Consumer Preference Survey on Directional LED Replacement Lamps for Retail Applications

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LEGAL NOTICE

ABBREVIATIONS AND ACRONYMS

CCT	Correlated color temperature
CFL	Compact fluorescent lamp
CLTC	California Lighting Technology Center
CRI	Color rendering index
kWh	Kilowatt-hour
LED(s)	Light-emitting diode(s)
LPD	Lighting power density
MR	Multifaceted reflector
PAR	Parabolic aluminized reflector
W	Watt

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EXECUTIVE SUMMARY

FIGURE 1. CITY OF DAVIS RETAILERS EXAMINE LIGHT QUALITY IN LUX RETAIL LIGHTING SHOWCASE

PROJECT GOAL

Pacific Gas and Electric Company (PG&E) partnered with the California Lighting Technology Center (CLTC) at the University of California, Davis, to assess how education or incentive programs for directional LED replacement lamps might best serve retail business owners within PG&E's service territory. LED replacement lamps provide a solution for business and building owners looking to increase the energy efficiency of their lighting systems in order to meet, or exceed, 2013 Title 24 standards. These new efficiency standards will significantly reduce the maximum lighting power density (LPD) allowed for nonresidential buildings, including retail spaces. As PG&E considers the inclusion of LED lamps in rebate programs or encourages the adoption of the technology by other means, it is important that quality, objective information, derived from a sound test methodology, inform the decision-making process. The California Energy Commission also contributed resources to this project through funding from the Public Interest Energy Research program.

PROJECT DESCRIPTION

A retail lighting vignette, called Lux, was created at CLTC to allow retailers to compare LED replacement lamps with traditional halogen light sources. The retail lighting demonstration space, built to resemble a small apparel boutique, also allowed visitors to compare lighting from different brands of LED lamps currently available on the market. The project focused on LED replacement options for halogen parabolic aluminized reflector (PAR) lamps and multifaceted reflector (MR) lamps, as these are commonly used for directional and accent lighting purposes in retail applications. More specifically, PAR 38 and MR 16 lamps were selected for evaluation, with an emphasis on the PAR 38. Linear LED jewelry case lighting products were also included in Lux. Approximately 400 square feet in size, the space

provided retailers with firsthand demonstrations of these directional LED replacement lamps, as well as basic lighting technology and design information.

The demonstration space also served as a venue for surveying retail professionals on their knowledge, current lighting choices, lighting preferences, and decision-making processes. Data was collected through a 20-question survey (see Appendix 1: Survey and Lux Visitor Feedback) that consisted of yes/no, multiple choice and open-ended questions. Information was gathered either at CLTC, in the course of touring the demonstration space, or as part of a follow-up visit at the retailers' stores. These follow-up visits allowed retailers to sample LED lamps on their sales floors, using their own merchandise and displays. Survey responses were made confidential to encourage visitors to offer candid, honest feedback. This information on consumer experiences and preferences will assist PG&E's Emerging Technologies team in the development of incentive programs and other means of encouraging the adoption of
LED technologies.

PROJECT FINDINGS/RESULTS

At the time this report was submitted, 87 retailers across various market segments (most notably, the apparel and boutique sectors) have provided information on their lighting preferences and factors that influence their purchasing decisions. Of those surveyed, 83 percent have not made any changes to their lighting systems in the last five years, yet over 50 percent are unsatisfied with their current lighting, and nearly 75 percent of respondents are considering upgrading to LED technologies. As 76 percent of those surveyed use predominantly incandescent sources, a lasting shift to LED replacement options would constitute a sizable reduction in lighting energy use within this sector (see Figure 2).

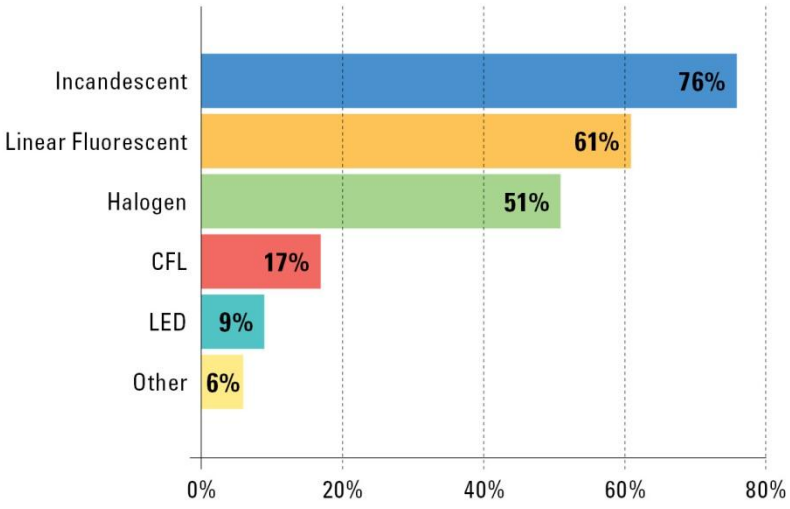

FIGURE 2. CURRENT LIGHTING CHOICES

Survey results indicate that incandescent sources, including halogen lamps, are currently far more prevalent than CFLs, LEDs or other energy-efficient alternatives. Retailers identified the initial cost of a lighting upgrade as their greatest concern. Most would accept a payback period of one to two years for an LED lighting retrofit, but only 13 percent were willing to accept anything longer.

The survey also revealed that retailers rely most heavily on their peers for information about lighting, and just 6 percent consider utilities their primary source for lighting facts or guidance. These survey results, coupled with outreach efforts for the Lux project, suggest that PG&E can likely extend its influence in this sector by tapping into retailers' professional and social networks and working with academic institutions and contractors to share information and provide guidance to its customers.

PROJECT RECOMMENDATIONS

Survey findings suggest that providing a financial incentive of $30–$35 per LED PAR 38 replacement lamp unit will reduce initial costs and shorten payback periods to the two-year length most survey participants deemed acceptable. This estimate is based upon the average cost and average wattage of the lamps used in the survey. Energy costs were estimated at 15 cents per kilowatt-hour (kWh) with calculations based on an operating time of 10 hours per day. Without rebates or incentives, current payback periods are about five and a half years—more than double the two-year payback deemed acceptable by retailers.

Survey data indicates that price and incentives have substantial influence on retailers' decisions when it comes to purchasing new lighting products (see Figure 3).

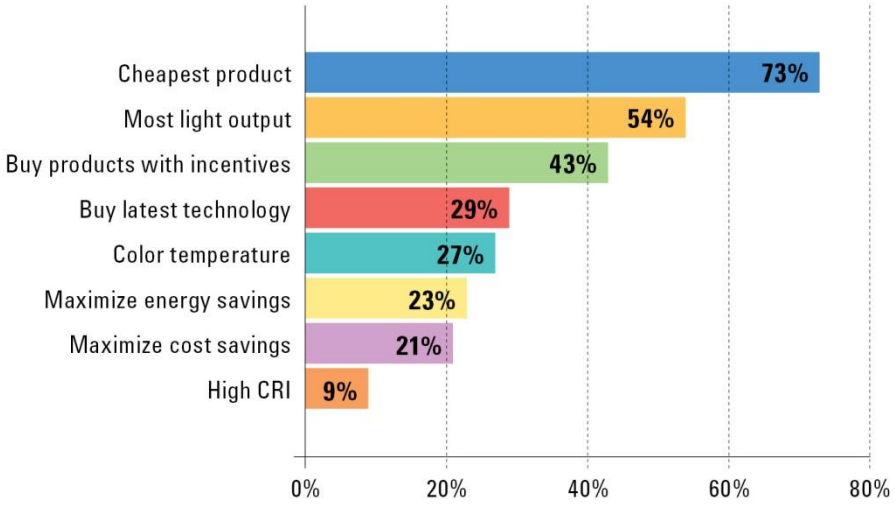

FIGURE 3. FACTORS WEIGHED IN SELECTING NEW LIGHTING PRODUCTS

OVERVIEW

According to estimates from the U.S. Department of Energy, light-emitting diodes (LEDs) will account for 70 percent of all commercial lighting by 2030.[1] This is due, in part, to the strengthening of efficiency standards in the U.S. and in California most notably. California's 2013 Title 24 standards, which take effect in 2014, significantly reduce the maximum lighting power density allowed for nonresidential buildings, including retail spaces. LEDs can provide excellent lighting for retail applications, as well as significant energy savings and longer lifetimes than older light sources, but LED replacement lamps vary widely in terms of their quality and reliability. Many consumers are still unfamiliar with this new technology. Guidance and education are needed across the commercial sector to help consumers select lighting products that will result in long-term satisfaction.

In response to this need, Pacific Gas and Electric Company (PG&E) partnered with California Lighting Technology Center (CLTC) at the University of California, Davis to assess how education or incentive programs might best support a transition to LED lighting technologies among retail business owners. The California Energy Commission also contributed resources to this project through funding from the Public Interest Energy Research program. To meet this objective, the project partners created a retail lighting vignette at CLTC that resembles a small apparel boutique. The vignette space, called Lux, was designed to provide retailers with firsthand demonstrations of directional LED replacement lamps, as well as basic lighting technology and design education, which could help them evaluate LED replacement lamps. The demonstration space also facilitated surveys of retail professionals on their knowledge, lighting preferences and decision-making processes. This collection of feedback and information on consumer experiences and preferences will assist PG&E's Emerging Technologies team in the development of incentive programs to facilitate large-scale adoption of LED technologies in retail spaces.

[1] U.S. Department of Energy (January 2012), Energy Savings Potential of Solid-State Lighting in General Illumination Applications. Washington D.C.: U.S. Department of Energy.

DEMONSTRATION SPACE AND TECHNOLOGIES

FIGURE 4. LUX, LED RETAIL LIGHTING SHOWCASE

Lux, the retail demonstration and education area at CLTC, was designed to provide small to medium-sized retail organizations with an expert introduction to LED lighting and replacement lamp options. The 400-square-foot vignette mimics a clothing and accessories boutique, providing products in an array of colors and textures, to offer a visually diverse environment that allows retail professionals to compare the effects of different light sources on the products.

The demonstration space allows visitors to engage in firsthand evaluations of PAR 38 and MR 16 replacement lamps that use LED technology, and to compare these LED lamps with traditional halogen equivalents.

Several types of LED technologies are available for evaluation in Lux; these include seven brands of PAR 38 lamps, five brands of MR 16 lamps, and two brands of linear LED lighting products for jewelry cases. Installed in parallel track lighting fixtures, each adjustable PAR 38 lamp in the showcase space can be individually controlled from a master panel, allowing visitors to see how different lighting products compare in terms of color rendering, brightness and light distribution, etc. (see Figure 5 and Figure 6).

FIGURE 5. CONTROL PANEL FOR LED REPLACEMENT LAMPS IN LUX

FIGURE 6. LED PAR 38 LAMPS IN TRACKS IN LUX

The LED PAR 38 lamps in Table 1, were selected for the survey based on their market availability, quality specifications (CRI, CCT, lifetime, etc.), and their eligibility for broad market adoption.

TABLE 1. LED PAR 38 LAMP SPECIFICATIONS

	LAMP A	LAMP B	LAMP C	LAMP D	LAMP E	LAMP F
Wattage	13	20	19	17	21	18
CCT	3000	2800	3000	3000	3000	3000
CRI	92	82	85	87	95	85
Lumens	1000	1200	1200	820	1150	850
Lumens/Watt	77	60	63	48	55	47
Lifetime (Hours)	35,000	25,000	25,000	25,000	25,000	25,000
Beam Angle	25 deg.	25 deg.	25 deg.	25 deg.	25 deg.	25 deg.
Dimming	yes	yes	yes	yes	yes	yes
Warranty	3 years	5 years	3 years	5 years	5 years	5 years

Lamps A–E were displayed in Lux, along with a halogen PAR 38 lamp, on a shelf beside the control panel pictured in Figure 5. Corresponding lighting facts labels were placed beside each one. These uniform lighting facts labels were created for the demonstration space to provide visitors with information like that listed in Table 1. The format allowed visitors to familiarize themselves with each lamp and compare factors like brightness and efficiency.

MR 16 pendant lights were also demonstrated in the space, four with LEDs and one with an incandescent source. These lamps were hung parallel and close together over a table display where they provided accent lighting as they might in a typical boutique display. A wide assortment of colored pashminas and displays of nail polish in a variety of colors and finishes allowed visitors to explore the differences between the available lighting products, and compare the visual appeal of the light. Basic lighting measurement tools, including light meters, were available to those who wished to evaluate more technical aspects. Lighting facts labels were also displayed near the MR 16 lamps.

Two linear lighting products for jewelry case displays were also included in Lux, demonstrating distinct correlated color temperatures (see Figure 7). As small directional light sources, LEDs are well suited for applications like this. Because the market for this type of product is fairly narrow, these two products represent a fairly sizable portion of what is available on the market today.

FIGURE 7. JEWELRY CASE LED LIGHTING IN LUX

Figure 7 illustrates how visitors to Lux could see the difference between LED lighting with a warmer and cooler CCT, in the left and right cases, respectively, and how this aspect of lighting can affect jewelry case displays.

SURVEY DESIGN

The demonstration and education space at CLTC also served as a venue for gathering information about retailers' lighting preferences and decision-making processes. Data was collected through a 20-question survey (see Appendix 1: Survey and Lux Visitor Feedback for questions included), in-depth interviews and discussions with retail business owners. The survey was designed to gather information about retailers' preferences and experiences with LEDs, as well as to further understand how retail organizations evaluate lighting and make upgrade decisions. Survey responses were made confidential to encourage visitors to offer candid, honest feedback. Information was gathered either at CLTC, in the course of touring the demonstration space, or as part of a follow-up visit at the retailers' stores. These follow-up visits allowed retailers to sample LED lamps on their sales floors, using their own merchandise and displays (see Figure 8).

FIGURE 8. JEWELER IN DAVIS, CA COMPARING LED REPLACEMENT TO INCUMBENT HALOGEN PAR 38

A sociologist from UC Davis' Energy Efficiency Center was consulted in the course of developing the survey instrument. A postdoctoral scholar with expertise in qualitative research design, she helped refine the survey to ensure that it conveyed the project's objectives to research participants, captured relevant demographic data, and elicited sound information and feedback, by employing a combination of open-ended and close-ended (multiple choice and yes/no) questions.

Initial participation in the LED demonstration program was facilitated primarily through existing partnerships with local businesses, Davis Chamber of Commerce and through local media coverage of the public Lux opening event. Thereafter, indirect outreach proved to be most effective. Most participants were referred to CLTC by other businesses in the retail sector, reflecting what retailers would later reveal in the survey: Retailers' primary source of information on lighting is gathered through other retailers. Many retailers expressed initial concerns that the event might be aimed at increasing sales, as opposed to research objectives or education. Peer relationships and word-of-mouth proved valuable in correcting this misconception.

Data was collected from 87 respondents (as of November 30, 2012). That data was then aggregated and the results summarized. Analysis consisted primarily of simple statistical evaluation of the survey sample to estimate population proportions of retailer opinions. Each retailer was given equal weight, under the assumption that our sample of participants is an accurate reflection of retailers interested in lighting upgrades. This assumption was made based on the fact that all respondents are retail professionals interested in lighting upgrades and potential incentives, and because all who participated in the survey did so voluntarily.

Each survey data point was identified according to market sector (e.g., boutique, furniture, supermarket/grocery, etc.) when it was recorded, allowing for cross-sectional analysis of how responses differed, or did not differ, by sector.

The survey was limited geographically to retailers within PG&E's territory, with the majority of respondents located within a 50-mile radius of the CLTC facility in Davis, California. The response sample was also limited to voluntary participants, potentially increasing the number of early technology adopters and more environmentally conscientious retailers represented in the sample.

SURVEY RESULTS

To date, 87 retailers across various retail market segments have provided detailed feedback. Most of the retailers surveyed identify themselves as "apparel" or "boutique" retailers (see Figure 9).

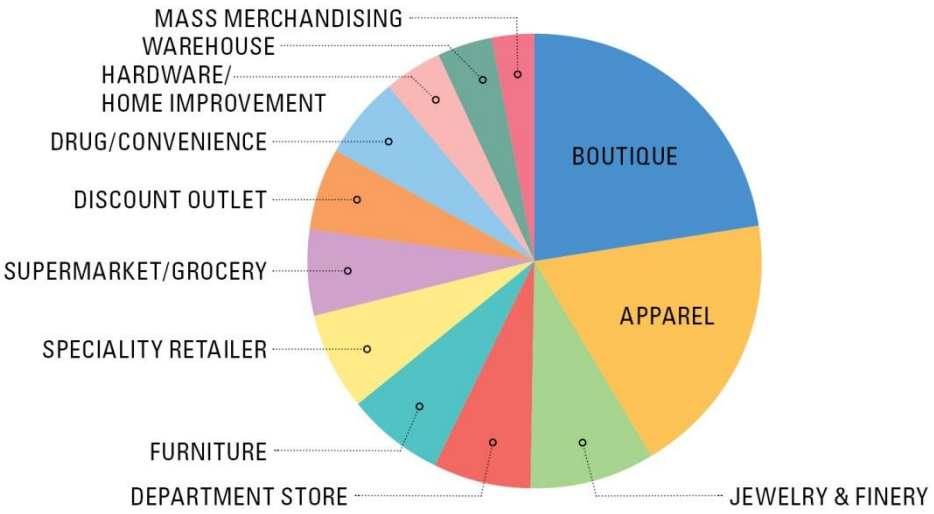

FIGURE 9. REPRESENTATION OF RETAIL MARKET SEGMENTS

Incandescent, linear fluorescent and halogen light sources are most prevalent in the retail establishments of those surveyed while CFL and LED sources are rarely used (see Figure 10). This indicates the sizable energy savings that could be achieved with a widescale move from incandescent and halogen lighting to LED technologies in this sector.

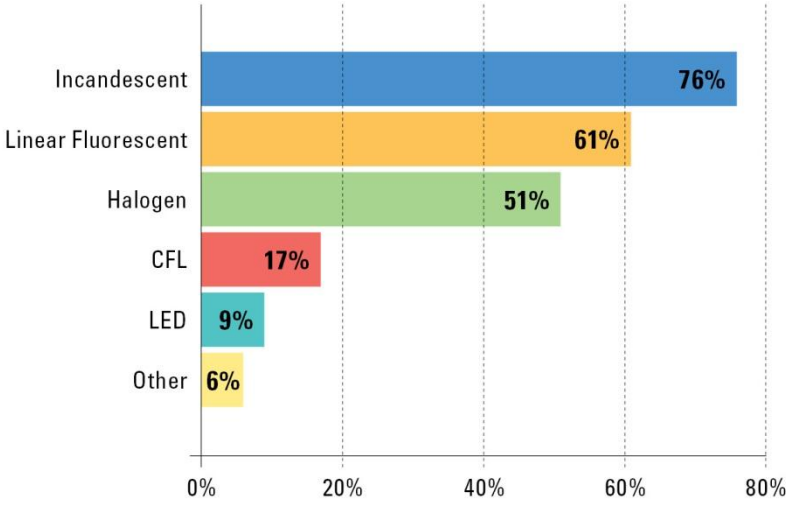

FIGURE 10. CURRENT LIGHTING CHOICES

Incandescent and halogen light sources, commonly used for directional and accent lighting purposes in retail applications, were demonstrated alongside LED replacement options in the retail showcase space at CLTC. Linear fluorescent lamp replacements were not among the technologies in the LED demonstration space, but this lamp type, common for task and ambient lighting in retail spaces, was included as an option on the survey in order to capture a whole and accurate picture of current lighting technology use in retail applications.

Of those surveyed, 83 percent have not made any changes to their lighting systems within the last five years, yet over 50 percent of respondents are at least "somewhat unsatisfied" with their current lighting (see Figure 11). The survey's scope did not address retailers' reasons for dissatisfaction.

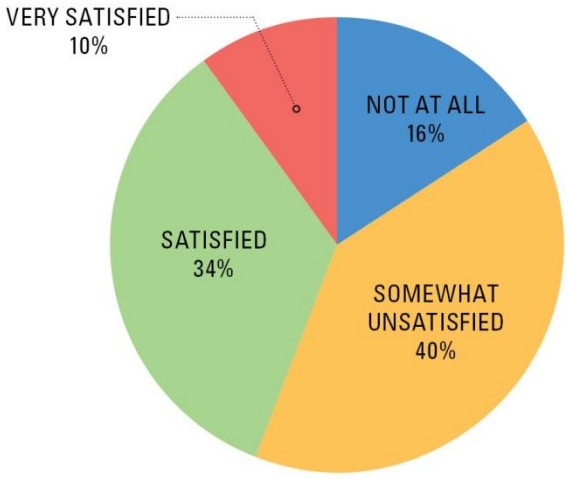

FIGURE 11. SATISFACTION WITH CURRENT LIGHTING

Nearly 75 percent of respondents are considering upgrading to LED lighting. When asked about their preferences regarding the specific brands of directional LED lamps available in the showcase, 53 percent of respondents cited low energy consumption as an attractive quality of all the LED lamps demonstrated (see Figure 12). Forty percent of those surveyed cited color temperature as an influential factor; 39 percent of respondents cited the lamps' aesthetic appeal, and 36 percent indicated that the amount of light emitted by a lamp made them prefer it.

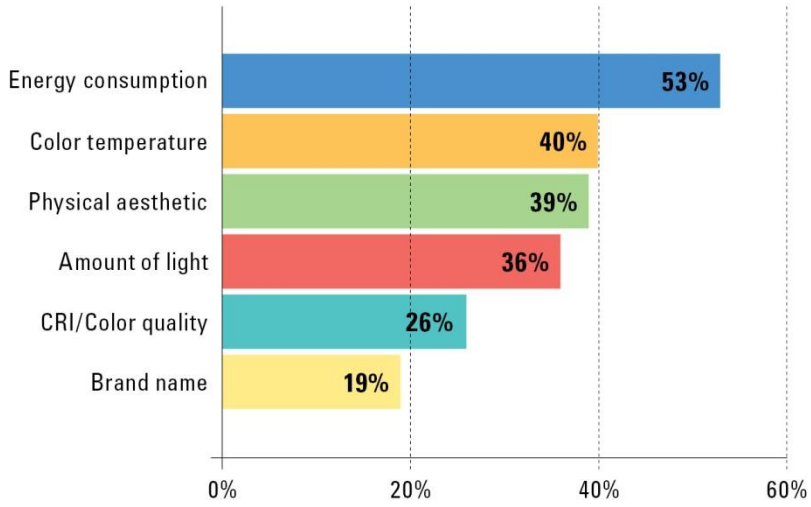

FIGURE 12. PREFERENCE FACTORS

When disaggregated, the data made evident that preferred characteristics varied by lamp. Results also varied by sector; for example, boutique retailers were more conscious of the physical form factors and aesthetics of lamps than any other sector.

Of those participants who had already evaluated LED replacement lamps prior to visiting Lux, most cited high upfront costs and long payback periods as their primary concerns when considering lighting upgrades (see Figure 13).

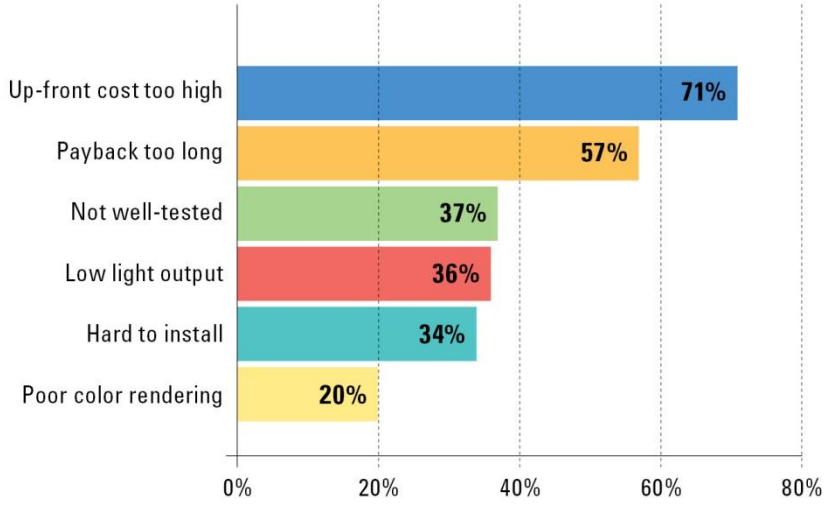

FIGURE 13. RETAILERS' PERCEPTIONS OF LED REPLACEMENT LAMPS PRIOR TO VISITING LUX

Most retailers deemed a payback period of about one to two years acceptable, but only 15 percent were willing to accept anything longer (see Figure 14).

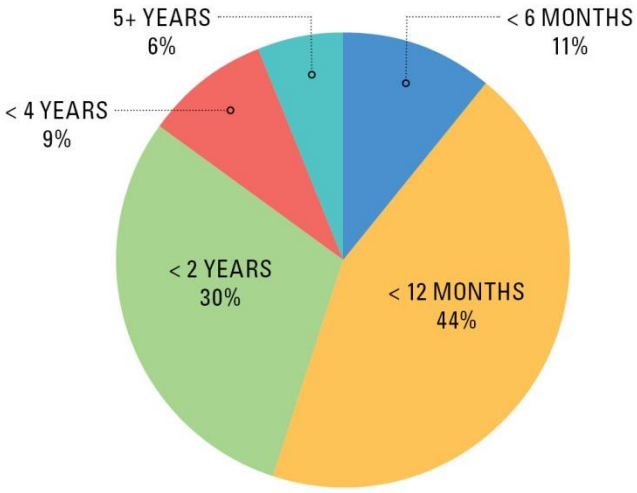

FIGURE 14. ACCEPTABLE PAYBACK PERIODS

TECHNOLOGY BARRIERS AND OPPORTUNITIES

The retailers surveyed indicated three primary factors driving their decision-making with regard to lighting upgrades:

- Cost
- Knowledge and understanding
- Potential impact on sales

The results indicate cost is first and foremost on retailers' minds when evaluating lighting upgrades. Those surveyed reported that this includes both upfront and long-term costs, yet 73 percent of them reported that they identify the cheapest product as an important part of their decision-making process (see Figure 15).

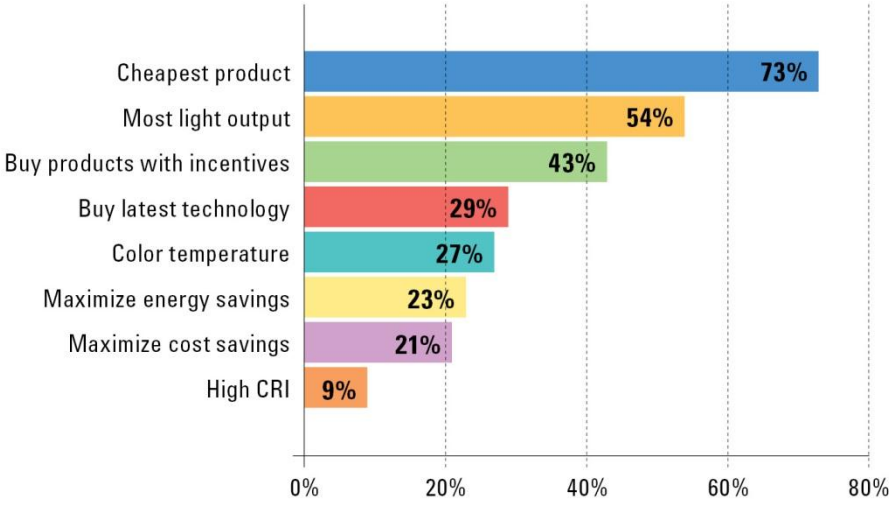

FIGURE 15. SELECTION PROCESS FOR NEW LIGHTING PRODUCTS

Most customers are looking to purchase lighting that is inexpensive and provides a large amount of light. This finding seems to highlight a market disadvantage for LED lighting products, which offer high lumen output and deliver long-term value but have higher upfront costs. It also underscores the critical role that rebates or other financial incentives can play in making LEDs more attractive to customers who are reluctant to pay high upfront costs.

Retailers surveyed indicated that they are not worried that changing light sources might negatively impact sales. Forty-seven percent indicated that the potential to increase sales would be a more compelling reason to upgrade than cost savings; 37 percent said they would be equally important; 14 percent said decreased energy costs would be a more compelling reason to switch; and just 2 percent responded that neither sales increases or energy savings would factor into their decision. (Figure 16 provides a graphic representation of these results.)

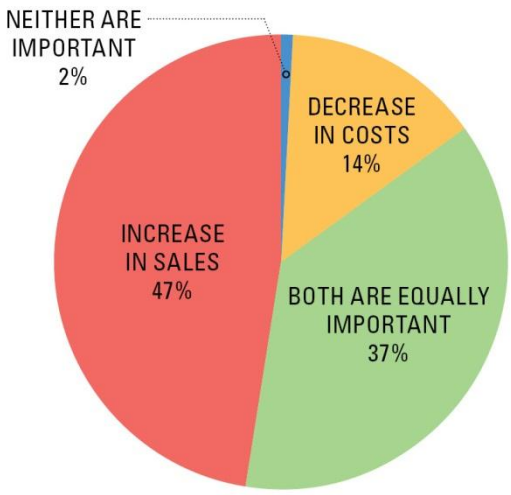

FIGURE 16. COMPELLING REASONS TO UPGRADE

LIGHTING EDUCATION IN THE RETAIL SECTOR

Of the business owners surveyed, the vast majority recognizes that lighting is a critical component of day-to-day operation; still, 31 percent indicated that they do not see value in upgrading their lighting systems (see Figure 17). Fifty-four percent of those surveyed cited "lack of understanding" as one of their biggest reservations when considering lighting upgrades; these retailers felt their knowledge of lighting design principles and technologies was lacking, and they were uncertain as to what they should look for when selecting LED replacement lamps. The cost of lighting upgrades was almost equally concerning to survey participants, followed by a perceived lack of real-world case studies conducted in retail stores.

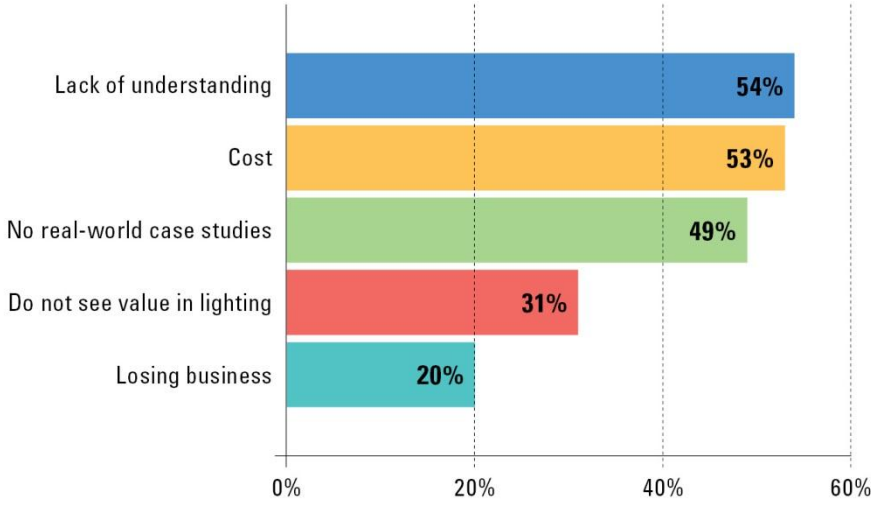

FIGURE 17. RESERVATIONS REGARDING LIGHTING UPGRADES

Many participants held outdated or incorrect assumptions about LEDs, especially regarding the cost and quality of LED luminaires. A significant number of those surveyed overestimated current price points for LEDs and were unaware of how quickly and consistently prices for this technology have dropped and continue to drop. According to the U.S. Department of Energy, the average cost of an LED luminaire was $180 in 2010. In 2015, it will be just $45, a price drop of roughly 75 percent in just five years.[2] The survey also revealed participants were unaware of how much LED quality and consistency has improved in recent years.

These misperceptions might be attributed, in part, to the surveyed retailers' heavy reliance on one other for information on lighting. Thirty-five percent of survey participants reported consulting fellow store owners for information on lighting, as opposed to other sources (see Figure 18).

[2] U.S. Department of Energy (January 2012), Energy Savings Potential of Solid-State Lighting in General Illumination Applications. Washington D.C.: U.S. Department of Energy.

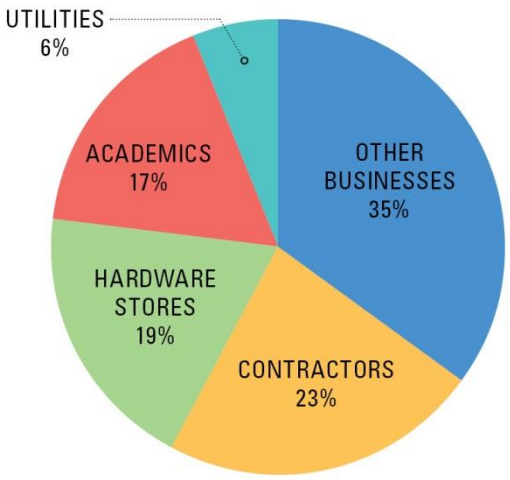

FIGURE 18. SOURCES FOR LIGHTING INFORMATION

EDUCATION CHANGES PERCEPTION OF LEDS

Most retailers have a basic understanding of lighting technology and terminology. After participating in the LED demonstration program, retailers began to recognize that transitioning to LEDs might provide a means to reduce operating costs and increasing sales.

More than half of respondents noted that they were familiar with the term Correlated Color Temperature (CCT) prior to visiting CLTC, but 70 percent noted that CCT was one of the most important concepts they learned during their visit to the lighting demonstration space. (Visitor feedback on the Lux space is included in Appendix 1: Survey and Lux Visitor Feedback.) This illustrates that even retailers who are acquainted with lighting concepts may
not have enough education to feel confident in their ability to evaluate and select LED products. (See Appendix 3:
Educational Materials and Outreach for select signage and print collateral displayed throughout Lux.)

Education also impacted survey respondents' attitudes toward energy efficiency as a feature of lighting products. Fifty-two percent of participants who previously did not consider energy use important indicated after the demonstration that they would make energy use part of their future evaluations of lighting systems and lamps. Participants also learned about cost savings associated with LEDs that are not related to energy savings, such as savings on maintenance, lamp replacement and disposal. These were factors that they had not considered prior to participating in the demonstration program.

Education has Immediate Impacts

Of the 87 participants in the demonstration program, five have upgraded or are in the process of upgrading to LED lighting as a direct result of their experience at CLTC. Their average lighting energy savings ranged from 60 to 75 percent. Business owners unanimously agreed that the decision to upgrade was clear once they understood the potential cost savings provided by LED technologies. Additional consideration was given to the increase in color quality provided by LED luminaires, especially in displays of high-value merchandise, where retailers were willing to see if lighting upgrades might increase sales of these high-ticket items.

Common Misconceptions and Knowledge Gaps

Retailers were generally unaware of how many options are available for LED technologies. Many were unaware of the long lifetimes associated with LED technology, and they were surprised to find that the color temperature and color rendering available in LED lamps was comparable to that found in traditional incandescent or halogen light sources.

Conclusions and Recommendations

Additional responses will provide improved statistical significance, especially for underrepresented retail subsectors. It has become clear that within the large retail sector there are several sub-sectors that have distinct preferences for LED replacement lamps. Further study would allow for more focused research into which lighting specifications play the largest roles for specific market segments.

Survey findings suggest that providing a financial incentive of $30–$35 per LED PAR 38 replacement lamp unit will reduce initial costs and payback periods to a sufficient degree to support retailers' adoption of LEDs. This estimate is based upon the average cost and average wattage of the lamps used in the survey. Energy costs were estimated at 15 cents per kWh with calculations based on an operating time of 10 hours per day. Without rebates or incentives, current payback periods are about five and a half years—more than double the two-year payback deemed acceptable by most of the retail survey participants.

Furthermore, survey data indicates that price and incentives have substantial influence on retailers' decisions when it comes to purchasing new lighting products.

On-site demonstrations were well received and could play a role in utility incentive programs aimed at increasing LED adoption. As retailers seem to rely on their peers for trusted information and referrals, targeted outreach events within PG&E's territory could serve to increase awareness of LED options for retail applications and increase customers' engagement in incentive programs.

As the retailers involved in the Lux opening event responded positively to being part of media coverage, PG&E might create opportunities for such visibility among its retail customers. For example, PG&E might create an online resource listing retail locations that have participated in LED incentive programs or installed a significant proportion of LED replacement lamps. This list or interactive map might present case studies or short summaries of retrofit results. A targeted outreach effort to direct small and medium business retail customers to this resource would allow retailers to identify other similar

businesses that have adopted LEDs and to perhaps view the results firsthand. That said, care should be taken to frame the results as objectively as possible as this project demonstrates this audience is sensitive to marketing materials that have an overt sales message; education resources with a more neutral, or academic, tone would likely be more effective in reaching this audience. Campaigns that tap into retailers' peer networks and that publicly highlight key retailers' participation could effectively encourage retailers to upgrade their lighting systems to more efficient sources.

APPENDIX 1: SURVEY AND LUX VISITOR FEEDBACK

TABLE 2. SURVEY QUESTIONNAIRE

1. How satisfied are you with your current lighting?
    a. Not at all
    b. Somewhat unsatisfied
    c. Satisfied
    d. Very satisfied
2. What are your biggest reservations when it comes to upgrading lighting systems?
3. How often do you evaluate the lighting in your store?
    a. Monthly
    b. Every 6 months
    c. Every 1-2 years
    d. Every 3-5 years
    e. Never
4. How do you select a new lighting product for an upgrade?
5. Where do you get most of your information about lighting?
    a. Other retail organizations
    b. Contractors
    c. Hardware stores
    d. Academics
    e. Utilities
    f. Lighting Designers
6. Are you familiar with the following terms? (Check if yes)
    a. Color Rendering Index
    b. Correlated Color Temperature
7. Have you made any recent changes to the lighting in your store?
    a. Yes
    b. No
8. Are you considering future lighting upgrades?
    a. Yes
    b. No
9. Have you conducted an evaluation of LED replacement lamps? What were the results?
10. What percent of total costs are your lighting energy costs in comparison with other costs of business?
    a. 0-5%
    b. 6-10%
    c. 11-15%
    d. 16-20%
    e. More than 20%
11. Which of these scenarios present a more compelling reason to upgrade?
    a. Decrease in costs
    b. Increase in sales
    c. Both are equally important
    d. Neither are important
12. What are you willing to accept in terms of payback period for lighting products?
    a. Less than 6 months
    b. Less than 1 year
    c. Less than 2 years
    d. Less than 4 years
    e. More than 5 years
13. What did you learn the most from the demonstration?
14. How could we improve the showcase experience for the future?
15. Overall, what was the most valuable part of your experience?

16. Overall, what was the least valuable part of your experience?
17. Which lamp do you prefer, overall?
18. What do you like about this lamp?
    a. Brand Name
    b. Amount of Light
    c. Color Temperature
    d. CRI/Color Quality
    e. Physical Aesthetic
    f. Energy Consumption
19. What lighting technologies are you currently using?
20. Which market segment do you belong to?
    a. Automotive Sales/Services
    b. Hardware/Home Improvement
    c. Mass Merchandising
    d. Supermarket/Grocery
    e. Warehouse
    f. Apparel
    g. Department Store
    h. Discount outlet
    i. Drug/Convenience
    j. Boutique
    k. Furniture
    l. Jewelry and Finery
    m. Specialty Retail

Visitors were asked to provide feedback on which aspects of their experience at Lux provided the greatest opportunity for learning about lighting. Respondents indicated that they learned the most about options available in LED technologies, especially with regard to longevity and CCT (see Figure 19). Information about utility incentive programs was also cited as being a critical component of the Lux experience.

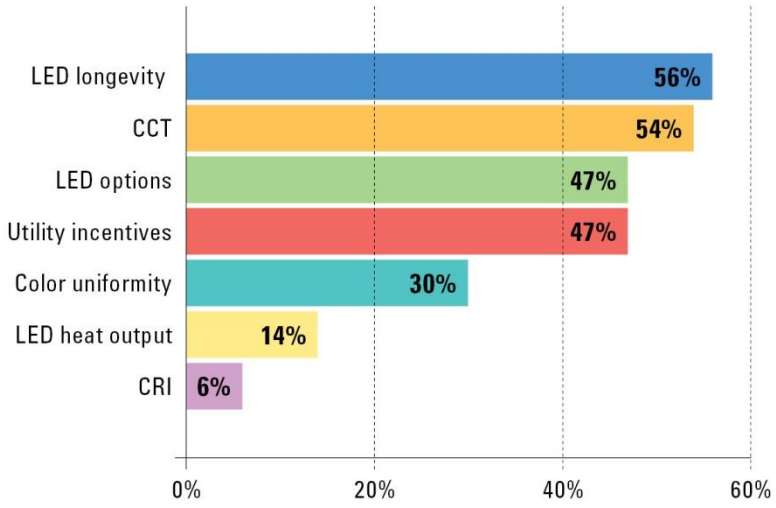

FIGURE 19. GREATEST LEARNING OUTCOMES FROM LUX VISITS

Other valuable outcomes from the experience included gaining a better understanding of LED pricing, incentives and financing options, as well as the ability to network with other retail professionals who are pursuing lighting improvements (see Figure 20).

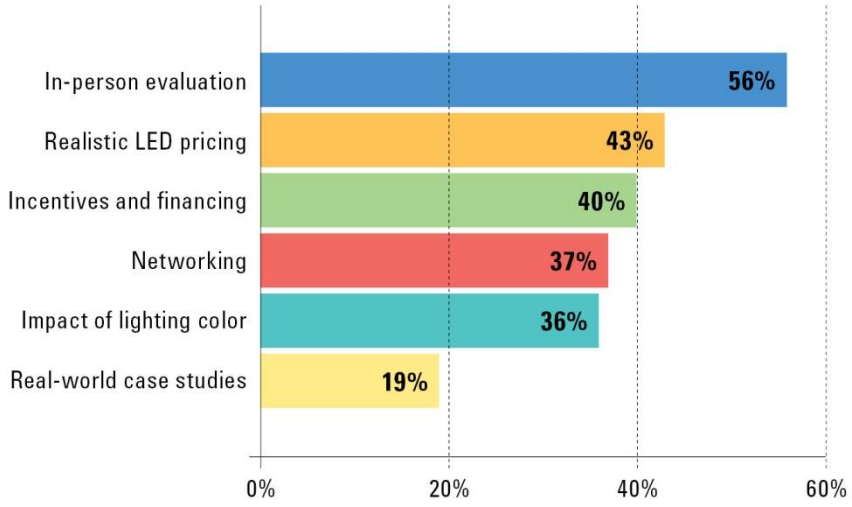

FIGURE 20. MOST VALUABLE ASPECT OF LUX VISIT

APPENDIX 2: ADDITIONAL SURVEY DATA

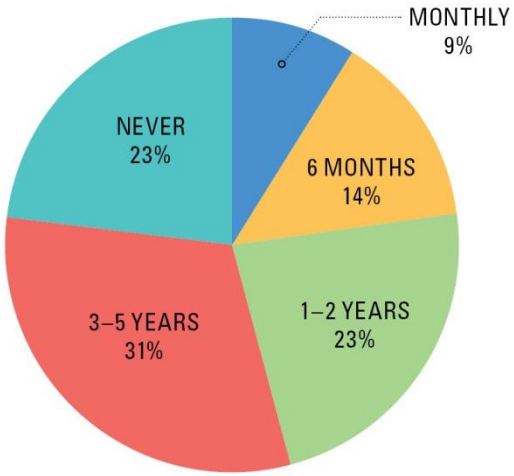

FIGURE 21. FREQUENCY OF LIGHTING EVALUATION IN STORES

Most respondents thought about lighting upgrades rarely, with 31 percent reporting they only considered lighting upgrades every three to five years, and 23 percent claiming to have never considered a lighting upgrade. Only 23 percent evaluated lighting more frequently than once per year.

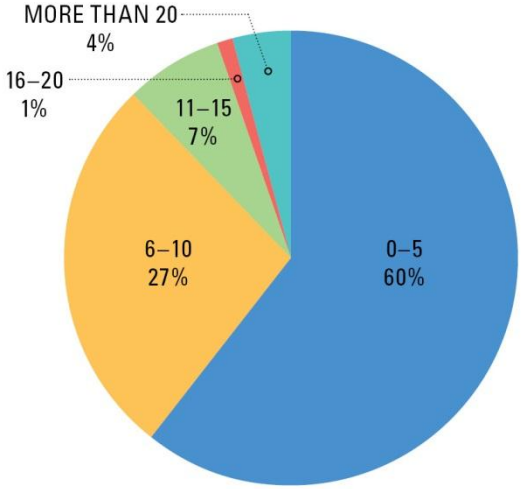

FIGURE 22. LIGHTING ENERGY COSTS VS. OTHER BUSINESS COSTS

Of survey respondents, 60 percent reported that lighting energy costs were typically less than 5 percent of their total operating costs; 27 percent reported lighting costs between 6 and 10 percent of their total operating costs. Respondents made these estimates based on information about lighting energy costs provided on their PG&E bills.

APPENDIX 3:
EDUCATIONAL MATERIALS AND OUTREACH

FIGURE 23. EDUCATIONAL SIGNAGE DISPLAYED IN LUX

Figure 23 includes select signage and print collateral displayed throughout Lux. These include information on LED technology, lighting quality factors and efficacy comparisons between LED and halogen sources.

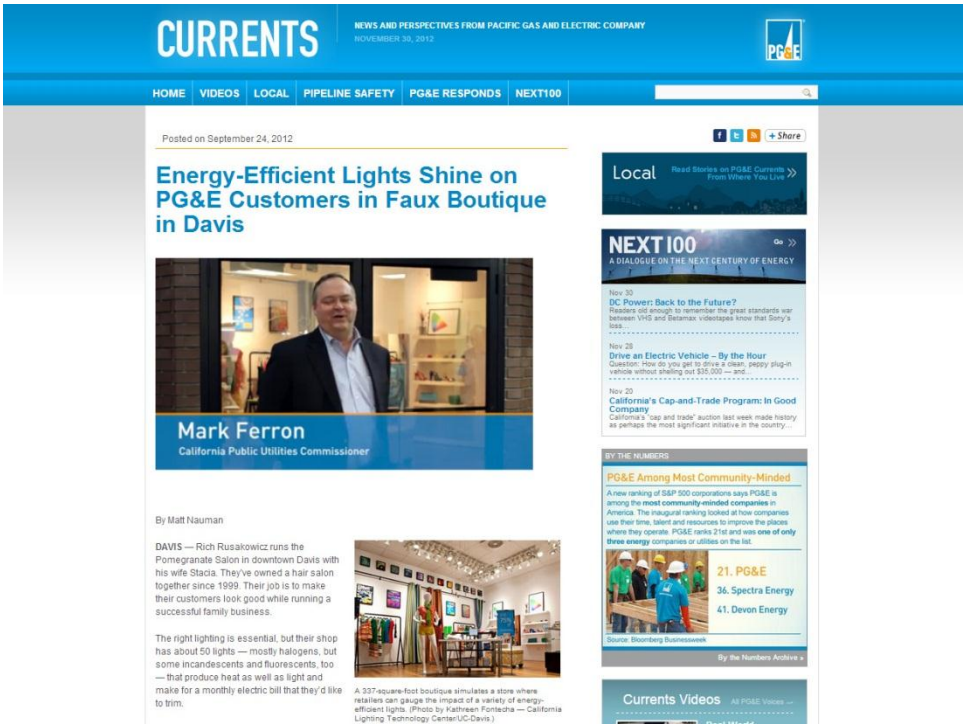

FIGURE 24. PACIFIC GAS & ELECTRIC CURRENTS ARTICLE WITH VIDEO FOOTAGE OF LUX

Targeted media outreach proved effective in getting news coverage to draw local retailers to the Lux opening event. CLTC and PG&E posted news briefs on the event to their websites and circulated news of the project through other communications networks as well, with lighting facts and contact information for those interested in touring the demonstration space and participating in the survey.

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