	4,034	24.02%	681,606	16.87%
TLEDs	1,083,966	0.91%	179	1.07%	31,111	0.77%
TOTAL	**119,105,287**	**100%**	**16,794**	**100%**	**4,040,347**	**100%**

Note: This is the population of lighting discounts paid between January 2020 and December 2020. These numbers are based on aggregated data provided to TRC in March 2021.

1.2 Evaluation Overview

The evaluation team designed a comprehensive evaluation of the Home Lighting Product to provide information on four key research objectives:

1. Estimate **product influence** on customer decisions (net-to-gross ratio, or NTGR), including major drivers for NTG, market effects, and peer utility NTGRs.
2. Get **feedback and understand barriers in using the Xcel Energy Home Lighting Product tools, including website, storefront, and retail outlets,** to see if the website is clear, is used by customers, is accessible, and helps drive participation to the product.
3. Gain **insight from stakeholders and peer utilities on what may take the place of home lighting** if EISA Tier 2 standards are enacted. How are they planning to fill the savings gap and retain engagement with customers served through home lighting programs? How are they anticipating possible standards and planning for future program designs?
4. Discover if there are **opportunities to increase cost effectiveness** of this already cost-effective product.

Table 2 presents an overview of the research topics and data sources used in this evaluation of the Colorado Home Lighting Product.

Table 2. Colorado Home Lighting Research Objectives and Methods

Primary Research Objectives	Staff Interviews (n=4)	Corporate Partner Interviews (n=5)	Residential Customer dscout Campaign (n=10)	Sales Data Analysis	Peer Utility Benchmarking Interviews (n=4-6)	Product Website Usability Testing (n=8)	Digital Marketplace Usability Testing (n=6)	GIS Opportunity Mapping
Product influence, major drivers, market effects, and peer utility NTGR		X		X	X			
Feedback and barriers for customers using Product tools			X			X	X	X
Insight from stakeholders and peer utilities on what may take place of home lighting if EISA Tier 2 standards are implemented		X			X			
Opportunities to increase cost effectiveness	X	X	X	X	X	X	X	X

1.3 Report Organization

The following chapters organize the evaluation findings into two components: impact and process evaluation results. Further detail on the evaluation approach is presented in the following chapters.

- Chapter 2 reviews the approach and results of the net impact evaluation and the attribution of product impacts using a standard NTGR analysis.
- Chapter 3 discusses the process evaluation components, including customer use of tools and satisfaction and barriers, and trade partner support, and peer utility comparisons.
- Chapter 4 presents conclusions and recommendations.
- Supporting documents, such as the evaluation plan, data collection instruments, and task-specific findings, can be accessed in this report's appendices.

2 Impact Findings

A central component of this evaluation was the estimation of the NTGR for the Xcel Energy Colorado Home Lighting Product. For DSM products, the NTGR is a metric that estimates the influence of the product on the target market. It is used both as a benchmarking indicator of effectiveness and to adjust reported gross energy savings to account for energy efficiency that would occur in the absence of a program. NTGR results can indicate opportunities for Xcel Energy to adjust the design and implementation of its products to increase the cost-effectiveness of both individual products and the entire portfolio. The NTGR includes several factors that create differences between gross and net savings, such as free-ridership and spillover. In prior years, Xcel Energy relied on a NTGR value of 0.61 for most residential lighting measures.[2]

The evaluation team estimated a retrospective NTGR based on nationwide sales data, with adjustments based on trade-partner interview responses, and then recommended prospective NTGRs based on trends in the residential lighting market. Note that a NTGR of 1.0 for an upstream product such as Xcel Energy Colorado Home Lighting may not be desirable, as eliminating all free-ridership may not be feasible for a program operating at significant scale. In addition, a variety of factors including the maturity of the product, the maturity of the technologies it promotes, product intervention strategies, and cross-product coordination strategies affect the achievable level of free-ridership. The evaluation team has taken care to present our NTGR results with this context in mind.

This chapter presents:

- **Key Impact Findings –** This section presents the recommended NTGR based on the evaluation team's synthesis of findings from market actors.
- **Retrospective Net-to-Gross Approach and Findings–** This section presents an overview of the evaluation team's methods to calculating the recommended NTGR.
- **Prospective Net-to-Gross Considerations –** This section presents findings the evaluation team considered when recommending its prospective NTGR.
- **Peer Utility Net-to-Gross Comparisons –** This section presents NTGR ratios across peer utilities included in this evaluation.
- **Appliance Bill Considerations –** This section describes how the NTGR is impacted by Colorado legislation entitled the Appliance Bill which phases out savings from certain specialty bulbs.

2.1 Key Impact Findings

This section presents a summary of the key findings from the impact evaluation for the Colorado Home Lighting Product, including retrospective and prospective NTGR recommendations. The evaluation team provides its estimated retrospective NTGRs, based on the quantitative and

[2] EMI Consulting and Apex Analytics, *Xcel Energy Home Lighting Product 2018 Evaluation Final Report*, December 12, 2018.

qualitative results of nationwide sales data and trade partner research. We then provide our recommended prospective NTGR, based on potential changes to the residential lighting market while considering potential changes in the mix of measures offered.

2.1.1 Retrospective Net-to-Gross Ratio

The evaluation team estimated a retrospective NTGR of 0.49 for the Colorado Home Lighting Product, based on sales analysis and participating trade partner responses. To estimate this NTGR, the evaluation team took the following steps:

- The evaluation team first estimated a NTGR of 0.35 using a regression analysis to quantify the relationship between program intensity (e.g., program spending per household) and LED sales (the percent of light bulb purchases that are LEDs). This NTGR includes market effects of 11.5% occurring from the momentum effect of the 13-year program history as estimated through the model.
- The evaluation team estimated a 4.7% counterfactual market share adjustment factor based on corporate partner interviews where 4 of 5 partners indicated they believe that the collective effect of all program influences sales in non-program areas. When this adjustment to no-program market shares is included in the modeling, the resulting NTGR inclusive of all market effects is 0.49.
- The evaluation team also calculated NTGR by bulb type as the sales data model estimates program lift by bulb type with the retrospective values for A-line, candelabra and globe, and reflectors estimated as 54.7%, 36.5%, and 16.9%, respectively. Detailed methodology for the NTGR calculation can be found in Section 2.2.

2.1.2 Prospective Net-to-Gross Ratio

The evaluation team projected prospective NTGR assuming decreasing market size and decreasing product influence. The overall market size is decreasing because the technical life of LEDs is much longer than that of bulbs replaced (13+ years for LED vs. 1 to 3 years for incandescents or halogens). Market lift is decreasing as LED market shares have continued to increase. As the NTGR is highly dependent on bulb mix, the evaluation team recommends a NTGR formula based on the mix of bulbs for each year. The sales data analysis estimated values for A-line (54.7%), candelabra and globe (36.5%), and reflector values (16.9%). The evaluation team projected these values would decline in future years due to decreasing market size and decreasing program lift, to get the values shown in equations 1 and 2 for the respective bulb types. Since the sales data analysis only covers the A-line, candelabra and globe, and reflector type lamps, the evaluation team recommends using the Midstream Lighting evaluated values for mogul, PL TLED lamps, and retrofit kits (78%). The equations below show the prospective NTG ratios, by style, for 2022 and 2023. Note these NTG ratios do *not* account for a decrease in claimed lamps due to the Colorado Appliance Bill, which is discussed in Section 2.5.[3]

[3] https://leg.colorado.gov/sites/default/files/documents/2019A/bills/2019a_1231_enr.pdf

Equation 1. 2022 Prospective NTGR Formula

$$2022\ NTGR = (47.9\%\ x\ gross\ kWh\ Alinelamps + 31.9\%\ x\ gross\ kWh\ candelabras\ and\ globes + 14.8\%\ x\ gross\ kWh\ reflector + 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls) / total\ program\ gross\ kWh$$

Equation 2. 2023 Prospective NTGR Formula

$$2023\ NTGR = (44.7\%\ x\ gross\ kWh\ Aline\ lamps + 29.9\%\ x\ gross\ kWh\ candelabras\ and\ globes + 13.8\%\ x\ gross\ kWh\ reflector + 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls) / total\ program\ gross\ kWh$$

2.2 Retrospective Net-to-Gross Approach and Findings

The NTGR for the Home Lighting Product was developed using sales data analysis and informed by corporate partner interviews and data on trends in market size. The methodology used in this evaluation is similar to that used in the previous evaluation, which also relied on sales data modeling, but differed slightly in that this analysis incorporated a counterfactual adjustment to account for market effects into non-program areas and used market size trends to project forward-looking NTGR values.

The data inputs to the NTGR analysis included:

- **LED sales program data –** from 43 states across the U.S.
- **Corporate trade partner interviews –** focused on determining the effect of collective programs on non-program-area LED sales and the effect of the Colorado Appliance Bill.
- **Potential for changes in measures offered through the product changes in upcoming years –** implications for changing sales by bulb type.

The evaluation team collected total state-level lighting sales data for screw-based bulbs across the U.S., along with program spending and sales data from utilities in the same regions to create a database for the sales data model.

The evaluation team also spoke with five of the larger participating corporate retailers or manufacturers that sold a variety of measure types. The corporate partners with whom we spoke represented 83% of the kWh sales through the program.

2.2.1 Sales Data Modeling

The evaluation team developed the initial retrospective NTGR for the Home Lighting Product using a modeling approach that relies on sales data prepared by the Consortium for Retail Energy Efficiency Data (CREED)[4] from 43 states across the U.S that included 2020 sales volume for CFLs, LEDs, halogens, and incandescent bulbs by screw-in bulb style, program spending, and demographic variables. The general form of the sales data model is shown in Equation 3. Detailed information about the sales data modeling is provided in Appendix C.

[4] https://www.creedlighttracker.com

Equation 3. Sales Data Model

$$LED\ Market\ Share_i = \beta_0 + \beta_1 * Program\ Spending\ Variable_i + \beta_2 * Program\ Age\ Variable_i + \beta_3 * \sum_1^3 Channel\ Variables_i + \beta_4 * \sum_1^7 Demographic\ Variables_i + \epsilon_i$$

Where:

LED Market Share$_i$	=	Proportion of total LED sales in state 'i'. Equal to [LED sales/total bulb sales].
β_0	=	The model intercept.
β_1	=	The primary coefficient of interest. This represents the marginal effect of program activity.
β_2	=	Another coefficient of interest. This represents the marginal effect of program maturity.
Program Spending Variable$_i$	=	A numeric variable that summarizes state-level retail lighting program dollars per household in state 'i'. Two different program spending variables were tested.
Program Maturity Variable$_i$	=	The number of years state 'i' has been running an upstream lighting program. Two different program age variables were tested.
β_3 and β_4	=	Array of regression coefficients for the channel and demographic variables.
Channel Variables	=	Numeric variables summarizing state-level retailer characteristics.
Demographic Variables	=	Numeric variables that summarize state-level population, housing, and economic attributes.
ϵ_i	=	Error term.

Using the results of the regression models, efficient bulb sales data, and the program tracking databases, the team estimated NTG ratios for LEDs in 2020. The team derived NTG ratios by first using the model to predict the share of efficient bulbs with and without a program (determining the counterfactual of no program activity by setting the program spending variable to zero). This change in share represents the program lift, or net increase in the share of efficient bulbs resulting from program activity.

To then calculate NTGR (see Equation 4), the evaluation team multiplied the change in share by the total number of bulbs—for all bulb types—sold in 2020, as determined by the sales data analysis described above. This value represents the net impact of the program (i.e., the total lift in the number of LEDs sold) and is then divided by the total number of program bulbs sold (i.e., the gross number of bulbs) to determine NTGR:

Equation 4. NTGR Formula

$$NTGR = \frac{(\#\ bulbs\ sold\ with\ program - \#\ bulbs\ sold\ with\ no\ program)}{\#\ program\ incented\ bulbs\ sold}$$

2.2.2 Counterfactual Adjustment

Once the evaluation team estimated the initial retrospective NTGR, the team incorporated a counterfactual adjustment using results from corporate partner surveys to adjust the "# bulbs sold with no program" variable, which then adjusted the NTGR. To estimate the counterfactual adjustment, we asked corporate partners the following questions[5]:

- Do you think the collective effect of all the programs across the nation affect LED sales in non-program areas?
- If so, by what percentage do you think non-program areas would be lower if no lighting programs ever existed?

The average response from the second question was 9.4% (in absolute, not relative, terms). To account for uncertainty, small sample size, and the fact that Xcel Energy Colorado program was only a portion of the "collective effect of all programs across the nation", the evaluation team applied half of the average response, or 4.7% to reduce the counterfactual market share from 67.6% to 62.9%. This resulted in increasing the individual bulb type retrospective NTGRs to 54.7%, 38.5%, and 16.9% for A-lines, candelabra and globes, and reflectors, respectively.

2.2.3 Determination of Retrospective Net-to-Gross Ratio

The evaluation team estimated Home Lighting Product's initial NTGR using the formula in Equation 5 below, with values shown in Equation 6:

Equation 5. 2020 Retrospective NTGR Formula

$$2020\ NTGR = (54.7\%\ x\ gross\ kWh\ A-lamps + 38.5\%\ x\ gross\ kWh\ candelabras\ and\ globes + 16.9\%\ x\ gross\ kWh\ reflector + 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls) / total\ program\ gross\ kWh$$

Equation 6. Calculated 2020 Retrospective NTGR

$$2020\ NTGR = (54.7\%\ x\ 148{,}741{,}092 + 38.5\%\ x\ 5{,}141{,}694 + 16.9\%\ x\ 39{,}594{,}793 + 78\%\ x\ 1{,}776{,}993)/195{,}254{,}572 = 0.47$$

2.3 Prospective Net-to-Gross Considerations

The evaluation team also examined market conditions and considered possible program changes to mix of bulbs included in the program to recommend a prospective NTGR. Findings indicate that NTGRs are expected to continue to decline across the country as LED market shares continue to increase in areas without programs. The recommended prospective NTGR

[5] The full survey guide is provided in Appendix B with a summary of findings from these interviews provided in Appendix C.

aligns with NTGRs applied to peer programs across the country based a benchmarking analysis conducted by the evaluation team.

The remainder of this section presents the evaluation team's methodology to forecast market size and program lift. It then presents the prospective NTGR findings and concludes by comparing these findings to peer utilities.

2.3.1 Market Size

Using the sales data from CREED as discussed earlier, the evaluation team accessed data that track all screw-based light bulbs sold in Colorado for 2017 through 2020. The evaluation team used these data to estimate Xcel Energy Colorado territory's market size as proportional to the statewide market size based on the number of households (53%). As shown in Table 3, the market size increased in 2018 and then declined in 2019 and 2020.

Table 3. Historical Market Size

Number of Light Bulbs Sold	2017	2018	2019	2020
Colorado	23,522,358	26,028,550	24,858,772	22,813,750
Change in Market Size	n/a	11%	-4%	-8%
Xcel Energy Colorado Market Size	12,351,817	13,667,843	13,053,581	11,979,720

The evaluation team considered market factors driving these trends and notes that 2018 saw a major increase in LED purchases replacing incandescent or halogen purchases. Since then, market size has decreased due to the fact that LED lifetimes are considerably longer than incandescent or halogen and therefore do not need replacing as often. The evaluation team reviewed changes in market size in Colorado, other states, and the U.S. in total and noticed no clear trend that applies across the board. As such, for Xcel Energy Colorado, the evaluation team assumed that market size will continue to drop at a modest rate and assumed ongoing change in market size of -5% per year through 2023.

2.3.2 Program Lift

As described in Equation 4 above, the NTGR calculation is derived from the difference between the total LEDs sold with the program and the model predictions of bulbs sold absent the program. This difference can also be computed by multiplying market lift by market size, as shown in Equation 7.

Equation 7. Program Lift and Market Size Formula

$$\#\ bulbs\ sold\ with\ the\ program - \#\ bulbs\ sold\ without\ the\ program = program\ lift\ x\ market\ size$$

The evaluation team could then use results from Equation 7 to develop a formula for the NTGR, as shown in Equation 8.

Equation 8. NTGR Formula

$$NTGR = \frac{program\ lift\ x\ market\ size}{\#\ of\ program\ incented\ bulbs\ sold}$$

The evaluation team calculated program lift in 2017 and in 2020 using the sales data model and performed similar modeling for numerous states across the country. Xcel Energy saw an increase in program lift from 11.9% in 2017 to 16.3% in 2020. From our review of Xcel Energy and other states, the evaluation team saw no clear trend in program lift but expects a slight decline going forward and LED market shares in non-program areas to continue to increase. As such, the evaluation team assumed a decline of 0.25% per year from 2020 through 2023[6]. Using these trending assumptions for program lift and market size, the evaluation team estimated prospective NTGRs for 2022 and 2023 by bulb type, which takes into account that Xcel Energy may change its bulb type mix in future years.

Recommended Prospective Net-to-Gross Ratio

The evaluation team recommends using the formulae below for 2022 and 2023 NTGRs. These NTGRs account for spillover and market effects from the 13 years of program activities, as well as market effects from the collective effect of all programs impacts on LED sales in non-program areas (which form the basis for the sales data modeling). The values do not include the Appliance Bill adjustments described in Section 2.5. The evaluation team determined the multipliers for each bulb type using the initial retrospective values for A-line, candelabra and globe, and reflectors of 54.7%, 36.5%, and 16.9%, respectively that were adjusted by trending market size and program lift to get corresponding values of 47.9%, 31.9%, and 14.8% for 2022 and 44.7%, 29.9%. and 13.8% for 2023.

Equation 9. 2022 Prospective NTGR Formula

$$2022\ NTGR = (47.9\%\ x\ gross\ kWh\ Alamps + 31.9\%\ x\ gross\ kWh\ candelabras\ and\ globes + 14.8\%\ x\ gross\ kWh\ reflector\ +\ 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls)\ /\ total\ program\ gross\ kWh$$

Equation 10. 2023 Prospective NTGR Formula

$$2023\ NTGR = (44.7\%\ x\ gross\ kWh\ Alamps + 29.9\%\ x\ gross\ kWh\ candelabras\ and\ globes + 13.8\%\ x\ gross\ kWh\ reflector +\ 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls)\ /\ total\ program\ gross\ kWh$$

[6] This value is based on the evaluator judgement and consistent with the assumption used in another recent evaluation in the Midwest (not publicly available).

2.4 Peer Utility Net-to-Gross Comparisons

The retrospective and prospective NTGR are in line with peer utilities interviewed through this evaluation effort. As shown in Table 4, peer utilities use a wide variety of methods and application years for lighting NTGR. Utility A has the highest NTGR, but this program currently only offers bulbs in discount stores. Utility C also has a higher NTGR, but it is based on data collected in 2018 and is used prospectively. Utility D is most similar to Xcel Energy, as it used a 2020 sales data modeling and then a trend analysis to estimate prospective value. However, the Utility D analysis did not account for the counterfactual adjustment as was applied to Xcel Energy. Utility B has the lowest NTGR, but it does not account for any market effects. Also shown for each utility is the 2020 overall LED market share, with Xcel Energy Colorado as the highest of the group.

Table 4. Peer Utility NTGR

Program Administrator	NTGR	Methodology	Type	Year Applied/Year Data	LED Market Share[a]
Xcel CO	0.61	Sales data modeling & manufacturer interviews	Prospective	2020/2017	79%
Xcel CO	0.49[b]	Sales Data modeling	Prospective	Retrospective/ 2020	79%
A	0.65	Demand elasticity modeling, in store intercepts, non-participant surveys	Retrospective	2020/2019	67%
B	0.20	Sales data modeling w/o market effects	Retrospective	2020/2020	68%
C	0.56	Intercept surveys	Prospective	2021/2018	71%
D	0.35	Sales data modeling with forecast market size	Prospective	2022/2020	73%
E	0.24	Sales data modeling	Retrospective	2020/2020	78%
F	0.36	Benchmarking	Prospective	2020/2019	79%
Average (A-F)	**0.39**	n/a	n/a	n/a	n/a

[a] LED market share in 2020, typically at the statewide level for each program administrator.

[b] Overall computed value from 2020 retrospective analysis was 0.49, the prospective recommendation varies by bulb type.

2.5 Appliance Bill Considerations

The Colorado Appliance Bill went into effect for light bulbs on January 1, 2020, and requires most specialty bulbs (reflectors, candelabras, and globes) to meet a minimum standard of 45 lumens/watt. The Appliance Bill specifically allowed for a transition period for Xcel Energy lighting programs to allow Xcel Energy to continue to claim 100% of program savings in 2020 and 2021, 67% of program savings during 2022, 33% in 2023, and zero thereafter[7].

The evaluation team interviewed corporate trade partners to gather information on their understanding of the Appliance Bill, whether it has impacted their LED offerings, and how they would rate the relative influence of Xcel Energy's Home Lighting Product versus the Appliance Bill on their LED sales in Colorado. The full survey guide is provided in Appendix B.5, and a summary of findings in Appendix C.6.

Three of five interviewees responded to the influence question, which asked respondents to allocate 100 points to either the Lighting Product or the Appliance Bill (i.e., they should sum to 100%). These results and the weighted average are shown in Table 5. While there was a range of values, on average LED sales were only slightly impacted by the Appliance Bill (7% out of 100%).

Table 5. Influence of Xcel Energy's Home Lighting Product versus Appliance Bill

Respondent	% Weight by 2020 Net kWh	Xcel Energy's Home Lighting Product	Colorado Appliance Bill
A	3.6%	20-25%	75-80%
B	82.4%	95%	5%
C	14.0%	100%	0%
Weighted Average		93%	7%

In addition, because Xcel Energy will be reducing the claimed LEDs for each of the impacted styles in 2022 (by one-third) and 2023 (by two-thirds), the claimed gross savings will be reduced. Because gross savings is the denominator in the NTGR, reducing the claimed gross savings has the effect of *increasing* the NTGR. For 2022, the NTGR is increased by 50% (relative) to the original forecasted NTGR, and for 2023 the adjustment is 200%. While these adjustments may appear large, this reflects the large quantity of bulbs that are removed from

[7] Pursuant to the Settlement Agreement in the 2019-2020 DSM Plan (Proceeding No. 18A-0606EG), the Company facilitated meetings with Settling Parties in 2019 to discuss implementation of EISA and the Appliance Bill. The phase out was agreed upon in these discussions and implemented via 60-Day Notice in the 2019-2020 DSM Plan and subsequently approved by the Colorado Public Utility Commission as part of the 2021-2022 DSM Plan (Proceeding No. 20A-0287EG).

the program savings claims in both years, particularly in 2023. The adjusted NTGRs are shown below in Table 6.

Table 6. Adjusted NTGRs Due to the Appliance Bill

Year	A-line (Standard)	TLEDs, Retrofit Kits, PLs/Moguls	Affected by Appliance Bill		
			Reflectors	Globe/ Candelabra	3-Way
2022 Unadjusted	47.9%	78%	14.8%	31.9%	47.9%
2022 Adjusted			22.2%	47.9%	71.8%
2023 Unadjusted	44.7%	78%	13.8%	29.9%	44.7%
2023 Adjusted			41.5%	89.6%	100.0%

3 Process Evaluation

The evaluation team conducted a process evaluation to determine how Xcel Energy can optimize the design and delivery of the Home Lighting Product to its customers. Specific research objectives of the process evaluation are listed in the bullets below:

- Get **feedback on and understand barriers to using the Xcel Energy Home Lighting Product tools**, including website, storefront, and retail outlets, to see if the website is clear, is used by customers, is accessible, and helps drive participation to the product.
- Gain **insight from stakeholders and peer utilities on what may take the place of home lighting** if EISA Tier 2 standards are enacted. How are they planning to fill the savings gap and retain engagement with customers served through home lighting programs? How are they anticipating possible standards and planning for future program designs?
- Discover if there are **opportunities to increase cost effectiveness** of this already cost-effective product.

To accomplish these objectives, the evaluation team elicited feedback from product staff, customers, trade partners in the Xcel Energy Colorado territory, and peer utilities. This chapter presents key findings from the process evaluation, the evaluation team's approach to conducting the process evaluation, and specific findings relating to each evaluation objective. Within the sub-section for each objective, the evaluation team included data from all relevant data collection efforts. The synthesis of findings places an emphasis on helping Xcel Energy to interpret research findings and identify actionable opportunities for improving product operations. These findings, along with findings from the impact evaluation, inform the conclusions and recommendations presented in the final chapter.

3.1 Key Findings

The evaluation team found that, overall, market actors were very satisfied with the current product operations, and staff reported that product processes were running smoothly. Customers and trade partners both noted that the product was easy to participate in and that they were happy with their experiences. Additional key findings from the process evaluation research included:

- **Feedback and Barriers to Using Xcel Energy Home Lighting Product Tools:** While customers appreciate the opportunity to purchase Xcel Energy discounted bulbs, those interviewed encountered barriers in using the website product tools to identify stores and purchase bulbs online. These barriers included difficulty finding the website and some issues in navigating the website, as well as challenges in creating accounts and paying for shipping when purchasing a bulb through the digital marketplace. A few rural zip code areas do not have access to stores with discounts within the zip code where they live.
- **Insights on Possible Replacement for Residential Lighting:** Many in the industry are expecting new lighting standards to occur at some future point, which will significantly

reduce the size of the program due to expected standards covering the majority of general purpose, reflector, candelabra and globe lamps. No peer utility has identified additional programs or measures that will completely make up for the loss in claimed savings. Interviewed utilities reported expanding their programs to low-income customers, promoting heat pumps, and looking to expand commercial programs in the future.

- **Opportunities to Increase Cost-Effectiveness:** The Xcel Energy Home Lighting Product is already very cost-effective. Further, Xcel Energy compared favorably to peer utilities in various metrics that measure relative cost-effectiveness of the product design. Additionally, corporate partners offered no suggestions for improving the program effectiveness.

In Section 3.2, we describe the overall approach used for the process evaluation research activities and, beginning in Section 3.3, we provide detailed results from all of these activities.

3.2 Approach

To accomplish the objectives for the Home Lighting Product evaluation, the evaluation team completed a suite of intersecting and complementary research activities in 2021. Detailed information on the sampling approach used for the research can be accessed in the evaluation plan, found in Appendix A.1. The following discussion highlights the research topics contributed by each research activity: staff interviews, dscout research, product website and digital marketplace usability interviews, GIS analysis, corporate partner interviews, and peer utility interviews.

3.2.1 Staff Interviews

The evaluation team conducted telephone interviews with six Xcel Energy staff members that were managing and implementing the Colorado Home Lighting Product, including:

- Xcel Energy Product Lead
- Team Lead
- Regulatory Analyst
- Engineer
- Marketing Manager
- Implementer Program Manager

The staff interviews covered the following topics:

- Description of the product's process and goals
- Staff perceptions of the product's challenges and successes
- Product staff evaluation priorities

Appendix B.1 includes the interview guide used for these discussions and Appendix C.1 provides results specific to this research activity.

3.2.2 Dscout and Digital Ethnography Customer Research

The evaluation team conducted a virtual ethnography and survey with Xcel Energy Colorado customers using the dscout mobile application. Dscout provides a highly qualitative analyses with rich data such as customer self-made videos and short answer prompts. We recruited ten Xcel Energy customers in the state of Colorado via the dscout application. This software allowed us to load a screener to ask recruits if they are Xcel Energy customers and verified with the customer that they had not participated in the light bulb discount program previously. For this part of the study, we gave customers a $150 gift card incentive for completing the ethnography and survey.

The ethnography and survey objectives were to collect feedback on the following process objectives:

- **Customer's Light Bulb Needs:** The evaluation team asked customers to find and describe a light bulb in their home that they would like to replace. We prompted customers to describe the location of the light bulb, why they wanted to replace it, and what, if any, qualities they would look for in the replacement light bulb.
- **Experience with Store Finder Tool:** The evaluation team asked customers to find a store near them that sells discounted light bulbs through Xcel Energy's program. We prompted customers to go to the Xcel Energy Colorado Home Lighting Product website, Bulb Finder (www.xcelenergy.com/lightingdeals), and talk through which store they wanted to go to, the zip code they used, and reasons why they wanted to go to that store.
- **In-Store Experience:** The evaluation team asked customers to go to the physical store that they found on the Bulb Finder website. While in the store, customers were prompted to find a light bulb to purchase, interact with the store clerk, and rate the clerk's friendliness/knowledge.
- **Feedback on Light Bulb Installation:** The evaluation team asked customers to take a short video after they had installed their new bulb. We prompted them to talk about the process of installation.

Appendix B.4 contains the survey instrument used for the dscout and digital ethnography customer research and Appendix C.4 provides results related specific to this research activity.

3.2.3 Product Website Usability Interviews

The evaluation team conducted a usability study of the Bulb Finder website with Xcel Energy Colorado customers in a remote, moderated environment using think-aloud methodology. These interviews were one-on-one utilizing Zoom software. We used Zoom so the interviewer could watch and listen to the participant navigate to the website and search for a store near them that sells Xcel Energy discounted light bulbs. Participants were recruited from an email list provided by Xcel Energy and received a $50 gift card for their time. Interviews took 40 minutes, on average.

We asked eight customers to complete a series of tasks to navigate to the Bulb Finder website (www.xcelenergy.com/lightingdeals) and find a store that sells discounted light bulbs near them.

The objectives of this activity were to collect feedback on the Bulb Finder website and lighting tools to see if the website is clear, is used by customers, is accessible, and helps drive participation in the product. The evaluation team spoke to eight respondents for this part of the study.

The usability study's objectives were to collect feedback on the following process objectives:

- **Experience with Finding the Bulb Finder Website:** The evaluation team asked customers to find a store near them that sells discounted light bulbs through Xcel Energy's program.
- **Experience with Using the Bulb Finder Website:** The evaluation team asked customers a series of questions about how easy or difficult it was to find the correct website, find the right light bulb, and make a purchase on the digital marketplace. We also asked customers what they would change to make their experience better with the Bulb Finder website.

Appendix B.2 contains the interview guide used for the product website usability study and Appendix C.2 provides results related specific to this research activity.

3.2.4 Digital Marketplace Usability Interviews

The evaluation team conducted a usability study of the digital marketplace (Xcel Energy CO Store | Home (poweredbyefi.org)) with Xcel Energy Colorado customers in a remote, moderated environment using think-aloud methodology. These interviews were one-on-one, utilizing Zoom software. We used Zoom so the interviewer could watch and listen to the participant navigate to the website and use the digital marketplace. Participants were recruited from an email list provided by Xcel Energy and received a $50 gift card for their time. Interviews took 40 minutes, on average.

We asked six customers to complete a series of tasks to purchase a light bulb on the digital marketplace and send the bulb to their home. The interview's objectives were to collect feedback on the re-launch of the Xcel Energy digital marketplace. These customers had not participated in buying discounted light bulbs through Xcel Energy before.

The usability study's objectives were to collect feedback on the following process objectives:

- **Experience with Finding the Digital Marketplace:** The evaluation team asked customers to find a replacement light bulb online via the Xcel Energy digital marketplace where customers can purchase discounted light bulbs online.
- **Experience with Using the Digital Marketplace:** The evaluation team asked customers a series of questions about how easy or difficult it was to find the correct website, find the right light bulb, and make a purchase on the digital marketplace. We also asked customers what they would change to make their experience better with the digital marketplace.

Appendix B.3 contains the survey instrument used for the digital marketplace usability study and Appendix C.3 provides results related specific to this research activity.

3.2.5 GIS Analysis

The evaluation team conducted geographic information system (GIS) opportunity mapping to understand where participating retailers (i.e., retailers who sell light bulbs at a discount through Xcel Energy) exist in Xcel Energy territory, and if there are opportunities for new engagements. For this analysis, we utilized five-year 2019 United States Census data, Xcel Energy participating store data, Xcel Energy territory zip codes, and Microsoft Excel's 3D mapping software.

The analysis objectives were to collect feedback on the following process objectives:

- **Participating Retailers That Exist in Xcel Energy Territory:** The evaluation team assessed via GIS mapping of the participating retailers in Xcel Energy territory in Colorado alongside the population density and median income.
- **Opportunities for New Engagements:** The evaluation team assessed Xcel Energy territory zip codes with populations with low- and middle- median income that did not have participating retailers within a 10-mile radius.

Appendix C.5 provides results related specific to this research activity.

3.2.6 Corporate Partner Interviews

In addition to the customer data collection efforts, the evaluation team conducted five in-depth interviews with corporate trade partners (e.g., corporate-level retailers and manufacturers). The trade partner research addressed the following process topics:

- **Awareness/Motivations:** The evaluation team asked trade partners how they became aware of the product.
- **Product Experience/Satisfaction:** The evaluation team discussed trade partners' product experiences and their satisfaction with the product, including any perceived strengths and challenges with the product.
- **NTG Indicators:** The evaluation team asked corporate partners about effects of utility programs on the sales of LED bulbs in non-program areas. We also asked about their knowledge of the Colorado Appliance Bill legislation and how it may have affected their sales of specialty LED bulbs in Colorado.

Appendix B.5 presents the interview guide used for the trade partner research and Appendix C.6 provides results related specifically to this research activity.

3.2.7 Peer Utility Benchmarking Interviews

Last, the evaluation team interviewed peer utilities. The objective of the peer utility benchmarking task was to compare program design and outcome metrics to assess the opportunities to improve the product cost-effectiveness and understand how other utilities are approaching the changing lighting market. The evaluation team collaborated with Xcel Energy staff to identify nine peer utilities to include in its sample, of which the evaluation team spoke with six. The team considered the following criteria when selecting peer utilities: similar program designs, programs known to have best practices or tools Xcel Energy is interested in pursuing,

and utilities that operate in similar territories (including the geography, the number of customers, and/or the number of small businesses in its territory).

The evaluation team recruited staff in key management roles related to residential lighting programs. Interviews with these staff focused on gathering data around program spending and results, cost-effectiveness, NTG, how programs are changing, and how utilities are anticipating possible EISA Tier 2 lighting standards.

Appendix B.6 presents the interview guide used for the peer utility research and Appendix C.7 provides results related specifically to this research activity.

3.3 Feedback and Barriers to Customers Using Product Tools

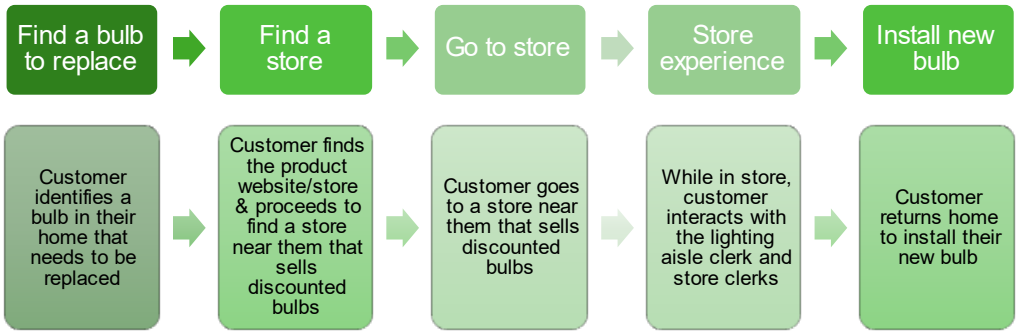
This section integrates findings from the dscout and digital ethnography, usability interviews, and GIS analysis to address the research objective to "get feedback on and understand barriers to using the Xcel Energy Home Lighting Product tools." The evaluation team assessed the customer journey to purchase light bulbs through the program as two distinct journeys (with the goal of purchasing a light bulb in-store or online). Initially, the customer identifies a light bulb they would like to replace. Then the customer can purchase the light bulb through Xcel Energy's Lighting Program, either in-store at a participating retailer they find through the Bulb Finder website or through the digital marketplace where they can have light bulbs delivered to their home. Both journeys are described below in Sections 3.3.1 and 3.3.2.

We present findings related to the feedback and barriers we collected during the studies. The synthesis of findings places an emphasis on helping Xcel Energy to interpret research findings and identify actionable opportunities for improving product operations. Overall, we found that while the customers we interviewed were pleased that Xcel Energy offered discounts, they had difficulty finding and using both the Bulb Finder website and the digital marketplace. Customers visiting stores found clerks helpful although a portion were unaware of the Xcel Energy discounts (possibly due to reduced store training since the Covid-19 pandemic). A few rural zip codes in Xcel Energy service territory did not have stores that were part of the program.

3.3.1 Customer Journey to Purchase Light Bulbs at Participating Retailers

To help understand the customer journey of purchasing light bulbs at participating retailers, the evaluation team utilized both the dscout/digital ethnography and usability interviews to understand the journey for Xcel Energy customers. Figure 1 summarizes this journey for customers purchasing light bulbs at participating retailers.

Figure 1. Customer Journey to Purchase Light Bulbs at Participating Retailers



The following sections describe feedback and barriers we found while evaluating the customer journey to purchase light bulbs at participating retailers.

Overall, we found that the customers we interviewed had difficulty finding and using the Bulb Finder website. Customers wanted a map radius choice in the store search, a more organized found stores list, and a more simplified "Find 2021 Deals" dropdown menu.

Finding a Light Bulb to Replace

The evaluation team first asked customers to find a light bulb in their home that they would like to replace. We wanted to know the location of the light bulb, why the customer wanted to replace it, and what, if any, qualities they would look for in the replacement light bulb.

Location of Light bulbs

The ten customers interviewed identified a variety of rooms for their desired bulb for purchasing, including the living room (3 customers), kitchen (2 customers), bedroom (2 customers), and then basement, hallway, and bathroom (1 customer each).

All customers to whom we spoke mentioned that the light bulb they needed to replace was burned out. Some customers offered additional reasons. A common reason was that the customer wanted a different level of brightness (4 customers). Below is one customer's quote on the topic:

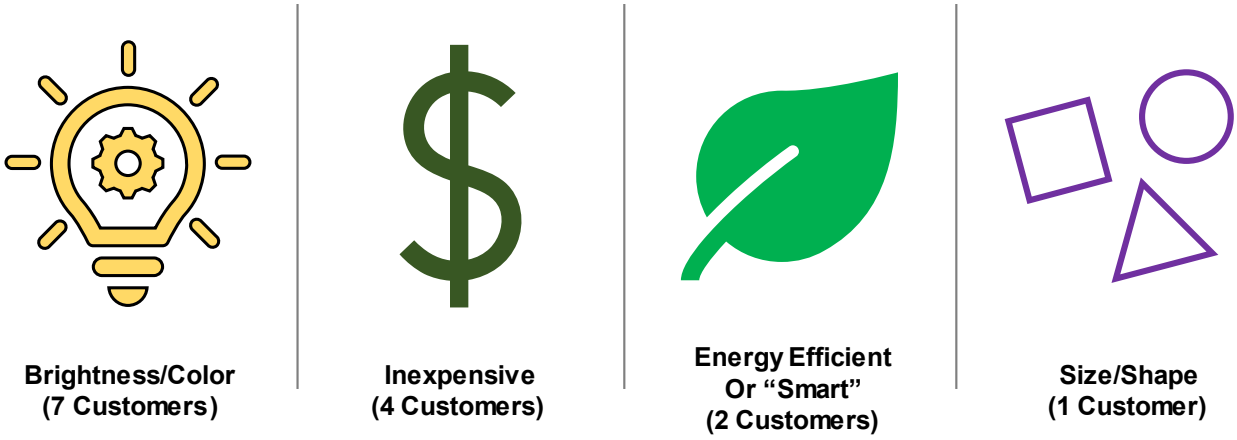
"And when this light burned out, we didn't have any warmer toned lights, so we just put this very bright LED in there. And that is why I want to replace it."

One customer mentioned that they wanted a more "energy efficient light bulb".

Desired Light bulb Attributes

The evaluation team also asked the ten interviewed customers to reflect on any desired attributes they would be looking for in a replacement bulb. As shown in Figure 2, there were four main categories of attributes.

Figure 2. Desired Customer Attributes of the Replacement Light Bulb



Below are examples of specific comments made by some customers:

> *"I don't really want something crazy expensive since I'm going to have to get two of them [light bulbs] because I have one on the other side [referring to the bedside table lamps]."*
>
> *"I'm actually in the market for a smart bulb at this point…. The main thing that I'm looking for is just for it to have some wi-fi connectivity to I can manipulate the colors and the brightness and things along those lines."*
>
> *"I just want one of them small enough to fit into here [shows fixture], so not very big. Probably right under a standard size. And I like the rounded ones, if I can get it."*

Finding A Store

Through the product website usability interviews, the evaluation team also asked customers (N = 8) to find a store near them that sells discounted light bulbs. We asked the following prompt: "I want you to find a store near you that sells discounted light bulbs. You learned that Xcel Energy has website where you can find a store near you that sells discounted bulbs." The website that the customers needed to find is called "Bulb Finder".

Bulb Finder Website Search

The evaluation team tracked the search terms used by the interviewed customers which included the following:

"xcel", "excel", "xcel energy"
"discount lightbulbs near me"
"stores that sell discounted bulbs"
"xcel energy discounted light bulbs"
"store near me that sells discounted lightbulbs through xcel energy"

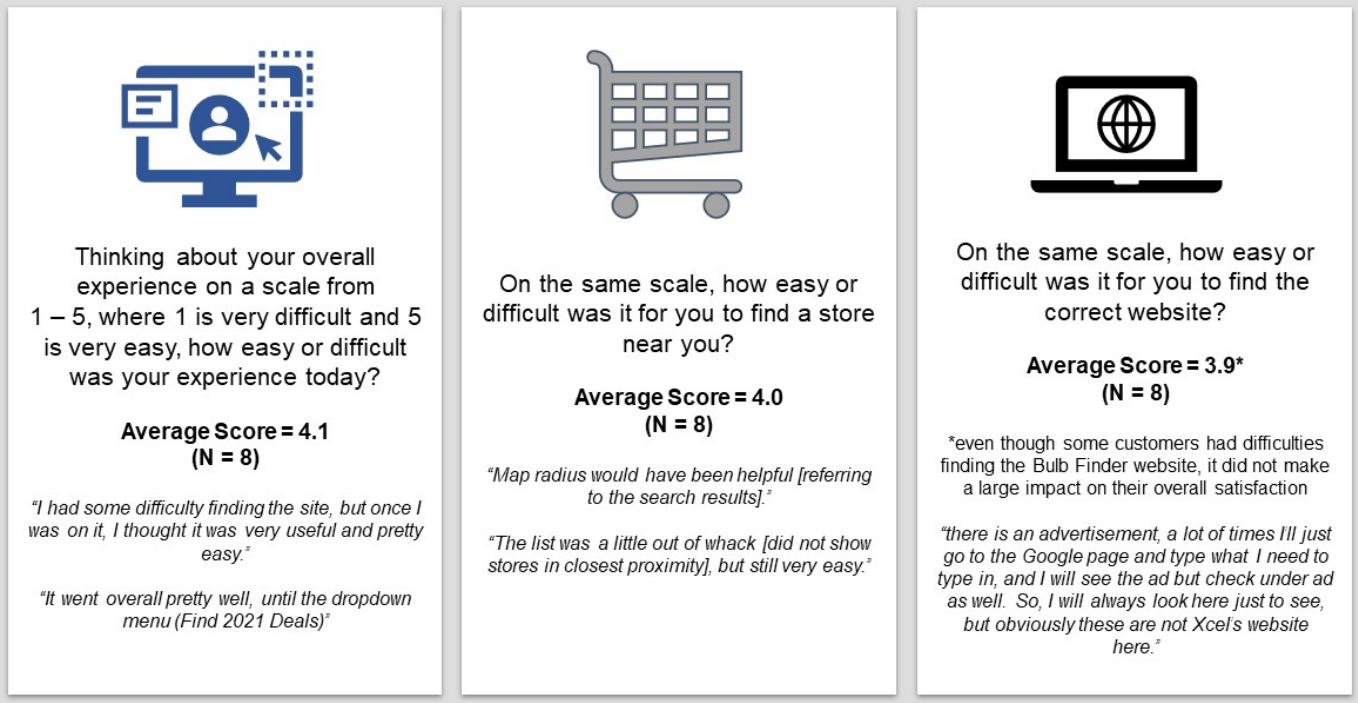
The most successful search term used was “xcel energy discounted light bulbs” and the least was “excel”.

- Based on the interviews, the evaluation team identified the following observations about customer’s use of the product website: Three customers mentioned that they wanted a “search box” on the main Xcel Energy website.
- Customers took on average 4 minutes to find the Bulb Finder website.
  - For some of the customers, the interviewer would ask the customer if they would proceed searching if they were searching by themselves. Anecdotally, all customers who were asked this said “no”.
  - Some customers started at the Xcel Energy homepage.
  - Some customers navigating using their search browser (i.e., Google).

Using the Bulb Finder to Find a Store

To gauge customers’ experiences with the Bulb Finder website, we asked three Likert [8] scale items and one opened-ended question. Figure 3 shows the questions asked, average scores, and anecdotal quotes.

Figure 3. Customer Experiences with Using the Bulb Finder Website



[8] Likert items are used in surveys as scales to measure and quantify attitudes about what variable you are measuring. Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 22 140, 55.

The evaluation team also asked one open-ended question, "If you could change things to make this experience better for customers like you, what would you change?". Below are the anecdotal responses customers had about their experiences:

- Easier to find product website (4 customers)

  "Make clearer how to find the store finder tool, maybe increase advertising?"

- Easier to find products in the store (1 customer)

  "The one thing I can think of is having a specific picture or graphic of the sticker that I would be looking for in the store. I know it is a sticker and I haven't been able to find an example of that. I know there is a large variety of what things look like in the world, so I would be confused of what I am looking for besides a sticker."

- How stores populate on zip code search results (4 customers)

  "Map radius would have been helpful"

- Other suggestions
  - Search results showing products to store (find these types of light bulbs at these stores) (1 customer)
  - Suggestions on where light bulbs can be used in the home (1 customer)

The evaluation team also noted feedback from customers about the 2021 Deals dropdown menu. Four customers found the information useful, and four customers found it to be too much or overwhelming.

> *"I feel like it is a good amount of information. Seeing the price is definitely helpful, seeing the manufacturer and wattage is helpful, because then I can go to my light bulb here and make sure the store has it…. Color is definitely helpful. Also, I teach photography, so I know about the color temperatures. Seeing the discount is helpful so I know how much I'm saving."*
>
> *"I wish some of these things [column headers of the drop-down menu] had links to their meanings. I also wish some of these bulbs had pictures so I can know what they were…. I'm not sure what an 'A-line' is."*

Going to the Store

Once the customer found the store they wanted to go to by using the Bulb Finder website, the evaluation team asked them to go to the physical store. While at the store, we prompted them to rate the friendliness/knowledge of the store clerk that they interacted with while at the lighting department. Overall, we found that store clerks were mostly helpful in terms of purchasing lightbulbs in store. Some of these store clerks (3/9 clerks) were unaware of the discounted lightbulb program.

The table below offers how knowledgeable and friendly customers found the store clerks. Seven customers experienced store clerks who knew about the Xcel Energy discounted bulbs, and three customers experienced clerks who did not know about the program. Due to COVID-19

protocols, Xcel Energy was not able to provide on-site training about the product during 2020 and 2021.

Friendliness Score 1 = not friendly 5 = very friendly	*Average score = 4.8* *(n=10)*	*"The store clerk didn't know much about the bulbs themselves, but she was extremely friendly, helpful, and understanding of my questions. The employee was not from the lighting department. She offered to find someone else who knows more, but I declined."*
Knowledgeable Score 1 = not knowledgeable 5 = very knowledgeable	*Average score = 3.2* *(n=10)*	*"They [the clerk] knew exactly what I was talking with rebate program…and knew the website and offered more energy saving options.* *"The clerk hadn't seen light bulbs that have the Xcel Energy sticker. And I called some other stores nearby, nearby, as in the adjacent city and farther. They did not seem to see these bulbs in their stores, even though they were in the list of those stores that seemed to have carried this."*

Store Availability Assessment

The evaluation team conducted a GIS opportunity mapping to understand where participating retailers (i.e., stores that sell light bulbs at a discount through Xcel Energy) exist in Xcel Energy territory and if there are gaps of easily accessible stores for any of Xcel Energy retail electric customers.

First, the evaluation team mapped Xcel Energy participating retailers in Xcel Energy territory in Colorado and overlaid it with population density maps by income level from Xcel Energy electric customers. The evaluation team used this information to identify potential areas where low- or middle-income customers do not have a store with Xcel Energy discounted bulbs within the same zip code.

The evaluation team identified 11 zip codes in low- and middle-income communities without participating retailers within a 10-radius (Table 7 and Table 8). Most of these zip codes are in the more rural areas of south-central Colorado, which likely do not have many of the corporate retail chain outlets available in the metro areas. As Xcel Energy seeks to expand services to these hard-to-reach populations, these areas may offer opportunities to target new retailers for the Home Lighting Product.

Table 7. Low Median-Income Zip Codes with No Participating Retailers

Zip Code	# of Participating Retailers	Median Income (by Class)	Xcel Customers (Combo or Electric Only)
81144	0	Low	2344

Zip Code	# of Participating Retailers	Median Income (by Class)	Xcel Customers (Combo or Electric Only)
81132	0	Low	802
81120	0	Low	1619
81152	0	Low	628
81133	0	Low	387
81149	0	Low	344
80438	0	Low	339
81148	0	Low	212
81136	0	Low	69

Table 8. Middle Median-Income Zip Codes with No Participating Retailers

Zip Code	# of Participating Retailers	Median Income (by Class)	Xcel Customers (Combo or Electric Only)
80018	0	Middle	6326
80516	0	Middle	5526

Installing the New Bulb

Lastly, the evaluation team asked customers to discuss their experience installing their new light bulb. Overall, seven customers described the installation process as “easy”. While installing their light bulbs, some customers reflected on how inexpensive the light bulbs were or how they did not know about this Xcel Energy program.

> *“**Okay, so this was super easy**. Honestly, I had a great time installing this, I just literally turned it into my light bulb in my bedside lamp -- it looks perfect next to my bed. I couldn't have asked for an easier experience. It looks really nice. It lights up the room really nicely. It's not too bright and it fits in my lamp. So doesn't like pop out like the other one did. **Installation was incredibly easy, and I didn't know that I could buy light bulbs that cheap.** So, it was just like a huge win-win for me. Yeah. I'm really happy with it all.”*

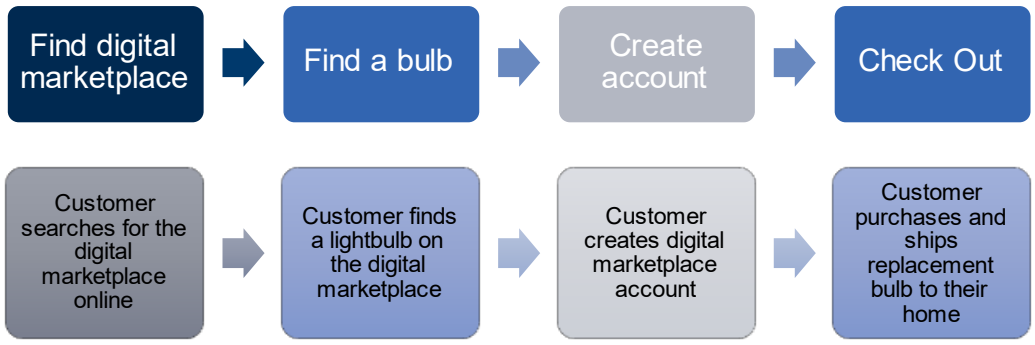
> *“**Installation was very easy**. One thing I didn't notice on the packaging is it said that the light bulb gets warmer as you dim the light. And that's that absolutely is true. This is the bulb that I was looking for 100 percent. It's very interesting that, you know, coincidentally I got the invite for this mission, because I literally was in the process of bulb shopping. So, this is perfect. You know**, I'm very happy to be saving some money being that these***

are LEDs and I have three more bulbs. *I purchased a four pack. I'm going to go ahead and go around my place and install the other three."*

3.3.2 Customer Journey to Purchase Bulbs at Digital Marketplace

To help understand the customer journey to purchasing light bulbs through the digital marketplace, we utilized usability interviews to understand the journey for Xcel Energy customers. Figure 4 summarizes this journey for customers purchasing light bulbs through the digital marketplace.

Figure 4. Customer Journey to Purchase Light Bulbs Through the Digital Marketplace



The following sections describe feedback and barriers we found while evaluating the customer journey to purchase light bulbs online at the digital marketplace.

Overall, we found that the customers we interviewed had difficulty finding and using the digital marketplace. Customers wanted to use their existing Xcel Energy log-in information or no login to access the marketplace and were also frustrated by the $5.00 shipping for one lightbulb purchase.

Finding the Digital Marketplace

The evaluation team asked the customers the prompt: "I want you to find a replacement for a light bulb in your home online. You learned that Xcel Energy has a digital marketplace where you can purchase discounted bulbs online." The evaluation team tracked the search terms used by the interviewed customers which included the following:

"xcel energy marketplace"

"xcel energy marketplace lightbulb purchasing"

"xcel energy digital marketplace"

"xcel energy"

Four of the five search terms used did not lead to the customer finding the digital marketplace website. One customer found the website via the Xcel Energy Colorado homepage website (see the steps they took in the second bullet below).

Based on the customer interviews (N=6), the evaluation team identified the following observations about customer's search for the digital marketplace:

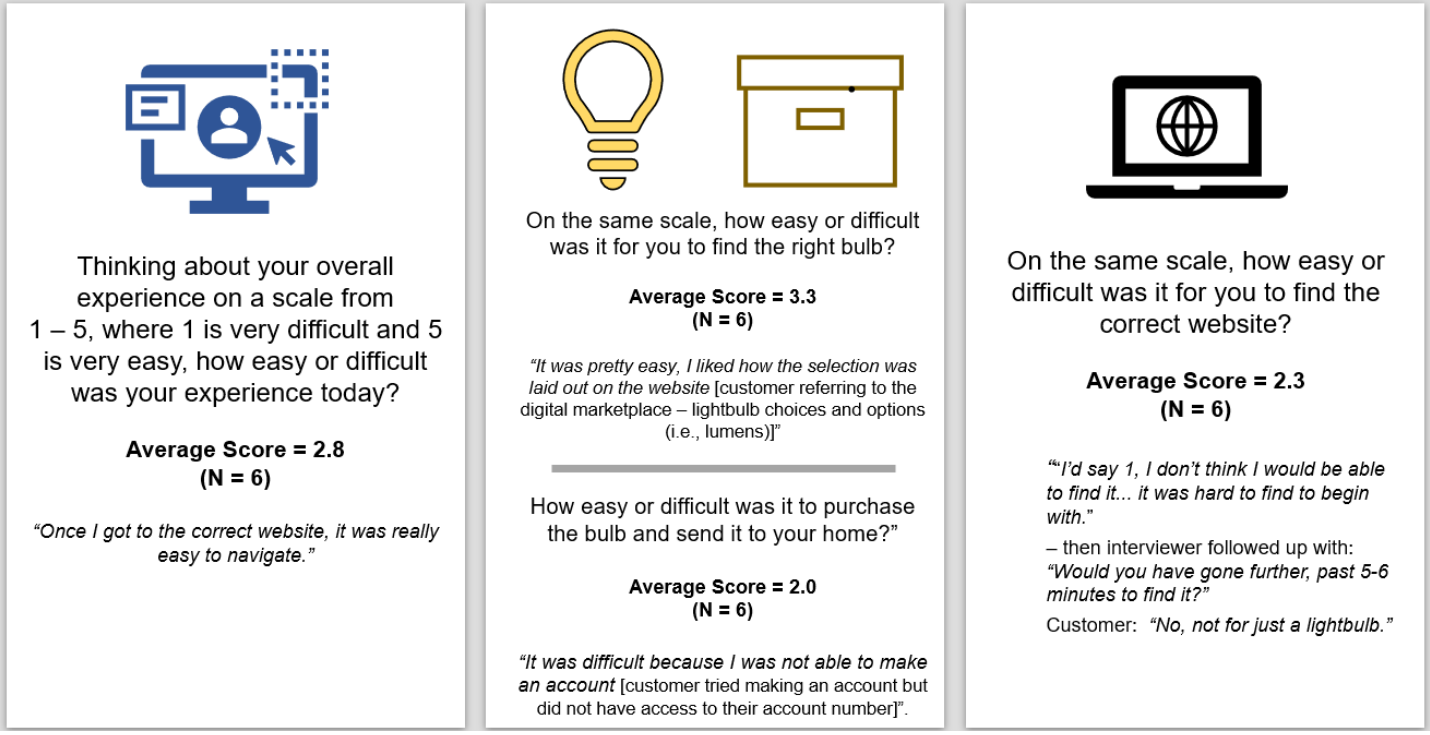
- Five of the six customers interviewed were not able to find the digital marketplace on their own (we supplied the link after several minutes).
- The one customer who was successful found the digital marketplace going through the Xcel Energy website. The customer performed the following steps:
  - Searched on Google: "xcel energy"
  - Xcel Energy
  - Residential Services | Xcel Energy
  - Clicked on "Find Deals"
  - Xcel Energy CO Store | Home (poweredbyefi.org)
- Two customers found the Bulb Finder website on Google and assumed it was the digital marketplace. The other three customers tried other search terms or navigated the Xcel Energy website without finding the digital marketplace.

Finding a Bulb, Creating an Account, and Checking Out

The evaluation team assessed customers' experience with the search and purchasing process by asking four Likert [9] scale questions and one opened-ended question. Figure 5 shows the questions asked, average scores, and anecdotal quotes.

[9] Likert items are used in surveys as scales to measure and quantify attitudes about what variable you are measuring. Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 22 140, 55.

Figure 5. Customer Experiences with the Digital Marketplace



The one open-ended question asked was "If you could change things to make this experience better for customers like you, what would you change?". Below are the anecdotal responses customers had about their experiences:

- Easier to make an account or use Xcel Energy login (5 customers)

  "Seamless without separate login for the store than my actual Xcel Energy login, and I would also make it, in order to sign up I didn't need information not readily available, or some sort of warning, in order to do this, you will need this information."

- Easier to find website (3 customers)

  "…make it easier to find website."

- Other suggestions (1 customer)

  "I would have more color, better explanation of different light and what it is used for. Customer better educated on why you would buy what light bulb. Difference between warm light and diffused light and family room versus kitchen, lamp for reading, working."

The following were some barriers the evaluation team observed during this digital marketplace usability study (N = 6).

- $5.00 shipping for light bulbs (3 customers). We were not able to observe any customers we interviewed make an actual purchase and ship to their home because of this barrier.
  - A few customers price checked with amazon.com to utilize their free shipping.

"Ugh, let me check Amazon… I get free shipping with my Prime account. I don't think I would buy a single bulb and then pay shipping on top of that."

- Customers who are renting or have roommates (1 customer)
  - One interviewed customer lived in an Xcel Energy household but was not the account holder, so he did not have access to the account number at the time.

3.4 Insights on Future Changes to Home Lighting

This section includes the insights from interviews with both peer utilities and corporate partners on the future of lighting programs. As the opportunities with light bulbs is expected to shrink due to increased market penetration and potential for future standards, neither utilities nor trade partners identified potential that will replace savings from lighting.

3.4.1 Peer Utility Outlook

Utilities across the country have been facing decreasing opportunities for lighting savings due to both increased LED market shares and increased efficiency standards. The evaluation team asked peer utilities what types of adjustments they have made to their program in responses to changes already occurring. The evaluation team also asked peer utilities whether they are making or planning any changes in anticipation of potential EISA-standard updates to essentially eliminate most lighting measures as LEDs will be the only widely-sold compliant bulb.

In response to the question about what recent adjustments peer utilities have made to the program, three of the six utilities we spoke with indicated they are expanding their lighting efforts through low-income channels, with some mentioning selling only in thrift retailers and others specifically mentioning food-bank distributions and kit programs. Two of the five utilities mentioned they have not made any recent changes nor planned any immediate program changes. One utility is planning to retire reflector lamps by 2022 and has already dropped rebates on A-lamps. None of the other utilities we spoke with mention TLEDs or the other more business-oriented lamps as an offering.

Regarding the question of how utilities plan to fill the savings gap as lighting savings drop off , no utility had found a complete solution to the problem. Some mentioned they haven't identified any other measures or programs, with others mentioning expansion in most all their residential programs including heat pumps and building electrification, appliance rebates, recycling programs, energy efficiency kits and weatherization.

3.4.2 Corporate Partner Outlook

The evaluation team also interviewed corporate retailers and manufacturers about their perspectives on lighting program's industry trends. The team specifically inquired about future trends of the LED market, new/underused products in energy savings, and where they think the industry is going in five years.

In response to the question about future trends of the LED market, corporate partners spoke of various avenues and did not have consensus on any particular one. Two of the five corporate

partners with whom we spoke brought up the idea of “smart” devices or connectability to devices, such as smart bulbs that will have different controls (e.g., color temperature and/or dimming) and products that will be part of customer’s homes and health/wellness (e.g., LEDs that can match someone’s circadian rhythm or sleep schedule). Other corporate partners suggested future trends including edge-lit fixtures, strip/tape lights, lights with socket changes, and LED fixtures that will replace incandescent bulbs.

When asked about new/underused products in energy savings, four of the five corporate partners indicated three product types: 1) products for the home, 2) “smart” products, and 3) outdoor lighting. Products for the home included heat pumps, water heaters, shower heads, insulation, and LED fixtures. “Smart” products included smart thermostats that can be connected to the home and/or customer devices. Outdoor lighting was described as “seasonal lighting” and porch lights.

Regarding the question about where corporate partners think where the industry is going in five years, “smart” products in general will continue to grow in popularity. Corporate partners also believe that LEDs will continue to transition.

3.5 Opportunities to Improve Cost-Effectiveness

The evaluation team considered whether there were opportunities to improve product cost-effectiveness across all research tasks. Some opportunities are discussed as recommendations from other research objectives (e.g., product influence and possible improvements to product tools) and are not repeated here. In this section, we compare key metrics of the Home Lighting Product to those of similar programs at peer utilities. We also asked corporate trade partners for their assessment of product strengths and weaknesses along with any opportunities to improve. These findings are described below.

Table 9 through Table 12 compare Xcel Energy Colorado to its peers in terms of program spending, rebate counts, cost-effectiveness, and incentive costs per bulb. Each table showed similar findings with Xcel Energy looking attractive relative to its peers. Xcel Energy has lower costs than average and achieves higher program participation that average. Additionally, it is second only to one other utility in terms of its overall total resource cost (TRC). These findings indicate limited opportunities to improve the program cost-effectiveness.

Table 9. 2020 Home Lighting Program Spending by Program Administrator (Sorted by $/Customer)

Program Administrator	Budget	$/Customer	Acquisition Cost ($/MWh)
F*	$0.2	$1.7	$53.8
Xcel CO	$7.2	$5.6	$60.5
D	$12.0	$6.0	$110.7
E	$4.9	$6.9	$98.3
C	$19.5	$7.7	$50.1
A	$9.0	$8.4	$77.7
B	$10.3	$11.6	$64.5
Weighted Average	**n/a**	**$7.6**	**$67.6**

* Budget estimated based on count of lamps and $/lamp rebate plus admin cost factor.

Table 10. 2020 Home Lighting Program Rebate Counts (Sorted by Lamps/Customer)

Program Administrator	Total Lamps	Lamps/Customer
B	3,773,251	4.2
Xcel CO	4,040,347	3.2
A	3,238,982	3.0
C	6,885,226	2.7
E	1,695,725	2.4
D	4,522,289	2.3
F	199,782	1.4
Average	**3,385,876**	**2.4**

Table 11. 2020 Home Lighting Program Cost-Effectiveness (Sorted by TRC Ratio)

Program Administrator	Total Resource Cost (TRC) Ratio
A	6.5
Xcel CO	5.1
E	3.7
C	3.6
D	2.4
F	Not provided
B	Not provided
Average	**4.0**

Table 12. 2020 Home Lighting Program Average Incentives by Lamp Type (Sorted by $/A-Lamp Customer)

Program Administrator	General Service	Reflector	Globe	Candelabra
Xcel CO	$1.36	$2.00	$1.73	$1.29
A	$1.60	$2.25	$1.50	$1.40
B	$2.00	$4.00	$1.25	$4.00
D	$3.50	$4.75	$1.13	$1.00
E	$4.00	$6.00	$3.11	n/a
F	n/a	$1.00	$1.00	$1.00
C	n/a	$3.50	$2.00	$2.00
Average	**$2.78**	**$3.58**	**$1.66**	**$1.88**

3.5.1 Corporate Partner Feedback

The evaluation team also interviewed corporate retailers and manufacturers about their perspectives on their experiences with the Xcel Energy Colorado Home Lighting Product. During the interviews, corporate partners identified the following strengths and challenges of the program.

Strengths of the Program

Three of the five corporate partners stated that Slipstream has been a great partnership, especially working with Slipstream's program manager. Corporate partners mentioned that Slipstream was both helpful, responsive, and a pleasure to work with. Also, it has been easy to submit and retrieve sales data via Slipstream.

Overall, corporate partners indicated the program can provide consumers with deals and rebates for the products their customers need in lighting. Additionally, the program is attractive because it helps lower customer's environmental footprint. One corporate partner stated that they love having the ability to provide consumers with great deals on products that are going to be best suited for their needs and at the same time, it helps reduce their environmental footprint.

One corporate partner mentioned that retailers have been getting more business because of the rebates via the program. Another mentioned that there have been no specific problems in maintaining their products on store shelves.

Challenges of the Program

None of the corporate partners we interviewed spoke of specific challenges of participating in the program indicating general satisfaction and effectiveness of the program.

One corporate partner mentioned that, in the past, Xcel Energy requested to send out promotional mailers; however, their specific retailer did not allow that. This statement was the only past challenge any of the partners brought up.

Two corporate partners spoke about the specific challenges due to the COVID-19 pandemic. These challenges were unrelated to the Xcel Energy program. COVID-19 challenges that corporate partners mentioned were that customers did not shop in-store, therefore limiting "impulse buys" through the program. Even when COVID-19 restrictions started lifting, people did not shop or browse in stores for very long. In addition, the cost of shipping containers via the supply chain had increased exponentially. This corporate partner mentioned that the cost had not hit the consumer prices yet but foresees that it will.

Lastly, one corporate partner mentioned that there was less money in 2021 being funded by utilities. This, in turn, has reduced the size and amount of rebates available.

4 Conclusions & Recommendations

This chapter presents the evaluation team's key findings and associated recommendations regarding the Xcel Energy Home Lighting Product in Colorado. All recommendations are based on key findings from our evaluation research and are designed to reflect the context of future product years, acknowledging expected changes in the market and planned product changes.

Overall, the evaluation team found that the Home Lighting Product operated smoothly, and corporate trade partners were satisfied with their experiences with the product. The evaluation team also found that the product continued to influence customers to install efficient lighting within the Xcel Energy Colorado service area. Despite high satisfaction and high product achievement, the evaluation team identified several recommendations to improve usability of product tools and sustain program influence. The remainder of this chapter presents key findings and recommendations.

- **Key Finding 1:** The Home Lighting Product remains influential in encouraging customers to adopt LED technologies; however, the level of influence varies significantly by bulb type. As market shares of LED technologies continue to rise across both program and non-program areas, NTGRs are declining. The market share of LEDs in reflector lamps is highest, reaching over 90% in non-program areas in 2020, resulting in the lowest NTGR for this bulb type.

  Recommendation 1a: The evaluation team recommends using a prospective NTGR (adjusted for the Colorado Appliance Bill) that varies by year and bulb type based on the following formulae:

  - $2022\ NTGR = (47.9\%\ x\ gross\ kWh\ Alamps + 71.8\%\ \text{x gross kWh 3 – way lamps} + 47.9\%\ x\ gross\ kWh\ candelabras\ and\ globes + 22.2\%\ x\ gross\ kWh\ reflector\ + 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls)\ /\ total\ program\ gross\ kWh$
  - $2023\ NTGR = (44.7\%\ x\ gross\ kWh\ Alamps + 100\%\ \text{x 3 – way} + 89.6\%\ x\ gross\ kWh\ candelabras\ and\ globes + 41.5\%\ x\ gross\ kWh\ reflector + 78\%\ x\ gross\ kWh\ TLEDs, retrofit\ kits, and\ PLs/moguls)\ /\ total\ program\ gross\ kWh$

    The formula approach will allow Xcel Energy to modify its mix of bulbs over time and optimize its offerings to achieve the highest net savings.

  Recommendation 1b: The evaluation team also recommends that Xcel Energy phase out reflector bulbs no later than the schedule established by the Colorado Appliance Bill. . Xcel Energy may be able to achieve greater net savings per dollar spent by phasing out this bulb type but the trade-off of effects on manufacturer/retailer relationships and other factors may make reducing the role of reflectors, rather than immediate phase out, more practical.

- **Key Finding 2: Both finding and using the Bulb Finder website presented barriers for customers.** Interviewed customers struggled to find the Bulb Finder website (took on average 4 minutes). Once at the correct website, some customers were 1) wanting a map radius choice in their store search, 2) confused by the way the store search results

populate (not in the order of proximity), and 3) overwhelmed by the "Find 2021 Deals" dropdown menu (although some customers found it helpful).

Recommendation 2: Consider making the following updates on the Bulb Finder website when the next update occurs.

- Increase customer awareness of the Bulb Finder website by adding links to highly visited pages.
- Add link of the Bulb Finder website to the digital marketplace and vice versa.
- Examine the algorithm for store search results as they do not necessarily show the closest in proximity store to zip codes entered.
- Add a map radius function to the search field.
- Simplify the "Find 2021 Deals" dropdown menu to key features customers need (e.g., adding images of lamps instead of descriptions).

- **Key Finding 3: The density of participating retailers roughly aligns with the density of the population; areas with larger populations have more participating retailers.** There are less dense areas with lower/medium median income that have no participating retailers selling discounted light bulbs. Many of these areas are found in the more rural areas of south-central Colorado. The implementer has searched for rural and independent retailers in the past, however sometimes LEDs are not offered.

  Recommendation 3: Continue searching for potential retailers, who carry or can be encouraged to carry LEDs, in the identified zip codes without participating retailers. These may be independent stores not part of a corporate retail chain (see Table 7 and Table 8 for identified zip codes). This would help make sure that low- and moderate-income customers can easily access the program.

- **Key Finding 4: Store clerks were mostly helpful in terms of purchasing light bulbs in store.** The customers that were asked to go to the physical store had pleasant interactions with store clerks. In three of the nine stores that participants visited, the store clerks with whom they interacted did not know of the Xcel Energy discounted light bulbs program (which may be due to suspension of training during the COVID-19 pandemic).

  Recommendation 4: When possible, **increase awareness and training among participating retailers.** More frequent training can assist when there is staff turnover – so new store clerks can receive training and better inform customers of the program.

- **Key Finding 5: Both finding and using the digital marketplace to purchase light bulbs presented barriers to customers.** Interviewed customers struggled in finding the digital marketplace website (only one customer out of six succeeded in finding the website). Once at the correct website, customers were not able to log in easily (customers wanted to use their Xcel Energy login) and were discouraged by the $5 shipping for a single purchase.

  Recommendation 5: Consider the feasibility of the following changes on the digital marketplace website when the next update occurs. Making some of these

changes may help reduce barriers that Xcel Energy customers face while using the digital marketplace for discounted lighting purchases and encourage them to follow through with making a purchase.

- Add links to highly visited Xcel Energy web pagesConsider adding a link of the digital marketplace to the Bulb Finder website and vice versa.
- Increase visibility of the digital marketplace on search engines (i.e., Google).
- Consider allowing customers to sign in as a “guest” and verify their Xcel Energy customer address.
- Consider free shipping for some or all types of purchases.

- **Key Finding 6: No peer utilities have plans for a full replacement of home lighting program savings if standards are enacted**. Additional expansions identified by other utilities included increasing offerings to IQ customers, offering heat pumps, and expanding commercial programs to boost savings. **Corporate partners suggested expanding into other niche lighting products such as smart lighting, edge lighting (specialized fixtures for aesthetic trends), and health and wellness products (e.g., lighting with varying color or intensity to match circadian rhythms).**

  Recommendation 6: Look to multiple types of products technologies to compensate for expected declines in residential lighting savings for the future. This approach mirrors how peers are handling the issue and also reduce the risks of relying on one technology to fill the gap in meeting future goals.

Appendix A: Evaluation Plan

To support the 2021 process and impact evaluation of Xcel Energy efficiency products, the TRC evaluation team will be conducting a process and impact evaluation of the Xcel Energy Colorado Home Lighting product. This memo provides a plan for the 2021 Home Lighting product evaluation based on staff feedback during the evaluation kickoff meeting, staff interview findings, and a review of product documentation. This evaluation plan includes the following sections:

- Product Overview
- Evaluation Overview
- Data Collection Activities and Sampling Plans
- Net-to-Gross (NTG) Approach

A.1 Product Overview

The Colorado Home Lighting product provides instant rebates for a variety of residential lighting measures. The product is designed to streamline the process for residential customers to purchase discounted LED bulbs. To achieve this objective, product staff use Slipstream as their implementer, who works with lighting manufacturers and their participating retailers to provide discounted bulbs at stores across the state. The product primarily serves residential customers, but it is understood that business customers may use these pathways as well, and these assumptions are integrated in Xcel Energy's savings calculations by bulb type.

To participate in the product, manufacturers must respond to an annual request for proposals (RFP), meet eligibility criteria, and provide a product workbook of all products for which they wish to receive incentives and a list of all participating retailers. Manufacturers may choose to provide additional discounts for their products in addition to the incentive amount. Slipstream then creates contracts between the parties (manufacturer, Slipstream, and sometimes the retailer), and retailers must sign a letter of authorization for the product. Incentive amounts can be negotiated but are typically 60% to 75% of the incremental cost. Once the contracts are completed, Slipstream staff go to each retailer location to put up point-of-purchase (POP) displays and educational breakroom posters, and to train store staff as needed. Slipstream conducts random quality assurance checks in stores to ensure quantity limits are enforced, prices ring up correctly, and POP displays are visible. Retailers send sales data to manufacturers on a weekly to monthly basis, and manufacturers provide those data to Slipstream to track bulb sales and savings over time.

The Home Lighting product is a high-performing product in the Colorado (CO) Xcel Energy portfolio. However, as shown in Table 1, Xcel Energy staff have reduced the product's savings goals for the past two years due to expected market saturation of LED bulbs. Xcel Energy staff have also reduced expected future savings for specialty LED bulbs due to the "Colorado Appliance Bill" (CO Appliance Bill), which was Colorado-specific legislation aimed at keeping as much of the original Energy Independence and Security Act (EISA) Tier 2 standards as possible without illegally overriding federal regulation which rescinded those standards in 2019. The CO Appliance Bill reduces the savings Xcel Energy can count for certain reflector and globe

products during the transition period of 2022 (reduces savings by 33%) and 2023 (reduces savings by 67%). Xcel Energy also anticipates reimplementation of the EISA Tier 2 standards by the Biden administration at some point in the future, which could potentially eliminate most savings from the product. Staff assessments of future goals cannot be fully accurate until the uncertainty around EISA Tier 2 standards is resolved. Staff expect dramatic savings reductions for the remaining product in the near future but are uncertain as to when.

Table 1: Colorado Xcel Energy Home Lighting Product Savings Goals and Actuals

Savings	2020	2021	2022
Goal (GWh)	93	77	62
Actual (GWh)	119	N/A	N/A

The product has undergone several changes in the past year. In 2020, the United States experienced an unprecedented pandemic from COVID-19, and Xcel Energy expanded some products to its customers during this time. One of these products was a partnership with their Income Qualified (IQ) weatherization product, where they worked with food banks and thrift stores to give away LED bulbs. Xcel Energy wants to continue finding opportunities to expand lighting opportunities to IQ customers. Xcel Energy also added TLEDs, PLs and Moguls to their measure offerings for the Home Lighting product in 2020. This measure is mostly purchased by business customers through the Home Lighting product distribution channels of home improvement outlets. In 2021, Xcel Energy updated and re-launched their bulb finder website to combine it with their program page.

Table 2: CO Home Lighting, January 2020 – December 2020

Measure	kWh		kW		Units	
	Quantity	% of Total	Quantity	% of Total	Quantity	% of Total
A-lamp LEDs	89,393,261	75.05%	12,581	74.91%	3,327,630	82.36%
Specialty LEDs	28,628,060	24.04%	4,034	24.02%	681,606	15.87%
TLEDs	1,083,966	0.91%	179	1.07%	31,111	0.77%
TOTAL	**119,105,287**	**100%**	**16,794**	**100%**	**4,040,347**	**100%**

Note: This is the population of lighting discounts paid between January 2020 and December 2020. These numbers are based on aggregated data provided to TRC in March 2021.

A.2 Evaluation Overview

The 2021 evaluation will consist of a process evaluation and an impact evaluation. The process evaluation will focus on customer and market actor experiences with the product, as well as upcoming market trends; the impact evaluation will focus on estimating a net-to-gross (NTG)

ratio. This section presents the objectives of the two evaluation components. It is followed by a more detailed description of the evaluation activities.

Process Evaluation

The evaluation team discussed process evaluation priorities during the kickoff meeting[1] and staff interviews[2]. During those conversations, several process-related themes emerged.

- EISA Tier 2 standards threaten the large savings of the Home Lighting product. Staff wonder what will take the place of those savings and how to continue their relationship with their customers.
- LED lighting can be confusing, and staff want to know if customers struggle to purchase the right types of LED bulbs for their home.
- Xcel Energy re-launched a digital marketplace this year and wants to understand how useful and accessible it is to customers.

These topics are mapped to the following **objectives of the process evaluation**:

- Get **feedback on the Xcel Energy Home Lighting product website** and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.
- Get **feedback on the re-launch of the Xcel Energy storefront.**
- Gain **insight from stakeholders and peer utilities on what may take the place of home lighting** if EISA Tier 2 standards are enacted. How are they planning to fill the savings gap and retain engagement with customers served through home lighting programs?
- **Understand if Xcel Energy customers encounter barriers** when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them[3].
- Discover if there are **opportunities to increase cost effectiveness** of this already cost-effective product.
- Describe how peer utilities are **anticipating EISA Tier 2 standards** and planning for their future program designs.

Impact Evaluation

The objective of the impact evaluation of the Colorado Home Lighting product is to develop a NTG ratio (NTGR) documenting the extent to which product activities influenced customer purchasing decisions. The evaluation team proposes to use sales data modeling and corporate partner interviews to estimate the Colorado Home Lighting product NTG (both retrospective and prospective). Accordingly, the **objectives of the impact evaluation** include:

- Determine NTGR for the product.
- Identify major drivers of NTG.

[1] The kickoff meeting was held in January 2021.
[2] Staff interviews took place in February and March 2021.
[3] Note that Xcel Energy was unable to train retail staff during 2020 and early 2021 due to the COVID-19 pandemic and therefore sales staff program knowledge may be limited.

- Assess market effects of the Home Lighting product.
- Investigate peer utility NTGR for similar programs.

The full NTG approach is detailed in a later section of this document.

A.3 Data Collection Activities and Sampling Plans

To meet the above objectives, we will conduct a variety of data collection activities. These activities are listed in Table 3 and explored more in this section.

Table 3: Home Lighting Product Research Summary

Task Ref.	Research Task	Included in Original Scope?	Sample Size	Research Objectives
1	Staff Interviews	✓	4	Inform evaluation plan
2	Corporate Partner Interviews	✓	5	Process evaluation, upcoming lighting trends, NTG
3	Customer Dscout Campaigns and Digital Ethnography		10	Process evaluation, customer knowledge of LEDs, store staff training, usability of general Xcel Energy website
4	Sales Data Analysis		NA	NTG
5	Peer Utility Benchmarking Interviews	✓	4–6 utilities	Program design, anticipation of EISA Tier 2 standards, and NTG
6	Recommended: A/B Product Website Usability Testing		12	Process evaluation, usability of main product website (not digital marketplace), comparison of efficacy of two different designs.
7	Recommended: Digital Marketplace Usability Testing		6	Process evaluation, feedback on re-launch of digital marketplace, customer knowledge of LEDs.
8	Recommended: GIS Opportunity Mapping		NA	Process evaluation, identify underserved and IQ market opportunities

Staff Interviews

In February and March 2021, the evaluation team conducted six interviews with Xcel Energy staff to inform this evaluation plan, discuss product goals, and review product processes, challenges, and successes. Those interviewed included the Team Lead, Product Manager,

Regulatory Analyst, Engineer, Marketing Manager, and implementer Program Manager. These interviews were conducted over the telephone and took between 30 minutes and one hour to complete. These meetings, combined with the kickoff meeting, allowed the evaluation team to create a focused evaluation plan with defined data-collection activities.

Corporate Partner Interviews

The evaluation team will use corporate partner interviews to meet both process and impact objectives. When speaking with Slipstream implementation staff during our staff interviews, it was clear that manufacturers are the key stakeholder for the product and must do most of the product processes. Manufacturers then engage their retail partners, but retailers typically do not cause barriers in the process and have few responsibilities. We expect to conduct five interviews with manufacturers or corporate retailers who are current participants of the product. These interviews will provide Xcel Energy staff with manufacturer perspectives and recommendations to further engage and retain manufacturers in the product. These interviews are integral for exploring the following topics.

- **Product Experiences:** We will explore how corporate partners became aware of the product, why they chose to participate, and what their experience was participating in the product.
- **Market Trends:** We will ask manufacturers about upcoming trends in the lighting market and see if we can identify future potential products for the Home Lighting product.
- **Opportunities for Improvement:** We will also identify potential opportunities for improvement in working with corporate partners. We will work with the product team to identify those partners likely to provide the best insight.
- **Market Effects:** We will explore whether nation-wide programs have contributed to increased sales in non-program states to determine whether the counterfactual scenario should be adjusted for the sales data modeling.
- **CO Appliance Bill:** Given the elements of the appliance bill that allow for a transition period for utility incentive programs, we will also ask these partners to assess whether they believe the CO Appliance Bill affects LED sales or stocking in Colorado to determine whether the NTGR sales modeling is double-counting the stipulated savings reductions of 33% in 2022 and 67% in 2023 for impacted lamps.

The evaluation team plans to interview five corporate partners as part of this effort, as shown in Table 4.

Table 4: Home Lighting Product Corporate Partner Target Interviews, by Interview Strata

Trade Partner Type	Strata	Population	Target Interviews
Manufacturers or Corporate Retail Partners	**Total**	**TBD**	**5**

Customer Dscout Campaigns and Digital Ethnographies

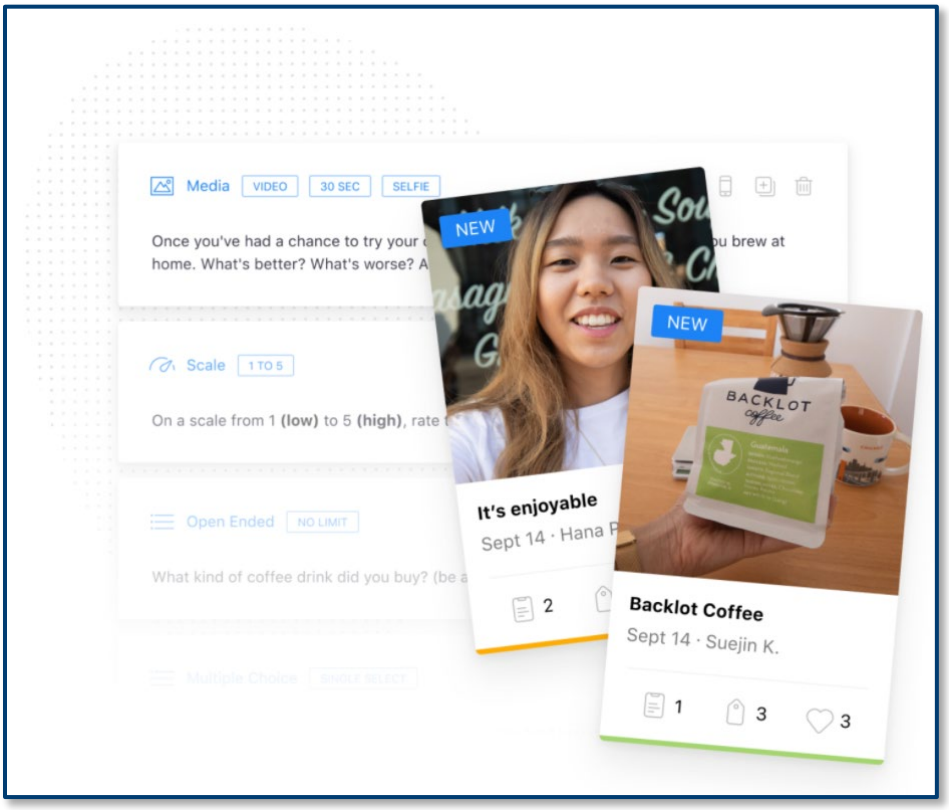
To meet process objectives for this evaluation, the evaluation team will conduct a virtual ethnography and mini-survey with CO Xcel Energy customers using the dscout platform (see Image 1 below). This platform provides highly qualitative analyses with rich data, so we do not recommend large sample sizes, since the goal is to create schemas of customer barriers, the patterns of which typically emerge quickly within a small sample size. These virtual ethnographies and mini-surveys will be used to understand the customer journey in the Home Lighting product and will focus on the following three topics:

- **Xcel Energy website experience:** The evaluation team will assess how customers navigate the general CO Xcel Energy website, and if they are able to successfully find a participating retailer near them using the website and the xcelenergy.com/lightingdeals page. We will have them record video of their thoughts as they navigate the website, highlighting any areas of confusion along the way.
- **Experience in the store, including choice selection and confusion:** The team will ask participating customers to record themselves as they are in the store selecting a lightbulb for their home. We will assess if they can navigate to the correct discounted bulbs, if they feel confident or overwhelmed on the selection, and how knowledgeable they are on choosing the right bulb for their house and what criteria they use (lumens, color, watt equivalent). We will also ask them to ask a store clerk for help in selecting the right lumen bulb and ask them to rate how knowledgeable the clerk was[4]. This task will indicate if the training education and breakroom posters have helped floor staff talk about LEDs with customers.
- **Satisfaction with lighting product:** Last, we will have these participants install the light in their home and assess their satisfaction with the light color, brightness, and type for their needs. We will ask which bulb the LED replaced and why they chose to replace it.

For the participating customer digital ethnography, the evaluation team will survey customers who are eligible for an instant discount in the CO Xcel Energy Home Lighting product using dscout's user panel. Dscout has a base of users who are already using the dscout platform, are familiar with the platform and how to use it, live in CO Xcel Energy territory, and are eligible for instant discount.

[4] The evaluation report will consider the fact that due to the COVID-19 pandemic, Xcel Energy was unable to train sales staff about the program in 2020 and early 2021.

Image 1: Dscout Platform Example Short Survey and Video Responses



Sales Data Analysis

The underlying theory behind the lighting sales data NTG model is that states with strong upstream lighting program activity—compared to those with little to no program activity—should have higher market share (via sales) of efficient lighting compared to states with little to no program activity. The model relies on full-category lighting sales data to estimate market lift as a function of program activity, while also controlling for other factors (e.g., household and demographic characteristics) that might impact efficient lighting sales. The result of the modeling is a comprehensive NTG estimate that captures free ridership, participant spillover, and nonparticipant spillover.

The evaluation team will leverage a variety of data sources for this model analysis, though we rely primarily on sales data prepared by the Consortium for Retail Energy Efficiency Data (CREED),[5] which were mostly generated from two sources. These sources are POS state sales

[5] CREED serves as a collaborative effort of program administrators, retailers, and manufacturers to collect the necessary data to better plan and evaluate energy efficiency programs. LightTracker is CREED's first initiative, focused on acquiring full-category lighting data, including incandescent, halogen, CFL, and LED bulb types, for all distribution channels in the entire United States. As a consortium,

data (representing grocery, drug, dollar, discount, mass merchandiser, and selected club stores) and National Consumer Panel (NCP) state sales data (representing home improvement, hardware, online, and selected club stores). The evaluation team will then clean and process all data for analysis. The model inputs also include a combination of program data collected by the evaluation team and household and demographic data collected through various publicly available websites. The primary model-input data sources are listed below:

- POS data (grocery, drug, dollar, discount, mass merchandiser, and selected club stores)
- Panel data (home improvement, hardware, online, and selected club stores)
- U.S. Census Bureau import data (LED and CFL imports)
- DSM Insights, an E Source database of utility program data
- ENERGY STAR Lighting Program data (utility lighting program budgets)
- ENERGY STAR shipment data (released by the U.S. Environmental Protection Agency)
- North American Electrical Manufacturers Association (NEMA) shipment data
- American Community Survey (ACS) data (household characteristics and demographic data)
- Retailer square footage per state (based on the two primary retailer channel data sources)
- General population surveys, lighting saturation studies and other secondary data collection made publicly available through evaluation reports

Peer Utility Benchmarking Interviews

The objective of the peer utility benchmarking task is to understand how peer utilities are approaching key issues related to implementing residential lighting programs. The evaluation team will collaborate with the product manager to identify 4 to 6 peer utilities to interview. The evaluation team will develop a peer utility interview guide that is customized to the desired benchmarking components, to be provided to Xcel Energy for approval prior to beginning any data collection. The evaluation team will summarize the results of the benchmarking analysis in a summary within the final evaluation report.

These interviews will emphasize the following research objectives:

- **Anticipation of EISA Tier 2 standards:** We will ask peer utilities what how they are anticipating these changes within their program and how they will curb the impact of these standards in terms of their portfolio.
- **Program characteristics:** We will ask peer utilities general information about their programs including the measures offered, and incentive amounts.

Recommended Activity: A/B Product Website Usability Testing

The evaluation team recommends performing usability tests on two versions of the product website (the core website which helps customers find a retailer near them to purchase LED

CREED speaks as one voice for program administrators nationwide for requesting, collecting, and reporting on the sales data needed by the energy efficiency community. https://www.creedlighttracker.com.

bulbs). The Xcel Energy team discussed that they have two concepts for the website that they want to validate and test and understand which performs better. This usability test would be split into two groups of 6 (for a total of 12 participants), one which uses version A, and one which uses version B. We will ask participants to find a bulb in their house they might replace and go to the website to find store near them that sells rebated lightbulbs from Xcel Energy to find a discounted bulb for that socket. We will record video of participants navigating the website and will prompt them to say their thoughts out loud so we will get the details of their decision making including what they are looking for in a particular bulb (including any aesthetic or wattage details) and ultimately why they chose the store they did. By priming the participant to think of a particular light in their home, we hope to get them thinking about their specific needs and whether that information is available on the site. Our usability experts will be online with them and prompt users, based on non-verbals, to explain any confusion or frustration they may be experiencing as they complete the task. Based on their reactions, we'll ask probing questions, which will ultimately help us decide if there should be updates to the information provided, and if so, what updates those should be. The versions of the site may be fully functional, digital prototypes, or paper concepts; our team will work with Xcel Energy staff to create a usability test based on the content available.

We will report results in the form of a detailed report of small user interface changes to maximize conversions on the site and a recommendation on which version of the website performed better in usability tests and why. We will also provide Xcel Energy with video recordings from the sessions.

The evaluation team would utilize usability testing with moderated remote user testing to meet process objectives. These usability tests would focus on the following topics:

- **A/B testing two product website concepts:** Xcel Energy has two competing product website concepts. This test would help Xcel Energy understand which website concept performs better from a usability perspective and is more likely to increase conversions (customers going to the retail store to purchase lightbulbs).
- **Product website experience:** We will use the usability tests to understand friction points and places of confusion when navigating the Xcel Energy Home Lighting Product website, including any barriers to navigating the site to find a store near them with discounted LED bulbs.

Recommended Activity: Digital Marketplace Usability Testing

The evaluation team recommends performing separate user testing interviews with up to 6 participating customers to test the clarity and usability of the re-launched digital marketplace (note, the ethnographies task will assess the regular product website, not the ecommerce website). Since the entire process is digital, it is important to identify potential friction points in the user flow and remove those friction points so that Xcel Energy can achieve more conversions on their site. These user tests will prompt participants, who have never seen the site, to navigate the site and send LED bulbs to their house. We will watch their process from start to finish with our trained usability analysts and identify places of difficulty and confusion. We will report results in the form of a detailed report of small user interface changes to maximize conversions on the site.

The evaluation team would utilize usability testing with moderated remote user testing to meet process objectives. These usability tests would focus on the following topics:

- **Digital marketplace experience:** We will use these tests to understand the customer experience from start to finish using the re-launched digital marketplace. We will ask customers to purchase a bulb through the Xcel Energy digital marketplace and observe as they complete the task. We will use minimal prompts and watch for friction points, or points of confusion, and probe the customer to help us understand why and how they became frustrated or confused. We will then create a deliverable of specific usability updates for the website to reduce user friction and increase conversion rates for the digital marketplace.
- **LED choice selection and knowledge:** Complimenting the ethnographic research, we will probe customers on why they selected the bulb they did, and if they experienced any confusion on differences between LED bulbs, to understand potential knowledge gaps of customers.

For the participating usability study, the evaluation team will survey customers who are eligible for an instant discount in the CO Xcel Energy Home Lighting product using by emailing a random sample of Xcel Energy customers to participate.

Recommended Activity: GIS Opportunity Mapping

The evaluation team would use GIS opportunity mapping to understand where participating retailers exist in Xcel Energy territory, and if there are opportunities for new engagements. We would overlay a map of Xcel Energy territory, along with the retail store locations by zip code, population density, sales per capita, and median household income to identify opportunity zones for retail locations to meet the products goals and objectives.

- **Regional Opportunities**: GIS mapping will be used to identify Xcel Energy territory zip codes where there is high population and/or a low median income where few or no participating retailers currently exist.

A.4 Net-to-Gross (NTG) Approach

The NTG assessment aims to estimate the percent of savings achieved that can be attributed to product actions, or a NTGR. The team will base its methodology on sales data modeling as this type of approach is used extensively in other jurisdictions, and it was the basis of our prior residential lighting evaluation conducted for Xcel Energy conducted in 2018.[6]

The evaluation team will estimate a retrospective and prospective NTG value. Using multiple sources of information, including actual retail sales data in Xcel Energy territory and in other states with and without programs, interviews with trade partners, and benchmarking from other similar utility programs, we will synthesize available data to develop the final NTGRs to ensure

[6] Note the 2018 evaluation (conducted for PY2017) also included questions for corporate partners to estimate the prospective NTG. In recent studies conducted by the evaluation team, however, we have found that the retailers and manufacturers are unwilling to provide this information given the uncertainty in the lighting market and the possible reinstatement of the EISA backstop.

that we provide the most accurate and reliable estimate of NTG. The remainder of this section presents the evaluation team's method to estimating the retrospective and prospective NTGRs.

Retrospective NTG

The evaluation team will estimate a retrospective NTG by examining free ridership, spillover, and market effects. The evaluation team will rely on nation-wide lighting data and the program database to develop a sales model to estimate the program impact on sales, along with additional input from trade partners. The evaluation team will then synthesize these results to estimate a NTGR for the product. This section describes how the evaluation team will use the data to estimate the retrospective NTGR.

Sales Data Analysis

In the sales data modeling approach, the evaluation team will develop a regression model using efficient bulb sales data from almost all states in the U.S., along with the program activity and incentives budgets, retail channel square footage, and state-level household and demographic characteristics. The evaluation team uses the model to predict the share of efficient bulbs with and without a program (determining the counterfactual of no program activity by setting the program variables to zero). This change in share represents the program lift, or net increase in the share of efficient bulbs resulting from program activity. Once the model is defined across the program, program data and total sales data by bulb styles can be used to allocate the lift among bulb styles.

To then calculate NTG, the evaluation team multiplies the lift—or change in share—by the total number of bulbs (for all bulb types) sold in 2020, as determined by the sales data analysis described above. This value represents the net impact of the program (i.e., the total lift in the number of LEDs sold), which the evaluation team then divides by the total number of program bulbs sold (i.e., the gross number of bulbs) to determine NTG:

$$NTG = \frac{(\#\ bulbs\ sold\ with\ program - \#\ bulbs\ sold\ with\ no\ program)}{\#\ of\ program\ incented\ bulbs\ sold}$$

The NTG analysis includes participant and non-participant "like" spillover (efficient lighting purchased by customers not participating in the program which were influenced by the program). In addition, the sales data modeling includes a program-age variable, which serves as a proxy for market effects occurring from the year-over-year program offerings. This variable represents the portion of efficient lighting sales from potentially permanent changes in the market as a results of ongoing program activity.

Corporate Partner Interviews

The corporate partner interviews offer important insights into the counterfactual scenario: what LED sales in non-program states would have been without the program (the incentives, marketing, education, and other program influences). As a baseline study in 2020[7], the

[7] 2020 Non-Program Residential Lighting Sales and Shelf-Stocking Study, Apex Analytics, February 2021.

evaluation team found LED stocking in states that had never had significant lighting program activity to be nearly as high as most program states. This may be due, in part, to market effects from the widespread program activity across the country. In other words, the combined programs have together increased the LED demand so significantly to drop prices and increase availability, which resulted in widespread stocking in even non-program states. To the extent we determine these market effects are occurring, the evaluation team will adjust the non-program states' efficient-bulb sales shares to account for the portion due to market effects. This will have the result of increasing the difference between states with program activity and those without, ultimately affecting the NTG value.

We will also ask these corporate partners about their knowledge of the CO Appliance Bill and how, if at all, this legislation has affected LED stocking and sales in Colorado, particularly for affected lamps. We will use this information to adjust the prospective NTG for lamps affected by the CO Appliance Bill to ensure adjustments for the phase-out period are not double discounted.

Prospective NTG Ratio (NTGR)

Given the fast-changing conditions of the lighting market, the team will review the retrospective NTG estimate to provide a more accurate forward-looking, or prospective, value. The team will assess recent changes to market size to track how much the size of the market is declining each year. Although Xcel Energy program sales remain strong, the past few years of sales data have shown that, nation-wide, total lighting sales are decreasing. This makes sense because when customers convert to LEDs, the LED bulbs last longer than halogens or incandescents, so that socket will not need a replacement bulb for at least 12years. The NTG calculation uses the percent lift due to the program (sales data model output) and multiplies it by the market size, then divides by program size. We will trend these three variables since the last 2017 study and project them going forward to estimate prospective NTG.

As mentioned above, we will rely on corporate partner interviews for two possible adjustments for prospective NTG. The first adjustment will consider whether the non-program counterfactual LED sales have been inflated due to nation-wide market effects from the combination of numerous year-over-year utility efficient lighting programs. While we have asked about this effect in past research and responses indicated the affect was minimal, the last couple of years has seen greater increases in LED stocking in non-program areas.[8] Our corporate partner interviews will assess the extent to which manufacturers and retailers believe that program activity all over the country has contributed to lower prices and higher efficient lamp availability that led to increased LED sales in non-program areas.

The second adjustment will consider whether the CO Appliance Bill, which reinstates planned EISA standards for certain reflector and globe lamps, has affected LED sales in Xcel Energy territory. The evaluation team will ask corporate partners questions to understand the extent to which the CO Appliance Bill has influenced their sales, as opposed to program incentives. Questions will include the following:

- Are they aware of the bill?
- If aware, can they report the requirements of the bill?
- If aware, did it have any impact on their 2020 sales?

[8] 2020 Non-Program Residential Lighting Sales and Shelf-Stocking Study, Apex Analytics, February 2021

- If aware, what proportion of the sales lift (computed by the NTG modeling relative to sales shares in non-program areas) do they attribute to the CO Appliance Bill?
- If aware, what is their prediction for the attributed sales lift due to the CO Appliance Bill for 2022 or 2023?

For those affected bulbs, we will report the proportion of net savings corporate partners predict will come from the appliance bill separately from the program. We will adjust the overall NTG for CO Appliance Bill affected bulbs to net the reduction already assumed in the savings reductions from the CO Appliance Bill. For instance, assume the sales data model calculated a NTG of 10% for the CO Appliance Bill affected bulbs. The sales data model does not differentiate between CO Appliance Bill and program effects. Since the transition period requirements already reduces savings by 33% in 2022, the 2022 adjusted NTG is 10%/33% or 15% which will be applied to estimate overall net savings. The NTG gets applied to the gross savings after the required 33% (2022) reduction in energy savings is applied. If the interviewees said that the CO Appliance Bill was responsible for 20% of the LED sales lift then 20% of the net savings will be reported as CO Appliance Bill result and the other 80% due to the program. Table 5 illustrates the approach with four scenarios, assuming the program incentivizes bulbs totaling gross savings 1,000 MWh. In each scenario the adjusted NTG is 15%, however the portion attributable to the program versus the Appliance Bill changes in each scenario. Scenario 1 is the example above with 20% of the net savings attributable to the CO Appliance Bill. Scenario 2 has zero net savings attributable to the CO Appliance Bill, while Scenario 3 has 100% of the net savings attributable to the CO Appliance Bill. Scenario 4 splits the savings between the CO Appliance Bill and the program.

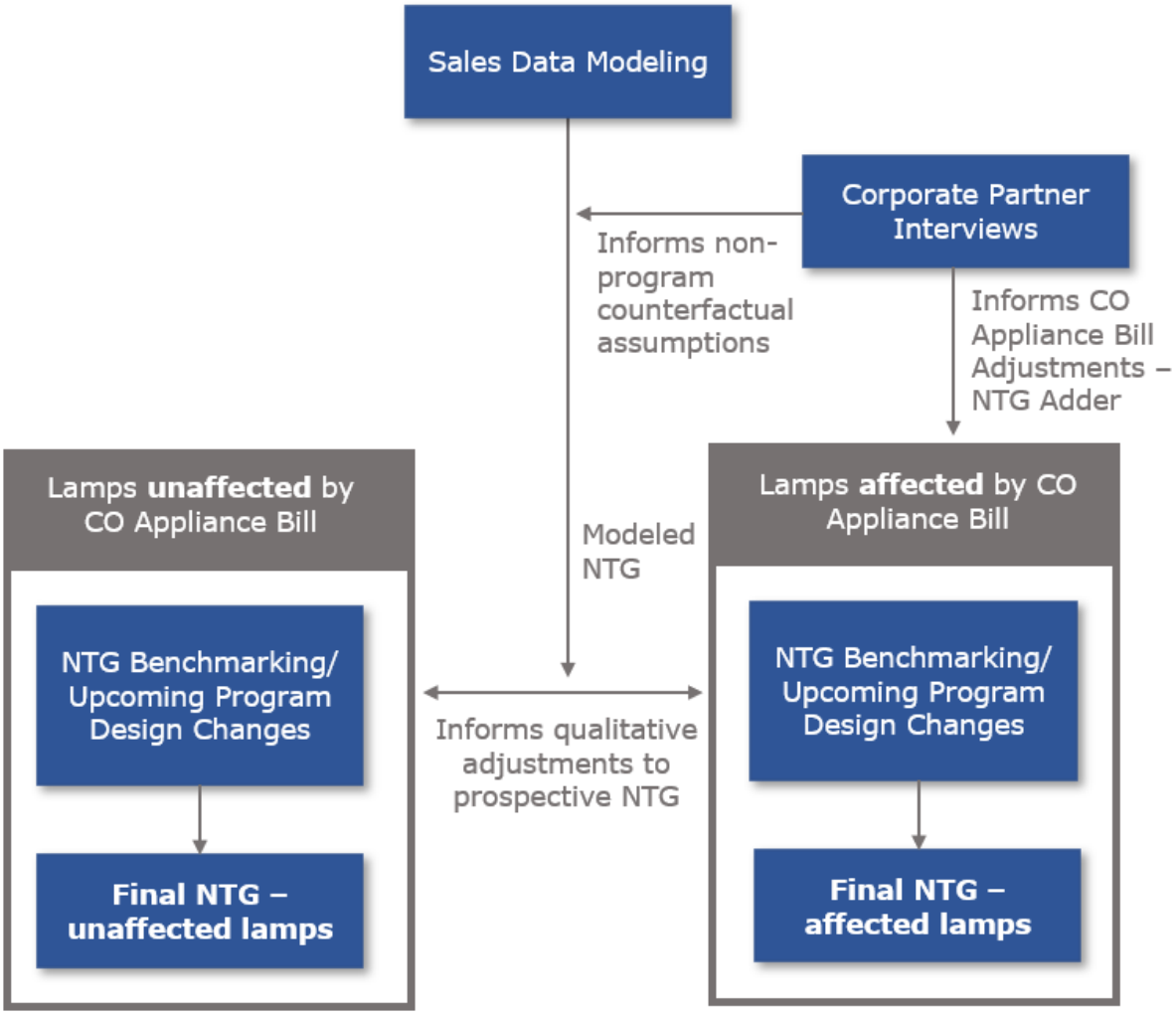
Table 5: Calculating NTG for CO Appliance Bill Affected Bulbs

Line	Metric	Scenario 1	Scenario 2	Scenario 3	Scenario 4
A	Sales Data Analysis NTG (Modeling Result)	10%	10%	10%	10%
B	Planned Legislative Adjustment (2022)	33%	33%	33%	33%
C	Adjusted NTG (Line A/Line B)	15%	15%	15%	15%
D	% of Lift Due to CO Appliance Bill (Interview Response)	20%	0%	100%	50%
E	Gross Savings (MWh) (Assumed for Example)	1,000	1,000	1,000	1,000
F	Claimed Savings (pre-NTG) (Line E x Line B)	670	670	670	670
F	Net Lift in Program Sales (CO Appliance Bill Affected Bulbs) (Line E x Line A)	100	100	100	100
G	Lift due to Standards (Line F x Line D)	20	0	100	50
	Lift due to Program (Line F x (1-Line D))	80	100	0	50

Estimation of Recommended NTG Ratio (NTGR)

The evaluation team will assess the validity of sales data modeling and adjustments from the corporate partner interviews when determining the final product NTG estimate. Similarly, we will use the benchmarking task to compare Xcel Energy values with those from similar upstream lighting programs. The evaluation team will also rely on feedback from product staff relating to expected product changes to provide insight into prospective NTGRs. Figure 1 illustrates the NTGR approach.

Figure 1: NTGR Assessment process



By design, our final NTG estimate recommendation includes data from mixed methods research—both quantitative data and qualitative data. The initial NTGR estimates will be calculated through sales data modeling and corporate-reported NTGR interview responses.

After the initial NTGR estimate is calculated, we will then utilize the quantitative and qualitative data to construct a logical, internally consistent, and coherent narrative of product attribution that attempts to identify all possible pathways of Xcel Energy influence. We will rely on the following data sources to construct the NTGR:

- Sales data and historic data – supplies data for modeling program influence
- Corporate-partner interviews – provides insight into market effects and impact of CO Appliance Bill
- Program benchmarking data – provides point of comparison
- Known product changes in upcoming years – factors in any known implications for future changes in product design

Based on these results, we then may adjust the NTGR to create a final recommended NTGR that is consistent with this narrative and that should be applied to the product after the completion of this report. The final NTGR recommendation is based on the professional judgement of our team after considering all available quantitative and qualitative data. This NTGR assumes no federal legislation occurs that reinstates the EISA backstop (as discussed earlier).

Appendix B: Data Collection Documents

Appendix B includes the following:

- B.1 Staff Interview Guide
- B.2 Product Website Usability Guide
- B.3 Digital Marketplace Usability Guide
- B.4 Dscout Campaign Guide
- B.5 Corporate Partner Interview Guide
- B.6 Peer Utility Interview Guide

B.1 Staff Interview Guide

Introduction

This guide is to be used to interview staff associated with Xcel Energy's DSM products as part of the TRC Companies 2021 evaluation of the Xcel Energy DSM products. The interviews will be semi-structured, with these questions serving as a basic guide for experienced TRC Companies staff during one-on-one phone interviews.[9] As a guide for semi-structured interviews, these questions will not necessarily be asked verbatim, but will serve as a roadmap during the conversation.

Staff Interview Research Questions or Objectives

List the research questions that this research task is designed to address.

- Assess the extent to which the product design supports product objectives and customer service/satisfaction objectives
- Understand Xcel Energy's current Home Lighting Product offerings
- Assess the degree to which product resources are sufficient to conduct product activities with fidelity to the implementation plan
- Collect staff feedback on implementation successes and challenges
- Identify themes and issues for possible revisions to the standard evaluation plan

Interview

Section A: Introduction

[If staff did not attend the kick-off meeting:] First we would like to give you some background about who we are and why we want to talk with you today. TRC Companies is an independent consulting firm that works with electric and gas utilities to review and improve product operations and delivery. Xcel Energy contracted with us to perform an evaluation of their portfolio of energy efficiency products, and we're currently in the process of conducting interviews with product managers and key staff involved in designing and delivering the Home

[9] Some interviews may be conducted jointly if someone's role recently changed or if more than one person performs the role.

Lighting Product to improve our understanding of Xcel Energy's DSM products and their influence on customers. We also want to understand how our research can be useful for you as Xcel Energy product staff and incorporate your priorities into our study so that the results are as useful as possible.

[ALL] Thank you for taking the time to speak with us today. My objective for this meeting today is to gain a deeper understanding of the Home Lighting Product, what Xcel Energy hopes to achieve through implementing this product, how it operates, and a bit about your experiences with the Home Lighting Product. We are interested in asking you some questions about the Home Lighting Product so we can benefit from your knowledge and experience to improve our understanding. I have a set of questions that should take approximately 45 minutes. We will combine the information you provide with information gathered from other interviews before reporting summarized information back to Xcel Energy.

Before I begin, is it alright if I record the conversation for note taking purposes? [RECORD IF ALLOWED AND CONFIRM YOU ARE RECORDING ONCE RECORDING BEGINS]. Thanks, we are recording now.

A1. First, can you take a moment and explain your role and scope of responsibilities with respect to the Home Lighting Product? [IF ALREADY KNOWN, REWORD TO CONFIRM]

Probes:

- Approximately how long have you held this position?
- What previous positions did you hold?
- Whom do you report to in the overall org structure?

Section B: Product Goals

I'd like to be sure I understand the goals of the Home Lighting Product, both overall and specific.

B1. Can you take me through the key 2020 goals for the Home Lighting Product?

[For staff outside of the Customer Solutions team] Can you take me through the key goals for the Home Lighting Product, as it relates to your role?

B1a. Can you describe the product's savings goals? Do you have specific goals for individual components of the product (e.g., by measure type)?

B1b. Any other, non-energy goals?

B1b1. Any more immediate goals? For example, participation goals, customer engagement goals, improving customer satisfaction? Changing customer awareness of or attitudes about energy efficiency measures?

B1b2. Any longer-term goals? For example, reducing greenhouse gas emissions? Altering market behaviors?

B2. Have any of these goals changed in the last few years?

B2a. What was the rationale for changing them?

B2b. In your opinion, how have these changes affected the product's operations or its outcomes?

B2c. Were these changes a result of internal factors (to Xcel Energy), external factors, or a combination of both?

B3. Have any of these goals changed for 2021?

B3a. What was the rationale for changing them? Probe: COVID-related changes?

B3b. In your opinion, how have these changes affected the product's operations or its outcomes?

B4. What are "indicators of success" for the Home Lighting Product?

B4a. What are interim indicators that the Home Lighting Product is or is not meetings its objectives or goals?

B5. What influences, if any, do you think the Home Lighting Product has had on the market? Do you believe this influence is the same across all customer segments? Why or why not?

B6. Do you foresee any changes to the types of LED lighting that is rebated by this program? Such as fixtures, or LED bulbs types?

B7. Can you walk us through the Colorado regulations with respect to lamp requirements, how the new administration and EISA standards affected them, and how Xcel is proceeding with respect to claiming savings?

B8. When do you believe the natural phase-out of this program may occur?

B8a. What variables will expedite or delay that phase out?

B8b. What would you like to achieve before this program is phased out? Why?

B9. On the contrary, how might the program continue even if certain bulbs may be phased out? Do you see any new opportunities that this program can take advantage of?

Section C: Product Activities

I would like to make sure I have a solid understanding of how this product operates and talk through the different components of the product. If there are any formal documentation and/or websites that you can refer me to as we walk through these next questions, I'd appreciate getting that information.

[TAILOR BASED ON WHAT IS ALREADY KNOWN]

[Only ask C1-C6 if talking with implementer]

[If Engineer, only ask C7]

C1. My understanding is that this product is an instant rebate program, and your main partners are retailers and manufacturers? Are there any other partners or contractors I should know about that also work within this program?

C2. Can you walk me through the steps a retailer takes to participate in the Home Lighting Product?

C2a. How do they find out about the product?

C2b. How do they sign up for the product?

C2b1. What are the mandatory requirements, if any, for a retailer to participate in this product? (e.g., training or certifications)?

C2c. What are their responsibilities in the program? Are there technologies (e.g., trade ally portals) they use or paperwork they must provide?

C2d. Are there marketing materials you supply to retailers? If yes, how do retailers respond to these materials? Do you know if they use them?

C2e. What educational meetings or training do you provide for this program, if any? How do retailers respond to these meetings? Have you received feedback on them?

C2f. Are there quality assurance checks in the program design?

C2g. How and when do retailers receive incentives for the product?

C2h. What would you like to understand about retailers in your program?

C3. Which types of retailers tend to be your top performers in this program? Why?

C3a. How do you decide which retailers to work with and which to stop working with? Are there any mandates you must abide by (e.g., open market)?

C3b. What are the biggest frustrations you experience with retailers currently?

C3c. What are some characteristics of your top-performing retailer partners? What do they do that you wish others would do?

C3d. What feedback have you received from retailers about what is and is not working well for them? Does this differ by retail size or other category?

C3e. What are the biggest barriers to getting retailers to participate or continue to participate, if any?

C3f. What differences, if any, have you noticed between large corporate retailers and smaller independent retailers?

C4. Can you walk me through the steps a manufacturer takes to participate in the Home Lighting Product?

C4a. How do they find out about the product?

C4b. How do they sign up for the product?

C4b1. What are the mandatory requirements, if any, for a manufacturer to participate in this product? (e.g., training or certifications)?

C4c. What are their responsibilities in the program? Are there technologies (e.g., trade ally portals) they use or paperwork they must provide?

C4d. Are there marketing materials you supply to manufacturers If yes, how do manufacturers respond to these materials? Do you know if they use them?

C4e. What educational meetings or training do you provide for this program, if any? How do manufacturers respond to these meetings? Have you received feedback on them?

C4g. Do manufacturers receive incentives for the product? If so, when?

C4h. What would you like to understand about manufacturers in your program?

C5. Which types of manufacturers tend to be your top performers in this program? Why?

C5a. How do you decide which manufacturers to work with and which to stop working with? Are there any mandates you must abide by (e.g., open market)?

C5b. What are the biggest frustrations you experience with manufacturers currently?

C5d. What feedback have you received from manufacturers about what is and is not working well for them? Does this differ by size or other category?

C5e. What are the biggest barriers to getting manufacturers to participate or continue to participate, if any?

C6. Can you walk me through the steps a customer takes to participate?

C6a. How do they find out about the program?

C6b. How do they participate in the program?

C6d. Do you have any per customer quantity or transaction limits for this program? How are these enforced?

C6e. What are the biggest barriers to getting customers to participate, if any?

C6f. Are there any current efforts for cross-program participation (i.e., moving residential lighting customers into other programs?)

C6g. What would you like to understand about customers in your program?

C7. Are there any customer segments you are interested in targeting where you feel there is opportunity? Which? Why? What are the barriers to reaching these customers?

C8. How do you determine the incentives to offer for the various products offered? How have incentives changed the past few years and why?

C9. Are there any additional activities within this product that we have not yet covered?

- Marketing (potentially include advertising)?
- Applications?
- Technical Assistance?
- Education?
- Contractor/Trade Partner Support?
- Drop Ship/Direct Install?

C10. Have any product processes changed in the last few years?

C10a. What was the rationale for changing them?

C10b. In your opinion, how have these changes affected the product's operations or its outcomes?

C10c. Have you measured how these changes impacted savings or participation?

Section D: Strengths and Challenges

Next, I'd like to get your feedback on how the product is running.

[TAILOR BASED ON WHAT IS ALREADY KNOWN]

D1. In your opinion, what are the strengths of the Home Lighting Product as it is currently being run?

D2. What are the most significant challenges for this product at this point?

D3. What feedback, if any, do you receive from customers on the product? (PROBE FOR CUSTOMER ENGAGEMENT/ CUSTOMER SATISFACTION)

D4. What do you believe are the biggest barriers to getting customers to participate in this product?

D5. Are there any specific opportunities for improvement in the design or implementation of the product? Please describe.

D6. What would you like to see changed in how the product is designed or run, if anything?

D6a. Do you think there are any roadblocks preventing these changes from happening?

Section E: Resources

E1. What resources are most constrained for the product or the biggest bottleneck? (e.g., implementers, contractors, retailers, engineers, QA/QC, technology).

E2. What additional resources, if any, would help you achieve program goals?

Section F: Product Tracking and Reporting

[ONLY ASK IF SPEAKING WITH IMPLEMENTER OR ENGINEER]

I'd like to understand how product activities are tracked to understand what data might be available to us in our evaluation.

[TAILOR BASED ON WHAT IS ALREADY KNOWN]

F1. What kind of documentation is available for the different product? Implementation plans? Product manuals? Process maps?

F2. What kinds of data are collected for the Home Lighting Product?

F3. Are there any data that you would like to collect for the Home Lighting Product but haven't been able to?

F4. [For Engineering Staff] What kind of baseline does the product use to estimate energy savings? [PROBE FOR CODE VS. COMMON PRACTICE]

Section G: Closing

G1. Based on the kickoff meeting, we are planning to prioritize <RESEARCH PRIORITIES IDENTIFIED> Does this align with your understanding?

G1a. Do you have anything you would like to add to these priorities, remove from this set of priorities, or change about these priorities?

G2. Do you have particular questions that you would like to see answered by the evaluation? Why are these questions important?

G3. Do you have any other comments, concerns or suggestions about the product that we didn't discuss that you would like to make sure I know about?

G5. Do you have any peer utilities that you'd like us to include in the peer utility benchmarking interviews? Peer utilities could either include utilities that have been identified by internal or external parties as exemplary or utilities with a similar climate, customer mix, etc. to understand their practices.

G5a. What criteria is most important to you when selecting a peer utility (e.g. similar climate, similar time in market, etc.)?

G5b. What performance indicators are you interested in the evaluation benchmarking?

Thank you very much for taking the time in assisting us with this evaluation. If I come up with any additional questions that come from this interview, do you mind if I send you an email or give you a quick call?

B.2 Product Website Usability Guide

Introduction

This guide is to be used to conduct a usability study of the product website with Colorado Xcel Energy customers in a remote moderated environment using think-aloud methodology. We will ask customers to complete a series of tasks to navigate the website and find a store that sells discounted lightbulbs near them. Since the entire process is digital, it is important to identify potential friction points in the user flow and remove those friction points so that Xcel Energy can achieve more conversions on their site. These user tests will prompt participants, who have never seen the site, to navigate the site and find a store that sells discounted lightbulbs near them. We will watch their process from start to finish with our trained usability analysts and identify places of difficulty and confusion. We will report results in the form of a detailed report of small user interface changes to maximize conversions on the site.

For the participating usability study, the evaluation team will survey customers who are in Colorado emailing a random sample of Xcel Energy customers to participate. Participants will be given a $50 digital gift card.

The interview guide below is mapped to the evaluation research objectives shown below in Table 1.

Table 1. Evaluation Objectives

Evaluation Objective	Impact or Process Objective	Research Activity	Product Website Usability Testing
Get feedback on the CO Xcel Energy Home Lighting product website and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.	Process	Customer Dscout Campaigns and Digital Ethnography; Product Website Usability Testing	✓
Get feedback on the re-launch of the Xcel Energy storefront.	Process	Digital Marketplace Usability Testing	
Gain insight from stakeholders and peer utilities on how they are planning to evolve home lighting programs once EISA Tier 2 standards are enacted Including how are they planning to fill the savings gap and retain engagement with customers served through home lighting programs.	Process	Peer utility Benchmarking; Corporate Partner Interviews	
Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them.	Process	Customer Dscout Campaigns and Digital Ethnography	
Discover if there are opportunities to increase cost effectiveness of this already cost-effective product.	Process	Peer Utility Benchmarking; Corporate Partner Interviews	
Describe how peer utilities are anticipating EISA Tier 2 standards and planning for their future program designs.	Process	Peer Utility Benchmarking	
Estimate an overall NTG ratio for the product and major drivers of NTG including market effects. Investigate peer utility NTGR for similar programs.	Impact	Peer Utility Benchmarking; Corporate Partner Interviews; Sales Data Analysis	

Table 2 identifies the interview questions related to each contextual theme.

Table 2: Mapping of interview questions to contextual themes

Contextual themes	Data Needed	Interview Questions
Product Website Experience	• Can the customer find the correct website from using their native search engine and/or browser? • Can the customer successfully search to find a store near them that sells discounted bulbs? What barriers do they encounter?	B1-B8, C1-C7

Recruitment

The evaluation team will recruit participant from a sample of residential customers provided by Xcel Energy. We will email this sample of customers to invite them to participate in the study.

Email

Subject Line: Request for Participation in research study on Xcel Energy's LED store finder tool

Hi {{First Name}},

My company, Apex Analytics LLC, is working with Xcel Energy to improve their store finder tool, where customers can find a retailer near them to purchase discounted LED bulbs.

We would like to invite you to participate in research to help us improve the website for customers like you.

In appreciation of your time, **we are giving each participant a $50 Visa gift card** upon completion of a one-hour informal virtual interview.

During the interview we will ask you to share screen as you navigate the website and find a store near you. We ask that you do not try to access the website before the interview.

If you are interested in participating in this study, please respond to this email and I will provide you with additional information and next steps.

To verify the validity of this study, you may contact the Xcel Energy Residential Lighting Product Manager, Sherryl Volkert, at sherryl.volkert@xcelenergy.com

Virtual Interview

Thank you for taking the time to talk with me today. We are working with Xcel Energy to make their Energy Efficiency programs easier for customers like you.

Section A: Eligibility

Before we begin today, I want to verify that you are eligible for this study.

A1. Have you *used the Xcel Energy website to learn about lighting or find discounted bulbs before?*

(Yes/No response) **[IF YES TERMINATE]**

A2. As part of this study, we will ask you to share your screen, and will be recording your screen and audio. This recording will be used for research purposes only. Are you comfortable with us recording your screen and audio for this research? **[IF NO TERMINATE]**

You are eligible for this study. At the end of this activity, I will send you a digital Visa gift card for your participation through email. I will verify your email address at the end.

In this research activity, we are going to focus on Xcel Energy's product website, where customers can find stores near them that sell discounted lightbulbs. We want to understand what this process is like for customers and where the process could be improved and be more clear.

For today's activity, we will have you share your screen as you navigate Xcel Energy's product website. I will be recording your screen and voice. This will only be shared for internal research purposes and will never be publicly shared. I will give you prompts to complete tasks on the website. As you complete these tasks, I would like you to say all of your internal thoughts aloud. By saying your thoughts aloud, we will get insight into any confusion you may be having or any internal experiences or feelings. There is no wrong way to think aloud; any confusion or issues you encounter are a result of the site not being designed properly and not indicative of your ability. In fact, our goal is to find as many of these places of confusion as possible today.

Throughout this process I will be silent, or ask you additional questions, but I will purposefully not help or answer questions. Our goal is to imitate what this experience would be like if a customer were alone on the website, so we want you to problem solve as you would if we were not on the phone. As you problem solve, it is helpful to explain what you are thinking, and doing. Before we begin, I will show you a demonstration of thinking aloud.

Do you have any questions for me about this study or what we will do today?

[IF NO, START EXAMPLE THINK ALOUD SESSION]

Do you have any questions about thinking aloud?

[IF NO, ASK PARTICIPANT TO OPEN A BROWSER SESSION (e.g., CHROME, MOZILLA, SAFARI) AND SHARE THEIR BROWSER. PROMPT THEM TO ONLY SHARE THEIR BROWSER NOT THEIR ENTIRE SCREEN]

Is it okay if I begin recording?

[IF YES, BEGIN RECORDING]

Section B: Website Usability

Before we begin, I want you think of a lightbulb in your home that you want to replace. If you do not have one that you would like to replace, please think of a light in your home that you *could* replace.

B1. Please describe this lightbulb for me, including its location and any features of the bulb that you think are relevant as you look for a replacement.

Next, I want you to find a store near you that sells discounted lightbulbs. You learned that Xcel Energy has website where you can find a store near you that sells discounted bulbs. You may have seen this advertisement online or in stores:

[SHOW XCEL ENERGY ADVERTISEMENT EXAMPLE]

Now, I would like you to try to find this website. You may find this website however you normally would search if I were not here. Please remember to say all of your thoughts aloud, and try to talk as much as possible while you do this. Once you believe you are on the correct website, please let me know. You may start now.

[ONCE WEBSITE REACHED, CONTINUE]

Next I would like you to look over the website. Please say all of your thoughts aloud and try to talk as much as possible while you do this.

Now, I would like you to find at least three stores near you that sell discounted lightbulbs. Please make note of the stores along with the zip codes however you would if you were doing this by yourself **[i.e., separate word document, post-it note, etc.]**

B3. Please describe what you are looking for as you search and say all of your thoughts aloud. Please let me know when you found the stores you would want to go to.

[ONCE STORES HAVE BEEN FOUND, CONTINUE TO B4]

[STORE NOT FOUND, CONTINUE TO B7]

B4. Why did you choose these particular stores? **[Probe if applicable – i.e., closest stores, regular stores they shop at, etc.]**

B5. What do you think about this part of the site? **[Probe if applicable – i.e., too much or not enough information?]**

Now I would like you to find a lightbulb you are looking for at the store. Please click on "show 2021 deals" and look at the list of bulbs and their features **[Refer to dropdown menu if needed].**

B6. What do you think about this part of the site? **[Probe if applicable – i.e., too much or not enough information?]**

B7. Is there anything else on the webpage that would be helpful? **[See if participant finds the educational/tips information on the page]**

B8. It looks like you did/did not find a store near you, what would you do now? **[Probe if applicable – i.e., when would you go to the store?]**

Section C: Wrap-Up Questions

Next, I would like to ask you a couple of questions about your overall experience.

C1. Thinking about your overall experience on a scale of 1 – 5, where 1 is very difficult and 5 is very easy, how easy or difficult was your experience today?

C2. On the same scale, how easy or difficult was it for you to find the correct website? Why?

C3. On the same scale, how easy or difficult was it for you to find a store near you? Why?

[IF PARTICIPANT DID NOT FIND CORRECT SITE, PLEASE HAVE THEM RE-DO STEPS B3 – C6 WITH THE CORRECT SITE PROVIDED (Bulb Finder (xcelenergy.com)**)]**

C4. Do you think that the store you found on the website would have the bulb you want? **[Probe- What would have helped you?]**

C5. If you could change things to make this experience better for customers like you, what would you change?

C6. Those are the questions that I had for you today, what other things would you like to share about your experience today that might be helpful for me to know?

C7. Without looking at the site or your list, do you remember which stores carry discounted lightbulbs?

I'd like to verify that the email I have for you is correct in order to send you your $50 Visa gift card. The email I have for you is **[SAY EMAIL],** is that the correct email?

I will be sending this gift card to you by the end of the week. If you have any trouble receiving it please email me and I will make sure you receive it. Do you have any questions for me before we are done today? **[IF NO, THANK AND END CALL]**

B.3 Digital Marketplace Usability Guide

Introduction

This guide is to be used to conduct a usability study of the re-launched digital marketplace with Colorado Xcel Energy customers in a remote moderated environment using think-aloud methodology. We will ask customers to complete a series of tasks to purchase a lightbulb on the digital marketplace and send the bulb to their home. Since the entire process is digital, it is important to identify potential friction points in the user flow and remove those friction points so that Xcel Energy can achieve more conversions on their site. These user tests will prompt participants, who have never seen the site, to navigate the site and send LED bulbs to their house. We will watch their process from start to finish with our trained usability analysts and identify places of difficulty and confusion. We will report results in the form of a detailed report of small user interface changes to maximize conversions on the site.

For the participating usability study, the evaluation team will survey customers who are eligible for an instant discount in the CO Xcel Energy Residential Lighting product using by emailing a random sample of Xcel Energy customers to participate. Participants will be given a $50 digital gift card.

The interview guide below is mapped to the evaluation research objectives shown below in Table 1.

Table 1. Evaluation Objectives

Evaluation Objective	Impact or Process Objective	Research Activity	Digital Marketplace Usability Testing
Get feedback on the CO Xcel Energy Residential Lighting product website and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.	Process	Customer Dscout Campaigns and Digital Ethnography; Product Website Usability Testing	
Get feedback on the re-launch of the Xcel Energy storefront.	Process	Digital Marketplace Usability Testing	✓
Gain insight from stakeholders and peer utilities on how they are planning to evolve home lighting programs once EISA Tier 2 standards are enacted Including how are they planning to fill the savings gap and retain engagement with customers served through home lighting programs.	Process	Peer utility Benchmarking; Corporate Partner Interviews	
Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them.	Process	Customer Dscout Campaigns and Digital Ethnography	

Evaluation Objective	Impact or Process Objective	Research Activity	Digital Marketplace Usability Testing
Discover if there are opportunities to increase cost effectiveness of this already cost-effective product.	Process	Peer Utility Benchmarking; Corporate Partner Interviews	
Describe how peer utilities are anticipating EISA Tier 2 standards and planning for their future program designs.	Process	Peer Utility Benchmarking	
Estimate an overall NTG ratio for the product and major drivers of NTG including market effects. Investigate peer utility NTGR for similar programs.	Impact	Peer Utility Benchmarking; Corporate Partner Interviews; Sales Data Analysis	

Table 2 identifies the interview questions related to each contextual theme.

Table 2: Mapping of interview questions to contextual themes

Contextual themes	Data Needed	Interview Questions
Digital Marketplace Experience	• Can the customer find the correct website from using their native search engine and/or browser? • Can the customer successfully search to find the bulb they want? What barriers do they encounter? • Can the customer successfully sign in to their Xcel Energy account, purchase the bulb, and send it to their home? What barriers do they encounter?	B2, B6, C1, C2, C3, C4, C5, C6
LED Choice Selection and Knowledge	• Does the customer understand how to navigate the differences in the selection of bulbs offered? • What terms does the customer use when describing desired attributes of lightbulbs? (energy use, color, brightness)	B1, B2, B3, B4, B5

Recruitment

The evaluation team will recruit participant from a sample of residential customers provided by Xcel Energy. We will email this sample of customers to invite them to participate in the study.

Email

Subject Line: Request for participation in research study on Xcel Energy's digital marketplace for LED bulbs

Hi {{First Name}},

My company, Apex Analytics LLC, is working with Xcel Energy to improve their digital marketplace, where customers can purchase discounted LED bulbs online.

We would like to invite you to participate in research to help us improve the website for customers like you.

In appreciation of your time, **we are giving each participant a $50 Visa gift card** upon completion of a one-hour informal virtual interview.

During the interview we will ask you to share screen as you navigate the website and find a bulb to purchase. We ask that you do not try to access the website before the interview.

If you are interested in participating in this study, please respond to this email and I will provide you with additional information and next steps.

To verify the validity of this study, you may contact the Xcel Energy Residential Lighting Product Manager, Sherryl Volkert, at sherryl.volkert@xcelenergy.com

Virtual Interview

Thank you for taking the time to talk with me today. We are working with Xcel Energy to make their Energy Efficiency programs easier for customers like you.

Section A: Eligibility

Before we begin today, I want to verify that you are eligible for this study.

A1. Are you a Colorado Xcel Energy electric customer? **[IF NO TERMINATE]**

A2. Have you purchased discounted lightbulbs through the Xcel Energy online store before? (Yes/No response) **[IF YES TERMINATE]**

A3. As part of this study, we will ask you to share your screen, and will be recording your screen and audio. We will not have you share your screen as you enter personal

information like address or email. This recording will be used for research purposes only. Are you comfortable with us recording your screen and audio for this research? **[IF NO TERMINATE]**

A4. As part of this study, we will ask you to purchase a discounted lightbulb online, at a minimum cost of $0.73 plus shipping. We will not pay for this purchase, but we will give you a $50 Visa gift card for completing this interview. Given this, are you willing to spend your own money to purchase this lightbulb online prior to receiving your gift card? **[IF NO TERMINATE]**

You are eligible for this study. At the end of this activity, I will send you a digital Visa gift card for your participation through email. I will verify your email address at the end.

In this research activity, we are going to focus on Xcel Energy's digital marketplace, where customers can purchase discounted lights online and send them directly to their home. We want to understand what this process is like for customers and where the process could be improved and be more clear.

For today's activity, we will have you share your screen as you order a lightbulb for your home on Xcel Energy's digital marketplace. I will be recording your screen and voice. This will only be shared for internal research purposes and will never be publicly shared. I will give you prompts to complete tasks on the website. As you complete these tasks, I would like you to say all of your internal thoughts aloud. By saying your thoughts aloud, we will get insight into any confusion you may be having or any internal experiences or feelings. There is no wrong way to think aloud; any confusion or issues you encounter are a result of the site not being designed properly and not indicative of your ability. In fact, our goal is to find as many of these places of confusion as possible today.

Throughout this process I will be silent, or ask you additional questions, but I will purposefully not help or answer questions. Our goal is to imitate what this experience would be like if a customer were alone on the website, so we want you to problem solve as you would if we were not on the phone. As you problem solve, it is helpful to explain what you are thinking, and doing. Before we begin, I will show you a demonstration of thinking aloud.

Do you have any questions for me about this study or what we will do today?

[IF NO, START EXAMPLE THINK ALOUD SESSION]

Do you have any questions about thinking aloud?

[IF NO, ASK PARTICIPANT TO OPEN A BROWSER SESSION (e.g., CHROME, MOZILLA, SAFARI) AND SHARE THEIR BROWSER. PROMPT THEM TO ONLY SHARE THEIR BROWSER NOT THEIR ENTIRE SCREEN]

Is it okay if I begin recording?

[IF YES, BEGIN RECORDING]

Section B: Website Usability

Before we begin, I want you think of a lightbulb in your home that you want to replace. If you do not have one that you would like to replace, please think of a light in your home that you *could* replace.

B1. Please describe this lightbulb for me, including its location and any features of the bulb that you think are relevant as you look for a replacement.

Next, I want you to find a replacement for this lightbulb online. You learned that Xcel Energy has a digital marketplace where you can purchase discounted bulbs online. I would like you to try to find this website. You may find this website however you normally would search if I were not here. Please remember to say all of your thoughts aloud, and try to talk as much as possible while you do this. Once you believe you are on the correct website, please let me know. You may start now.

[IF REACH CORRECT WEBSITE, CONTINUE]

Now, I would like you to find a bulb to replace the bulb we talked about earlier.

B2. Please describe what you are looking for as you search, and say all of your thoughts aloud. Please let me know when you found the bulb you want to purchase.

[ONCE HAS BULB SELECTED, CONTINUE]

B3. Why did you choose this particular bulb? **[Probe on light qualities if applicable]**

B4. On a scale of 1 – 5, where 1 is very uncertain and 5 is very certain, how certain do you feel that the lightbulb you found will be a good replacement in your home?

B5. Tell me more about your response and why you chose it.

Now that you have the bulb selected, I want you purchase it and send it to your house. When you get to the field to enter personal information like address or credit card information, I want you to STOP sharing your screen. If you do not remember, I will stop the screen sharing on my side. Please get the screen to purchase the lightbulb.

[ONCE ON SCREEN WITH FIELD DATA, STOP SHARING. REQUEST THAT PARTICIPANT CONTINUES TO SPEAK ALOUD ABOUT EXPERIENCE BUT DOES NOT VOICE ANY PERSONAL INFORMATION. CONFIRM WHEN PARTICIPANT IS NO LONGER ON A SCREEN WITH PERSONAL INFORMATION]

Please let me know when you are past the page where you enter your personal information so that we may resume.

[ONCE RESUMED, CONTINUE, AND MAKE SURE SCREEN SHARED]

B6. What do you think happens next? **[PROBE ON CLARITY OF COMPLETED PURCHASE AND EXPECTED DELIVERY DATE]**

Section C: Wrap-Up Questions

Next, I would like to ask you a couple of questions about your overall experience.

C1. Thinking about your overall experience on a scale of 1 – 5, where 1 is very difficult and 5 is very easy, how easy or difficult was your experience today?

C2. On the same scale, how easy or difficult was it for you to find the correct website? Why?

C3. On the same scale, how easy or difficult was it for you to find the right bulb? Why?

C4. On the same scale, how easy or difficult was it to purchase the bulb and send it to your home? Why?

C5. If you could change one thing to make this experience better for customers like you, what would you change?

C6. Those are the questions that I had for you today, what other things would you like to share about your experience today that might be helpful for me to know?

I'd like to verify that the email I have for you is correct in order to send you your $50 Visa gift card. The email I have for you is **[SAY EMAIL],** is that the correct email?

I will be sending this gift card to you by the end of the week. If you have any trouble receiving it, please email me and I will make sure you receive it. Do you have any questions for me before we are done today? **[IF NO, THANK AND END CALL]**

B.4 Dscout Campaign Guide

Introduction

This guide is to be used conduct a virtual ethnography and mini-survey with Colorado Xcel Energy customers using the dscout platform. This platform provides highly qualitative analyses with rich data such as customer self-made videos and short answer prompts. We will use these data to understand the customer journey in the Residential Lighting Product Program.

The interview guide below is mapped to the evaluation research objectives shown below in Table 1.

Table 1. Evaluation Objectives

Evaluation Objective	Impact or Process Objective	Research Activity	Dscout Interview Guide Objective
Get feedback on the CO Xcel Energy Residential Lighting product website and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.	Process	Customer Dscout Campaigns and Digital Ethnography; A/B Product Website Usability Testing	✓
Get feedback on the re-launch of the Xcel Energy storefront.	Process	Digital Marketplace Usability Testing	
Gain insight from stakeholders and peer utilities on how they are planning to evolve home lighting programs once EISA Tier 2 standards are enacted Includeing how are they planning to fill the savings gap and retain engagement with customers served through home lighting programs.	Process	Peer utililty Benchmarking; Corporate Partner Interviews	
Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them.	Process	Customer Dscout Campaigns and Digital Ethnography	✓
Discover if there are opportunities to increase cost effectiveness of this already cost-effective product.	Process	Peer Utililty Benchmarking; Corporate Partner Interviews	
Describe how peer utilities are anticipating EISA Tier 2 standards and planning for their future program designs.	Process	Peer Utility Benchmarking	

Evaluation Objective	Impact or Process Objective	Research Activity	Dscout Interview Guide Objective
Estimate an overall NTG ratio for the product and major drivers of NTG including market effects. Investigate peer utility NTGR for similar programs.	Impact	Peer Utility Benchmarking; Corporate Partner Interviews; Sales Data Analysis	

Research Questions or Objectives

Table 2 identifies the interview questions related to each contextual theme.

Table 2: Mapping of interview questions to contextual themes

Contextual themes	Data Needed	Survey Prompts
Xcel Energy Website Experience	• How will customers navigate the general Colorado Xcel Energy website? • Are customers able to successfully find a participating retailer near them using the website and the xcelenergy.com/lighting deals page?	D1-D4, G5
Experience in the Store (Including Choice Selection and Confusion)	• Will customers be able to navigate to the correct discounted bulbs? • Will customers feel confident or overwhelmed on the selection? • How knowledgeable are customers on choosing the right bulb for their home and what criteria will they use (lumens, color, watt equivalent)? • How knowledgeable is the store clerk?	E1, F1-F3, G1, G5
Satisfaction with Lighting Product	• How satisfied are customers with their lightbulb purchase (color, brightness, and type for their needs)? • Which bulb will be replaced and why did the customer choose to replace it?	G2-G5

Dscout Campaign & Enthography

Section A: Screening of Participants

This segment of the dscout campaign is to screen for potential participants (N = 10).

A1. Are you a Colorado Xcel Energy customer? (Yes/No response)

A2. Why are you interested in this mission? (Video response)

Section B: Overview of Campaign

This segment of the dscout campaign is to provide an overview of the study.

Welcome to the Xcel Energy Lightbulb Mission! In this 5-part mission, you will help us understand your process and strategies for buying a lightbulb using Xcel Energy's rebate program.

Please note that you will need to purchase the lightbulb and will not be reimbursed for your lighting purchase, so please keep that in mind when selecting a bulb.

Please read all the instructions to each part before getting started so you fully understand what we're looking for!

You will complete this mission one part at a time. After you submit your entry for Part 1, the next part will unlock for you, and so on. This means you can move at your own pace. To prevent falling behind, we recommend that you aim to meet the part deadlines listed below. Complete all 5 parts in this mission to earn your $100 reward!

Recommended Part Deadlines:
Part 1 [start date/time] - [end date/time]
Part 2 [start date/time] - [end date/time]
Part 3 [start date/time] - [end date/time]
Part 4 [start date/time] - [end date/time]
Part 5 [start date/time] - [end date/time]

If there are any changes to this timeline, your mission leader (Liz) will be in touch! If you have any questions about the mission requirements or deadlines, be sure to contact your mission leader by sending a message in the app! If you have technical issues or questions, you can always contact dscout technical support at help@dscout.com.

If you plan to complete this mission please tap "accept" now, so we know we can count on you!

Section C: Mission Part 1: Find a Lightbulb

Instructions: Find a lightbulb in your home that you want to replace.

C1. Media Response: Now in a 1-minute video, describe which light it is, why you want to replace it, and what qualities you will look for in your replacement lightbulb (examples: light color, size, shape, price).

Section D: Mission Part 2: Find a Store Near You

Instructions: Your utility provider, **Xcel Energy**, discounts LED bulbs at retail stores in Colorado. You can find a physical store near you that sells these discounted bulbs by going to https://co.my.xcelenergy.com/s/residential/home-rebates/home-lighting. Please reach out to Liz (mission leader) if you need any help with this task.

D1. Media Response: Go to the Xcel Energy website URL above. Once you are on the website, start recording your video (2-minutes). Use the website to find a physical store near you that sells the LED bulb(s) you are interested in. During your recording, try to talk the entire time, saying your internal thoughts out loud. These can be things you notice, things you are trying to complete, or feelings, like intrigue or frustration (example: "I am clicking this link because I think it will take me to a list of retailers" or "I feel frustrated because I cannot find where to enter my zip code").

Tip: Try to angle your phone so that it captures you and your computer screen if possible (or have someone help you take the video).

D2. Open Ended: Please list the name of the store you went to.

D3. Open Ended: Please list the zip code of the store.

D4. Open Ended: Briefly explain why you decided to go to that particular store and whether or not you think they will have the bulb you are looking for.

Section E: Mission Part 3: Go to the Store

Instructions: Go to the physical store (that you found on the website using your zip code) and find the aisle that sells those bulbs.

E1. Media Response: Take a 2-minute video of yourself in the aisle as you decide which bulb(s) to purchase. Like the other video, try to say all of your internal thoughts out loud as you decide, and make sure to note anything that is confusing or unclear in regard to finding or deciding which bulb to purchase.

Section F: Mission Part 4: Find a Store Clerk

Instructions: Find a store clerk and ask for help - even if you found the bulb you were looking for. Tell them what type of bulb you are looking for as well as any attributes it must have and ask them for help selecting it (you may want to wait until you leave the store before filling this part out).

After they help you, purchase the bulb. If you did not find a bulb to purchase, please contact Liz (mission leader). Please still ask a store clerk for help and fill out the questions below and continue to part 5

F1. Scale: On a scale of 1 - 5, where 1 = not friendly and 5 = very friendly, how friendly was the store clerk who helped you?

F2. Scale: On a scale of 1 - 5, where 1 = not knowledgeable and 5 = very knowledgeable, how knowledgeable was the store clerk who helped you?

F3. Open Ended: Please add more detail on your interaction with the store staff here. Think about what made the store clerk friendly or knowledgeable, if they needed to ask another store employee for help, and any other observations you made during this time.

Section G: Mission Part 5: Returning Home

Complete this part when you have returned home from the store.

G1: Multiple Choice: Were you able to find and purchase a light bulb? (Yes/No response)

[IF G1 = YES, G2:G4]

Instructions: Once you are at home, install the new bulb.

G2. Media Response: Take a 2-minute video of yourself once it is installed and describe the installation process.

G3. Scale: On a scale of 1 - 5, where 1 = dissatisfied and 5 = satisfied, what is your satisfaction level of the bulb?

G4. Open Ended: Please give more details about the reasons for your satisfaction rating.

[IF G1 = NO, G5]

G5. Media Response: Take a 2-minute video of yourself describing your overall process of attempting to find and buy a bulb. Include what you think would be helpful next time and/or any other observations you think were important during this process.

B.5 Corporate Partner Interview Guide

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy energy efficiency products, the TRC evaluation team will interview corporate partners (manufacturers and retailers). The objective of these interviews is to meet both process and impact objectives and will provide Xcel Energy staff with manufacturer perspective on the program processes, market trends, and market impacts. To conduct the interviews, the TRC evaluation team will work with the product implementer to contact and hold video conferences with five corporate partners. If we cannot get ahold of our sample for video conference, we will call them by telephone.

This document presents the in-depth interview guide for the Colorado Residential Lighting Product corporate partner interviews. Interviews will be conducted with five of Xcel Energy's participating manufacturers or corporate retailers detailed in Table 1 below. Target respondents are owners or managers with long historical standing at the company and in the industry generally. Table 1 shows the intended sampling plan for corporate partner interviews.

Table 6: Sampling Plan

Trade Partner Type	Strata	Population[b]	Target Interviews
Corporate Partner	Manufacturers	13	3
	Corporate Retailers	16	2
	Total	TBD	**5**

The interview guide below is mapped to the evaluation research objectives shown below in Table 2.

Table 7. Evaluation Objectives

Evaluation Objective	Impact or Process Objective	Research Activity	Corporate Partner Interview Guide Objective
Get feedback on the CO Xcel Energy Residential Lighting product website and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.	Process	Customer Dscout Campaigns and Digital Ethnography; A/B Product Website Usability Testing	

Evaluation Objective	Impact or Process Objective	Research Activity	Corporate Partner Interview Guide Objective
Get feedback on the re-launch of the Xcel Energy storefront.	Process	Digital Marketplace Usability Testing	
Gain insight from stakeholders and peer utilities on how they are planning to evolve home lighting programs once EISA Tier 2 standards are enacted Includeing how are they planning to fill the savings gap and retain engagement with customers served through home lighting programs.	Process	Peer utililty Benchmarking; Corporate Partner Interviews	✓
Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them.	Process	Customer Dscout Campaigns and Digital Ethnography	
Discover if there are opportunities to increase cost effectiveness of this already cost-effective product.	Process	Peer Utililty Benchmarking; Corporate Partner Interviews	✓
Describe how peer utilities are anticipating EISA Tier 2 standards and planning for their future program designs.	Process	Peer Utility Benchmarking	
Estimate an overall NTG ratio for the product and major drivers of NTG including market effects. Investigate peer utility NTGR for similar programs.	Impact	Peer Utility Benchmarking; Corporate Partner Interviews; Sales Data Analysis	✓

Table 3 identifies the interview questions related to each contextual theme.

Table 3: Mapping of interview questions to contextual themes

Contextual themes	Data Needed	Interview Section
Awareness and Program Experience	• How did partner become aware of the program? • What is going well for partners, and what could be improved?	B
Net to Gross	• What is the effect of the Colorado Appliance Bill legislation on the manufacturing and sales of specialty light bulbs? • What is the effect of lighting programs on non-program states LED market shares?	C
Industry Trends	• What changes are happening in the industry? • What energy savings opportunities are emerging?	D

Recruiting Instructions

The research team plans to work with the product implementer to send emails to corporate partners. These emails will contain an explanation of the research, as well as both an Xcel

Energy and Apex Analytics contact person the partner can reach out to if they have additional questions or would like to schedule an interview at their convenience.

Potential respondents will be recruited by consultants on the research team who will be conducting interviews and have been trained on the purpose and goals of the Colorado Residential Lighting Product qualitative research. The research team will be as flexible as possible in scheduling these interviews, including scheduling early morning or evening interviews when possible to accommodate busy schedules. The research team will leave a voicemail or receptionist message on the first attempt whenever possible, and then use discretion to determine any additional messages left on subsequent attempts. The research team will strive to attempt to contact each corporate partner a minimum of 4 times before giving up on that particular contact, but depending on each unique situation, the research team may need to attempt some contacts more times to ultimately reach the correct person.

Interview

Introduction/Recruitment Email

Hello {{first_name if applicable}},

My company is working with Xcel Energy on their CO Home Lighting Product to quantify and improve their efforts to promote energy efficient lighting in residential homes. As a [manufacturer or retailer], you have valuable experience in the industry. I would like to learn about your experience in the program and gain insights from your unique perspective.

We are offering a $50 electronic gift card for your participation in a 30-minute interview.

Please click here to schedule time with me directly, or send me an email and let me know when you are available.

I look forward to hearing from you, and would be happy to answer any questions you have about this research. You may also reach out to Austin Dowd at adowd@slipstreaminc.org to verify the validity of this study.

Introduction/Recruitment Phone

INTRO 1	Hello, this is INTERVIEWER NAME, calling from Apex Analytics on behalf of Xcel Energy. Is CONTACT NAME available?
INTRO 2	We are working with Xcel Energy on their Colorado Residential Lighting programs. As part of this study, we are reaching out to their corporate partners to learn about innovations in the industry and your experience in the program.

We would like to include COMPANY NAME in this study, as you are a top partner that is participating in this program. In your interview, we would talk about your role with COMPANY NAME, your experience in the Colorado Xcel Energy Residential Lighting Program, and your opinions about the future of the LED market.

INTRO 3 Can we include your COMPANY in the study?

a. Yes **[RECORD CONTACT INFORMATION; SETUP INTERVIEW TIME; EMAIL INTERVIEW TOPICS]**
b. No **[DISCUSS CONCERNS; ANSWER QUESTIONS; ATTEMPT TO CONVERT TO "YES"]**

Section A: Introduction

[IF DIRECT FROM INTRO YOU MAY SKIP] Thank you for speaking with me today. Our interview will take about 30 minutes. We will talk about your role with COMPANY NAME, your experience in the Xcel Energy Residiential Lighting Program and your opinions about the future of the LED market.

Do you have any questions for me before we get started?

For better note-taking and internal purposes, it is helpful for me to record this call, is ot ok if I record our phone call today?

[IF YES BEGIN RECORDING]

First, we'd like to learn a little more about you and your role at COMPANY

A1. What is your role at COMPANY?

A2. How long have you worked at COMPANY?

A3. How long have you been working in the lighting industry?

A4. Does COMPANY currently sell or manufacturer non-LED residential light bulbs? Why or why not?

Section B: Program Awareness and Experience

Next, I'd like to talk about your experience participating in the Colorado Xcel Energy Residential Lighting program.

B1. What are your responsibilities regarding the Colorado Xcel Energy Residential lighting program?

B2. How did COMPANY first become aware of the program?

B3. What, in your opinion, is the best part of COMPANY participating in the Colorado Xcel Energy Residential Lighting program?

B4. What, in your opinion, are the challenges of participating in the Colorado Xcel Energy Residential Lighting program?

[IF > 20 minutes left in interview, ask B7:B9, otherwise SKIP]

B7. Have you experienced any difficulty maintaining Xcel Energy discounted lighting products on your retailer shelves? **[PROBE IF YES]**

B8. As part of the process you send Slipstream, Xcel Energy's implementer, sales data from your participating retailers. How easy or difficult is that process for you? Why?

B9. In order to participate you responded to a request for proposal from Slipstream. What, if anything, would you change about that process?

B7. Overall, on a scale of 1-10 how would you rate your satisfaction with the program? Why?

Section C: NTG

Next, I'd like to ask you a series of questions to understand your opinion of the effect of legislation adopted by the State of Colorado and Xcel Energy programs on your sales of LED bulbs.

C1. Do you maintain general knowledge of these type of efficiency legislation requirements as part of your job? **[YES, NO]**

C2. **[IF Q1=NO]** Is there someone else at your company that I should talk with about these specific questions? **[IF YES, GET CONTACT INFORMATION].**

C3. **[IF Q1=YES]** Are you aware of the Colorado Appliance Bill, No. 19-1231 **[YES, NO, UNSURE]**

C4. **[IF Q3=UNSURE]** The Colorado Appliance Bill requires energy efficiency standards for a variety of equipment including certain specialty light bulbs sold in Colorado to meet energy efficiency and water standards starting in 2020. Does this sound familiar to you? **[YES, NO]**

C5. **[IF C1 OR C4=YES]** What is your understanding of the bill requirements? **[ASK TO ASSESS KNOWLEDGE AND UNDERSTANDING]**

C6. As a result of this legislation, did your company change any of your light bulb offerings for 2020 in Colorado state? **[YES, NO]**

C7. **[IF C6=YES, ELSE IF C6=NO SKIP TO C10]** How did they change? **[PROBE FOR WHETHER THEY DROPPED MODELS OF INEFFICIENT BULBS AND/OR ADDED MODELS OF EFFICIENT BULBS]**

C8. We are trying to assess the relative influence of the Colorado Appliance Bill and Xcel Energy's program on sales of specialty LED bulbs (reflectors, globes, and decorative bulbs) in Colorado. If you had 100 points to assign between the Xcel Energy's Residential Lighting Program and the Colorado Appliance Bill, representing the influence on specialty LED sales, how many points out of 100 would you give to each of these? **[APPLIANCE BILL___, RLP ____ (must total 100)]**

Counterfactual Scenario

C10. My company, Apex Analytics, collects lighting sales data in most states across the nation to track trends in LED market shares in states or areas with and without programs. We currently see that market shares in states with programs average close to 70% LED market share and states without programs average about 63% LED market share. These market shares of LEDs have been steadily increasing in both program states and non-program states for the past 8 years. Do you think the collective effect of all the programs across the nation affect LED sales in non-program areas? **[YES, NO]**

C11. Why do you say that? **[DO NOT READ ANSWERS ALOUD, CHECK ALL THAT APPLY]**

1. Increased manufacturing leads to price decreases in non-program states
2. Increased variety of LED models in program states, help sell bulbs in non-program states
3. Other **[OPEN END, FILL IN ALL OTHER REASONS]**

C12. **[IF C11_1 <> TRUE]** Please tell me if you agree or disagree with this statement "Lighting programs across the United states have resulted in a greater variety of LED models being manufacturered**"[AGREE, DISAGREE]**

C13. **[IF C11_2 <> TRUE or C12="AGREE"]** Please tell me if you agree or disagree with this statement "The greater demand for LEDs in program areas led to price decreases that affected LED prices everywhere." **[AGREE, DISAGREE]**

C14. We noted that non-program states have 63% LED market share, and program states have 70% market share. Of the 63% LED market shares in non-program states, what percentage would you estimate came about purely due to factors that would have existed in the absence of lighting programs, or legislation, such as customer preferences and manufacturing innovations? (i.e. naturally occurring market adoption versus the impact of programs that occurred in other areas across the country)? **[PERCENTAGE THAT SHOULD BE SUBTRACTED FROM 63% TO GET NON-NATURALLY OCCURING PERCENT]**

C15. **[CONFIRM C14 ANSWER].** So just to confirm, of the 63% non-program area market shares, **[63%-C14]** is due to naturally occurring market adoption, and **[C14]** is due to effects of programs that brought about the changes to market shares?

Section D: Industry Trends

Finally, I'd like to close by asking you about your opinion about the lighting market generally.

D1. Do you see a "next big thing" in the LED market for residential customers? If yes, what. If not, why not?

D2. What new, or underused products might provide future energy savings in residential markets (whether lights or otherwise)?

D3. Where do you see the industry in 5 years?

D4. **[IF D3 = SEE INDUSTRY WANING/REDUCING**] how might you adapt?

D5. What else do you think would be helpful for Xcel Energy to know about your experience, or about the industry more broadly to help you be successful in this program?

Section E: Closing

E1. Great! Thank you so much for your time. Those are all the questions we have for you today. Before we finish, do you have any questions for me, or anything else you would like to add?

[EXPLAIN NEXT STEPS FOR RECEIVING INCENTIVE AND VERIFY EMAIL ADDRESS FOR SENDING]

B.6 Peer Utility Interview Guide

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy energy efficiency products, the TRC evaluation team will benchmark the Xcel Energy products against peer utilities. The objective of the benchmarking is to identify opportunities to improve the Xcel Energy products based on a comparison of peer utility programs' design, delivery, and processes. In addition, benchmarking allows the evaluation team to understand the performance of the product in context with the performance of other utilities. To conduct the benchmarking, the evaluation team will conduct secondary research on the peer utilities identified and perform in-depth interviews with program managers at the peer utilities.

This document presents the in-depth interview guide for the Colorado Residential Lighting Product peer utilities interviews. Interviews will be conducted with four to six of Xcel Energy's peer utilities detailed in Table 1 below. Target respondents are managers of residential lighting energy efficiency programs.

Table 8: List of Peer Utilities

Utility	Program Name	Priority
ComEd	Lighting Discounts	High
NV Energy*	PowerShift by NV Energy	High
Ameren Missouri	Residential Lighting	High
Public Service Company of New Mexico*	Residential Lighting	High
Baltimore Gas & Electric	Lighting Discounts	Medium
Rocky Mountain Power – UT*	Residential - Wattsmart® Incentives	High
Eversource - MA	Lighting Discounts	High
DTE Energy	Residential Lighting Discounts	High
Consumers Energy	Instant Discounts	Medium
Platte River/City of Fort Collins*	Residential LEDs	High
Efficiency Maine	Residential Lighting	High

* The evaluation team will plan to interview at least one western states utility and gather secondary research on at least two.

Table 2 shows the objectives for the overall evaluation and indicates which of these objectives will be addressed by the peer utility interviews.

Table 9. Evaluation Objectives

Evaluation Objective	Impact or Process Objective	Research Activity	Peer Utility Interview Guide Objective
Get feedback on the Xcel Energy Residential Lighting product website and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.	Process		
Get feedback on the re-launch of the Xcel Energy storefront.	Process		
Gain insight from stakehodlers and peer utilities on how they are planning to evolve home lighting programs once EISa Tier 2 standards are enacted Includeing how are they planning to fill the savings gap and retain engagement with customers served through home lighting programs.	Process	Peer utililty and trade partner interviews	✓
Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them.	Process		
Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb, and if retail staff are able to help them.	Process		
Discover if there are opportunities to increase cost effectiveness of this already cost-effective product.	Process	Trade partner, customer surveys and peer utility interviews	✓
Describe how peer utilities are anticipating EISA Tier 2 standards and planning for their future program designs.	Process	Peer utility interviews	✓
Estimate an overall NTG ratio for the product and major drivers of NTG including market effects. Investigate peer utility NTGR for similar programs.	Impact	Sales data analysis, trade partner interviews, and peer utility interviews.	✓

Table 3 identifies the interview questions related to each key performance indicator.

Table 3: Mapping of interview questions to indicators

Key Performance Indicator	Data Needed	Interview Question
Program energy savings goals	• 2020 program energy savings goals (MWh) • 2020 program's savings (MWh) • 2020 total energy efficiency portfolio goal (MWh)	B4, B6, B7
Program budget cost of acquisition (e.g. $/MWh, $/Mcf)	• 2020 program budget • 2020 total gross energy savings for each peer program	B9
Customer Participation Levels	• Number of individual products sold 1.	B1
Net-to-gross ratios (NTGRs)	• NTG methods	B5
Total resource cost test (TRC) values	• TRC values	B10

Table 4 identifies the interview questions related to each contextual theme.

Table 4: Mapping of interview questions to contextual themes

Contextual themes	Data Needed	Interview Question
Measure types and incentives	• List of measures and their efficiency levels, incentive levels	A2
How program is changing	• Recent program changes and reasons • Planned program changes and reasons	A1
Planned response to EISA Tier 2	• How will they fill savings gap? • How will they retain customer engagement served through home lighting?	C1, C2, C3
Net-to-gross (NTG) savings approach	• NTG method, ratio applied, calculation details, retrospective and/or prospective	B5, B8

Recruiting Instructions

The research team plans to send advance emails to any program managers with available emails. This email will contain an explanation of the research, as well as both an Xcel Energy and Apex Analytics contact person the utility can reach out to if they have additional questions or would like to schedule an interview at their convenience.

Potential respondents will be recruited by consultants on the research team who will be conducting interviews and have been trained on the purpose and goals of the Colorado Residential Lighting Product qualitative research. The research team will be as flexible as possible in scheduling these interviews, including scheduling early morning or evening interviews when possible to accommodate busy utility schedules. The research team will leave a voicemail or receptionist message on the first attempt whenever possible, and then use discretion to determine any additional messages left on subsequent attempts. The research team will strive to attempt to contact each peer utility a minimum of 4 times before giving up on that particular contact, but depending on each unique situation, the research team may need to attempt some contacts more times to ultimately reach the correct person.

Interview

Introduction/Recruitment

INTRO 2 Thanks for agreeing to our interview. We are working with Xcel Energy on a benchmarking and best practices study for Home Lighting energy efficiency programs. As part of this study, we are reaching out to leaders of Home Lighting programs to learn about innovative programs and best practices in the field.

We would like to include UTILITY in this study, as your Home Lighting program has been identified as a peer program. In your interview, we would talk about your Home Lighting program's design and implementation, as well as its successes and challenges. We would be very happy to share an anonymized version of our report on peer Home Lighting programs with you once we've completed our research.

[IF NEEDED:] We will not be requesting any customer or participant data.

Section A: KPIs/Program Design

A1. First, we'd like to talk through the basic design and organization of your program. **[ASK/CONFIRM BASED ON HOLES IN BACKGROUND RESEARCH ON PROGRAM]**

Can you describe your program at a high level?

a. What are the program's overall objectives?

b. Have there been any recent changes to the program? [PROBE: specific changes and why]

c. What will the program be like in the near future? [PROBE: phasing out or adding any types of products and why]

A2. Next, I'd like to talk about your program's efficiency incentives. **[ASK/CONFIRM BASED ON HOLES IN BACKGROUND RESEARCH. CAN ASK QUESTIONS BELOW OR ASK RESPONDENT IF OK TO FOLLOW UP VIA EMAIL]**

a. What types of measures do you offer? [PROBE**:** bulb type, fixtures, other]

b. Can you recommend a web page or other resource where I can find a list of your available measures and their incentive values?

a. If "NO": What specific measures are offered? What are the incentive levels for each measure?

Section B: Savings Goals/Cost

Next, I'd like to talk about the participation and energy savings achieved through the program in 2020.

[ASK/CONFIRM BASED ON HOLES IN BACKGROUND RESEARCH. CAN ASK QUESTIONS BELOW OR ASK RESPONDENT IF OK TO FOLLOW UP VIA EMAIL]

B1. How many products were sold through retailers in 2020 for each type?

B2. Approximately how many retailers are active in the program?

B3. Do you have an e-commerce site? If so, how many products were sold through the e-commerce site for each type? What type of marketing did you do of the e-commerce site? Is there a particular tactic that works the best?

B4. What were the program's energy savings goals (for combined retailer and e-commerce) in 2020? (MWh)? What percent of your total program comes from e-commerce?

B5. Are these goals based on gross or net savings?

a. Did/will you apply a NTG ratio to these savings?

b. What NTG ratio did you use for 2020?

c. What methods are used to calculate NTG ratio?

d. Are NTG ratios estimated at the program level, measure level, or both?

e. Are NTG ratios applied retrospectively or prospectively? When was the 2020 NTG ratio determined?

B6. How much net/gross energy savings did the program report in 2020?

B7. What was the total energy efficiency portfolio goal in 2020?

B8. Do you have estimated NTG ratios for 2021, 2022, and 2023? If so, what are they and how were they determined?

B9. We'd like to know more about the budget or total operating costs of your program to get a sense of the utility cost of energy savings. Ideally, this includes program incentives, salaries of program staff (including support staff who may not work on the project full-time), marketing, consulting, and other overhead.

a. What is the program's total operating budget?

b. If sub-programs exist, how does this break down between sub-programs?

B10. What type of cost effectiveness test is applied to the program?

a. If Total Resource Cost (TRC), what was the TRC in 2020?

Section C: EISA Tier 2 Standards

C1. How is your utility addressing the uncertainty around EISA Tier 2 standards?

C2. How is your utility planning to replace the savings you've historically earned from Home Lighting program?

C3. How is your utility planning to replace the customer engagement opportunity from this program?

Section D: Closing

D1. Great! Thank you so much for your time. Those are all the questions we have for you today. Before we finish, do you have any questions for me, or anything else you would like to add?

Appendix C: Data Collection Findings

Appendix C includes the following:

- C.1 Staff Interview Findings
- C.2. Product Website Usability Findings
- C.3 Digital Marketplace Findings
- C.4 Dscout Findings
- C.5 GIS Analysis Findings
- C.6 Corporate Partner Interview Findings
- C.7 Peer Utility Benchmarking Findings
- C.8 Sales Data Analysis Findings

C.1 Staff Interview Findings

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy Demand Side Management (DSM) products, members of the TRC Companies (TRC) evaluation team from Apex Analytics conducted telephone interviews with key staff managing and implementing the Xcel Energy DSM products. The interview objectives were to collect staff feedback on product experiences and input on evaluation priorities. Members of the TRC evaluation team interviewed the following key staff managing and implementing the Residential Lighting product.

Xcel Energy Staff:

- Team Lead
- Product Manager
- Regulatory Analyst
- Engineer
- Marketing Manager

Slipstream Staff (Implementer):

- Program Manager

This memo contains our summary of the key takeaways, a description of the product, an inventory of the product's strengths and barriers, and feedback on evaluation priorities.

Key Takeaways

Below are key takeaways from staff experiences with the Residential Lighting product. These key takeaways provide a summary of the product context and feedback received during both the kick-off meeting and the subsequent staff interviews.

- The Residential Lighting product is targeted at residential customers however a portion of sales go to business customers. The program includes linear LEDs

- **The Residential Lighting product makes up a substantial part of the overall energy efficiency portfolio for Colorado.** All staff noted that the Residential Lighting product makes up the majority of savings for their residential energy efficiency products. The product often surpasses its goals and is used as a backstop for products that may not have met their goals that year.
- **Staff believe the Biden administration will likely reinstitute planned Energy Independence and Security Act (EISA) Tier 2 standards, but they do not know when it will happen.** Because of this, staff were uncertain how many more years they could claim savings for LED bulbs, as savings are already decreasing for some specialty products due to the Colorado Appliance Bill. Staff wanted clarity on what was likely to happen with EISA Tier 2 standards so they can better plan the product's future.
- **The product has severely reduced savings for specialty bulbs based on the Colorado Appliance Bill, but if reinstated, EISA Tier 2 standards will affect bulbs beyond specialty, which will have a large impact on future savings.** Intervener groups promoted the "Appliance Bill" through the state legislature, which intended to continue EISA Tier 2 standards for bulbs. The Colorado state legislature could not override federal regulation of the rescission of EISA Tier 2, but they were able to instate the EISA Tier 2 updates for some specialty bulbs since it was not specifically covered in the rescission legislation.
- **Staff see the Residential Lighting product as a potential gateway to other Xcel Energy products.** All staff recognized that the Residential Lighting product was one of the Xcel Energy DSM products that has the biggest potential to reach and engage all customers. Staff also believe it is a gateway to other Xcel Energy products. As staff consider what will happen to the Residential Lighting product with EISA standards, they want to maintain the engagement and touchpoints the product has with customers.
- **Staff want to know what might replace common bulbs in the product.** It is clear that this product will not be able to continue its current savings in the long-term, and staff are curious about what might replace this product's savings. Some are curious about the internet of things (IoT) and lighting controls, others were interested new LED bulb varieties. Staff want to know from manufacturers and retailers what types of technology might be available in the future.
- **Staff are happy with their implementer.** There were no concerns about Slipstream as an implementer, and staff are generally happy with the services they provide.
- **Staff want to continue efforts to reach income-qualified (IQ) audiences.** Staff worked with the IQ Weatherization product to offer LED bulb packs to food banks and thrift stores in the area. All staff wanted to understand how to expand these offerings to better and further serve IQ audiences.
- **Staff want to understand the usefulness of its planned updated webpage to assist customers with their lighting purchases as well as the new online store.** The website offers tools to find retailers with discounts and how to choose the right bulb while the online store offers discounted LEDs for purchase. Xcel Energy staff are concerned whether the planned website is user friendly enough as the zip code finder does not sort by stores closest to the customer. would like customer feedback on this issue in addition to general feedback on these tools and whether they are used.

Product Activities, Goals, and Resources

The following sections present the evaluation team's understanding of the product based on staff interviews and review of available product documentation.

The Residential Lighting product's primary goal is based on energy savings achievement (kWh, kW, and peak coincident demand). Goals are often met and exceeded, and internal goals are higher than external goals as the product is often used as a buffer if other products cannot meet goal. In 2020, the product reached 119 GWh hours. The external goal is 77 GWh for 2021 and reduces to 62 GWh for 2022 due to assumptions of market saturation and impacts of the Appliance Bill. For 2021, Xcel Energy's internal goal is 110 GWh.

Table 1: Colorado Xcel Energy Residential Lighting Product Filed Savings Goals and Actuals

2020	2021	2022
93 GWh – goal 119 GWh – actual	77 GWh – goal	62 GWh - goal

In addition to savings goals, staff also see opportunity for the product to reach the following objectives:

- Use the product for customer engagement,
- Use the product to promote or bring awareness to other Xcel Energy products, and
- Use the product to provide deeper influence and engagement in the IQ community.

Activities

The following activity list and visual diagram presents the evaluation team's understanding of the product activities for the Residential Lighting product.

Xcel Energy works with Slipstream, who implements the Colorado Xcel Energy Residential Lighting product. In the fall of each year, Slipstream sends out a request for proposal (RFP) document to all manufacturers on their contact list and makes it publicly available on the Slipstream website. (Slipstream staff attend the Energy Star conference annually to add contacts.) Manufacturers return proposals, and then Slipstream verifies eligibility and sets incentive rates. Incentive rates can be negotiated with manufacturers, but they are typically about 60-75% of the incremental cost.

Manufacturers send a list of available retailers who can participate, and these retailers must sign off on the contract. Manufacturers also supply Slipstream with a product workbook which details the MSRP and any manufacturer contributions (manufacturers may choose to add their own discount to bulbs). Once the proposal has been verified and the manufacturer eligible, Slipstream creates a contract for the manufacturer. Slipstream then collects letters of authorization from participating retailers that are working with the manufacturer.

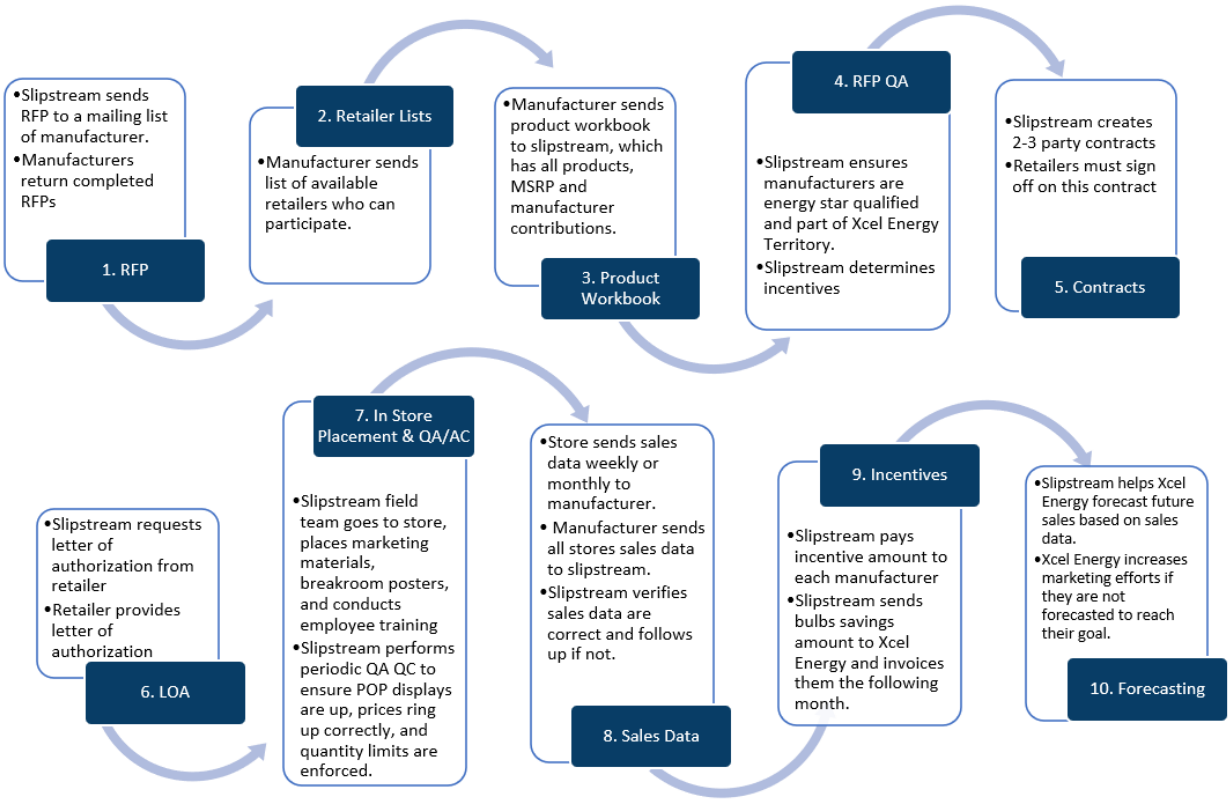
Once all contracts and letters of authorization are in place, Slipstream staff will visit each retailer location, set up point of purchase displays and break room posters, and conduct staff training at the store. Throughout the year, Slipstream conducts quality assurance checks to ensure price, point of purchase displays, and quantity limits are correct at each store.

Stores send sales data to their manufacturer, who passes the data to Slipstream on a weekly or monthly basis. Slipstream performs quality assurance checks on these data. Slipstream then uses these data to pay incentives and calculate the associated energy savings and help Xcel Energy forecast future sales. Xcel Energy uses Slipstreams savings calcuation as the system of record and uses this information to report final savings. If forecasting shows that sales goals

will not be reached, Xcel Energy may increase marketing efforts and/or rebates to reach their sales goals for the product.

Xcel Energy is also re-launching a storefront that sells energy efficient lighting to retail customers.

Diagram 1: CO Xcel Energy Residential Lighting Product Activities



Resources

Slipstream does all tracking and calculating of the savings and then provides Xcel Energy with a monthly scorecard of the total savings. Slipstream also helps with forecasting, by month and retailer.

Staff use the following resources to implement the product:

- Xcel Energy and implementation staff relationships with manufacturers and retailers, which are used for the RFP bid each year.
- Slipstream attends the Energy Star conference annually to recruit new manufacturer participants.
- Email for communication, coordination and file sharing among retailers, manufacturers, the implementer, and Xcel Energy.
- Xcel Energy and Slipstream staff use sales data to forecast future sales to help Xcel Energy determine if savings goals will be met.
- The product uses point of purchase displays and breakroom posters at retailers.

- Slipstream staff conduct educational training for floor staff at retailers.
- Slipstream has several documents they use including their RFP template, contracts, product workbooks, letter of authorization, and sales data.
- Xcel Energy engineering staff to monitor assumptions and estimate unit energy savings.

Product Strengths and Challenges

During interviews, staff identified the following strengths and challenges to implementing the Residential Lighting product. Strengths include factors that product staff identified as supporting the success of the product; challenges include factors that product staff identified as preventing the product from reaching its goals.

Strengths

- The Residential Lighting product often outperforms its goals and brings in a high amount of savings to the overall portfolio every year.
- Through the product, Xcel Energy and Slipstream have formed strong connections with retailers and manufacturers.
- The product is very easy to participate in, and there are few barriers to entry for customers.

Challenges

- It is likely the Biden administration will re-instate EISA Tier 2 standards, and the details of that reinstatement may have large impacts on the product. Staff feel uncertain of how long to plan on the product in its current form until they get more information.
- LEDs are increasing in saturation and new products likely will not bring the same net savings. Staff are considering controls, internet of things, and other LED applications, but admit they know these will have substantially fewer savings than what the product sees now.

Feedback on Evaluation Priorities

During interviews, staff identified research topics they would like the evaluation to address. The following bullets compile these topics along with additional topics that the evaluation team identified based on staff interview findings. The evaluation team will consider these research topics when prioritizing portfolio-wide evaluation needs and as able, incorporate them into the final evaluation plan for the 2021 Residential Lighting product.

- Get clarity on EISA standards, if possible, and/or ask peer utilities what they are doing to anticipate new legislation.
- Get feedback on the Xcel Energy Residential Lighting product website and lighting tools to see if website is clear, is used by customers, is accessible, and helps drive participation to the product.
- Get feedback on the re-launch of the Xcel Energy storefront.
- Gain feedback from stakeholders on what may take the place of home lighting once/if EISA standards are enacted, including new LED technologies, manufacturer insights of upcoming products, and customer desires and commonly bundled purchases.
- Understand if Xcel Energy customers encounter barriers when shopping for bulbs, including if they know how to purchase the right intensity and color of bulb.

- While the product is already cost-effectiveness, Xcel Energy is interested in opportunities to increase cost effectiveness of the product.
- Assess how Xcel Energy can best use results of the 2020 shelf stocking study to optimize the future product resources.
- Understand the retrospective and prospective net-to-gross ratio of the product.

C.2 Product Website Usability Findings

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy Demand Side Management (DSM) products, members of the TRC Companies (TRC) evaluation team from Apex Analytics conducted a usability study of the product website with Colorado Xcel Energy customers in a remote, moderated environment using think-aloud methodology. We asked eight customers to complete a series of tasks to navigate to the Bulb Finder website (www.xcelenergy.com/lightingdeals) and find a store that sells discounted light bulbs near them. The objectives of this activity were to collect feedback on the Xcel Energy Colorado Residential Lighting Product website (Bulb Finder) and lighting tools to see if the website is clear, is used by customers, is accessible, and helps drive participation to the product.

The usability interviews with customers were one-on-one utilizing Zoom software. This method allowed the interviewer to watch and listen to the participant navigate to the website and search for a store near them that sells Xcel Energy discounted light bulbs. Participants were recruited from an email list provided by Xcel Energy and received a $50 gift card for their time. Interviews took 40 minutes, on average.

This memo contains a summary of the key takeaways and customer's experiences with finding and using the product website.

Key Takeaways

Below are key takeaways from customer experiences with the Residential Lighting product. These key takeaways provide a summary of trends within the customer experiences:

- Some customers struggled in finding the Bulb Finder website. On average, it took them 4 minutes to find the correct website. The interviewer asked some customers if they would proceed to search for the website on their own if they were not being interviewed, customers would often say "no". Interestingly, although some customers struggled during the interview to find the correct website, the average rated experience was a 3.9 (easy).
- All eight of the customers interviewed were unaware of the Xcel Energy Discounted Light bulbs program and the Bulb Finder website prior to the interview.
- The "stores near you" list that populates can be confusing for some customers as it does not necessarily show the closest store, and sometimes the closest store is over an hour away. Additionally, four interviewed customers indicated that they would like a radius choice or map of stores near the zip code they entered. Two interviewed customers did not have a store near the zip code they entered.
- Information in the "Find 2021 Deals" dropdown menu can be either helpful or overwhelming, depending on the customer's existing knowledge about light bulbs (e.g., if they know what lumens are already).

The following sections present the evaluation team's understanding of customer's experiences with the Bulb Finder website.

Navigating to the Bulb Finder Website

To start the interview, we asked the following prompt: "I want you to find a store near you that sells discounted light bulbs. You learned that Xcel Energy has website where you can find a store near you that sells discounted bulbs." The following list provides examples of search terms customers used:

- "xcel", "excel", "xcel energy"
- "discount light bulbs near me"
- "stores that sell discounted bulbs"
- "xcel energy discounted light bulbs"
- "store near me that sells discounted light bulbs through xcel energy"

The most successful search term used was "xcel energy discounted light bulbs" and the least successful was "excel". One example of a customer's pathway to the Bulb Finder website is listed below.

Barriers to Finding the Bulb Finder Website

Listed below are barriers we observed during the interviews:

- Three customers we interviewed wanted a "search box" on the main Xcel Energy webpage.
- Customers took, on average, 4 minutes to find the Bulb Finder website (depending on what search terms used or where they started). For some of the customers, the interviewer would ask the customer if they would proceed searching if they were searching by themselves. Anecdotally, all customers who were asked this question said "no".
- Some customers only navigated using Google, whereas others used the Xcel Energy website and navigated using the following steps:
  - Xcel Energy
  - Clicked on "Residential Services"
  - Residential Services | Xcel Energy
  - Clicked on "Home Rebates"
  - Home Rebates | Xcel Energy
  - Clicked on "Search LED deals"
  - Bulb Finder | Xcel Energy

Customer Awareness of Xcel Energy Discounted Light Bulbs

All eight customers interviewed were unaware of the discounted light bulbs and Bulb Finder website. Many of them were pleasantly surprised to hear about the program.

Using the Bulb Finder to Find a Store

To gauge customers' experiences, the evaluation team asked the following three Likert[10] scale items (scale of 1–5) and one opened-ended question at the end of the interview:

1. "Thinking about your overall experience on a scale of 1–5, where 1 is very difficult and 5 is very easy, how easy or difficult was your experience today?"
   - **Average Score = 4.1** (N = 8)
     - "I had some difficulty finding the site but once I was on it, I thought it was very useful and pretty easy."
     - "It went overall pretty well, until the dropdown menu [Find 2021 Deals]."
2. "On the same scale, how easy or difficult was it for you to find a store near you? Why?"
   - **Average Score = 4.0** (N = 8)
   - Even though some customers had difficulties finding a store near them (store list can show up out of order), it did not make a large impact on their overall satisfaction.
     - "Map radius would have been helpful."
     - "The list was a little out of whack [did not show stores in closest proximity], but still very easy."
3. "If you could change things to make this experience better for customers like you, what would you change?" Below are the anecdotal responses customers had about their experiences.
     - Easier to find product website (4 customers)
       - *"Make clearer how to find the store finder tool, maybe increase advertising?"*
     - Easier to find products in the store (1 customer)
       - *"The one thing I can think of is having a specific picture or graphic of the sticker that I would be looking for in the store. I know it is a sticker and I haven't been able to find an example of that. I know there is a large variety of what things look like in the world, so I would be confused of what I am looking for besides a sticker."*
     - How stores populate on zip code search results (4 customers)
       - *"Map radius would have been helpful."*
     - Other suggestions:
       - Search results showing products at a specific store (find these types of light bulbs at these stores) (1 customer)
       - Suggestions on where light bulbs can be used in the home (1 customer)

We also included a question about finding the Bulb Finder website. This question was important to ask towards the end of the interview because it gave the customer time to reflect on their experience.

4. "On the same scale, how easy or difficult was it for you to find the correct website? Why?"

[10] Likert items are used in surveys as scales to measure and quantify attitudes about what variable you are measuring. Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 22 140, 55.

- **Average Score = 3.9** (N = 8)
    - Even though some had difficulties finding the site, it did not make a large impact on their overall satisfaction.
    - "There is an advertisement, a lot of times I'll just go to the Google page and type what I need to type in, and I will see the ad but check under ad as well. So, I will always look here just to see, but obviously this is not Xcel's website here."

Barriers to Using the Bulb Finder Website

Listed below was another barrier we observed during the interviews:

- The "2021 Deals" dropdown menu was either useful or overwhelming, depending on the customer. Four customers found the information useful, and four customers found it to be too much or overwhelming.
    - "I feel like it is a good amount of information. Seeing the price is definitely helpful, seeing the manufacturer and wattage is helpful, because then I can go to my light bulb here and make sure the store has it…. Color is definitely helpful. Also, I teach photography, so I know about the color temperatures. Seeing the discount is helpful so I know how much I'm saving."
    - "I wish some of these things [i.e., column headers of the drop-down menu] had links to their meanings. I also wish some of these bulbs had pictures so I can know what they were…. I'm not sure what an 'A-line' is."

Post-Interview Survey Results

After the usability interview, we emailed a short survey to customers. Xcel Energy requested this specific question be asked.

- *"Thinking about your overall experience on a scale of 1–5, where 1 is strongly disagree and 5 is strongly agree, please select your answer to the following statements."* (Statements listed in table below.)

The data below are meant to be compared to results from a previous survey used by Xcel Energy. All scores were 4 or greater on the scale of 1 to 10, with the lowest (4.0) about the site itself (I liked using it, I found the design appealing, and it was easy for me to find what I was looking for). The highest score was 4.75 regarding information on the site being accurate.

Table 10. Post Interview Survey Results

Prompt	Average
I found the site responded quickly	4.63
I found the information on the site to be accurate	4.75
The site does what I need it to do	4.50
The information on the site was useful to me	4.63
I found the site easy to use	4.63
It was easy for me to find what I was looking for on the site	4.00
It didn't take me long to learn how to use the site	4.63
It didn't take me long to complete my task on the site	4.25
I found the design on the site appealing	4.00
I liked using the site	4.00

C.3 Digital Marketplace Findings

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy Demand Side Management (DSM) products, members of the TRC Companies (TRC) evaluation team from Apex Analytics conducted a usability study of Xcel Energy's digital marketplace (Xcel Energy CO Store | Home (poweredbyefi.org)) with Xcel Energy Colorado customers in a remote, moderated environment using think-aloud methodology. We asked six customers to complete a series of tasks to purchase a light bulb on the digital marketplace and send the bulb to their home. The interview's objectives were to collect feedback on the re-launch of the Xcel Energy digital marketplace.

The usability interviews were one-on-one utilizing Zoom software. This method allowed the interviewer to watch and listen to the participant navigate to the website, search for, and attempt to purchase a light bulb on the digital marketplace. Customers were recruited from an email list provided by Xcel Energy and received a $50 gift card for their time. Interviews took 40 minutes, on average.

This memo contains our summary of the key takeaways and customer's experiences with finding and using the digital marketplace.

Key Takeaways

Below are key takeaways from customer experiences with the digital marketplace. These key takeaways provide a summary of trends within the customer experiences:

- Five of the six customers we interviewed struggled to find the digital marketplace website. One customer who found the digital marketplace found it within the Xcel Energy Colorado homepage.
- All six customers interviewed were unaware of that Xcel Energy offered discounts on LEDs or of the digital marketplace prior to our interview.
- The task of making a separate account for the digital marketplace was a significant barrier to our respondents. Five of the six customers thought that the log-in for the digital marketplace is the same as their Xcel Energy log-in and therefore had trouble with creating a new account. Customers who are renters or have roommates may not have access to their Xcel Energy account number to make an account. We interviewed one customer who had this specific barrier.
- $5.00 shipping for a small light bulb purchase can be barrier for customers. Three customers price-checked with amazon.com to utilize their free shipping, rather than order through the marketplace.

The following sections present the evaluation team's understanding of customer's experiences with digital marketplace.

Navigating to the Digital Marketplace

To start the interview, we asked the following prompt: "I want you to choose a light bulb in your home and find a replacement for it online. You learned that Xcel Energy has a digital marketplace where you can purchase discounted bulbs online." The following list provides examples of search terms customers used:

- "xcel energy marketplace"

- "xcel energy marketplace light bulb purchasing"
- "xcel energy digital marketplace"
- "xcel energy"

Four of the five search terms used did not lead to the customer finding the digital marketplace website. One customer found the website via the Xcel Energy Colorado homepage website.

Five of the six customers we interviewed were not able to find the digital marketplace on their own (we supplied the link after several minutes). The one customer who was successful found the digital marketplace going through the Xcel Energy website. The customer performed the following steps:

- Searched on Google: "xcel energy"
- Xcel Energy
- Residential Services | Xcel Energy
- Clicked on "Find Deals"
- Xcel Energy CO Store | Home (poweredbyefi.org)

Two customers found the product website ("Bulb Finder") on Google and assumed it was the digital marketplace. The other three customers tried other search terms or navigated the Xcel Energy website but could not find the digital marketplace from there.

Customer Awareness of Xcel Energy Discounted Light Bulbs

All six customers we interviewed for this part of the study were unaware of the discounted light bulbs and digital marketplace. Many of them were pleasantly surprised to hear about the program.

Using the Digital Marketplace to Make a Purchase

To gauge customer's overall experiences, we asked the following four Likert[11] scale items (scale of 1–5) and one opened-ended question at the end of the interview:

1. "Thinking about your overall experience on a scale of 1–5, where 1 is very difficult and 5 is very easy, how easy or difficult was your experience today?"

- **Average Score = 2.8** (N = 6)
  - "Once I got to the correct website, it was really easy to navigate."

2. "On the same scale, how easy or difficult was it for you to find the right bulb? Why?"

- **Average Score = 3.3** (N = 6)
  - "It was pretty easy, I liked how the selection was laid out on the website." *[Customer referring to the digital marketplace – light bulb choices and options (e.g., lumens).]*

[11] Likert items are used in surveys as scales to measure and quantify attitudes about what variable you are measuring. Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 22 140, 55.

3. "On the same scale, how easy or difficult was it to purchase the bulb and send it to your home? Why?"

- **Average Score = 2.0** (N = 6)
  - "It was difficult because I was not able to make an account." *[Customer tried making an account but did not have access to their account number during the interview.]*

4. "If you could change one thing to make this experience better for customers like you, what would you change?"
   - *Easier to make an account or use Xcel Energy log-in (5 customers)*
     - *"Seamless without separate login for the store than my actual Xcel Energy login, and I would also make it, so that in order to sign up I didn't need information not readily available, or some sort of warning, like in order to do this, you will need this information."*
   - *Easier to find website (3 customers)*
     - *"…make it easier to find website."*
   - *Other suggestions (1 customer)*
     - *"I would have more color, better explanation of different light and what it is used for. Customer better educated on why you would buy what light bulb. Difference between warm light and diffused light and family room versus kitchen, lamp for reading, working."*

We also included a question about finding the digital marketplace website. This was important to ask towards the end of the interview because it gave the customer time to reflect on their experience.

5. "On the same scale, how easy or difficult was it for you to find the correct website? Why?"

- **Average Score = 2.3** (N = 6)
  - "I'd say 1, I don't think I would be able to find it... it was hard to find to begin with." *The interviewer followed up with:* "Would you have gone further, past 5-6 minutes to find it?"
  - "No, not for just a light bulb."

Barriers to Using the Digital Marketplace

Listed below are some other barriers we observed during the interviews:

- $5.00 shipping for light bulbs (3 customers)
  - *Three customers price checked with amazon.com to utilize their free shipping.*
    - *"Ugh, let me check Amazon…. I get free shipping with my Prime account. I don't think I would buy a single bulb and then pay shipping on top of that."*
- Customers who are renting or have roommates (1 customer)
  - *One customer we interviewed lived in an Xcel Energy household but was not the account holder. The customer did not have access to the account number at the time and could not participate because of it.*

Post-Interview Survey Results

After the usability interview, we emailed a short survey to customers. Xcel Energy requested this specific question be asked.

- *"Thinking about your overall experience on a scale of 1–5, where 1 is strongly disagree and 5 is strongly agree, please select your answer to the following statements."* (Statements listed in table below.)

The data below are meant to be compared to results from a previous survey used by Xcel Energy. The lowest score was 2.17 for "I liked using the site" and "it didn't take me long to complete my task on the site". The highest score was 3.67 for "I found the information on the site to be accurate".

Table 11. Post Interview Survey Results

Prompt	Average
I found the site responded quickly	2.33
I found the information on the site to be accurate	3.67
The site does what I need it to do	3.00
The information on the site was useful to me	3.33
I found the site easy to use	3.17
It was easy for me to find what I was looking for on the site	3.00
It didn't take me long to learn how to use the site	3.50
It didn't take me long to complete my task on the site	2.17
I found the design on the site appealing	3.00
I liked using the site	2.17

C.4 Dscout Findings

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy Demand Side Management (DSM) products, members of the TRC Companies (TRC) evaluation team from Apex Analytics conducted a virtual ethnography and customer survey with ten Xcel Energy Colorado customers using the dscout platform. This platform provides a highly qualitative analyses with rich data, including customer self-made videos and short answer prompts. The ethnography and survey objectives were to collect feedback on customer's light bulb needs, customer's experiences with the Bulb Finder website (www.xcelenergy.com/lightingdeals), in-store experience, and feedback on light bulb installation.

We recruited ten Xcel Energy customers in the state of Colorado via the dscout application. This software allowed us to load a screener to ask recruits if they are Xcel Energy customers and verified with the customer that they had not participated in the light bulb discount program previously. The customers were given a $150 gift card incentive for completing the ethnography and survey.

This memo contains our summary of the key takeaways, customer light bulb needs, customer's Bulb Finder experiences, customer's in-store experiences, and feedback on light bulb installation.

Key Takeaways

Below are key takeaways from customer experiences with the Bulb Finder website. These key takeaways provide a summary of trends within the customer experiences:

- Seven of the ten customers who participated in this study were unaware that Xcel Energy offered discounts on LEDs prior to our survey. Several of these customers were pleasantly surprised when they found out about the program, and some indicated that they had intentions to use the program in the future.
- Ten customers chose to replace light bulbs that were inside of the home and were burned out. Customers noted that the replacement light bulbs that they will be looking for should have a different brightness (usually brighter than the original light bulb) and be inexpensive.
- The top reason to go to a participating retailer is the proximity of the store to the participant's home (n=7).
- Participating customers felt that the store clerks were very friendly and mostly helpful in terms of purchasing light bulbs in store; however, three clerks did not know of the Xcel Energy lighting discounts.
- Customers described installing the replacement light bulbs as "easy" (n=7). Eight customers were pleased with the quality and price of the light bulbs. Some customers mentioned that they did not know of the program, and four customers intended on using it in the future.

The following sections present the evaluation team's understanding of customer's experiences with their light bulb needs, Bulb Finder website, and in-store experiences, along with customer feedback on light bulb installation.

Customer Light Bulb Needs

We asked customers to find a light bulb in their home that they would like to replace. We prompted customers to record a video about:

- Location of the light bulb.
- Reasons they wanted to replace the light bulb.
- Desired qualities, if any, they will look for in the replacement light bulb.

Location of the Light Bulb

The list below includes the locations of the light bulbs that customers of this study wanted to replace:

- Living Room (3 customers)
- Kitchen (2 customers)
- Bedroom (2 customers)
- Basement (1 customer)
- Hallway (1 customer)
- Bathroom (1 customer)

Reasons to Replace Light Bulb

Listed below are reasons why customers wanted to replace the particular light bulb. The top reason provided was because the light bulb was burnt out—all customers participating in this study gave this reason.

- Light bulb was burned out (all customers reflected on this)
- Wanted a different level of brightness (4 customers)
    - *"And when this light burned out, we didn't have any warmer toned lights, so we just put this very bright LED in there. And that is why I want to replace it."*
- Wanted a more energy efficient light bulb (1 customer)

Desired Light Bulb Qualities

Listed below are customers' reflections on desired attributes they would be looking for in a replacement bulb:

- Brightness and/or color of light bulb (7 customers)
- Inexpensive (4 customers)
    - *"I don't really want something crazy expensive since I'm going to have to get two of them [light bulbs] because I have one on the other side [referring to the bedside table lamps]."*
- Energy efficiency and/or smart (2 customers)
    - *"I'm actually in the market for a smart bulb at this point…. The main thing that I'm looking for is just for it to have some wi-fi connectivity so I can manipulate the colors and the brightness and things along those lines."*
- Size/shape of bulb (1 customer)
    - *"I just want one of them small enough to fit into here [shows fixture], so not very big. Probably right under a standard size. And I like the rounded ones, if I can get it."*

Bulb Finder Experience

We asked customers to find a store near them that sells discounted light bulbs through Xcel Energy's program. We prompted customers to go to the Xcel Energy Bulb Finder website (we gave them the URL www.xcelenergy.com/lightingdeals) and record a video of themselves using the website to find a store. We also asked them to tell us:

- Which store they wanted to go to.
- What zip code they entered.
- Reasons they would want to go to that store.

Customer Awareness

Although we did not explicitly ask about customer's awareness of the Xcel Energy discounted light bulbs program, seven customers mentioned that they did not know about the program.

"I'm going to check out some more of those Xcel discount prices. I had no idea! King Soopers, Wal-Mart—they all have them [Xcel Energy discounted light bulb]…so yeah, I was impressed!"

Stores

Listed below are the stores customers found on the Bulb Finder website and mentioned they wanted to go to. Please note that some customers named a couple stores, so they number of stores do not add up to ten. Additionally, one customer did not find a store near them to go to.

- Ace Hardware (4 customers)
- King Soopers (4 customers)
- Dollar Tree (2 customers)
- Home Depot (1 customer)
- Lowes (1 customer)
- Sam's Club/Walmart (2 customers)

Reasons for Particular Store

Listed below are the reasons customers chose a particular store:

- Proximity to home (7 customers)
  - *"It is right next to our house so I can walk over there with my kids in the stroller. I don't even have to drive."*
- Usual store customer shops at (2 customers)
  - *"I shop at this particular store often."*
- Customer likes the variety of products the store sells (2 customers)
  - *"…this specific location tends to have the best selection in all of downtown Denver."*
- One customer did not have a participating store near them.
  - *[After checking the website and finding no stores near her] "I checked with the store manager and other employees, and they did not [have discounted bulbs]. They have not seen such bulbs that have the Xcel Energy sticker. And I called some other stores nearby…."*

Zip Codes That Customers Entered in the Bulb Finder

Zip codes that customers input in the Bulb Finder website are given in Table 1. Much of our study sample was in Denver, Colorado.

Table 12. Zip Codes and Corresponding Cities

Zip Code	City in Colorado
80202	Denver
80206	Denver
80209	Denver
80124	Lone Tree
80129	Littleton
80218*	Denver
80233	Denver
80550	Windsor
81101	Alamosa

* Two customers used this zip code.

In-Store Experience

Once the customer found the store through the Bulb Finder website that offered discounted lamps, we asked them to go to their chosen physical store. While in the store, we prompted the customer to:

- Find a light bulb to purchase.
- Rate the friendliness/knowledge of the store clerk.

Light Bulbs That Customers Purchased

Nine out of ten customers were able to purchase discounted light bulbs; one did not have a participating store near them. Table 2 below shows the brand, wattage, lumens, and pack sizes that customers bought at participating retailers.

Table 13. Brand, Wattage, Lumens, and Pack Size of Light Bulbs

Brand	Wattage (W)	Lumens (lm)	Pack Size
Ecosmart	60	800	4
Ecosmart	65	5000	6
Feit Electric*	60	800	4
GE	60	760	4
Great Value	60	800	4
Greenlight	9	800	4
Phillips	60	800	1
Phillips	60	800	4

* Two customers purchased this brand and type.

Store Clerk Experiences

Table 3 offers how knowledgeable and friendly customers found the store clerks. Seven customers experienced store clerks that knew about the Xcel Energy discounted bulbs, and three customers experienced clerks that did not know about the program.

Table 14. Store Clerk Friendliness and Knowledgeable Scores

Friendliness Score 1 = not friendly 5 = very friendly	Average score = 4.8 (n=10)	*"The store clerk didn't know much about the bulbs themselves, but she was extremely friendly, helpful, and understanding of my questions. The employee was not from the lighting department. She offered to find someone else who know more, but I declined."*
Knowledgeable Score 1 = not knowledgeable 5 = very knowledgeable	Average score = 3.2 (n=10)	*"They [the clerk] knew exactly what I was talking with rebate program…and knew the website and offered more energy saving options."* *"The clerk hadn't seen light bulbs that have the Xcel Energy sticker. And I called some other stores nearby, nearby, as in the adjacent city and farther. They did not seem to see*

		these bulbs in their stores, even though they were in the list of those stores that seemed to have carried this."

Light Bulb Installation

Lastly, we asked customers to take a short video after they had installed their new bulb. Overall, seven customers described the installation process as "easy". While installing their light bulbs, customers would reflect on how inexpensive the light bulbs are or how they did not know about this Xcel Energy program.

*"**Okay, so this was super easy**. Honestly, I had a great time installing this, I just literally turned it into my light bulb in my bedside lamp -- it looks perfect next to my bed. I couldn't have asked for an easier experience. It looks really nice. It lights up the room really nicely. It's not too bright and it fits in my lamp. So doesn't like pop out like the other one did. **Installation was incredibly easy, and I didn't know that I could buy light bulbs that cheap.** So, it was just like a huge win-win for me. Yeah. I'm really happy with it all."*

*"**Installation was very easy**. One thing I didn't notice on the packaging is it said that the light bulb gets warmer as you dim the light. And that's that absolutely is true. This is the bulb that I was looking for 100 percent. It's very interesting that, you know, coincidentally I got the invite for this mission, because I literally was in the process of bulb shopping. So, this is perfect. You know**, I'm very happy to be saving some money being that these are LEDs and I have three more bulbs.** I purchased a four pack. I'm going to go ahead and go around my place and install the other three."*

C.5 GIS Analysis Findings

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy Demand Side Management (DSM) products, members of the TRC Companies (TRC) evaluation team from Apex Analytics conducted geographic information system (GIS) opportunity mapping to understand where participating retailers exist in Xcel Energy's territory and if there are opportunities for new engagements. Retailers are considered "participants" in this evaluation if they offer instant discounts on approved light bulbs and are reimbursed for these discounts through Xcel Energy. For this analysis, we utilized five-year 2019 United States Census data, Xcel Energy participating store data, Xcel Energy territory zip codes, and Microsoft Excel's 3D mapping software.

This memo contains our summary of the key takeaways, GIS mapping of participating retailers, GIS mapping of population density and median income, and opportunities for new engagements.

Key Takeaways

Below are key takeaways from the GIS mapping of participating retailers. These key takeaways provide a summary of findings:

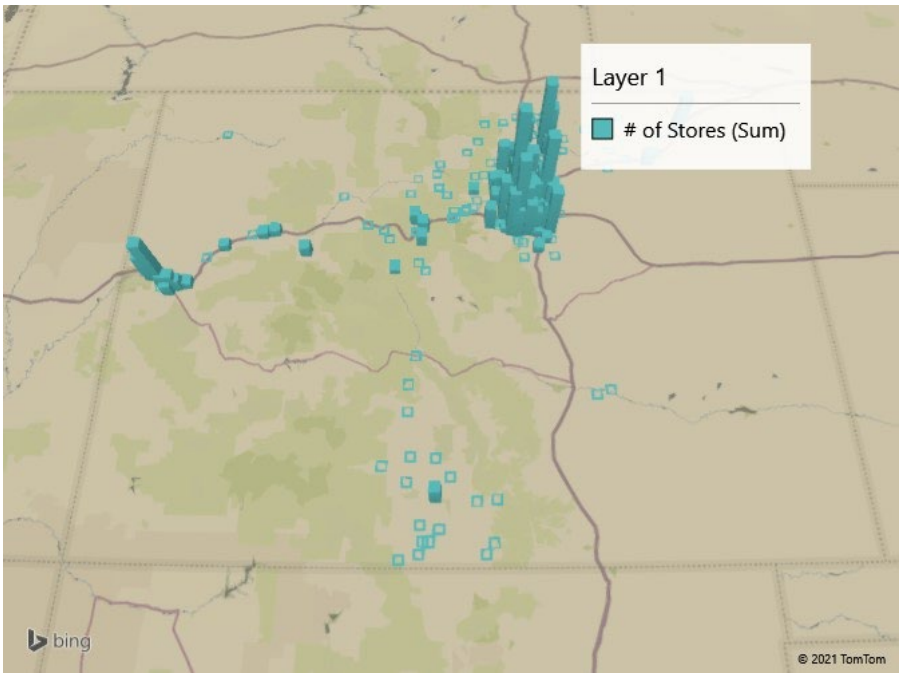
- The density of participating retailers roughly aligns with the density of population; areas with larger populations have more participating retailers.

- There are 11 zip codes within low-income areas in rural Colorado that have no participating retailers offering Xcel Energy discounted lamps. Many of these zip codes are in south-central Colorado.
- There are seven zip codes within medium-income areas in Colorado that have no participating retailers offering Xcel Energy discounted lamps. Many of these zip codes are in rural south-central Colorado.

GIS Mapping of Participating Retailers

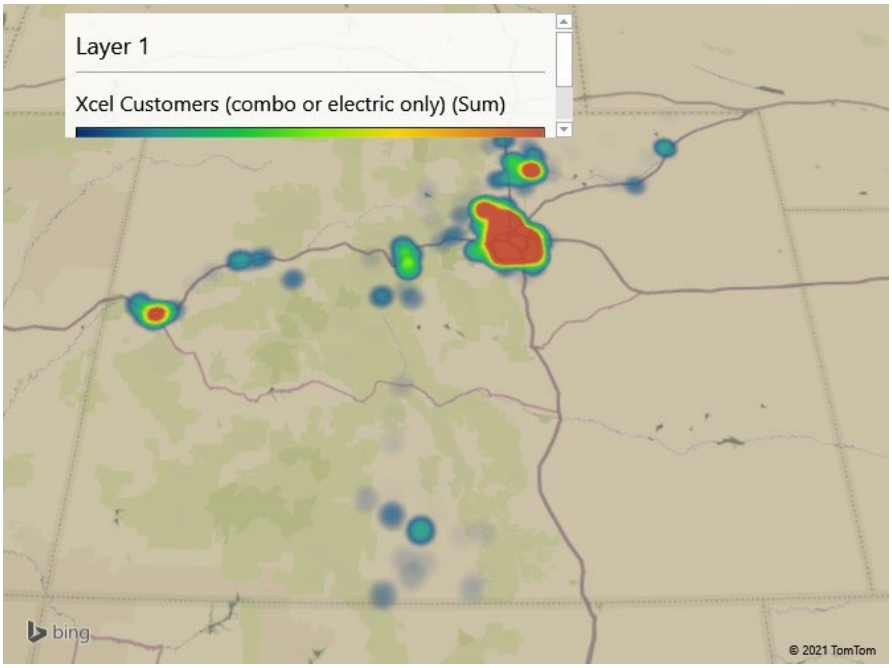
First, we mapped Xcel Energy participating retailers in Xcel Energy's territory in Colorado. Figure 1 depicts the number of participating stores in Xcel Energy territory, where the height of the bar corresponds with the number of participating stores. Most of the participating stores are in the Boulder/Denver metro areas.

Figure 2: Xcel Energy Participating Retailers in Colorado



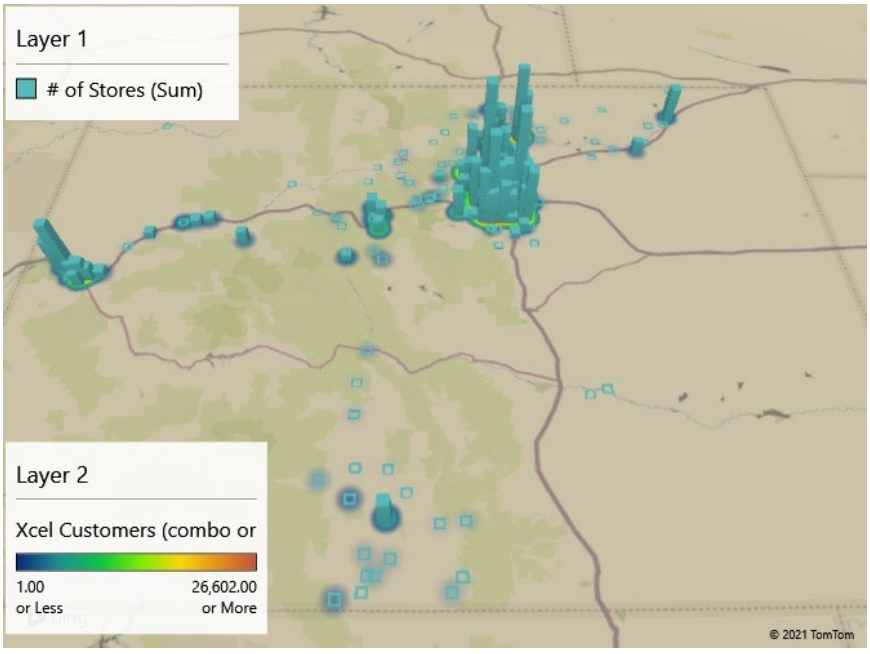
We also mapped the population density of Xcel Energy's territory in Colorado. Figure 2 depicts population density, where red is highest population density and blue is lowest population density. Populations are most dense near the Boulder/Denver metro areas.

Figure 3: Population Density in Xcel Energy Colorado Customer Territory



Next, we examined the participating retailers and how they corresponded with population density. In Figure 3, we see that density of participating retailers roughly aligns with the population density. For example, in the Denver metro area, there are highest number of participating retailers that correlate with higher population density.

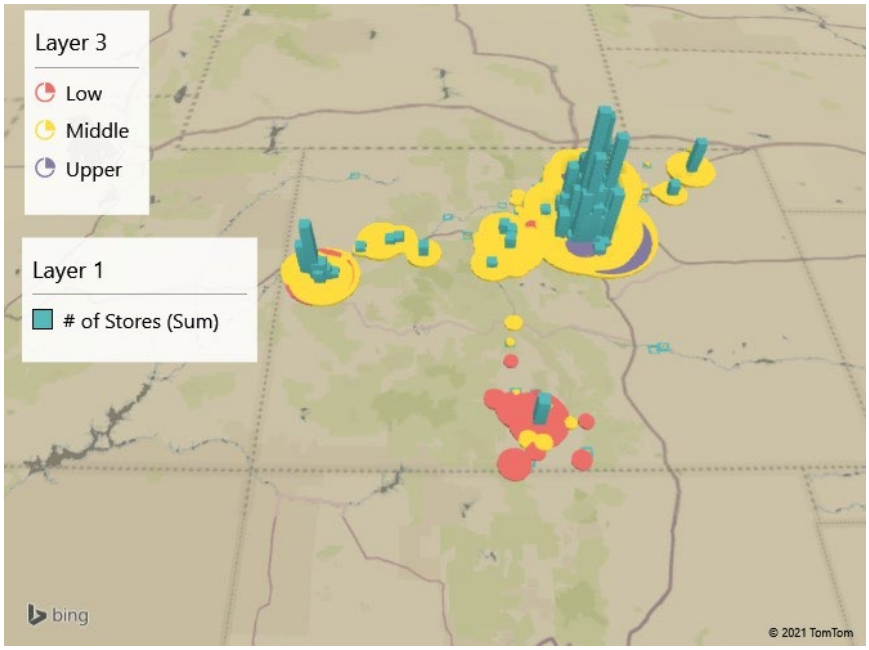
Figure 4: Xcel Energy Participating Retailers Overlapped with Population Density



GIS Mapping of Population Density & Median Income

Next, we overlayed the number of participant retailers with the median income of Colorado residents. Figure 4 shows low-, middle-, and upper-income levels[12] corresponding to their population density, overlayed with participating retailers. The size of the income circles corresponds with the size of the population of that income group.

Figure 5: Participating Retailers Overlapped with Median Income (Low, Middle, and Upper)



Opportunities for New Engagement

We found 18 zip codes in low- and middle-income communities without participating retailers (summarized in Table 1 and Table 2). Most of these zip codes are in south-central Colorado. As Xcel Energy seeks to expand services to these hard-to-reach populations, these areas may offer opportunities to target new retailers for the Residential Lighting Product.

Table 15: Low Median-Income Zip Codes with No Participating Retailers

Zip Code	# of Participating Retailers	Median Income (by Class)	Xcel Customers (Combo or Electric Only)
81144	0	Low	2344
81132	0	Low	802
81120	0	Low	1619
81152	0	Low	628
81141	0	Low	555

[12] Income groups include Low (less than $40,100), Middle ($41,000 - $120,400), and Upper (more than $120,400) – from Pew Research Center (www.pewresearch.org) January 2020 study.

Zip Code	# of Participating Retailers	Median Income (by Class)	Xcel Customers (Combo or Electric Only)
81133	0	Low	387
81149	0	Low	344
80438	0	Low	339
81148	0	Low	212
80024	0	Low	109
81136	0	Low	69

Table 16: Middle Median-Income Zip Codes with No Participating Retailers

Zip Code	# of Participating Retailers	Median Income (by Class)	Xcel Customers (Combo or Electric Only)
80226	0	Middle	13101
80241	0	Middle	12235
80304	0	Middle	11740
80303	0	Middle	9019
80232	0	Middle	8931
80018	0	Middle	6326
80516	0	Middle	5526

C.6 Corporate Partner Interview Findings

Introduction

To support the process and impact evaluation of the 2021 Xcel Energy Demand Side Management (DSM) products, members of the TRC Companies (TRC) evaluation team from Apex Analytics conducted telephone interviews with corporate partners. The objective of these interviews was to meet both process and impact objectives. Findings of these interviews will provide Xcel Energy staff with manufacturer perspective on the program processes, market trends, and market impacts. We completed five interviews with:

Corporate Retailers

- Senior Rebate Manager
- Electrical Assistant Buyer

Manufacturers

- Utility Manager
- Director of Sales
- Marketing Manager

This memo contains our summary of the key takeaways and the perceptions of the corporate partner's program awareness/experiences, net-to-gross insights, and industry trends.

Key Takeaways

Below are key takeaways from corporate partner's program awareness/experiences, net-to-gross insights, and industry trends. These key takeaways provide a summary of trends within the corporate partner interviews:

- Slipstream's program manager has been helpful and responsive – a common strength attributing to the program

- Few challenges arose due to the COVID-19 pandemic, including stores closing, unrelated to the program itself

- Four of the five corporate partners think the collective effect of all the programs across the nation had at least some effect on LED sales in non-program areas.

- Corporate partners had split opinions on whether lighting programs across the United States resulted in greater variety of LED models being manufactured and whether greater demand for LEDs in program areas led to price decreases that affected LED prices everywhere. Four of the five respondents offered opinions; three corporate partners agreed that lighting programs resulted in greater variety being manufactured and two agreed that greater demand led to decreased price.

- Corporate partners that believed in minimal or zero program impact from programs in non-program areas believe the LED market shares in non-program states are due to factors that would have existed in the absence of lighting programs or legislation, such as customer preferences and manufacturing innovations.

- Corporate partners in believe that the Residential Lighting Product is more influential than the Appliance Bill in influencing LED sales in Colorado.

- Corporate partners identified products with potential for energy efficiency savings going forward listing heat pumps, insulation, outdoor lighting, as examples.

- When asked about future opportunities, one corporate partner stated, "The future of lighting is smart". Most corporate sponsors spoke of opportunities to increase market shares for lighting and other products to become integrated and connected into other aspects of life.

Program Awareness

Three of the five corporate partners had become aware of the Colorado Xcel Energy Residential Lighting product through manufacturer partners. However, most companies have been partnered with Xcel Energy for over a decade, so there was not much insight about how the company's first learned of the program. One corporate partner mentioned that they became aware of the program through an RFP (request for proposal) process.

Program Responsibilities

The corporate partner contacts we spoke to have various responsibilities regarding the Colorado Xcel Energy Residential lighting product. These responsibilities included:

- Recruiting, coordinating, and working with vendors/retailers
- Invoicing and tracking
- Handling of contracts and memorandum of understanding

Strengths/Challenges of Program

During interviews, corporate partners identified the following strengths and challenges of the Colorado Xcel Energy Residential Lighting product. Strengths are factors identified by corporate partners as the best parts of participating in the program; challenges are factors that corporate partners identified as challenges to participating in the program.

Strengths of Program

- Corporate partners like the program because it allows them to provide consumers with deals and rebates for products that customers need (lighting).

- The program is attractive because it helps lower consumer's environmental footprint:

  "I think for us it's just we love the ability of being able to provide consumers with great deals on products that are going to be best suited for their needs. When we think about LED light bulbs, we know that they are much better for consumers, both in terms of functionality, and general lighting, but at the same time, it helps reduce customer's environmental footprints."

- One corporate partner indicated that individual stores can decide whether to participate in the program or not, and felt it was a strength that more of their stores were willing to participate than in other types of programs. Corporate partners and vendors shared that sales data has been easy to submit and retrieve via Slipstream.

- There have been no specific problems maintaining products on retailer shelves.

- Stores have been gaining more business (because of the rebates/program).

- Slipstream's program manager is great to work with: both helpful and responsive.
  - Three interviewees shared similar experiences regarding Slipstream's program manager, exclusively:
    "[Program manager] is great to work with. He's always responsive and just very -- stays on top of everything, so he's always a pleasure to work with."

Challenges of Program

None of the corporate partners mentioned specific challenges of participating in the program. One corporate partner spoke about how in the past Xcel Energy wanted to send out a mailer with promotional prices; however, the retailer does not allow that.

Two corporate partners spoke of challenges during COVID-19 pandemic, unrelated to the Xcel Energy specific program:

- People did not shop in-store, limiting the "impulse buys" encouraged through these programs. When stores did open, people did not shop or browse in stores for long.

- For 2021 – less money is being funded by utilities which has reduced the size and amount of rebates available.

- The cost of shipping containers via the supply chain has increased exponentially. That cost has not hit consumer prices yet, but it will.

Net-to-Gross Indicators

During interviews, corporate partners offered opinions on the effect of utility programs on the sales of LED bulbs in non-program areas. Corporate partners were asked the following prompts:

> Do you think the collective effect of all the programs across the nation affect LED sales in non-program areas?

- Four corporate partners said yes that the collective effect of all the programs across the nation affected LED sales in non-program areas.
  - *"Yes, but to what extent, I couldn't honestly tell you. Because I mean, there's a natural adoption, but I really do believe these programs specific to their individual markets help expedite that transition in a very meaningful way."*

- One corporate partner said no.
  - *"As these programs increase sales of LED lamps on the store shelves due to price mark-downs, they would have little effect in areas that do not run programs. The same lamp types are pretty much available across the board the only difference with the Utility program states is they increase sales of the LED lamps vs. the non-LED lamps due to the lower initial purchase price of LEDs. The other states are primarily moving to LED due to the overall lowering of LED product prices over the past 8 years by manufacturers and consumer preference."*

- One corporate partner stated both yes and no.
  - *"I'd say yes and no. I mean, that's where the industry is going, is to LED. Now, whether it has a utility rebate to make that final consumer price cheaper, the consumer is going to buy it at one price or they're going to buy it at another. But if that's 70 percent of the SKU mix within a store, that's what they're going to be pushed by. And with legislation and impacting the tariffs, in addition to the cost of an incandescent or halogen, you're better off buying an LED, rebate or no rebate. It's cheaper and more efficient by an LED versus a halogen 4-pack."*

To delve into this topic, corporate partners were asked if they agreed or disagreed with the following two prompts (Table 1). There was not consensus on if utility lighting programs increased the variety of LED lamps offered or decreased lamp prices in non-program areas.

Table 17: Answers to Agree/Disagree Prompts About LED Programs and Prices (n=4)

	1) Lighting programs across the United States have resulted in a greater variety of LED models being manufactured	2) The greater demand for LEDs in program areas led to price decreases that affected LED prices everywhere
Agree	3	1
Somewhat Agree	-	1[13]

[13] This partner noted that it was hard to say either/or. *"Somewhat Agree. This one is hard to say either/or. Increased sales volume due to utility programs would have an additional impact on lowering pricing. However, reduced prices*

	1) Lighting programs across the United States have resulted in a greater variety of LED models being manufactured	2) The greater demand for LEDs in program areas led to price decreases that affected LED prices everywhere
Disagree	1	2

Finally, corporate partners were asked about LED sales in non-program states that would have existed in the absence of lighting programs or legislation. This is often referred to as naturally occurring adoption.

Respondents were asked: Of the 63% LED market shares in non-program states, what percentage would you estimate came about purely due to factors that would have existed in the absence of lighting programs or legislation, such as customer preferences and manufacturing innovations?

Most of the corporate partners had trouble answering this prompt. All interviewees mentioned that they were unsure or "tough to answer". When prompted further, respondents offered the following estimates of naturally occurring adoption in non-program areas[14]:

- 100% (0% market effects)
- 60-80% (13-25% market effects)
- 100% (0% or minimal market effects)
- 60% (25% market effects)
- *"Yes, but to what extent, I couldn't honestly tell you."*

Corporate partners also offered opinions on the effect of legislation adopted by the State of Colorado had on the sales of specialty LED bulbs in Colorado. Only two of the corporate partners (the other three were not) were familiar with the Colorado legislative requirements; tracking state policies seem to be outside of our primary contacts' responsibilities so the respondents for the legislation battery were from differing areas of the company. One corporate partner mentioned that they kept the same light bulb offering the same as a result of the legislation, the other change their offerings. The one that changed their offerings began preparing for the requirements last year, and slowly added replacement (compliant) lamps to the planograms and restricting shipments of the noncompliant lamps. When the legislation came into effect, there was very few non-compliant lamps remaining on the shelf.

Lastly, corporate partners familiar with the legislation were asked the following prompt: If you had 100 points to assign between the Xcel Energy's Residential Lighting Program and the Colorado Appliance Bill, representing the influence on specialty LED sales, how many points out of 100 would you give to each of these?

are mainly due to engineering design improvements over time and manufacturing improvements gained with time and experience in manufacturing LED lamps. This activity lowered LED prices leading to be increased sales volume due to greatly increasing natural market demand for LED lamps at lower price levels. This dynamic would have occurred with, or without, utility programs. Utility programs helped accelerate a trend that was already occurring."

[14] Note that these are percents of 63%. As an example, one respondent stated that 60% of the 63% of led market shares are from naturally occurring adoption; the remaining 40% is due to program impacts and/or legislation.

Three of the five corporate partners were able to speak of this prompt. One respondent said that the Appliance Bill had a much larger influence than the Xcel Energy Residential Lighting Program, while two partners said that the program had a much larger influence (Table 2).

Table 18: Answers to Prompt about the Influence of Specialty LED Sales (n=3)

Xcel Energy's Residential Lighting Program (points)	Colorado Appliance Bill (points)
20-25	75-80
95	5
100	0

*Total must = 100 points

The corporate partner that stated 100/0 mentioned:

"We wouldn't sell any bulbs in Colorado without utility programs because that's all we participate in. Whether it'd be Energy Star® or not Energy Star®. You know, we only participate with Energy Star® and we only participate in utility programs.

Industry Trends

During interviews, corporate partners identified the following future trends of the LED market, new/underused products in energy savings, and where they think the industry is going in five years.

LED Market

- Smart bulbs that will have different functions and controls such as color temperature, dimming, and can connect to smartphones/devices.
- Various products such as edge-lit fixtures, strip/tape lights, lights with socket changes and LED fixtures that replace incandescent bulbs.
- Products that will perform with smart homes that can lead to safety/security, and consumers' health and wellness (i.e., LEDs that can match someone's circadian rhythm or sleep schedule).

New/Underused Products

- Products for the home such as heat pumps, water heaters/shower heads, insultation, and LED fixtures.
- "Smart" products such as smart thermostats and other products that can be connected to devices and the home.
- Outdoor lighting including porch lights and seasonal lighting.

Industry in 5 Years

- "Smart" products in general will grow in popularity, and LEDs will continue to transition.
- Utilities will also continue to expedite these rebates and programs and this partner foresees the continuation of lighting programs:

  "So, the need, in my opinion, for lighting programs is not diminished. In low-income programs, you know -- that's where there's a lot of low hanging fruit for lighting programs over the next few years. But we don't expect utilities to drastically cut back on lighting because after lighting, then you have to get into some really expensive

incentives. You know, $100 for a thermostat. Or $400 for an EV charger, which we're in both of those businesses."

C.7 Peer Utility Benchmarking Findings

Introduction

This memo summarizes Apex Analytics' (Apex or evaluation team) findings from a recent residential upstream lighting benchmarking survey of program managers from six peer program administrators (PA) throughout the United States. Conducted in June and July of 2021, the survey sought to collect information on current and expected changes in their residential lighting programs and portfolios due to the possible Energy Independence and Security Act of 2007 (EISA) LED Tier 2 standards, expanded lamp definitions under the EISA regulations to include specialty lamps, and the rapid market transformation towards LED lamps. Specifically, the objectives of the survey and benchmarking exercise are as follows:

- Collect benchmarking data on the following key performance indicators:
  - 2020 program energy savings (MWh)
  - 2020 total energy efficiency portfolio savings (MWh)
  - 2020 program budgets and acquisition costs ($/MWh)
  - 2020 customer participation levels (number of lamps rebated)
  - Net-to-gross (NTG) ratios
  - Total Resource Cost (TRC) values
  - Incentive by lamp type ($/lamp)
- Gain insight from stakeholders and peer PAs on how they are planning to evolve home lighting programs once EISA Tier 2 standards are enacted, including how are they planning to fill the savings gap and retain engagement with customers served through home lighting programs.
- Describe how peer PAs are anticipating EISA Tier 2 standards and planning for their future program designs.
- Investigate peer program NTG ratios for similar programs. Describe the NTG method, calculation details and whether NTG are retrospective or prospective.
- Describe how programs are changing (recent and planned changes and reasons).

Information about the six PAs interviewed as part of this survey are listed in Table 1.

Table 19. Surveyed Program Administrators

Program Administrator	Energy Type	Location
Xcel CO	Electric & Gas	Colorado
PA A	Electric & Gas	Missouri
PA B	Electric & Gas	Maryland
PA C	Electric	Illinois
PA D	Electric & Gas	Michigan
PA E	Electric & Gas	Maine
PA F	Electric	Colorado

Key Performance Indicator Benchmarking Results

Program & Portfolio Savings

Xcel Energy's Home Lighting Program realized 119,105 MWh of net energy savings in 2020, representing 92.9 kWh per residential customer[15] (Table 2). Surveyed peer PAs' lighting programs saved from 1,641 MWh (PA F) to 180,737 MWh (PA C) of net savings in 2020. Xcel Energy's 92.9 kWh per customer in 2020 is greater than the peers weighted average savings of 58.4 kWh per customer. Only one other utility provided their lighting program savings goals (PA A). Like Xcel Energy, PA A surpassed their lighting program goal, achieving 567% of their goal in 2020.

Table 20. 2020 Residential Lighting Program Net Savings by Program Administrator

Program Administrator	Achieved MWh	Achieved kWh/Customer	Goal MWh	% Goal Achieved
Xcel CO	119,105	92.9	68,639	174%
A	74,812	70.2	13,203	567%
B	34,627	38.7	-	n/a
C	180,737	71.7	-	n/a
D	108,169	54.0	-	n/a
E	28,714	40.4	-	n/a
F	1,641	11.2	-	n/a
Weighted Average		**58.4**	**-**	**n/a**

Xcel Energy's total portfolio savings of 311 kWh per customer is right in line with the peer average of 315 kWh per customer (Table 3).

Table 21. 2020 Portfolio Net Savings by Program Administrator

Program Administrator	Achieved MWh	Achieved kWh/Customer	Goal MWh	% Goal Achieved
Xcel CO	466,645	311.2	501,716	93%
A	274,502	228.8	270,685	101%
B	216,762	224.5	-	n/a
C	1,162,045	425.6	1,021,810	114%
D	770,000	348.6	769,000	100%
E	90,392	114.3	-	n/a
F	26,833	162.5	-	n/a
Weighted Average		**315.1**	**-**	**n/a**

[15] Electric customer accounts per service territory as reported by the Energy Information Agency in Form 861.The evaluation team used customers to normalize reported values by PA where appropriate.

Program Spending

Xcel Energy's Home Lighting Program had a budget of $7.2 million in 2020, representing an average budget of $5.60 per residential customer and an acquisition cost of $60.50/MWh saved[16]. Surveyed PA lighting programs budgeted from $0.2 million (PA F) to $19.5 million (PA C) in 2020. Xcel Energy's acquisition cost of $60.50/MWh in 2020 is slightly less than the peer PAs' weighted average acquisition cost of $67.60/MWh, with two PAs (PA C and PA F) having a lower 2020 acquisition cost (Table 4).

Table 22. 2020 Residential Lighting Program Spending by Program Administrator

Program Administrator	Budget ($M)	$/Customer	Acquisition Cost ($/MWh)
Xcel CO	$7.2	$5.6	$60.5
A	$9.0	$8.4	$77.7
B	$10.3	$11.6	$64.5
C	$19.5	$7.7	$50.1
D	$12.0	$6.0	$110.7
E	$4.9	$6.9	$98.3
F*	$0.2	$1.7	$53.8
Weighted Average		**$7.6**	**$67.6**

* Budget estimated based on count of lamps and $/lamp rebate plus admin cost factor

Program Participation (LED Rebates)

Table 5 summarizes the total count of rebates across all LED lamp types by PA. In 2020, Xcel Energy rebated just over 4 million LED lamps, representing approximately 3.2 lamps per customer[17]. This is more than the peer average of 2.4 lamps per customer, and only PA B rebated more lamps per customer (4.2) than Xcel Energy in 2020.

Table 23. 2020 LED Rebate Counts by Utility

Utility	Total Lamps	Lamps/ Customer
Xcel CO	4,040,347	3.2
A	3,238,982	3.0
B	3,773,251	4.2
C	6,885,226	2.7
D	4,522,289	2.3
E	1,695,725	2.4
F	199,782	1.4
Average	**3,385,876**	**2.4**

[16] Acquisition cost based on first-year savings.
[17] Total lamps sold divided by total residential electric customers in service territory

Program Net-to-Gross

NTG ratios among surveyed peers ranged from 0.19 (PA B) to 0.65 (PA A). Xcel Energy's NTG factor of 0.61 was above the average of the peer PAs (0.41). To determine NTG, methodologies ranged from in-store intercepts (PA C) and sales data modeling (PAs B, D, E and Xcel) to demand elasticity modeling (PA A). Table 6 summarizes the evaluation team's findings.

Table 24. Average Upstream Lighting NTG by Lamp Type by Year

Program Administrator	NTG	Methodology	Type	Year Applied/Year Data	LED Market Share[a]
Xcel CO	0.61	Sales data modeling & manufacturer interviews	Retrospective	2020/2017	79%
Xcel CO	0.49b	Sales Data modeling	Prospective	Retrospective/2020	79%
A	0.65	Demand elasticity modeling, in store intercepts, non-participant surveys	Retrospective	2020/2019	67%
B	0.19	Sales data modeling	Retrospective	2019/2019	68%
C	0.56	Intercept surveys	Prospective	2021/2018	71%
D	0.45	Sales data modeling with forecast market size	Prospective	2023/2020	73%
E	0.24	Sales data modeling	Retrospective	2020/2020	78%
F	0.36	Benchmarking	Prospective	2020/2019	79%
Average	**0.41**	**n/a**	**n/a**		**n/a**

[a]LED market share in 2020, typically at the statewide level for each program administrator.

[b] Overall computed value from 2020 retrospective analysis was 0.49, the prospective recommendation varies by bulb type.

Program Total Resource Cost (TRC) Values

Table 7 provides the TRC test ratio in 2020 for residential lighting programs among the peer PAs. TRC ratios range from 2.4 (PA D) to 6.5 (PA A). Xcel Energy's TRC ratio of 5.1 was above the 4.0 average of the peer PAs.

Table 25. 2020 Residential Lighting Program TRC Ratios by Program Administrator

Program Administrator	TRC
Xcel CO	5.1
A	6.5
B	Not available
C	3.6
D	2.4
E	3.7
F	Not provided
Average	**4.0**

Program Incentive Levels

Xcel Energy's Home Lighting Program provided incentives ranging from $1.29 for candelabra LED lamps to $2.00 for reflector LED lamps in 2020. The average rebate per LED lamp among the surveyed peers was $2.78/A-lamp, $3.58/reflector, $1.66/globe and $1.88/candelabra lamp (Table 8).

Table 26. LED Incentives by Lamp Type by Program Administrator

Program Administrator	A-Lamp	Reflector	Globe	Candelabra
Xcel CO	$1.36	$2.00	$1.73	$1.29
A	$1.60	$2.25	$1.50	$1.40
B	$2.00	$4.00	$1.25	$4.00
C	n/a	$3.50	$2.00	$2.00
D	$3.50	$4.75	$1.13	$1.00
E	$4.00	$6.00	$3.11	n/a
F	n/a	$1.00	$1.00	$1.00
Average	**$2.78**	**$3.58**	**$1.66**	**$1.88**

EISA Tier 2 Impact on Program Design

This next section summarizes our team's findings from open-ended responses provided by interviewed PAs on how they have addressed EISA Tier 2 standards to-date, and how they anticipate adjusting their residential lighting programs and portfolios going forward.

Current Approach to EISA Tier 2 Standards

Some PAs throughout North America have already begun to phase out their residential upstream lighting programs in anticipation of the EISA Tier 2 standards.[18] However, all six of the surveyed PAs had an active residential lighting program as of 2020. While all the PAs surveyed

[18] Some example program administrators that have publicly stated plans to phase out residential lighting programs include Eversource and National Grid in Massachusetts, Efficiency Vermont, all Pennsylvania Electric Distribution Companies, Colorado Springs Utilities, and NV Energy.

anticipated future impacts from EISA Tier 2 standards, there was a consensus among the PAs to generally take a "wait and see" approach with their residential lighting program. As the program manager of PA E put it, "It's easier to turn the [residential upstream lighting] program off, than it is to turn it back on" (if the EISA Tier 2 standards are delayed further).

Like Xcel Energy, four of the peer PAs are currently monitoring federal legislation but have not made any significant changes to their lighting programs to-date. PA B stated that they were increasing focus on specialty lamp rebates, while PA F had already retired all general purpose (A-lamp) LED rebates from their lighting program. Responses are summarized in Table 9.

Table 27. Summary of Upstream Lighting Program Changes due to EISA

Program Administrator	Response
Xcel CO	Monitor federal legislation, but no action yet
A	Monitor federal legislation, but no action yet
B	Increased focus on specialty lamps
C	Monitor federal legislation, but no action yet
D	Monitor federal legislation, but no action yet
E	Monitor federal legislation, but no action yet
F	Retired all general service lamp rebates

Anticipated Lighting Program Changes Due to EISA Tier 2 Standards

Even before potential EISA Tier 2 standards PAs A, C and D are exploring a more targeted approach towards low-income households due to their more favorable lifetime benefits and NTG ratios. Programmatic changes include a shift from mass-market LED discount programs to low-income lighting programs delivered via income-eligible stores (e.g., Dollar Store) and expansions of food bank LED distributions. PA F had plans to retire all LED reflector lamp rebates by 2022. PAs B and E had no immediate plans to adjust their lighting programs. A summary of the anticipated program adjustments is provided in Table 10.

Table 28. Lighting Program Adjustments due to EISA

Program Administrator	Lighting Program Adjustment
Xcel CO	Expand low-income give-away channel and explore T-LED discounts at big box pro-desks
A	Transition from mass market lighting to low-income targeted programs via thrift retailers and food banks; also reduce LED savings through an assumed CFL baseline starting 2022
B	No immediate program changes, but exploring options through regional collaborations and working groups
C	Focus LED lamp incentives on income-eligible retailers, expand food bank distributions and kit programs
D	Shift from mass market lighting discounts to low-income program lighting savings
E	No immediate plans to adjust program or replace savings
F	Retire reflector lamps by 2022, focus on specialty (globe/candelabra) lamps

Non-Lighting Program Adjustments to Offset LED Savings Gap

There was consensus among the peer PAs that there is no way to fully make up the gap in lost or reduced LED screw-based savings should EISA Tier 2 standards go into effect. All peers were actively exploring options to fill a portion of the savings gap, though there was no consensus among peer PAs on what programs would be best. Program and measure offerings of interest include heat pumps and building electrification, appliance rebates, recycling programs, energy efficiency kits and weatherization. There was, however, concern that many of these program offerings wouldn't provide the same level of cost-effective savings as screw-based lighting measures. A summary of peer responses is provided in Table 11.

Table 29. Program Offerings to Offset LED Savings Gap

Program Administrator	Program/Measure Offerings to Offset LED Savings Gap
Xcel CO	No other programs identified
A	Efficient Products, HVAC, Refrigerator/Freezer Recycling
B	Expand all other residential programs
C	Appliance rebates and energy efficiency Kits
D	Heat Pumps, Electrification, Weatherization (however not cost-effective)
E	No response
G	No other programs identified

C.8 Sales Data Analysis findings

Introduction

As part of the Xcel Energy Residential Lighting Product evaluation, Apex Analytics, along with Demand Side Analytics, developed a national lighting sales model to estimate program administrator attribution for LED market share.[19] The research described below focuses exclusively on estimating the net impacts of the program. This memo describes the objectives, data sources, methods, and findings for the sales data modeling effort.

Market Trends

The evaluation team's research indicates that the lighting market continues to tilt toward LEDs—sales of LEDs have gone from 51% of the national lighting market in 2018 to 60% in 2019 and 70% in 2020. Even in states without upstream lighting programs, LED market shares are now around 60% to 70%. Other high-level lighting market findings include the following:

- **The LED market share in Colorado is approximately 78.7%.** This is up from 53.2% in 2018 and 67.2% in 2019. In 2020, Colorado's LED market share was about nine percentage points above the national market share. In Xcel Energy Colorado service territory, we estimate LED market share to be 79.2%.

[19] Note that the model is part of a multistate effort and included the input and support of other consulting firms, including Demand Side Analytics.

- **The gap between LED market shares in states with and without upstream lighting offerings is narrowing.** The gap between LED market shares in program states and non-program states has decreased from approximately ten percentage points in 2016 to approximately six percentage points in 2020. On a relative percentage basis, the gap has decreased from 45% to 9%.[20] The team estimates that six to seven of every 10 light bulbs sold in a non-program state are LEDs.

Net-To-Gross Estimates

For Xcel Energy Colorado's Residential Lighting product, the evaluation team recommends net-to-gross (NTG) ratios of 35.0% with market effects and 23.5% without market effects. The low ratios are largely tied to the changes in the lighting market, where the market share of LEDs continues to rise throughout the U.S. As noted above, 6 to 7 of every 10 light bulbs sold in states without upstream lighting offerings are LEDs. This means that any upstream lighting offering in 2020 is bound to produce a high rate of free-ridership.

Despite the low NTG ratio (NTGR), it should be noted that Xcel Energy's Home Lighting Product continues to have an impact and is an important source of cost-effective savings. For example, net of free riders, the Program led to over 1.4 million additional LEDs sold in Colorado in 2020, an annual savings to customers of approximately $5.6 million on their energy bills.[21] In addition, even with this low NTGR, upstream lighting programs represent high-volume savings at a low acquisition cost compared to other residential savings opportunities.

In future years, the evaluation team expects to continue seeing low NTGRs for upstream lighting in Colorado. However, the team cautions against significant reductions to the upstream lighting offering; several other jurisdictions have experienced stagnation and backsliding when upstream lighting offerings are simply turned off or budgets are cut substantially.[22] To combat high rates of free-ridership, the team recommends the following:

- **Target styles other than reflectors.** In states without lighting programs, LEDs account for more than 90% of reflector sales. In other words, 9 of every 10 reflectors purchased will be LED absent Home Lighting incentives.
- **Target store types where LED sales are lagging.** The sales data analysis continues to show that retailers in point-of-sale (POS) data—grocery, dollar, drug, discount, and mass merchandiser—have a lower LED market share than the "big box" and major club stores. Targeting retailers in these distribution channels can maximize program influence.

[20] The increasingly high non-program LED share makes the relative difference smaller each year. In 2016, non-program states had an LED share of 20% and program states were at 29% ((29-20)/20 = 45%). In 2020, non-program states had an LED share of 64% and program states were at 72%.

[21] Based on a savings assumption of 40 kWh/bulb, and a retail rate of 10 cents/kWh.

[22] For example, after Illinois utilities cut off incentives for A-line LEDs in 2019, their market share dropped from 67% in 2018 to 62% in 2019. During the same period, the A-line LED share increased from 54% to 58% nationally.

Study Objectives

The primary objective of the study is to quantify the relationship between program intensity (e.g., program spending per household) and LED sales (the percent of light bulb purchases that are LEDs), which is then used to estimate a net-to-gross (NTG) ratio for Xcel Energy Colorado's Residential Lighting Product.

In addition to estimating the NTG ratio (NTGR), the data provide helpful insights into what other factors drive purchases of LEDs, plus provide opportunities for benchmarking Colorado's lighting efficiency shares and program spending against other states. These additional analyses are also presented in the memo.

Data Sources

The team leveraged a variety of data sources for the analysis but relied primarily on sales data prepared by the Consortium for Retail Energy Efficiency Data (CREED).[23] CREED serves as a consortium of program administrators, retailers, and manufacturers working together to collect the necessary data to better plan and evaluate energy efficiency programs. LightTracker is CREED's first initiative, focused on acquiring full-category lighting data, including incandescent, halogen, CFL, and LED bulb types, for all distribution channels in the entire United States. As a consortium, CREED speaks as one voice for program administrators nationwide as they request, collect, and report on the sales data needed by the energy efficiency community.

The sales data were primarily generated from two sources: point-of-of sale (POS) state sales data (representing grocery, drug, dollar, discount, mass merchandiser, and selected club stores) and National Consumer Panel (NCP) state sales data (representing home improvement, hardware, online, and selected club stores). Raw datasets were purchased from third-party vendors, and through a CREED initiative, the team cleaned and processed the data for analysis.[24,25]

Note that both the POS and NCP (referred to as the non-POS) datasets only provide data at the state level, so much of the analysis shown in this report is based on Colorado state, rather than Xcel Energy service territory. However, as discussed below, the regression model used to calculate NTG is calibrated to Xcel Energy Colorado, and the model is also used to estimate LED market share for the Xcel Energy Colorado service territory.

Besides the sales data made available through LightTracker, the model inputs are a combination of program data collected by the evaluation team and household and demographic data collected through various publicly available websites. These are the sources for the primary model input data:

[23] https://www.creedlighttracker.com

[24] The information contained herein is based in part on data reported by IRI through its Advantage service for, and as interpreted solely by, Lighttracker, Inc. Any opinions expressed herein reflect the judgment of Lighttracker Inc. and are subject to change. IRI disclaims liability of any kind arising from the use of this information.

[25] Data presented include LightTracker calculations based in part on data reported by Nielsen through its Strategic Planner and Homescan Services for the lighting category for the 52-week period ending approximately on December 31, 2020, for the available state level markets and Expanded All Outlets Combined (xAOC) and Total Market Channels. Copyright © 2020, Nielsen.

- National bulb sales
    - POS data (grocery, drug, dollar, discount, mass merchandiser, and selected club stores)
    - Panel data (home improvement, hardware, online, and selected club stores)
- U.S. Census Bureau Import data (LED imports)
- DSM Insights, an E Source database of utility program data
- ENERGY STAR Lighting Program data (utility lighting program budgets)
- ENERGY STAR shipment data (released by the Environmental Protection Agency)
- North American Electrical Manufacturers Association (NEMA) shipment data
- American Community Survey (ACS) data (household characteristics and demographic data)
- Retailer square footage per state (based on the three primary retailer channel data sources)
- General population surveys, lighting saturation studies, and other secondary data collection made publicly available through evaluation reports

Lighting Sales

The LightTracker POS dataset includes lighting sales data for grocery, drug, dollar, selected club, and mass market distribution channels. These data represent actual sales that are scanned at the cash register for participating retailers.

The NCP represents a panel of approximately 100,000 residential households that are provided a handheld scanner for their home and instructed to scan in every purchase they make that has a bar code. For Colorado, the NCP included approximately 514 households in 2020. The use of a scanner avoids potential “recall bias” that is prevalent in self-report methods that ask about lighting purchases.

Although the dataset included detailed records of lighting data purchases, the evaluation team spent considerable time ensuring data integrity and inclusion of all the necessary bulb attributes. For example, not all records were populated with some of the more critical variables such as bulb type, style, and wattage or the data had clearly erroneous values (e.g., 60-watt LEDs). After thorough review and quality control of the dataset, the evaluation team reclassified, standardized, and populated missing records, created additional variables, and performed general enhancements to the data.

To populate missing records, validate existing records, and include additional bulb attributes, CREED created a Universal Product Code (UPC) database from four sources:

- Product catalogs downloaded from manufacturer and retailer web sites via “web scraping”.
- Automated lookups of online UPC databases, such as www.upcitemdb.com.
- Bulb attributes entered as part of shelf-stocking studies from research conducted in California and the Northwest.

CREED then merged the UPC database with the POS data, populating fields based on a hierarchy of data sources believed to be most reliable. Prioritization was typically based in the following order: manufacturer specifications, UPC lookups, and original POS-based database values. The team also conducted manual Web lookups on over 200 high-volume bulbs to verify final assignments.

Additionally, CREED investigated the bulb assignment and the quantity of bulbs per package by examining the average price per unit and identifying outliers in terms of per bulb prices. This process helped identify misclassification of certain bulb types (e.g., bulbs that were flagged as low-cost LEDs but were really LED nightlights and needed to be moved to the "other" lamp type bin), bulb counts that sometimes represented box shipments (e.g., a package identified as having 36 bulbs was really a six-pack of LEDs that was shipped with six packages per box), or high-cost LEDs that were really Wi-Fi-enabled smart LEDs. The CREED team also used lumens per watt (LPW) as a check on bulb assignments (efficient bulbs should have higher LPW values than inefficient bulbs). The sales model is restricted to screw-based bulbs, so any bulbs classified as type "other" were not included in the model.

CREED estimated missing lumen values and missing lamp styles. Regarding lumens, CREED leveraged ordinary least squares (OLS) regression models that predicted lumens based on the type of light and the wattage of the bulb. Regarding style (i.e., A-line, reflector, globe, candelabra), CREED leveraged classification and regression trees (CART), a method commonly used for classification problems, to populate the style attribute for lamps that were missing data.

After accounting for the smaller states that lacked sufficient sample size from the panel data or had incomplete program data available, the final model contained 43 states.[26] The lighting dataset included these key aspects:

- 2020 sales volume and pricing for CFLs, LEDs, halogens, and incandescent bulbs for all channels combined, and broken out by the POS and non-POS channels
- Data reporting by state (with 43 states included in both POS and non-POS) and bulb type
- Inclusion of all bulb styles (A-lamps, reflectors, globes, and candelabras) and controls (e.g., three-way, dimmers, etc.)

As detailed below, the dependent variable of the model was the percentage of LED sales, rather than total LED sales, to normalize for states with greater or lesser bulb sales (LED or standard) because of differences in number of households, number of sockets, existing saturation, and other factors that drive lighting sales.

Program Activity

To research program activity, the evaluation team used internal resources and conducted a literature review of publicly available reports found on the internet or provided by program administrators or their evaluators.[27] The team contacted local utilities in each given area when reports with the relevant information were not available. The program data collection activity included:

[26] The seven states that were not included are: Alaska, Hawaii, Iowa, Montana, New Jersey, North Dakota, and Vermont.

[27] In particular, the Evaluation Team began by searching the ENERGY STAR Summary of Lighting Programs website (https://www.energystar.gov/productfinder/downloads/2020/2020%20ENERGY%20STAR%20Summary%20of%20Lighting%20Programs.pdf), accessed February 2021, and referenced the Database of State Incentives for Renewables & Efficiency, accessed February 2021: dsireusa.org.

- Total number of claimed LED upstream program bulbs reported by each program, broken out by style (A-line, globe, candelabra, reflector) if possible
- Upstream LED incentives
- Total upstream program budget

Where available, the evaluation team leveraged actual program expenditures; otherwise, ENERGY STAR reported expenditures, planning values, or prior program spending were used as a proxy.[28] After accounting for the states with incomplete program data, the final model included 43 states (detailed below).

To determine the Residential Lighting program activity for Xcel Energy Colorado, the evaluation team used the data as provided by Xcel Energy as a key input in developing a 2020 LED lighting NTG estimate. Program values from 2020 are shown in Table 1[29]. Of the 4,009,236 program LEDs, 3,354,700 were A-lamps, 549,083 were reflectors, and 105,453 were globes or candelabras. (Note the values shown in Table 1 do not include linear LEDs, but the Residential Lighting Product did provide incentives for approximately 31,000 linear LEDs.)

Table 30. 2020 Program Statistics

Utility	Program Expenses	LED Qty.	LED Incentives
Xcel Energy Colorado	$7,147,12	4,009,236	$5,922,589

Presence and Absence of Retailers (Channel Variables)

The evaluation team conducted secondary internet research to determine the number and total square footage of store locations in each state for five primary energy efficient bulb retailers: Home Depot, Lowes, Wal-Mart, Costco, and Menards. These data were used as explanatory variables in the model since these retailers sell a large quantity of energy efficient bulbs, thus the percentage of efficient bulbs may differ in states with more or less of these retailers.

State-Level Household and Demographic Characteristics

The evaluation team gathered state-level demographic data from the ACS, including annual state-level data for the population, total number of households, household tenure (own versus rent), home age, education, and income. As explained below, the team then combined these data with other potential explanatory variables, including political index, average cost of living, and average electric retail rates.

Analysis of the Combined Dataset (Descriptive Statistics)

As noted above, some of the key attributes the team was able to develop include:

[28] Note that because the ENERGY STAR report only included expenditure ranges, the midpoints of the ranges were used to represent the expenditures.

[29] Data provided via email correspondence with Sheryl Volkert on March 15, 2021. Note the values shown in Table 1 do not include linear LEDs, but the Home Lighting Program did provide incentives for approximately 31,000 linear LEDs.

- **Market share distribution:** LED market share distribution for the U.S. as a whole, Colorado vs. the U.S., as well as across each state and across retail channels.
- **Program intensity:** LED lighting market share relative to overall program expenditures per household.
- **Program incentives:** Average LED lighting program incentives per bulb.
- **ENERGY STAR market share distribution:** LED market share distribution in Colorado compared to non-program states.

Market Trends

Figure 1 shows the national market share of the four bulb types (incandescent, halogen, CFL, and LED) across the past six years. LEDs continue to gain substantial market share, rising from 19% in 2015 to 70% in 2020. From 2015 to 2017, LEDs largely displaced sales of CFLs only. In 2018, LEDs began to displace inefficient bulbs. Even so, inefficient lighting (incandescent bulbs and halogens) still represents almost a third of the lighting market.

Figure 6. Year-Over-Year Total U.S. Market Share by Type

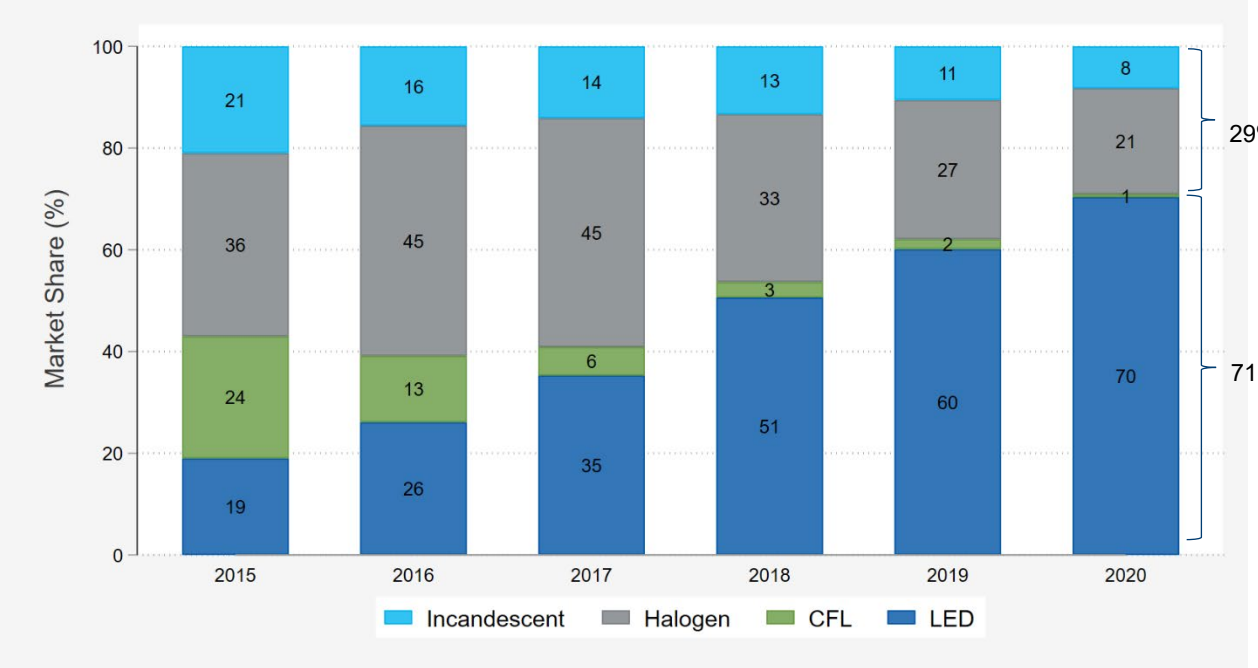


Figure 2 compares the data above to Colorado market shares. LED market share in Colorado has outpaced the national market share by a few percentage points every year. Over the past couple of years, the gap between the LED market share in Colorado and nationally has widened.

Figure 7. Colorado and Total U.S. Year-Over-Year Market Share by Bulb Type

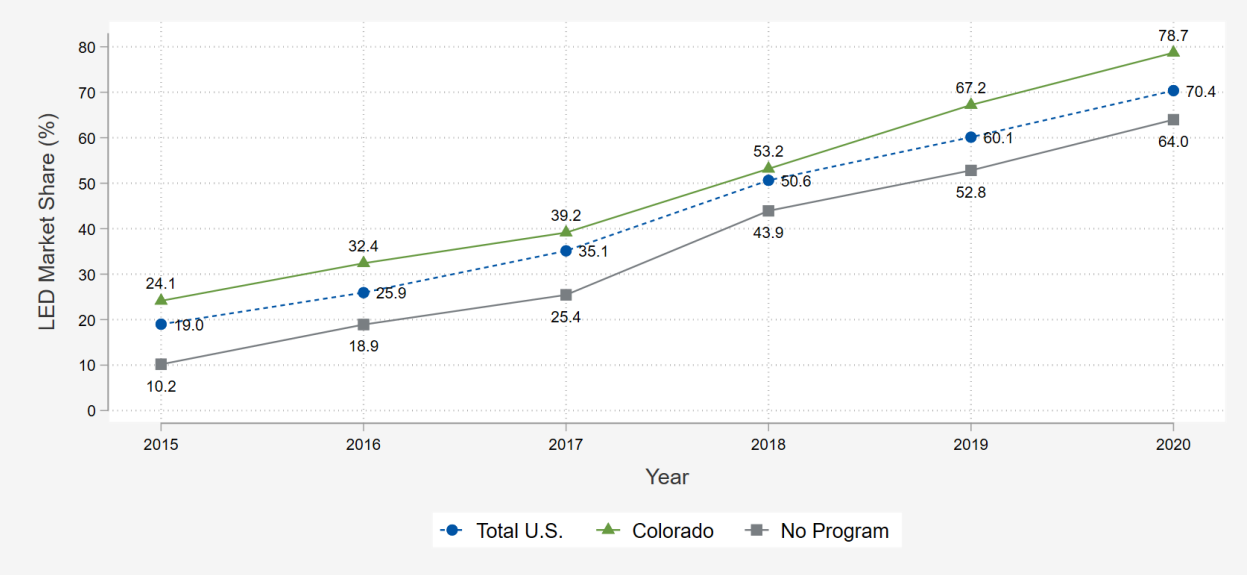
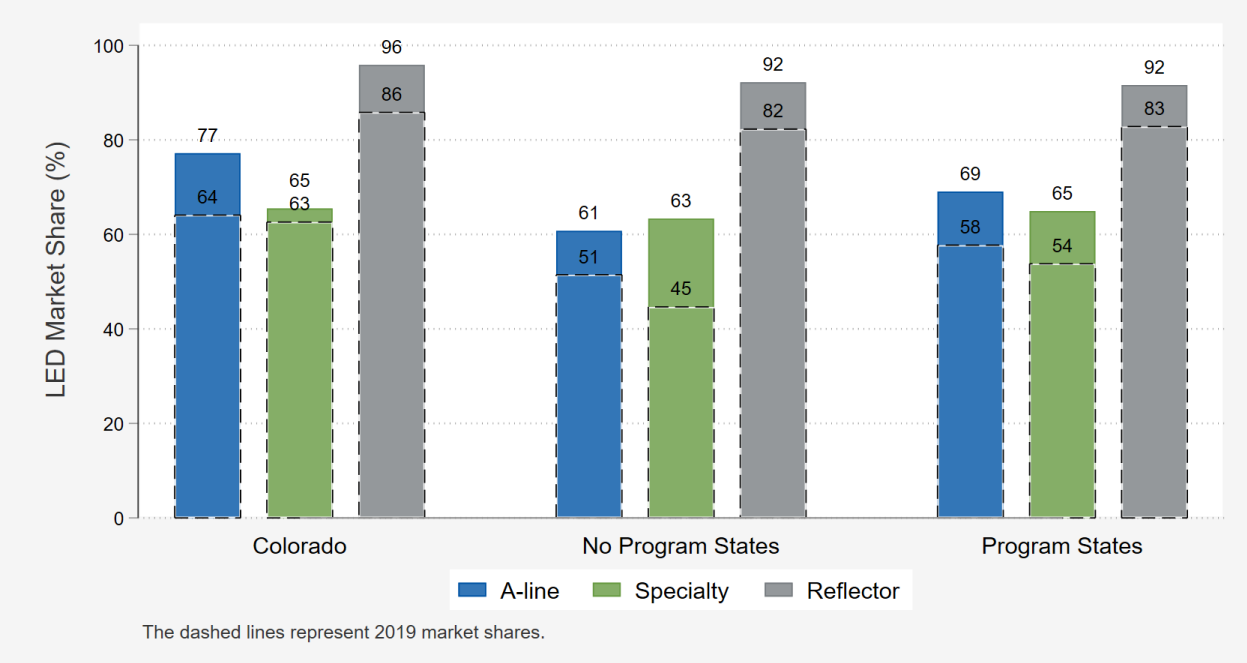


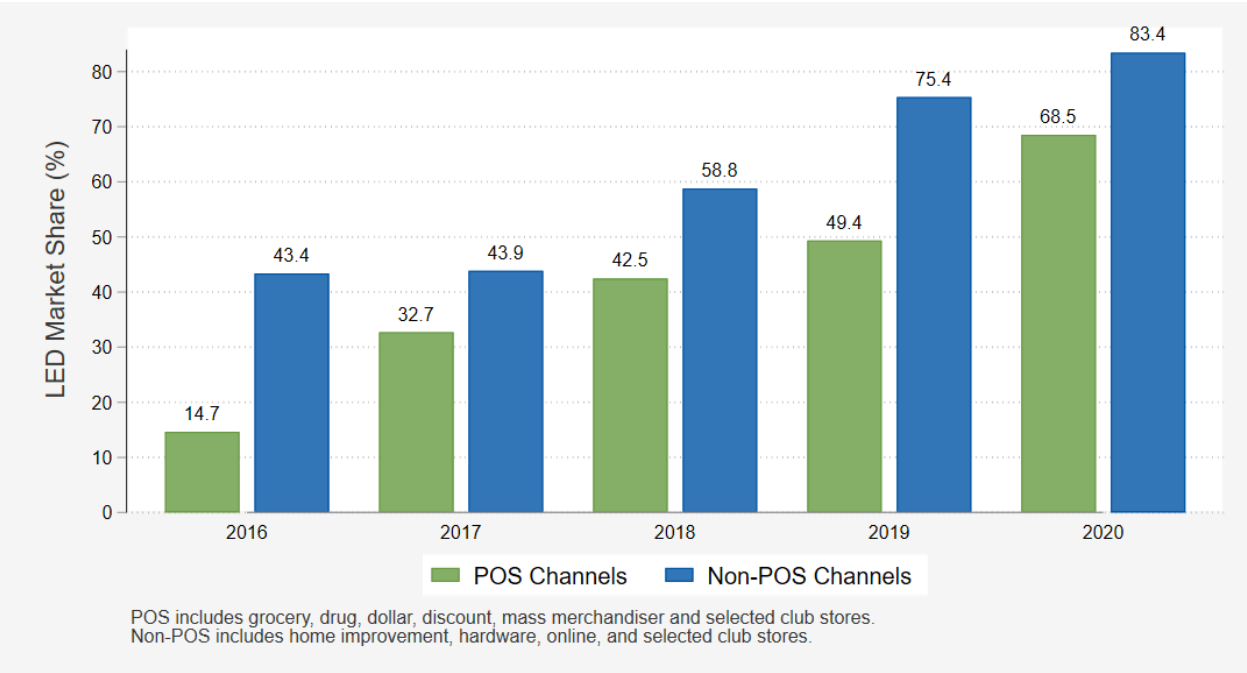
Figure 3 shows the LED market share by lamp style. Breakouts are shown for Colorado, non-program states, and program states across 2019 and 2020. The market shares differ substantially by style, with LEDs representing a majority of all bulb styles in 2020, even in states without programs. Among all bulb styles, LED market shares in Colorado exceed market shares in non-program states.

Figure 8. LED Market Share by Lamp Style (2019–2020)



Analysis of the sales data model shows that market share for LEDs is greater in the non-POS retail channels than the POS retail channels.[30] As shown in Figure 4, LED market share has increased in both retail channels since 2016 (14.7% to 68.5% in POS channels and 43.4% to 83.4% in non-POS channels). Notably, the LED market share in the POS channel increased by nearly 20 percentage points from 2019 to 2020.

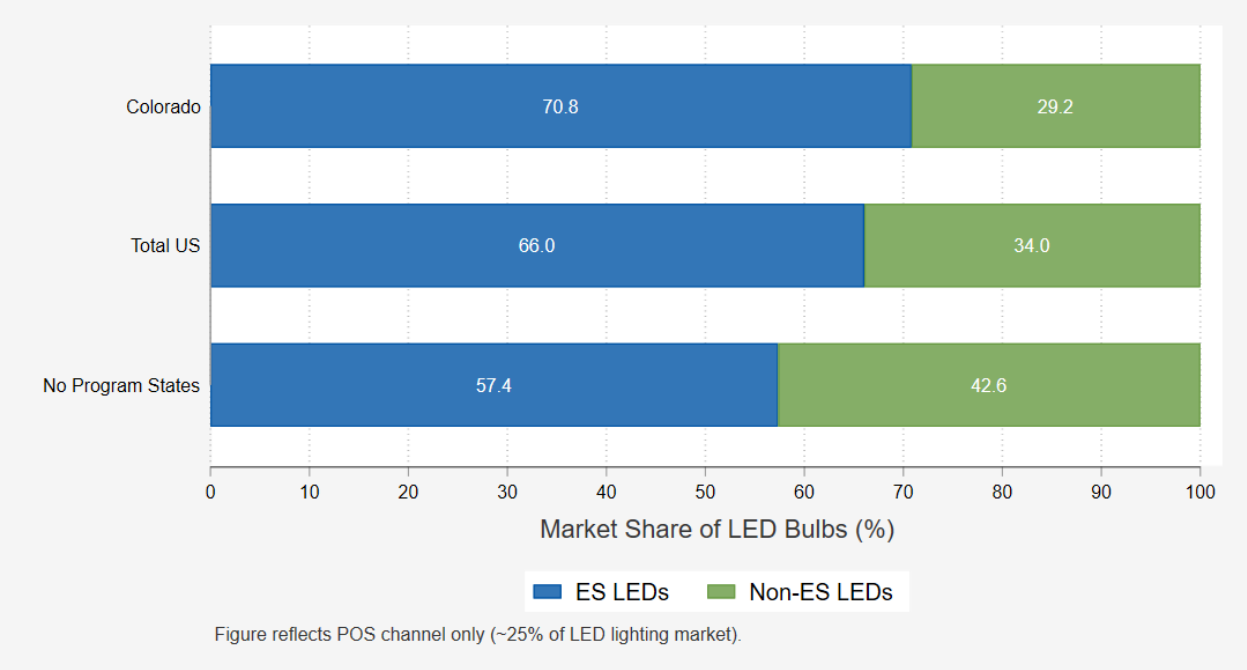
Figure 9. Colorado LED Market Share by Retail Channel Year-Over-Year



The evaluation team looked at ENERGY STAR LED distribution when there was sufficient resolution.[31] As shown in Figure 5, the POS retail channel shows that approximately 71% of LED purchases in Colorado are ENERGY STAR LEDs, whereas only about 57% of LED purchases in no-program states are ENERGY STAR LEDs.

[30] In total, approximately 68% of Colorado bulbs are purchased in the non-POS channels.
[31] Because the ENERGY STAR website does not include the UPCs of qualifying lamps, the team had to identify ENERGY STAR qualified lamps through a make and model lookup. In total, the evaluation team was successful at attributing 97% of LED sales with an ENERGY STAR attribute (that is, an LED was designated ENERGY STAR or was not). The remaining 3% of LEDs are excluded in Figure 10. This analysis is only conducted based on the POS data, as the panel data did not contain sufficient sample size to stratify by ENERGY STAR designation.

Figure 10. ENERGY STAR LED Market Share (2020 POS Channels)



Program Activity

Figure 6 shows the state-level LED share as a function of program activity (program state or non-program state). In 2020, there were 7 states in the non-program bin and 36 states in the program bin.[32] The figure shows that LED share is several percentage points higher in program states, although the relative gap between program states and non-program states has decreased significantly from 2016 to 2020 (i.e., the relative gap in 2016 was 45% ((29-20)/20) and 13% in 2020). Additionally, LED share in non-program states typically lags LED share in program states by about one year (e.g., in 2018 the average program state LED market share was 52%, and in 2019 the non-program states had an LED market share of about 54%).

[32] The non-program states in 2020 are Alabama, Kansas, Kentucky, Mississippi, Nebraska, Tennessee, and Wyoming. Two prior non-program states—Virginia and Delaware—offered programs in 2020.

Figure 11. Relationship between Program Spending and LED Sales

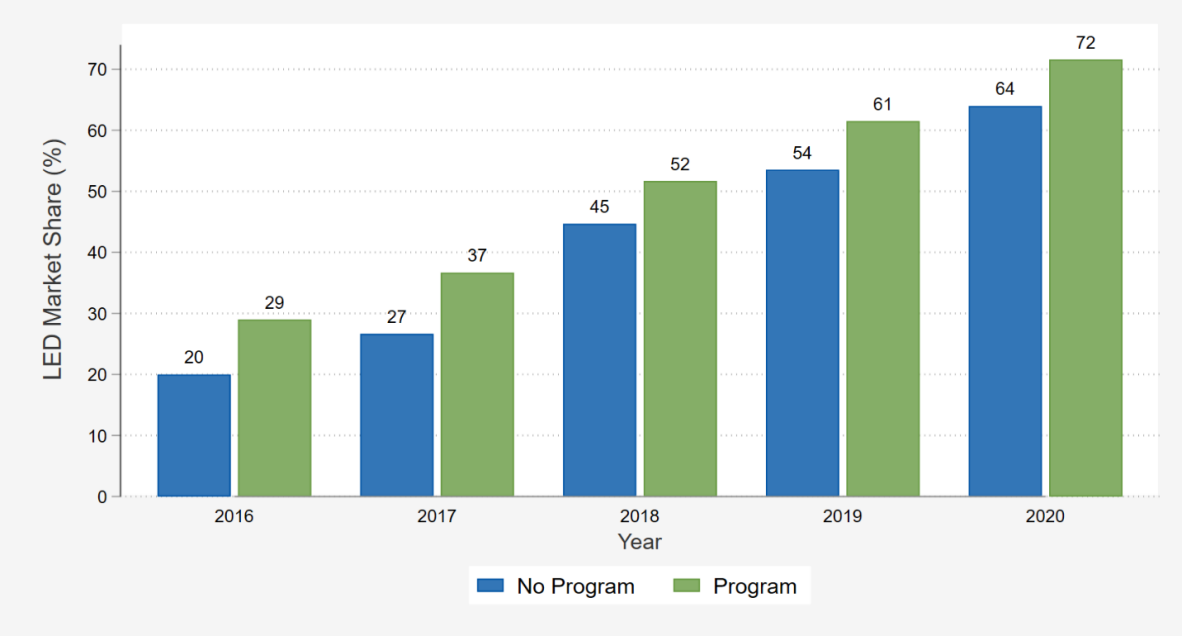
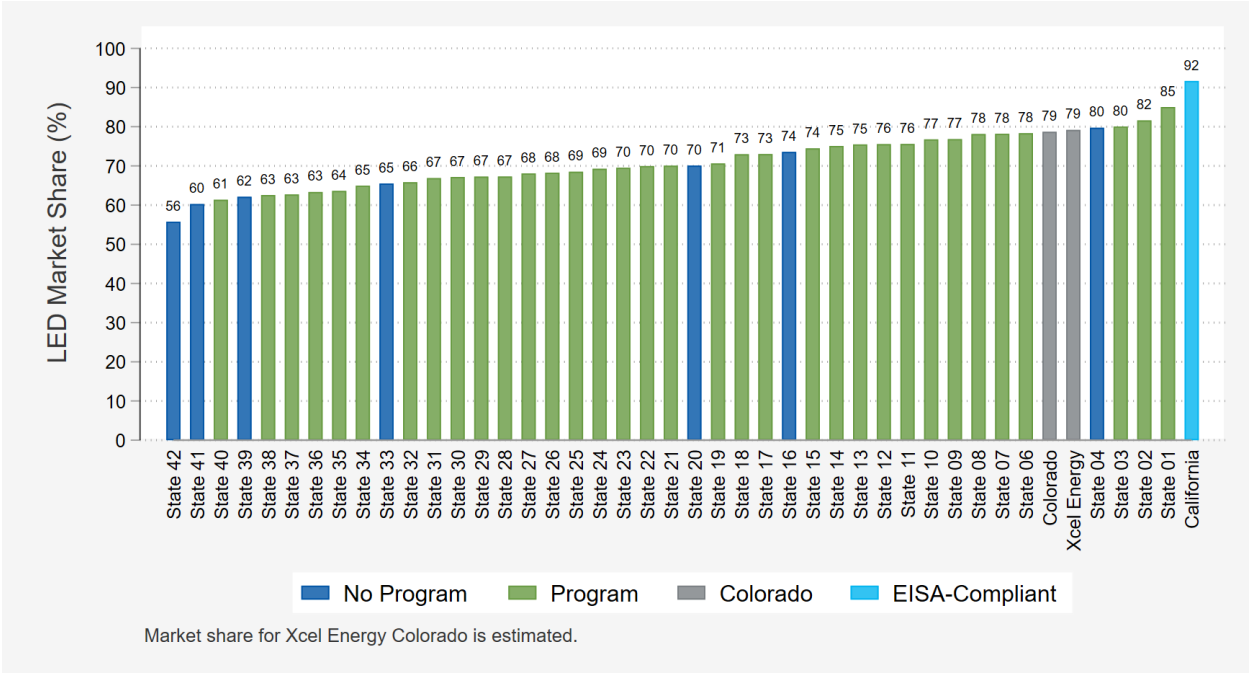


Figure 7 shows where Colorado and Xcel Energy's portion of Colorado are positioned in comparison to the modeled states when looking at LED sales. There are a handful of program states (green bars) with low LED market shares, but the overall trend is clear: states with programs generally have higher LED market shares than states without lighting programs. Most of the non-program states (blue bars) have LED market share at or below 70% (the national market share).

Figure 12. LED Sales Distribution Across States (2020)



Market share for Xcel Energy Colorado is estimated.

Program Intensity

Figure 8 shows the distribution of program lamps per household for states in which the evaluation team had sufficient data. Xcel Energy Colorado's Residential Lighting product incented approximately three LED lamps per household. This ranks above the average (1.53 LEDs per household) and median (1.33 LEDs per household) values for the included states.

Figure 13. Average Number of Program Lamps per Household (2020)

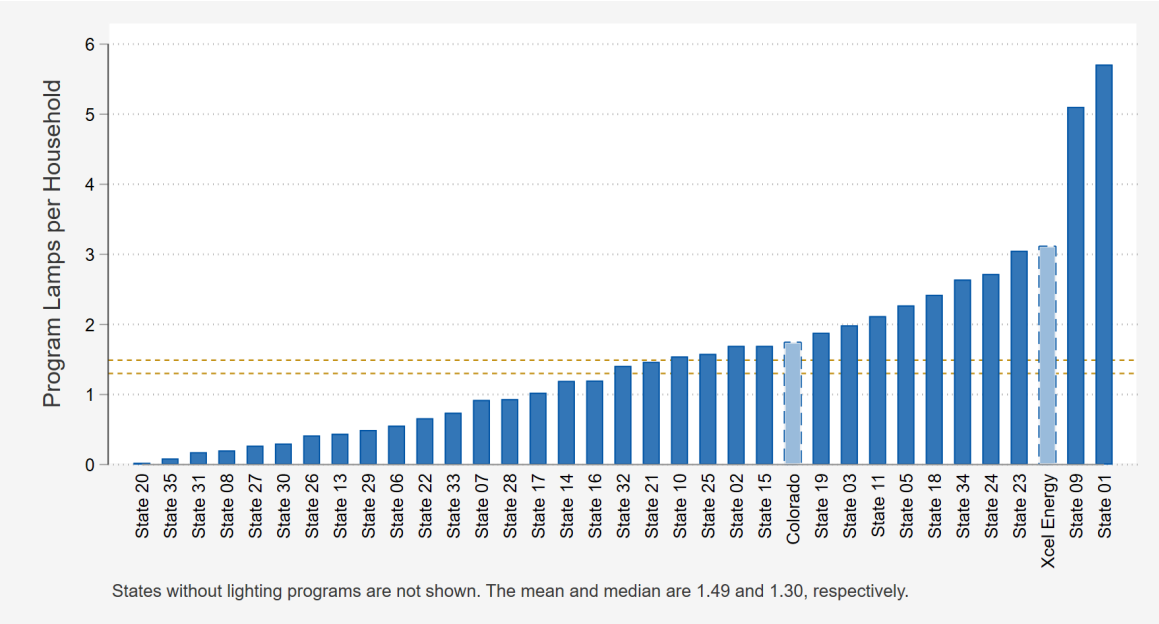
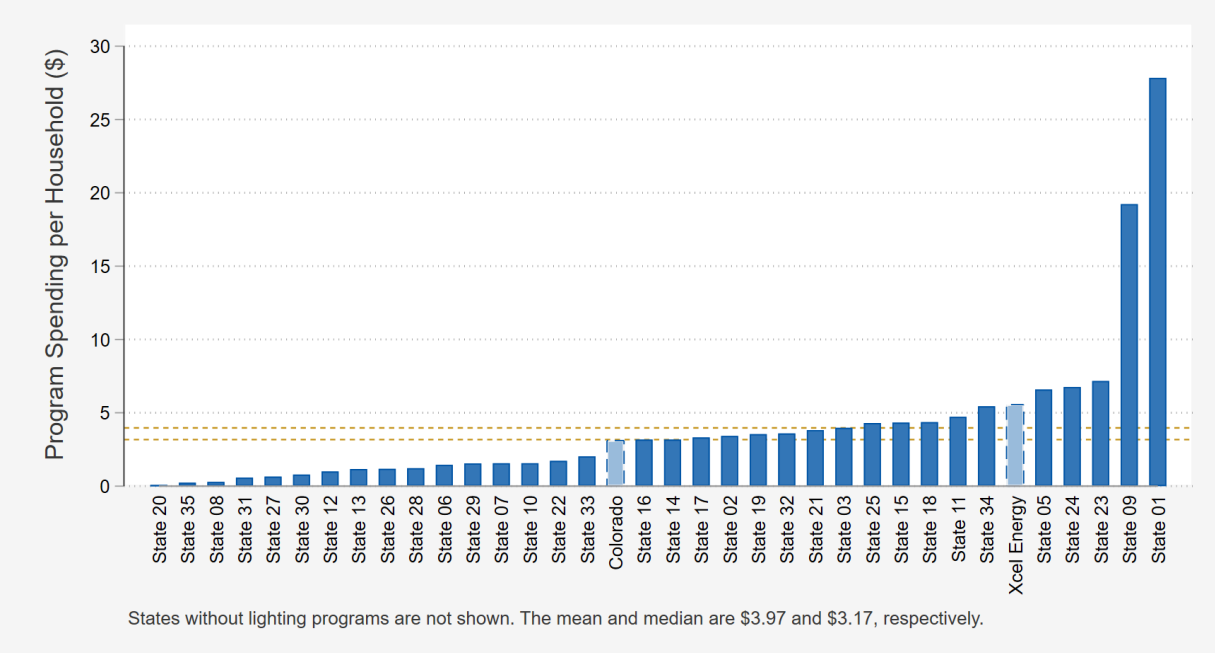


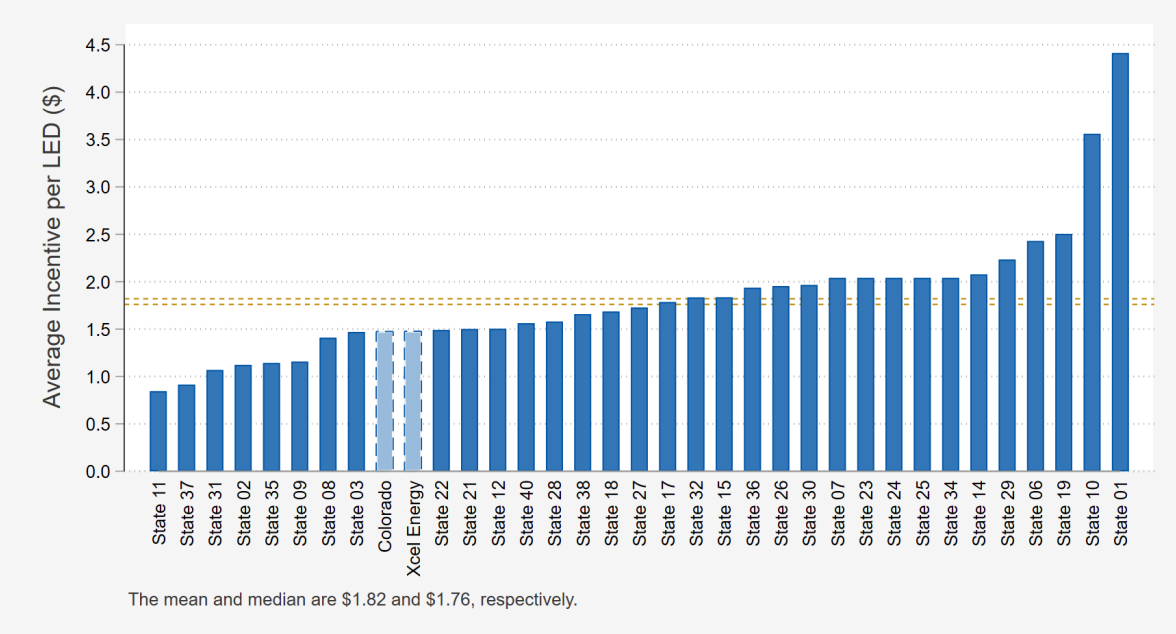
Figure 9 shows the distribution of program spending per household for states in which the team had sufficient data. In most states, upstream lighting programs spend fewer than $5 per household. Across states, the average and median values were $3.97 and $3.17 per household. Xcel Energy Colorado's upstream lighting program falls above the mean at $5.58 per household.

Figure 14. Average Program Spending per Household



As shown in Figure 10, the evaluation team also compared the average incentive offered per LED across states in which LED incentive information was collected. A simple calculation of incentive dollars divided by bulb units yielded average incentives per state. In the states that had sufficient data, LED incentives ranged from approximately $0.75 to $4.50 per LED bulb, with most of these states offering between $1 and $2 per LED. The mean and median LED incentive are $1.82 and $1.76, respectively. At approximately $1.50 per LED, Xcel Energy Colorado is slightly below the national average incentive.

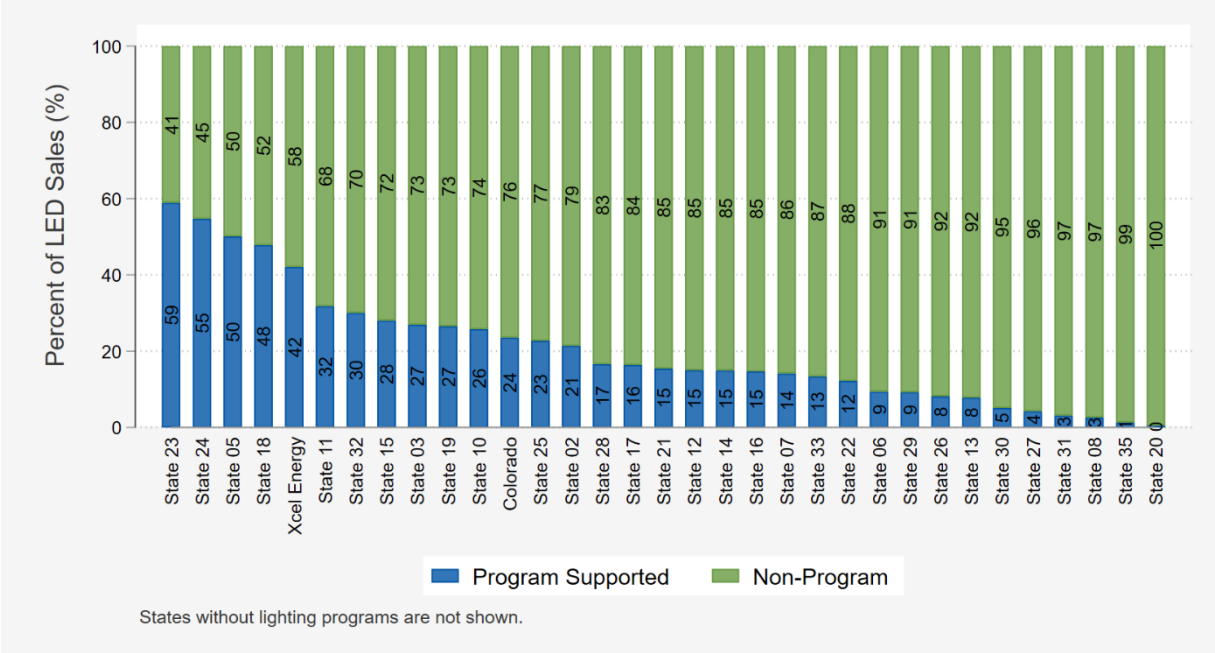
Figure 15. Average Upstream Lighting Incentive Per LED (2020)



By state, Figure 11 shows the percentage of LED sales that were incented by an upstream lighting program (where this percentage is calculated by dividing the number of incented LED bulbs by the total LED bulbs sold in the state).[33] Xcel Energy's portion of Colorado falls on the higher end of the distribution at 42%.

[33] The calculation was slightly different for Xcel Energy CO: (Number of bulbs incented by Xcel Energy) / ((Total number of LEDs sold in CO) * (Xcel Energy CO households / CO households)).

Figure 16. Percentage of LED Sales Supported by Upstream Lighting Program



It is clear from the data used for the national sales model that program spending was at least partially responsible for an increased market share of LED sales. Although these figures help illustrate program activity in relation to LED sales, the regression analysis provided information about what other factors could be influencing the marketplace and a better understanding of the programmatic impacts. The next section presents the key findings from the national sales model.

Modeling Methods

The primary goal of the model is to quantify the impact of state-level program activity on the sales of LEDs. Clearly, there are other factors that influence LED sales and, as noted above, the team considered a number of demographics, household characteristics, and retail channel variables to capture and control for the unique characteristics of each state that potentially affect the uptake of efficient lighting products.

The general form of the model is specified below, followed by a more detailed discussion of the data sources for each variable. The evaluation team considered the comprehensive set of variables listed below; the final model, presented in Table 5, lists the variables ultimately selected for inclusion based on their statistical significance and ability to improve the model specification (see the *Multivariate Regression Model* section under *Key Findings* for more information).

$$LED\ Market\ Share_i = \beta_0 + \beta_1 * Program\ Spending\ Variable_i + \beta_2 * Program\ Age\ Variable_i + \beta_3 * \sum_{1}^{3} Channel\ Variables_i + \beta_4 * \sum_{1}^{7} Demographic\ Variables_i + \epsilon_i$$

Where:

LED Market Share$_i$	=	Proportion of total LED sales in state 'i'. Equal to [LED sales/total bulb sales].
β_0	=	The model intercept.
β_1	=	The primary coefficient of interest. This represents the marginal effect of program intensity.
β_2	=	Another coefficient of interest. This represents the marginal effect of program age.
Program Spending Variable$_i$	=	A numeric variable that summarizes state-level retail lighting program dollars per household in state 'i'. Two different program spending variables were tested; Table 2 lists additional detail.
Program Age Variable$_i$	=	The number of years state 'i' has been running an upstream lighting program. Two different program age variables were tested; Table 2 lists additional detail.
β_3 *and* β_4	=	Array of regression coefficients for the channel and demographic variables
Channel Variables$_i$	=	Numeric variables summarizing state-level retailer characteristics. Table 2 lists additional detail.
Demographic Variables$_i$	=	Numeric variables that summarize state-level population, housing, and economic attributes. Table 2 lists additional detail.
ϵ_i	=	Error term.

Table 31. Channel and Demographic Variable Descriptions

Type of Variable	Description
Program Intensity Variables	
Program Spending per Household (HH)$_i$	Total upstream program budget in state 'i' divided by the number of households in state 'i'.
SQRT (Program Spending per Household)$_i$	Square root of the program spending per household.
Program Age$_i$	Number of years program administrators in state 'i' have operated upstream lighting programs (CFL or LED).
SQRT (Program Age)$_i$	Square root of the program age.
Channel Variables	
Sqft NonPOS per HH$_i$	The average non-POS retail square footage per household in state 'i.' Equal to non-POS square footage divided by the number of households in state 'i'.
Percent Sqft NonPOS$_i$	The percentage of total retail square footage belonging to non-POS retailers in state 'i.' Equal to non-POS square footage divided by (POS sqft + non-POS sqft).

Type of Variable	Description
Sqft POS per HH_i	The average POS retail square footage per household in state 'i.' Equal to POS square footage divided by the number of households in state 'i'.
$EISA_i$	Indicator variable equal to 1 for states that have implemented EISA standards and equal to 0 otherwise.
Demographic Variables	
Political $Index_i$	A state-level partisan voter index developed by Gallup[1] using presidential election voting results as a state-level partisan proxy. A higher than 1.0 value represents greater democratic influence and a value less than 1.0 indicates greater republican influence.
Average Electricity $Cost_i$	The state-level average residential retail rate of electricity sourced directly from the Energy Information Agency.[2]
Cost of $Living_i$	State-level cost of living indices developed by the Missouri Economic Research and Information Center.[3]
Percentage of Renters Paying $Utilities_i$	All of these state-level demographic and household variables were derived from the most current U.S. Census ACS.[4]
Median $Income_i$	
Percentage Owner $Occupied_i$	
Percentage of Population with College $Degree_i$	

[1] http://news.gallup.com/poll/125066/state-states.aspx
[2] https://www.eia.gov/electricity/data/state/
[3] https://www.missourieconomy.org/indicators/cost_of_living/
[4] http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t

Correlation of the Independent (Explanatory) Variables

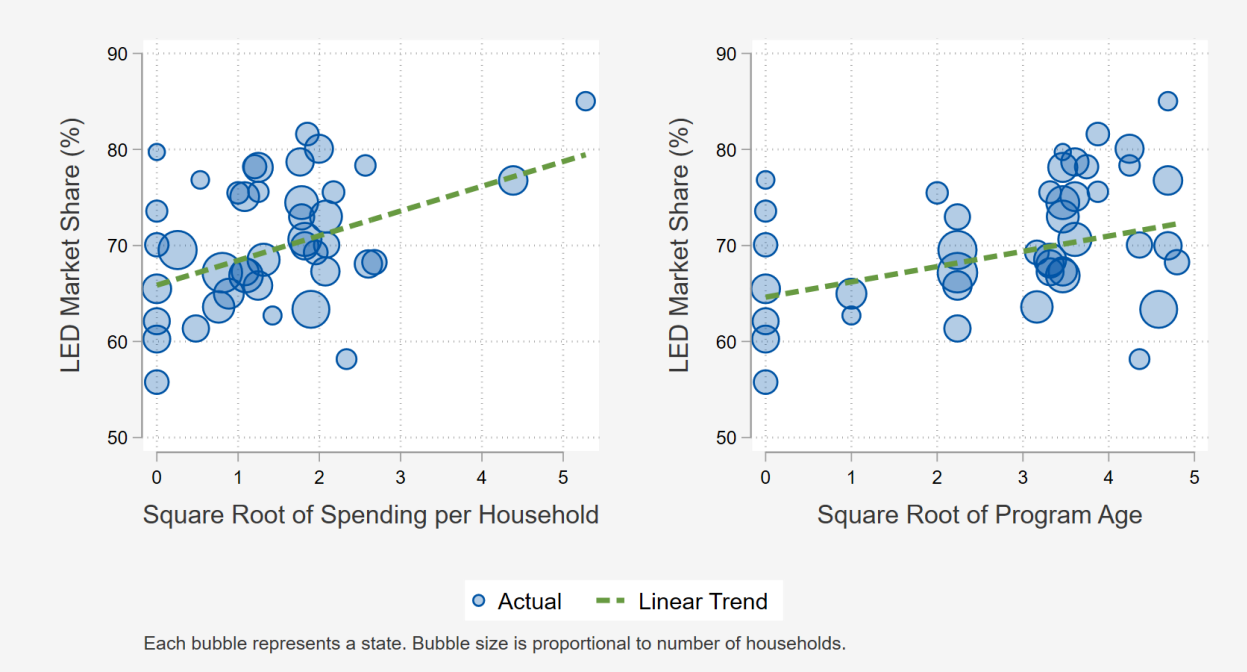
Table 3 shows the correlation between the dependent variable (LED market share) and fourteen potential explanatory variables—three program intensity variables (spending per household, square root of spending per household, and program age) and ten channel and demographic/household variables. Twelve of the variables are positively correlated with LED market share (green bars) and two are negatively correlated (red). The absolute value of the correlation coefficient indicates the strength of the linear correlation.

Table 32. Independent Variable Correlation Table

Explanatory Variable	Correlation with LED Market Share
Spending per Household	0.393
Square Root of Spending per Household	0.443
Program Age	0.335
Square Root of Program Age	0.394
Non-POS Square Footage per Household	0.221
POS Square Footage per Household	-0.152
Percentage of Square Footage in Non-POS	0.188
Political Index	0.069
Median Income	0.253
Average Electricity Cost	0.028
Cost of Living	0.024
Percentage of Renters Paying Utilities	-0.212
Percentage Owner Occupied	0.206
Percentage of Population with College Degree	0.320

As expected, of the fourteen variables, program age and program spending show the strongest correlation with LED market share (i.e., higher LED market shares typically occurring in states with more program spending and longer-running programs). Notably, the square root transformations of program spending and program age show greater correlation with LED market share than the non-transformed versions. Figure 12 visualizes the correlation between these key variables and LED market share.

Figure 17. LED Market Share against Program Intensity



In addition to being correlated with LED market share, many of the explanatory variables are correlated with each other. Table 4 shows a pairwise correlation matrix among the potential independent variables. When multiple independent variables that are correlated with one another are included in a regression model, the model will have difficulty precisely estimating the effect of either term. This issue is compounded by the relatively low number of observations in the dataset.

Because of the complexity of the relationships and numerous combinations of these channel, demographic, and household characteristic variables, the evaluation team tested over 70 different model options. In general, the models provided similar results, with square root of program spending and square root of program age being the two most significant predictors of LED market share. Of the models tested, we selected the model with the highest Adjusted R^2 value as the final model.[34] The final model is discussed in more detail in the *Key Findings* section.

[34] Adjusted R^2 measures the percentage of the variation in LED market share that can be explained by the set of predictor variables included in the model.

Table 33. Covariance Table of Potential Independent Variables

	LED Market Share	Spending per Household	Square Root of Spending per Household	Program Age	Square Root of Program Age	Non-POS Square Footage per Household	POS Square Footage per Household	Percentage of Square Footage in Non-POS	Political Index	Median Income	Average Electricity Cost	Cost of Living	Percentage of Renters Paying Utilities	Percentage Owner Occupied
Spending per Household	0.39													
Square Root of Spending per Household	0.44	0.90												
Program Age	0.34	0.61	0.78											
Square Root of Program Age	0.39	0.53	0.76	0.95										
Non-POS Square Footage per Household	0.22	-0.21	-0.12	-0.19	-0.10									
POS Square Footage per Household	-0.15	-0.42	-0.47	-0.64	-0.61	0.24								
Percentage of Square Footage in Non-POS	0.19	0.44	0.51	0.65	0.61	-0.03	-0.96							
Political Index	0.07	0.56	0.64	0.65	0.61	-0.27	-0.81	0.78						
Median Income	0.25	0.51	0.56	0.53	0.48	0.08	-0.65	0.73	0.69					
Average Electricity Cost	0.03	0.72	0.63	0.62	0.48	-0.34	-0.62	0.61	0.62	0.50				
Cost of Living	0.02	0.50	0.53	0.67	0.56	-0.42	-0.82	0.80	0.77	0.70	0.68			
Percentage of Renters Paying Utilities	-0.21	-0.57	-0.61	-0.63	-0.49	0.39	0.58	-0.53	-0.59	-0.57	-0.64	-0.69		
Percentage Owner Occupied	0.21	-0.12	-0.13	-0.31	-0.26	0.51	0.43	-0.37	-0.36	-0.33	-0.33	-0.60	0.29	
Percentage of Population with College Degree	0.32	0.38	0.44	0.50	0.46	0.17	-0.51	0.57	0.53	0.87	0.39	0.50	-0.43	-0.23

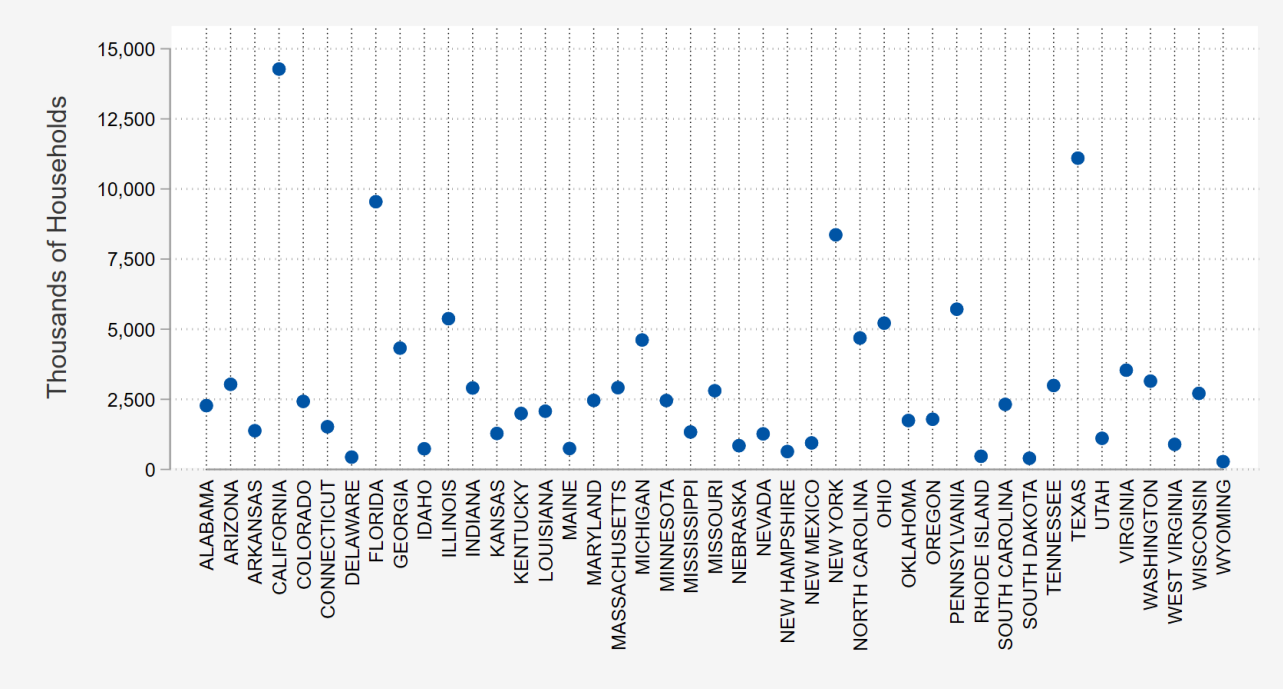
Model Weighting

One key consideration in developing the model was how to weight each of the states. Each state is a single observation in the model, but the data for that state are comprised of summarized observations from sales and panel data. Weighting each state equally would not have accounted for larger states having larger sample sizes in the panel data and bigger impacts on the lighting market as a whole. To capture these differences, the evaluation team considered using either the number of households or total bulb sales as the weight. The evaluation team determined that using total bulb sales as analytic weights in the model was inappropriate because sales are correlated with the dependent variable. Specifically, states with high LED market share tend to have lower total lamp sales because efficient lamps have longer measure lives than inefficient lamps, so the sockets turn over less frequently.

In the NCP data, the sample size was generally proportional to number of households, and large states represented a larger share of the overall U.S. lighting market than smaller states. Given the difference in panel sizes, the average lighting share value in large states was based on more measurements than small states, with a commensurate increase in aggregate measurement precision. Therefore, the Evaluation Team used number of households per state as the weight.

Figure 13 shows the distribution of households for each of the 43 states in the model.

Figure 18. Number of Households by State

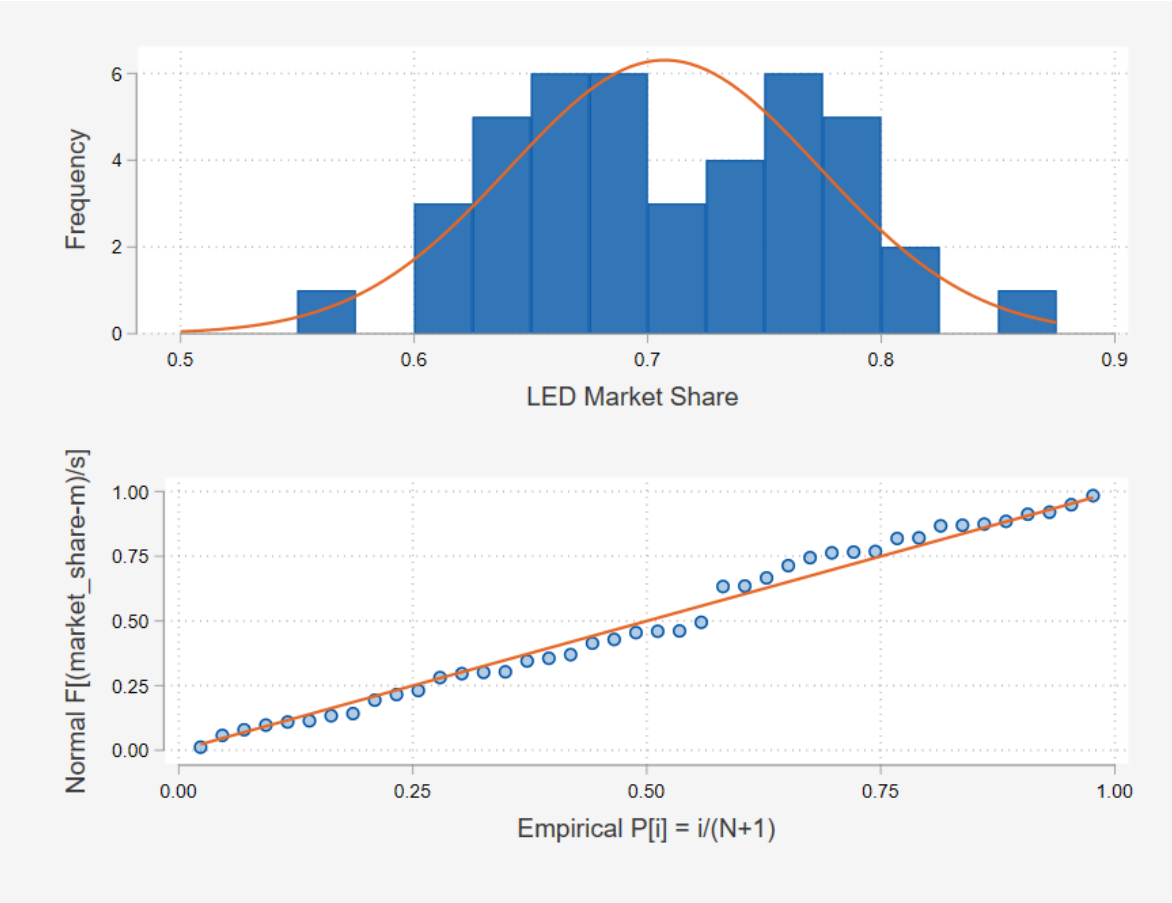


Model Functional Form

Another critical decision in the modeling process is the selection of the functional form of the model. A key input in this decision is the distribution of the dependent variable. Figure 14 contains a histogram and a standardized normal probability plot for the LED market share of the 43 states in the analysis dataset and indicates that the data are approximately normally distributed.[35]

LED market share is constrained by 0 and 1. In other words, it cannot be less than 0% and it cannot be greater than 100%. The evaluation team looked at functional forms that impose these limits to produce the top half of an S-curve. Since the LED market share values only range from 56% to 85%, and so much of that variation is explained by program intensity and program age, the evaluation team elected to estimate the model using OLS regression. Using OLS did not result in any unrealistic predictions (e.g., less than 0% or greater than 100%).

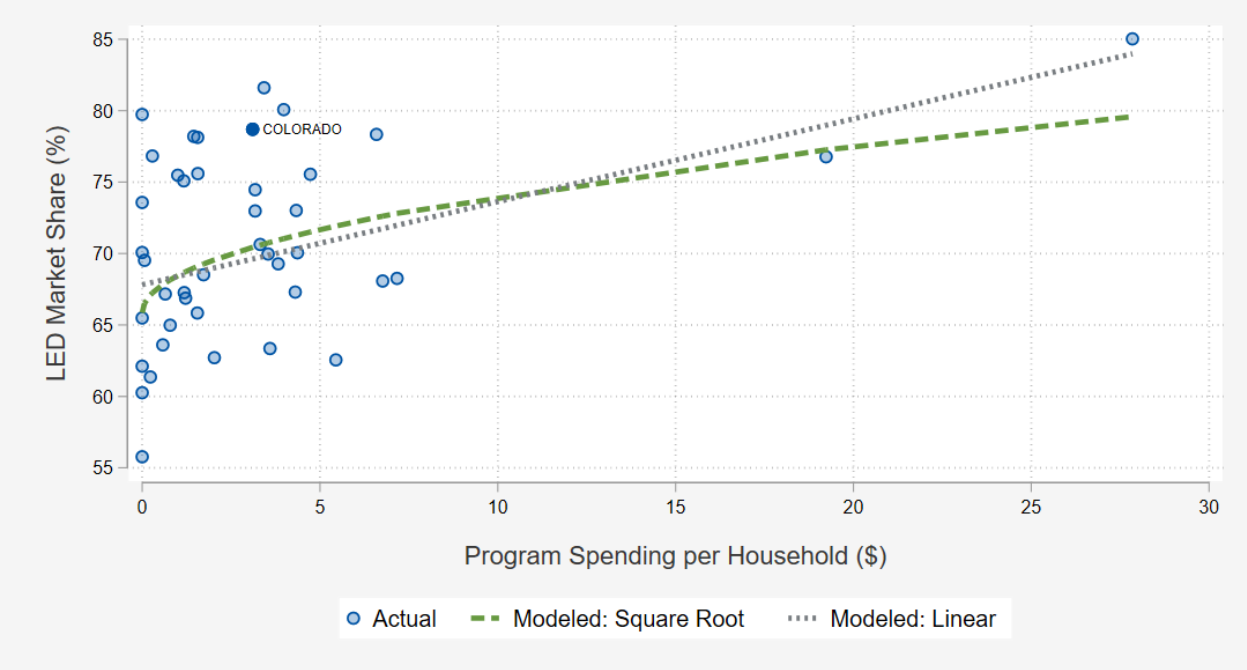
Figure 19. Histogram and Standardized Normal Probability Plot



[35] The team also ran a Shapiro-Wilk test for normality, where the null hypothesis is that the data are normally distributed. The p-value of this test was 0.90. At the 95% confidence level, there is no reason to reject the hypothesis that LED market share is normally distributed.

The evaluation team also explored transformations of independent variables, including the square root of spending as the program intensity variable. Figure 15 shows that the square root model tapers LED market share as the square root of spending increases. This reflects diminishing returns in terms of market share as program spending increases and graphically provides a good fit for the data.

Figure 20. Linear vs. Non-Linear Modeling



Net-To-Gross Estimates

Using the results of the regression models, efficient bulb sales data, and the program tracking databases, the team estimated NTGRs for LEDs in 2020. The team derived NTGRs by first using the model to predict the share of efficient bulbs with and without a program (determining the counterfactual of no program activity by setting the program spending variable to zero). This change in share represents the program lift, or net increase in the share of efficient bulbs resulting from program activity.

To then calculate NTGR, the evaluation team multiplied the change in share by the total number of bulbs—for all bulb types—sold in 2020, as determined by the sales data analysis described above. This value represents the net impact of the program (i.e., the total lift in the number of LEDs sold), and is then divided by the total number of program bulbs sold (i.e., the gross number of bulbs) to determine NTGR:

$$NTGR = \frac{(\#\ bulbs\ sold\ with\ program - \#\ bulbs\ sold\ with\ no\ program)}{\#\ of\ program\ incented\ bulbs\ sold}$$

Key Findings

The following section presents the findings from applying the multivariate regression model.

Multivariate Regression Model

The regression coefficients for the program intensity variables, and subsequent estimates of the NTGR, proved relatively stable across a number of model specifications. Table 5 displays the relevant statistics for the 2020 model, which leveraged five explanatory variables: the square root of program spending per household, the square root of program age, non-POS retail square footage per household, political index, and an EISA implementation indicator variable (equal to 1 for California and 0 otherwise).

Table 34. Model Summary Statistics (n = 43 States)

Independent Variables	Model Coefficient	P-Value of Coefficient
Intercept	0.680	0.000
Sqrt(Program Spending per Household)	0.029	0.026
Sqrt(Program Age)	0.010	0.256
Non-POS sqft per HH	0.021	0.131
Political Index	-0.138	0.074
EISA Indicator	0.242	0.000
Model Adjusted R-squared	**0.745**	

Though an adjusted R-squared value of 74.5% is reasonable, there are a few potential limitations to the model that are worth noting. First, it is possible that the model omitted variables that might better explain LED market share. In addition, the use of comparison states in the baseline will not reflect any potential interstate influence on non-program states. In other words, the efforts of Xcel Energy Colorado, combined with the millions of dollars spent on lighting in other program states, may have impacted the retailer sales of lamps in non-program (or even moderate program) states. This would increase the baseline/comparison area sales and mean that the program spending coefficient was being underestimated (and the resulting NTG would be a conservative estimate). This appendix describes the analysis without any such adjustment, however other elements of the evaluation address this issue which are described in the main report and the corporate partner interviews summary (Appendix C.6). Final prospective recommended NTG values also incorporate a baseline adjustment.

The negative coefficient for political index seems counter-intuitive. Notably, the correlation between political index and LED market share is positive. However, in a multiple regression framework, the interplay between all variables is relevant. After accounting for the effects of program activity and non-POS square footage, market share and political index are negatively correlated (hence the negative coefficient).

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framework, the interplay between all variables is relevant. After accounting for the effects of program activity and non-POS square footage, market share and political index are negatively correlated (hence the negative coefficient).

Net-To-Gross Results

The NTG calculations are shown in Table 6 below. NTG was performed using a "modeled:modeled" calculation as opposed to a "modeled:actual." This means that the counterfactual scenario (which can only be modeled) was compared to a *modeled* LED market share.[36]

In assessing NTG, the evaluation team zeroed out the program spending variable to calculate the counterfactual. There are two options for treating the program age in the counterfactual:

- Programs have never existed (Program Age is set to 0).
- The programs did not exist in the year 2020 (subtract 1 year from the actual Program Age of 13 years).

Table 6 shows the calculations for each of the two options identified above. In the "Current and Past Influence" scenario (i.e., the "offering never existed" scenario), the counterfactual market share is 67.6% (row G). With the offering, however, modeled LED share is 79.2% (row H). The "lift" resulting from the offering is the difference of these two figures, 11.6% or 1,401,146 LEDs (row K). Since the offering claimed 4,009,236 LEDs in 2020, the NTG is 35.0% (the net "lift" in LED sales divided by the gross number of bulbs claimed). Using a similar approach, but examining the influence of the current program under the assumption that influences up to one year prior would have continued if the current program was terminated, the net "lift" in LED sales is only 943,734, with a NTG ratio of 23.5%.

Table 35. Xcel Energy Colorado NTG Calculations

Calculation Term	Current and Past Influence	Current Offering Spending and Age Influence
Total Xcel Energy Bulbs 2020 (A)[37]	12,064,022	12,064,022
Program $ per HH Actual (B)	$5.58	$5.58
Program $ per HH Counterfactual (C)	$0.00	$0.00
Program Age Actual (D)	13	13
Program Age Counterfactual (E)	0	12

[36] To model LED market share for Xcel Energy Colorado, the evaluation team used the following values for non-POS square footage per household and political index: 4.32 and 1.14. The former was derived based on the number of Home Depots, Lowes, and Costcos in Xcel Energy Colorado service territory (along with an assumption about the square footage for each retailer). The latter was derived based on a comparison between voter party affiliation in Colorado (with a focus on Adams, Arapahoe, Boulder, Denver, Douglas, Logan, Mesa, Morgan, and Weld counties) with national voter party affiliation.

[37] To estimate the number of bulbs sold in Xcel Energy Colorado service territory, the evaluation team multiplied the number of bulbs sold in Colorado by a ratio of Xcel Energy Colorado households to total Colorado households.

Calculation Term	Current and Past Influence	Current Offering Spending and Age Influence
Ratio Adjustment (F)[38]	1.101	1.101
Adjusted LED Market Share Counterfactual (G)	67.6%	71.4%
Adjusted LED Market Share Modeled (H)	79.2%	79.2%
LED Qty Counterfactual (I = A * G)	8,152,948	8,610,359
LED Qty Modeled (J = A * H)	9,554,094	9,554,094
Net LEDs Modeled (K = J – I)	1,401,146	943,734
Claimed Bulbs 2020 (L)	4,009,236	4,009,236
NTG Modeled (M = K / L)	**35.0%**	**23.5%**
Market Effects (N = Difference of NTG of columns)	**11.5%**	**n/a**
Market Effects Lamps (O = L * N)	**457,411**	**n/a**

Net-To-Gross by Bulb Style

Because the evaluation team did not have sufficient program data (e.g., spending by bulb style) across enough states to run separate NTG models by bulb style, it used an alternative approach. There are two key steps to the approach. First, the evaluation team compared LED market shares (by bulb style) in Colorado to LED market shares in non-program states.[39] Then, the evaluation team calibrated the findings from the first step to the results from the national lighting sales model (shown in Table 6).

Table 7 shows the comparison of LED market share by bulb type. The Lift column is simply the difference between the LED market share in Colorado and the LED market share in the aggregate non-program comparison state. For A-lamps, the LED market share in Colorado (77.2%) is significantly higher than in the aggregate non-program comparison state (60.8%). For specialty styles, the LED share in Colorado is only slightly higher than in the aggregate non-program comparison state.

Table 36. Comparison Between Colorado and Non-Program (NP) States

Bulb Style	CO LED Share	NP LED Share	Lift
A-Lamps	77.2%	60.8%	16.4%
Globes and Candelabras	65.5%	63.4%	2.1%
Reflectors	95.9%	92.2%	3.7%
Non-Reflectors[1]	75.5%	61.2%	14.3%

[1] Calculated as the total of the A-lamps and globes/candelabras.

[38] The ratio adjustment accounts for the model's underprediction of LED market share in Colorado statewide. Actual LED market share in Colorado is 78.7% and the predicted LED market share is 71.5%. The ratio adjustment is simply a ratio of actual LED market share in Colorado to predicted.

[39] The "no program" states in CY 2020 are Alabama, Kansas, Kentucky, Mississippi, Nebraska, Tennessee, and Wyoming. Bulb sales for these states are summed to create an aggregate non-program comparison state.

The lift in Table 7 can be converted to bulbs by multiplying by the number of bulbs of the relevant style sold in Colorado during CY 2020. This math is shown in Table 8. For each bulb style, Table 8 also shows the number of bulbs incented by the upstream lighting offering. Note the Total row is a sum of the first three rows (i.e., the Non-Reflectors row does not get double-counted in the total).

Table 37. Calculating Lift as a Percentage of Upstream Lighting Offering Activity

Bulb Style	Lift (%)	Xcel Energy Colorado Territory Total Bulb Sales	Lift (Bulbs)	LEDs Incented by Upstream Lighting Offering	Lift as % of Upstream Lighting Offering
A-Lamps	16.4%	8,680,886	1,425,843	3,354,700	42.5%
Globes and Candelabras	2.1%	1,423,055	30,325	105,453	28.8%
Reflectors	3.7%	1,942,875	71,877	549,083	13.1%
Non-Reflectors[1]	14.3%	10,103,940	1,445,959	3,460,153	41.8%
Total			**1,528,045**	**4,009,236**	**38.1%**

[1] Calculated as the total of the A-lamps and globes/candelabras and not double-counted in the total.

Across all styles, the estimated lift is 1,528,045 bulbs. This total is greater than the net LEDs shown in row K in Table 6 for both counterfactual approaches. The total lift in bulbs, therefore, is calibrated so that it sums to the total values shown Table 6. For the Current and Past Influence counterfactual approach, the calibration factor is 91.7% (1,401,146/1,528,045), and for the Current Offering Spending and Age Influence the calibration factor is 61.8% (943,734/1,528,045). NTG by style (Table 9) is then calculated by multiplying the last column in Table 8 by each of the calibration factors.

Table 38. NTG Results by Bulb Style

Bulb Style	Current and Past Influence	Current Offering Spending and Age Influence
A-Lamps	39.0%	26.3%
Globes and Candelabras	26.4%	17.8%
Reflectors	12.0%	8.1%
Non-Reflectors[1]	38.3%	25.8%

[1] Calculated as the total of the A-lamps and globes/candelabras.

Incorporating Market Effects

The evaluation team recommends including past program influence (market effects) when calculating program savings for the following reasons:

- **The program seeks to have long-term market effects impacts that are likely being reflected in the program age variable.** The program incentives, and marketing and outreach, seek to impact customer awareness and demand for energy efficient lighting, as well as retailer stocking and promotion of efficient lighting. Program age can be thought of as a proxy for these effects, measuring long-term trends due to multiple years of running programs. These effects, therefore, should reflect positively, rather than negatively, in the NTG estimate.
- **The savings are new estimates realized in 2020.** The change in market share due to prior program activities was realized in 2020 (i.e., prior program activities helped bump up the current market share). This represents increased sales of LEDs in 2020 that were not counted in prior years (i.e., they were not being double counted) and if they are not claimed in the current year, they are program-induced impacts that are never credited at any time to program spending (past or present).
- **The timing of expenditures and savings is already modified for the upstream lighting offering.** The gross savings analysis for the offering already accounts for the future installation of program lamps in the current offering year (i.e., although the first-year in-service rate is less than 100%, an installation trajectory is used to model and claim discounted savings for lamps that are installed in future years). Rather than accelerating future savings, as is done with the in-service rate, claiming impacts from prior expenditures is effectively using a lagged impact savings analysis. Savings that accrue today from programs in previous years, along with the savings from current programs, together comprise a reasonable estimate of energy efficiency offering.

Home Lighting and Recycling Evaluation

2021 Program Evaluation: Recommendations and Responses

The Xcel Energy Home Lighting and Recycling product in Colorado offers discounted LED prices, via upstream incentives to retailers and manufacturers, on ENERGY STAR LEDs. An instant rebate enables customers to purchase a variety of energy-efficient bulb models at a discounted price and it is an easy and inexpensive way for customers to save electricity.

Xcel Energy ("the Company") engaged a team of researchers led by TRC Companies and Apex Analytics to conduct a process and impact evaluation of the Home Lighting and Recycling product. The evaluation team completed the following activities as part of that evaluation:

- Calculated the retrospective and prospective Net-to-Gross Ratio ("NTGR");
- Researched and provided feedback to help the Company understand barriers in using the Xcel Energy Home Lighting Product tools, including website, storefront, and retail outlets, to see if the website is clear, is used by customers, is accessible, and helps drive participation to the product;
- Gained insight from stakeholders and peer utilities on what may take the place of home lighting if federal EISA Tier 2 standards are enacted; and
- Evaluated opportunities to increase cost effectiveness of this already cost-effective product.

Based on the results of this research, the evaluation team developed key findings and recommendations for Xcel Energy.

Recommendation	Response
1a) The evaluation team recommends using a prospective NTGR (adjusted for the Colorado Appliance Bill) that varies by year and bulb type	The Company agrees to use the NTGR formula as outlined in the final evaluation report.
1b) The evaluation team recommends that Xcel Energy phase out reflector bulbs no later than the schedule established by the Colorado Appliance Bill.	The Company agrees to phase out reflector bulbs no later than the schedule outlined in the Colorado Appliance Bill.
2) Consider making the following updates on the Bulb Finder website when the next update occurs: a) Increase customer awareness of the Bulb Finder website by adding links to highly visited pages. b) Add link of the Bulb Finder website to the digital marketplace and vice versa. c) Examine the algorithm for store search results as they do not necessarily show the closest in proximity store to zip codes entered. d) Add a map radius function to the search field e) Simplify the "Find 2021 Deals" dropdown menu to key features customers need (e.g., adding images of lamps instead of descriptions)	a) Links for the bulb finder is already on 2 highly visited pages. The Company will work on enhancing navigation functionality resulting in the LED bulb finder being more visible to users. b) The Company will implement this recommendation. c) The Company agrees that the search capability should be reconfigured and is evaluating ways to enhance the customers experience when searching for bulb discounts on our website. d) The Company will investigate the capability to add a map radius function to the bulb search field. e) The Company will evaluate ways to simplify the bulb detail information.

3) Continue searching for potential retailers, who carry or can be encouraged to carry program-eligible lamps, in the 18 identified zip codes without participating retailers.	The Company will research stores in these zip codes to determine the feasibility of partnering with stores in the area. If opportunities are identified, the Company will work with the manufacturers/retailers to set up contracts to offer product discounts at those stores. Customers in these zip codes can also purchase discounted LEDs on the Company's marketplace and order them to be shipped to their home. The Company notes that the following zip codes on the report list do contain stores that actively participate in the program: 80226 – Walmart Lakewood 80241 – Dollar Tree Thornton 80232 – King Soopers Lakewood
4) When possible, increase awareness and training among participating retailers.	As pandemic restrictions are easing, the Company will resume program education and training for all retail stores to ensure store associates understand the program. The product team is also in the process of revamping program materials distributed at stores to re-enforce the trainings and provide further awareness of the product offerings.
5) Consider the feasibility of the following changes on the digital marketplace website when the next update occurs: a) Add links to highly visited Xcel Energy web pages. Consider adding a link of the digital marketplace to the Bulb Finder website and vice versa. b) Increase visibility of the digital marketplace on search engines (i.e., Google). c) Consider allowing customers to sign in as a "guest" and verify their Xcel Energy customer address. d) Consider free shipping for some or all types of purchases.	a) The Company will implement this recommendation to give customers more purchasing options. b) The Company will engage our advertising agency to increase visibility of the marketplace on search engines. c) All customers visiting the digital marketplace can view the offerings on the site as a "guest", but to verify rebate eligibility, customers need to create a marketplace account to validate they are an Xcel Energy customer. The marketplace is hosted on our vendor's platform, so customer use of xcelenergy.com customer account as a marketplace log in is not feasible at this time. d) The Company has offered free shipping promotions in the past and will evaluate offering free shipping promotions again.
6) Look to multiple types of products technologies to compensate for expected declines in residential lighting savings for the future.	The Company agrees to determine if the niche lighting products suggested in the report are cost-effective to include in our product mix.

11.1 Home Lighting

Algorithms

$$kW\ Savings\ per\ Bulb = (WattageB_{aseline} - WattageLE_{D})/1000$$

$$Customer\ kW = Number\ of\ Bulbs\ x\ kW\ Savings\ per\ Bulb$$

$$Customer\ kWh = Customer\ kW\ x\ Hours$$

$$Peak\ Coincident\ kW = Customer\ kW\ x\ Coincident\ Factor$$

Variables

Number of Bulbs	Vendor Input	Number of bulbs sold.
$Wattage_{Baseline}$	Tables 11.1.1-11.1.5	Baseline wattages are determined using an adjusted ENERGYSTAR lumen equivalency rating, adjusted for EISA requirements based on lumen ouptut. Direct install measures use removed wattage. Linear lamps based on past participation.[1, 2]
$Wattage_{LED}$	Manufacturer	Wattage of the LED bulb, provided by each manufacturer.
Lifetime Hours	Table 11.1.6	Lifetime Hours for LEDs.[5]
Hours	Table 11.1.7	Annual hours of operation for the bulbs for both residential and non-residential segments.[3, 4, 8, 9]
Coincident Factor	Table 11.1.7	Probability that peak demand of the bulb will coincide with peak utility system demand.[3, 4, 8]
Measure Life	~~Tables 11.1.8~~ Table 11.1.7	Measure life of the average bulb sold, determined by lifetime hours divided by hours of use by segment.
Incremental Cost of Bulbs	Table 11.1.9	Cost difference between baseline and efficient bulb options.[6, 7]
Labor Costs	Table 11.1.10	Cost of labor to install fixtures, Type B, and Type C lamps.[15]
~~NTG~~	~~61%~~	~~Net to Gross for A-Line and Specialty bulbs.~~[9]
~~NTG~~	~~100%~~	~~Net to Gross for LED Tubes, PL and Mogul lamps.~~[10]
NTG	Table 11.1.11	Net-to-gross factor.[9,10,17]
Installation Rate	99%	Future savings for bulbs purchased and put in storage and installed in later years. The net present value of the saving for all bulbs purchased is 100% if all bulbs are installed when purchased.[8]
Non-Energy O&M savings	$0.00	Non-Energy operation and maintenance savings are assumed to be zero.

Provided by Product Vendor	**M&V Verified**
Number and type of bulbs purchased	Yes

Assumptions

The baseline bulb cost and LED bulb cost will be tracked and updated at the end of the year in the status report to account for the rapid evolving market and cost for LED bulbs. The baseline will be reviewed and updated at least semi-annually and the LED bulb cost will be reviewed and updated monthly.
Specialty bulbs on the forecast include Specialty, R, BR, and ER Bulbs, 3-way Bulbs as well as PAR, MR, and MRX Bulbs.
Assume all sales made through the pro-desk will be to small business customers.
If the formula below for the PAR, MR and MRX Lamp baseline equivalent results in a negative or undefined value, the manufacturer recommendation is used.

Table 11.1.1: GSL Bulbs [1]

Minimum Lumens	Maximum Lumens	Incandescent Equivalent Wattage	
		Baseline (Exempt Bulbs)	Baseline (Post-EISA)
2,000	2,600	150	72
1,600	1,999	100	72
1,100	1,599	75	53
800	1,099	60	43
450	799	40	29
310	449	25	25

*GSL bulbs are medium screw-base bulbs that are not globe, bullet, candle, flood, reflector, or decorative shaped

Table 11.1.2: Specialty Bulbs [1]

Lumen Bins				Incandescent Equivalent Wattage	
Decorative Shape		Globe Shape		Baseline	Baseline
		1100	1300	150	72
		650	1099	100	72
		575	649	75	53
500	699	500	574	60	43
300	499	350	499	40	29
150	299	250	349	25	25
90	149			15	15
70	89			10	10

*Specialty bulbs are medium screw-base bulbs that are globe, bullet, candle or decorative shaped

Table 11.1.3: R, BR, and ER Bulbs[1, 2]
EISA Impacted[1, 2, 14]

Bulb Type	Lower Lumen Range	Upper Lumen Range	$Watts_{Base}$
R, ER, BR with medium screw bases w/diameter >2.25" (*see exceptions below)	420	472	40
	473	524	45
	525	714	50
	715	937	65
	938	1,259	75
	1,260	1,399	90
	1,400	1,739	100
	1,740	2,174	120
	2,175	2,624	150
	2,625	2,999	175
	3,000	4,500	200
*R, BR, and ER with medium screw bases w/diameter <=2.25"	400	449	40
	450	499	45
	500	649	50
	650	1,199	65
*ER30, BR30, BR40, or ER40	400	449	40
	450	499	45
	500	649	50
*BR30, BR40, or ER40	650	1,419	65
*R20	400	449	40
	450	719	45
*LED Fixtures	420	560	45
	561	837	60
	838	1,203	75
	1,204	1,681	100
	1,682	2,339	120
	2,340	3,075	150
*All reflector lamps below lumen ranges specified above	200	299	20
	300	399	30

PAR, MR, MRX Bulbs
The following equation is used to determine the baseline wattage for these bulbs, result should be rounded down to the nearest wattage in Table 4.

$$Wattsbase = 375.1 - 4.355(D) - \sqrt{227{,}800 - 937.9(D) - 0.9903(D^2) - 1479(BA) - 12.02(D * BA) + 14.69(BA^2) - 16{,}720 * ln(CBCP)}$$

D = Bulb Diameter
BA = Beam Angle
CBCP = Center Beam Candle Power

Table 11.1.4: PAR, MR, MRX Bulbs - Energy Star Permitted Wattages [1, 2]

Diameter	Permitted Wattages
16	20, 35, 40, 45, 50, 60, 75
20	50
30S	40, 45, 50, 60, 75
30L	50, 75
38	40, 45, 50, 55, 60, 65, 75, 85, 90, 100, 120, 150, 250

Table 11.1.5: Linear Lamps [11]

	Watts
Baseline	30.50

Table 11.1.6: Lifetime Hours [5]

Bulb Category	Lifetime (Hours)
A-Line	16,695
~~Specialty~~	~~23,118~~
~~Specialty (Exempt)~~	~~53,639~~
Reflectors	23,380
Globe/Decorative	15,068
3-Way	15,241
Fixtures (Retrofit kits)	53,639
Linear Lamps	49,714

Table 11.1.7: Hours, CF, Measure Lifetime [3, 4, 8, 13]

Bulb Category	Installation Type	Hours	CF	% Breakdown	Measure Lifetime 2021	Measure Lifetime 2022
A-Line	Residential	986	12.6%	94%	16.9	16.9
~~Specialty~~					20.0	20.0
~~Specialty (Exempt)~~					20.0	20.0
Reflectors					3.0	2.0
Globe/Decorative					3.0	2.0
3-Way					15.5	15.5
Fixtures (Retrofit kits)					20.0	20.0
Linear Lamps				24%	20.0	20.0
A-Line	Non-Residential	4,897	75.3%	6%	3.4	3.4
~~Specialty~~					4.7	4.7
~~Specialty (Exempt)~~					11.0	11.0
Reflectors					3.0	2.0
Globe/Decorative					3.0	2.0
3-Way					3.1	3.1
Fixtures (Retrofit kits)					11.0	11.0
Linear Lamps				76%	10.2	10.2

~~**Table 11.1.8: Measure Life (Years)**~~

~~Installation Type~~	~~Program Year~~	~~Specialty (Non-Exempt)~~	~~Specialty (Exempt)~~
~~Residential~~	~~2021~~	~~6.5~~	~~20~~
	~~2022~~	~~5.1~~	~~20~~
~~Non-Residential~~	~~2021~~	~~3.7~~	~~11.0~~
	~~2022~~	~~2.7~~	~~11.0~~

Table 11.1.9: Average Costs* [6, 7, 12, 15]

Type	Rebate
A-Line	$1.24
Fixtures (Retrofit kits) Residential	$1.47
Fixtures (Retrofit kits) Business	$2.88
Reflectors Residential	$1.47
Reflectors Business	$1.47
Globe/Decorative Residential	$1.47
Globe/Decorative Business	$1.47
3-Way Residential	$1.47
3-Way Business	$1.47
~~Specialty Residential~~	~~$1.55~~
~~Specialty Business~~	~~$1.74~~
Linear Lamps Residential	$2.00
Linear Lamps Business	$2.75
MFBE LED Globe	$5.00
MFBE LED A19 EnergyStar Rated Lamp	$5.00
MFBE LED Candelabra	$5.00
MFBE LED BR30 Flood	$5.00
MFBE LED MR16 Reflector	$5.00
MFBE LED PAR30	$5.50
School kits 9W LED	$3.19
School kits 11W LED	$4.81
School kits 15W LED	$2.65
School kits 8W Reflector	$2.65
School kits 6W Globe	$2.65
School kits 3-Way LED	$2.65
School kits 5W Candelabra	$2.65
Squad LEDs	$2.65

Costs are provided by the vendor and are re-evaluated throughout the year to account for the rapidly evolving market.

Table 11.1.10: Labor Costs* [15]

Bulb Category	Labor Cost
LED Linear Lamps - Type B	$8.00
LED Linear Lamps - Type C	$12.00
LED PL Lamp - Type B	$12.00
LED Mogul Based HID Replacement	$55.00

Table 11.1.11: NTG Values[9,10,17]

Bulb Category	Program Year 2021	Program Year 2022
LED Bulb - A-Line	61.0%	47.9%
LED Bulb - Fixtures (Retrofit kits)	61.0%	78.0%
LED Bulb - Reflectors	61.0%	22.2%
LED Bulb - Globe/Decorative	61.0%	47.9%
LED Bulb 3-Way	61.0%	71.8%
LED Tubes (Linear Lamps)	100.0%	78.0%

References:

1. The Uniform Methods Project: Residential Lighting Evaluation Protocol, published April 2013. Page 11.
2. State of Illinois Energy Efficiency Technical Reference Manual Final Technical Version as of February 8th, 2017, effective January 1st, 2018. Vol 3, Pages 244-245.
3. Northeast Residential Lighting Hours-of-Use Study, Pages XVI and 37
4. "Lighting - Small Business" participation data from 3/1/2017 through 2018.
5. Lifetime hours from program administrator for bulbs sold in 2019 used to calculate weighted lifetimes.
6. 2018 CO Home Lighting Product Results compiled by WECC (program administrator).
7. Market survey 2018 (homedepot.com, lowes.com, samsclub.com, target.com, walmart.com, etc)
8. 2016 CO Home Lighting and Recycling Evaluation by Cadmus, 2016. Pages 35, 72-73.
9. 2018 CO Home Lighting and Recycling Evaluation by EMI Consulting, Dec 12 2018. Page 5.
10. 2019 Unopposed Comprehensive Settlement Agreement
11. Estimated values based on ranges provided by Slipstream (WECC) and historical participation in "CO Lighting Efficiency" product
12. 2019 CO Home Lighting Product Results complied by program administrator.
13. DOE 2015 US Lighting Market Characterization.
14. MN Technical Reference Manual Version 3.0 Page 26.
15. "Lighting Efficiency - CO" and "Lighting - Small Business" participation data from 2017 through 2019.
16. Colorado House Bill 2019-1231
17. 2021 CO home Lighting and Recycling Evaluation by TRC and Apex Analytics, Jan 25 2022. Page 5

Changes from Recent Filing:

1. Updating NTG Values to reflect the most recent program evaluation completed by TRC Apex Analytics provided to Xcel on Jan 25 2022.

Program	Measure Group	Measure Lifetime (years)	Rebate Amount ($)	Incremental Cost ($)	Annual Customer kWh Savings (kWh/yr)	Annual Customer Peak Coincident Demand Savings (PCkW)	Gas Savings (Dth)	Non-Energy O&M Savings ($)	Electric NTG (%)	Gas NTG (%)	Install Rate (%)	2021 Electric Units	2022 Electric Units	2021 Gas Units	2022 Gas Units
Home Lighting	Residential Home Lighting - Residential Customers	10	$1	$2	43	0.005	0.0	$0.00	50%	50%	99%	1,609,034	1,433,168	0	0
Home Lighting	Residential Home Lighting - Business Customers	6	$2	$8	138	0.021	0.0	$0.00	66%	66%	99%	270,487	287,717	0	0

HOME LIGHTING & RECYCLING

2022 Net Present Cost Benefit Summary Analysis For All Participants

	Participant Test ($Total)	Utility Test ($Total)	Rate Impact Test ($Total)	Modified Total Resource Test ($Total)
Benefits				
Avoided Revenue Requirements				
Generation Capacity	N/A	$5,110,976	$5,110,976	$5,110,976
Trans. & Dist. Capacity	N/A	$640,085	$640,085	$640,085
Marginal Energy	N/A	$8,260,625	$8,260,625	$8,260,625
Avoided Emissions (CO2)	N/A	N/A	N/A	$6,347,918
Subtotal				$20,359,604
Non-Energy Benefits Adder (20.0%)				$2,802,337
Subtotal	N/A	$14,011,686	$14,011,686	$23,161,941
Participant Benefits				
Bill Reduction - Electric	$41,143,985	N/A	N/A	N/A
Participant Rebates and Incentives	$2,802,239	N/A	N/A	$2,802,239
Incremental Capital Savings	$0	N/A	N/A	$0
Incremental O&M Savings	$0	N/A	N/A	$0
Subtotal	$43,946,223	N/A	N/A	$2,802,239
Total Benefits	$43,946,223	$14,011,686	$14,011,686	$25,964,180
Costs				
Utility Project Costs				
Program Planning & Design	N/A	$0	$0	$0
Administration & Program Delivery	N/A	$759,863	$759,863	$759,863
Advertising/Promotion/Customer Ed	N/A	$625,000	$625,000	$625,000
Participant Rebates and Incentives	N/A	$2,802,239	$2,802,239	$2,802,239
Equipment & Installation	N/A	$0	$0	$0
Measurement and Verification	N/A	$5,000	$5,000	$5,000
Subtotal	N/A	$4,192,102	$4,192,102	$4,192,102
Utility Revenue Reduction				
Revenue Reduction - Electric	N/A	N/A	$41,143,985	N/A
Subtotal	N/A	N/A	$41,143,985	N/A
Participant Costs				
Incremental Capital Costs	$6,617,549	N/A	N/A	$3,965,208
Incremental O&M Costs	$0	N/A	N/A	$0
Subtotal	$6,617,549	N/A	N/A	$3,965,208
Total Costs	$6,617,549	$4,192,102	$45,336,087	$8,157,310
Net Benefit (Cost)	$37,328,675	$9,819,584	($31,324,401)	**$17,806,870**
Benefit/Cost Ratio	6.64	3.34	0.31	**3.18**

Note: Dollar values represent present value of impacts accumulated over the lifetime of the measures.

2022 ELECTRIC GOAL

Input Summary and Totals

Program "Inputs" per Customer kW and per Participant		
Lifetime (Weighted on Generator kWh)	A	8.8 years
T & D Loss Factor (Energy)	B	6.00%
T & D Loss Factor (Demand)	C	8.46%
Net-to-Gross (Energy)	D	50.49%
Net-to-Gross (Demand)	E	51.14%
Installation Rate (Energy)	F	**99.00%**
Installation Rate (Demand)	G	**99.00%**
Net coincident kW Saved at Generator	H	0.00 kW
Gross Annual kWh Saved at Customer	I	48.31 kWh
Net Annual kWh Saved at Generator	J	25.67 kWh

Program Summary All Participants		
Total Budget	K	**$4,192,102**
Net coincident kW Saved at Generator	L	**6,313 kW**
Gross Annual kWh Saved at Customer	M	83,136,603 kWh
Net Annual kWh Saved at Generator	N	**44,175,156 kWh**
Total MTRC Net Benefits with Adder	O	**$17,806,870**
Total MTRC Net Benefits without Adder	P	**$15,004,533**
Utility Program Cost per kWh Lifetime	K/(A x N)	**$0.0108**
Utility Program Cost per kW at Gen	K/ L	**$664**
Avoided Lifetime CO2 Emissions, Total Program (tons CO2)		**155,177**