

Next Generation Light Bulb Optimization

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ABBREVIATIONS AND ACRONYMS

ASEMAP SM	Adaptive Self-Explicated Multi-Attribute Preference
CFL	Compact Fluorescent Lamp
EVC	Economic Value to Customers
LED	Light-Emitting Diode
MSB	Medium Screw Base
OSMPS	Optimal Strategix Marketing Positioning System

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EXECUTIVE SUMMARY

PROJECT GOAL

The purpose of this research is to help PG&E increase its understanding of customers' preferences in the MSB lighting category. Specifically, this research focuses on determining the role different product features play in customer preferences in order to guide future program design and marketing communication strategies. In addition, this study seeks to ascertain how PG&E can most effectively educate its customers on the benefits of energy-efficient lighting products.

PROJECT FINDINGS / RESULTS

In the short term, CFLs should be the focus of PG&E's marketing efforts. They have the highest current adoption in California and are most comparable to incandescent bulbs. Customers are aware of the savings potential and longevity of CFLs. Product feature changes, such as no mercury (and thus easy to recycle), no flicker and hum, dimmability and immediate warm up time would increase uptake of the technology.

In the long term, LED lamps will become the MSB market leader as manufacturing costs decline. Currently, customers perceive the value of LEDs to be greater than other MSB types on all bulb features, with the exception of price. LEDs surpass CFLs in that they typically last three years longer, do not contain mercury, have no flicker and hum, are dimmable and light up immediately. Price is the only major hurdle that needs to be overcome to increase adoption of LEDs.

Consumers need to understand how newer MSB bulbs offer relevant value in the short and long term, but these benefits should not come at the cost of current functional expectations. Cost-of-entry attributes include price, wattage, bulb savings (money and energy) and bulb longevity.

Differentiating attributes that drive MSB purchase depend upon customers' adoption behaviors. Early Adopters have already adopted CFLs and are moving on to the more-advanced LED technology (see **Table 1**). Early Adopters are the segment most receptive to branding, messaging and product recommendations. Imitators use more CFLs than any other type, but driving additional adoption for these and other types of MSBs will require effective messaging regarding energy savings and color quality. To encourage uptake of energy-efficient lighting products among Late Adopters, it is important to emphasize that efficient lighting sources share certain features (e.g. wattage) with incandescent lighting. Late Adopters are the most receptive segment to dollar savings messaging.

TABLE 1 – NUMBER OF MSBs USED IN HOME

Q03a. Number of MSBs Used in Home (avg. by technology) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
Total Number of MSB Light Bulbs	17.0	15.6	17.7	16.5
CFL (Compact Fluorescent)	7.5	7.9	7.7	7.1
Incandescent	6.8	4.4	7.0	7.3
Advanced incandescent (halogen)	1.6	1.8	1.9	1.3
LED	0.8	1.6	0.8	0.5
Other	0.3	0.0	0.4	0.4

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Q03a. Thinking about all of the fixtures or lamps inside of your home, approximately how many of each of the following medium screw base light bulb types are you using inside of your home? Do not count fixtures or lamps that do not hold bulbs similar to the ones in the image below. (Enter the approximate number of light bulbs in your home for each)

PROJECT RECOMMENDATIONS

PG&E can encourage efficiency lighting adoption by emphasizing that efficiency lighting, especially LEDs, have similar (often more optimal) features to traditional lighting. The lifetime value (cost / energy savings) that the customer will receive by migrating to more efficient bulbs should be clearly communicated. In addition, it is important to educate consumers on how light bulb usage effects energy consumption in CA.

Not only will rebates help overcome the price barrier to LED adoption and other high-end MSB bulbs, but they will also drive long-term PG&E objectives regarding energy savings as LEDs are more energy efficient and environmentally friendly and have many of the features customers seek in a light bulb. PG&E needs to communicate to its customers that LEDs have many of the features they look for in a light bulb such as dimmability, no mercury, instant lighting, disposal in the regular garbage and no flicker and hum.

Rebating CFLs will accelerate the 88% of the market who are slower to adopt in advance of the legislation. In addition to lowering costs, encouraging manufacturers to advance technologies with less mercury, less flicker or hum, dimmer capability and recyclability will drive further adoption of CFLs. PG&E should continue to partner with retailers to provide more locations at which energy efficient bulbs can be purchased and recycled.

INTRODUCTION

On January 1, 2011, new EISA legislation came into effect in California, changing the availability of certain types of medium screw base (MSB) light bulbs. Traditional 100W incandescent bulbs must become 28% more efficient (72W equivalent). Halogen lamps currently on the market barely meet EISA standards while LED and CFL lamps comfortably satisfy the wattage thresholds until 2014. In 2020, all medium screw base lamps will need to generate at least 45 lumens per watt in order to meet EISA standards. Approximately 90% of CFLs and LEDs on the market already meet even these more restrictive standards¹.

As a result of EISA legislation, PG&E customers will need to make different choices in lighting purchase behaviors. Projecting consumer behavior is important so PG&E can more effectively execute its mass consumer lighting strategy. Further, understanding the response to 100W bulbs will allow the company to plan more effectively for when the legislation impacts the more widely used 40W and 60W lamps in 2013.

LEADING MSB TECHNOLOGY

Consumer awareness and purchase of CFLs have increased steadily in California since the early 1990s. Both CFL socket penetration and saturation have increased substantially since 2000. CFL socket penetration – the percentage of sockets containing a CFL – has risen from just 1% in 2000 to 21% currently. CFL saturation – the percentage of homes with at least one CFL – has shot up from 12% in 2000 to approximately 91% currently².

Since 1999, the average retail price for CFL bulbs in California has decreased from \$12 to approximately \$2 while the price in the rest of the U.S. is approximately \$3 per bulb. Sales of CFLs in California skyrocketed from 4.8 million units in 2006 to 11.0 million units in 2008. On the contrary, sales of incandescent lamps fell from 52.1 million to 43.8 million during the same period. Over the last decade, declining prices in CFLs have contributed to a 20% gain in market share over incandescent. Continued product innovation focused on resolving current performance issues (e.g., flickering, warm-up, dimmability) will increase the share of CFLs even more^{2, 3}.

Due primarily to the inexpensive bulk CFL packs that became available in food and drug stores, sales via these channels have increased dramatically over the last half decade. Most likely due to rebate programs, CFL sales at hardware stores in the first and fourth quarters of the year are generally higher than in the second and third quarters⁴.

The three largest light bulb manufacturers – Sylvania, GE and Philips – accounted for less than 14% of all CFL models manufactured in 2008. This is largely because several of the top CFL producers only operate in the energy-efficient lighting market. In California, CFL sales are dominated by lamps in the 19-24 watt range (85-watt incandescent equivalent) while the rest of the U.S. is led by lamps with outputs of 30 watts or greater (150-watt incandescent equivalent)².

EMERGING MSB TECHNOLOGY

LEDs are the next generation of MSB lighting. They are 30 times more efficient than traditional incandescent lamps and outperform both incandescents and CFLs on all major product features. With a higher lumen-to-watt ratio than traditional incandescent lighting sources, LEDs are capable of producing the same quality of light at a much lower level of energy consumption. During a test in February 2010, Cree, the LED manufacturing market leader, surpassed the 200 lumen per watt threshold. With their superior efficiency, LEDs typically last between 35,000 to 50,000 hours, compared to 10,000 to 15,000 hours for CFLs and only 1,000 to 2,000 hours for incandescents. Unlike CFLs, the efficacy of LED lamps is not affected by shape and size. Other advantages LEDs have over CFLs are very quick illumination time, dimming capability, little infrared radiation and strong resistance to external shock^{5, 6, 7}.

The only major disadvantage of LEDs is their steep price, driven mainly by intricate product design. Due to the potential decline in manufacturing costs, the price of LEDs is expected to drop tenfold over the next decade. As a result, LEDs will achieve 46% penetration of the lighting market by 2020³.

STUDY OBJECTIVES

The purpose of this research is to help PG&E increase its understanding of customers' preferences in the MSB lighting category. Specifically, this research focuses on determining the role different product features play in customer preferences. This engagement will guide future program design and marketing communication strategies by answering the following questions:

- Which factors matter most to consumers in the choice of light bulbs?
- How can PG&E optimize its programs in the lighting category?
- How should customers be educated about the benefits of new lighting products to encourage future efficient lighting purchase decisions?

STUDY METHODOLOGY

SAMPLING METHODOLOGY

This study used an online survey methodology to interview a random sample of 1,031 current PG&E customers. Fieldwork began on December 16, 2010 and concluded on January 5, 2011.

To qualify for this study, respondents must:

- Use PG&E as their electricity provider,
- Reside within PG&E's footprint,
- Have purchased an MSB light bulb within the past twelve months,
- Have not participated in any research for a CA-based power or electricity company during the past six months and
- Pass industry security screening.

QUESTIONNAIRE DESIGN

The online survey opened up by probing respondents on their usage and purchase of MSB light bulbs, including technologies used, number of bulbs purchased in the last year, average price paid per bulb and purchase location preferences. Then, respondents were asked how likely they would be to replace each type of bulb they currently use with another type. Subsequently, the adaptive ASEMAP exercise identified the product features that are most important to each respondent when deciding which type of bulb to purchase. The preference for each level of each feature was gauged to establish certain thresholds for product improvement.

Following the ASEMAP exercise, respondents were asked if they were aware of EISA legislation (and if so, what they heard about it) as well as any light bulb rebate programs that electric companies sponsor. To gauge customers' reaction to the new legislation, respondents indicated their attitudes toward energy conservation, their perceptions of the quality of lower-wattage energy-efficient light bulbs vs. standard 100-watt bulbs and their views on PG&E's involvement with energy efficiency and environmental friendliness. The survey concluded with basic demographic information such as monthly bill amount, education, income and adoption behavior.

CONJOINT APPROACH

Developed by V. "Seenu" Srinivasan from Stanford University and Oded Netzer from Columbia University, the Adaptive Self-Explicated Multi-Attribute Preference (ASEMAPSM) is a cutting-edge tradeoff methodology that offers a simple web-based approach for measuring customers' preferences. Relative to other methodologies such as Adaptive Conjoint Analysis (ACA), Constant Sum and MaxDiff that are currently used in the market research industry, ASEMAP produces greater variability in attribute importance and provides a substantially higher predictive accuracy. Empirical data has shown that ASEMAP is 50% more reliable at predicting respondents' preferences than the current industry standard. In addition, ASEMAP is capable of providing robust results with smaller sample sizes and can handle a larger number of product or service attributes than other conjoint methodologies.

The ASEMAP approach is superior to other self-explicated methods in several ways. First, unlike simple rating scales, the constant-sum paired comparison questions (100-point allocation) capture tradeoffs between product attributes. Second, ASEMAP overcomes the limitations of traditional constant-sum methods by asking respondents to tradeoff one attribute against another attribute, not one partial product profile against another partial product profile. This way, respondents are able to more meaningfully allocate an importance level for each attribute of the product when there are a large number of attributes (usually ten or more). Third, the method is adaptive, which means that each paired comparison is automatically chosen through a dynamic algorithm based on the respondent's answers to previous questions. This way, only the questions that need to be answered are asked, which in turn reduces respondent fatigue and improves the accuracy of the results.

Practically speaking, ASEMAP can help answer questions businesses in all industries and markets want answered such as:

- Which features of our product or service are more important to our existing and potential customers?
- How much is the market willing to pay for an improvement in a product or service feature?
- How do consumers value our brand relative to other brands?
- What is the price elasticity of our market?

The questions used in the ASEMAP exercise for this particular study are as follows:

Attribute Categorization

*Below you will see the same list of 21 characteristics that you might consider when replacing a **medium screw base light bulb**.*

*Please review the full list of characteristics below, and pick 8 things that are **most important** to you when replacing a medium screw base light bulb.*

Now you will see that the characteristics you picked before have been removed from the screen.

*Still thinking of the characteristics that are most important to you when replacing a **medium screw base light bulb**, please review the list of remaining characteristics below, and pick the **NEXT 8** things that are most important to you.*

Attribute Ranking

*Please continue to think of what is important to you when you replace a **medium screw base light bulb**. Please click and drag the characteristics on this page so that they are ordered from the most important (on the top) to the least important (at the bottom).*

Attribute Pair Comparison

*When replacing a **medium screw base light bulb**, which of the two characteristics below is **more important to you? By how much more?***

Level Desirability Rating:

*When replacing a **medium screw base light bulb**, please rate how desirable each of the following possibilities for [**attribute – e.g. the wattage of the light bulb**] is to you.*

RESULTS

CUSTOMER ADOPTION PROFILES

In the ensuing Overview of Lighting Category and Drivers to MSB Light Bulb Purchase sections, the adoption behavior of customers is used as the primary point of analysis. Analyzing the data this way informs PG&E of the similarities and differences in customers' demographics, behaviors, attitudes, and preferences between the three distinct categories of adoption: Early Adopters, Imitators, and Late Adopters (see **Figure 1** for sample distribution). In order for PG&E to target these customer groups, profiles were developed as follows.

Early Adopters

- Younger than other customers
- Well-educated and higher-income
- More likely to rent than other customers
- More likely to be Asian or Hispanic than other customers
- Least likely to show an interest in light bulb efficiency but are the most likely to have an affinity for energy conservation
- Highest awareness of EISA legislation
- Slightly lower awareness of and participation in PG&E programs than other customers
- More likely than other customers to be extremely satisfied with PG&E

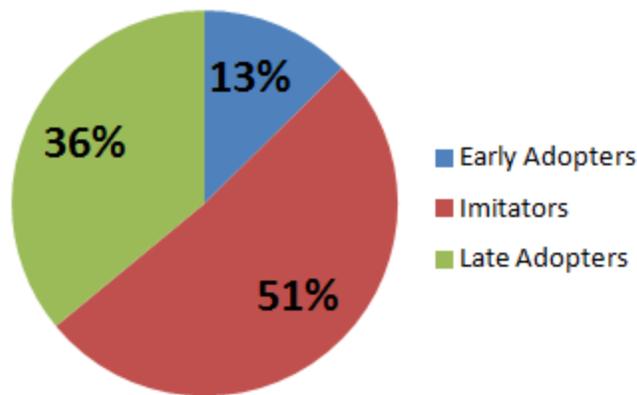
Imitators

- Older than Early Adopters but younger than Late Adopters
- As well-educated and earn approximately the same income as Early Adopters
- More likely to own than Early Adopters
- Less likely to show an interest in energy conservation than Early Adopters but more likely than Late Adopters
- Lower awareness of EISA legislation than Early Adopters
- More aware of PG&E's CFL program, California Solar Initiative, appliance rebates / refrigerator recycling, Low Income Energy Efficiency, and Time of Use than Early Adopters
- Most likely to have participated in the CFL program
- Least likely to be extremely satisfied with PG&E

Late Adopters

- Older than other customers
- Less likely to have earned a college degree and have lower incomes
- More likely to own than Early Adopters
- Less likely to show an interest in energy conservation than Early Adopters
- Lower awareness of EISA legislation than Early Adopters
- More aware of available PG&E programs and rebates than other customers
- More undecided about their satisfaction with PG&E than Early Adopters

FIGURE 1 – CUSTOMER ADOPTION BEHAVIOR



D09. When thinking about your purchase behavior, you typically: (Select one)
 Are the first to purchase a new product [Early Adopters]
 Wait until the 2nd or 3rd iteration of a product [Imitators]
 Buy products that have already been proven popular by mass adoption [Late Adopters]

OVERVIEW OF LIGHTING CATEGORY

Note: For the Overview of Lighting Category and Drivers to MSB Light Bulb Purchase sections, adoption behavior is the primary point of analysis while residential status and monthly bill amount are secondary points of analysis.

Awareness of all MSB types is high, and CFL bulbs are the predominant type used in the home (see **Table 2**). According to Early Adopters, LED is the upcoming technology in the market. Conversely, incandescent bulbs show the highest penetration with Later Adopters, possibly forecasting the departure of this technology from the market. All bulbs, to some degree, are currently being used by Imitators (see **Table 3**).

In general, homeowners are more aware of different types of bulbs than renters. Homeowners tend to use a larger variety of bulbs in their homes than renters, specifically CFL, incandescent and halogen bulbs.

TABLE 2 – AWARENESS OF MSB LIGHT BULBS

Q01. Awareness of MSB Light Bulbs by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
Incandescent	 95.5%	95.4%	96.4%	94.3%
CFL (Compact Fluorescent)	 93.4%	91.5%	94.3%	92.7%
LED	 90.0%	90.0%	92.5%	86.5%
Advanced incandescent (halogen)	 88.7%	90.0%	87.7%	89.5%

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Q01. How aware are you of the following types of medium screw base light bulbs? (Select one for each)

TABLE 3 – CURRENTLY USING MSB LIGHT BULBS

Q01. Currently Using MSB Light Bulbs by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
CFL (Compact Fluorescent)	 71.9%	63.8%	73.2%	72.8%
Incandescent	 58.6%	43.8%	60.2%	61.5%
Advanced incandescent (halogen)	 24.5%	26.9%	27.0%	20.2%
LED	 23.2%	33.8%	24.5%	17.5%

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Q01. How aware are you of the following types of medium screw base light bulbs? (Select one for each)

In the last year, customers averaged 11 MSB purchases at an average price of \$6 per bulb (see **Table 4**). Early Adopters on average pay \$9 per bulb compared to only \$5.50 for Later Adopters (see **Table 5**).

Homeowners have purchased more MSB bulbs in the past 12 months and pay on average about a dollar less per bulb than renters (\$5.60 vs. \$6.60). Furthermore, customers paying \$100 or more on their monthly PG&E bill purchase more MSB bulbs at higher prices than those who pay less than \$100 per month.

TABLE 4 – NUMBER OF MSBs PURCHASED

Q04. Number of MSBs Purchased (avg. past 12 months) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
Number of MSB Light Bulbs	10.8	11.7	10.6	10.8

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Q04. In the past 12 months, approximately how many medium screw base light bulbs have you purchased for your home? If you purchased a package of light bulbs, please estimate the total number of actual bulbs. (Enter a whole number only, not a range)

TABLE 5 – PRICE PAID FOR SINGLE MSB

Q05. Price Paid for Single MSB (avg.) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
MSB Light Bulb Price	6.0	9.2	5.5	5.6

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Q05. How much, on average, do you typically pay for a single medium screw base light bulb for your home? (Enter the exact dollar amount, in dollars and cents. Do not include a "\$" sign.)

Fifty percent of customers are likely to replace incandescent bulbs, predominantly with CFLs. Early Adopters are more likely to replace all bulb types (see **Table 6**). Specific to incandescent replacement options, Early Adopters are more inclined to choose LED and halogen bulbs than other customers, albeit CFL is still the replacement bulb of choice (see **Table 7**).

Compared with renters, owners are more likely to replace halogen bulbs in their homes with other types. Although both groups are most likely to replace incandescent bulbs with CFL bulbs, homeowners have a higher proclivity for doing so.

Customers with lower energy bills are more likely to replace their LED bulbs than those with higher bills.

TABLE 6 – LIKELIHOOD TO REPLACE CURRENT BULB WITH DIFFERENT TYPE

Q09a. Likelihood to Replace Current Bulb with Different Type (T2B) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
Likelihood to replace incandescent	 50.4%	52.3%	53.2%	45.8%
Likelihood to replace CFL (Compact Fluorescent)	 20.9%	29.2%	19.4%	19.9%
Likelihood to replace advanced incandescent (halogen)	 11.3%	20.8%	10.2%	9.7%
Likelihood to replace LED	 7.1%	17.7%	6.0%	4.9%

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Q09a. You mentioned earlier that you currently have [PIPE RESPONSE FROM Q03A (TYPE)] light bulbs in your home. How likely would you be to replace your [PIPE RESPONSE FROM Q03A (TYPE)] light bulb with a different type of bulb? (Select one) (% "Somewhat Likely" and "Extremely Likely")

TABLE 7 – INCANDESCENT REPLACEMENT OPTIONS

Q09b. Incandescent Replacement Options by D09. Adoption Behaviors	All Respondents N=520	Early Adopters N=68	Imitators N=282	Late Adopters N=170
CFL (Compact Fluorescent)	 82.9%	82.4%	82.6%	83.5%
LED	 25.4%	38.2%	25.5%	20.0%
Advanced incandescent (halogen)	 9.6%	20.6%	9.6%	5.3%
Other	 1.3%	-	1.1%	2.4%

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Q09b. You mention that you are [PIPE RESPONSE FROM Q09A (LIKELIHOOD)] to replace your [PIPE RESPONSE FROM Q03A (TYPE)] light bulb with a different light bulb type? What light bulb type would you be likely to replace it with? (Select all that apply)

Mass merchandiser and home improvement stores are the most common locations for MSB bulbs to be purchased. Over half (52%) of all customers primarily shop for light bulbs at these stores. Hardware stores, drug stores and grocery stores fall in the next tier for customers' shopping preferences (see **Table 8**).

Early Adopters have a stronger preference than Late Adopters for buying MSB light bulbs at club stores, lighting stores, furniture stores, electronic stores, department stores, specialty stores and over the Internet.

Renters are more likely to purchase light bulbs at mass merchandisers, furniture stores, discount stores, grocery stores and drug stores than homeowners. Homeowners are more likely to make these purchases at home improvement and club stores.

As the PG&E bill increases, so does the proclivity to shop at home improvement stores, grocery stores and club stores.

TABLE 8 – MSB PURCHASE LOCATIONS

Q08. MSB Purchase Locations (all and most often)	All Locations	Most Often
Mass merchandiser like Target, K-Mart, or Wal-Mart	62.1%	27.9%
Home improvement store like Home Depot, Lowes, or OSH	61.3%	24.4%
Hardware store like Ace or True Value	39.9%	9.1%
Drug store like CVS, Rite Aid, or Walgreen`s	38.4%	8.0%
Grocery store like Safeway or Lucky`s	36.5%	8.1%
Club store like Costco or Sam`s Clubs	29.4%	9.1%
Discount / 99 Cent Store	24.3%	7.7%
Lighting store	9.2%	0.9%
Furniture store like IKEA	8.4%	0.6%
Electronic store like Best Buy or Fry`s	7.7%	1.3%
Department store like Sears	6.2%	0.5%
Specialty store like Bed Bath and Beyond	5.4%	0.5%
Over the Internet	4.3%	1.0%
Mail-order catalog	1.7%	0.2%
Other	1.6%	0.8%
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Q08. In the first column of the grid below, please select all the locations where you have purchased light bulbs, and in the second column please select the one location where you purchase light bulbs most often. (Select multiple locations in the first column and one location in the second)

About two-thirds of customers purchase MSB bulbs at a combination of full and sale prices (64%). One-quarter of customers only purchase MSB bulbs when they are on sale (27%). Early Adopters are more likely than Imitators and Late Adopters to purchase bulbs only at full price (see **Table 9**).

TABLE 9 – HOW MSB PURCHASE IS MADE

Q07. How MSB Purchase Is Made by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
I purchase some light bulbs on sale and some at full price	 64.3%	56.2%	65.5%	65.5%
I purchase light bulbs only when they were on sale	 26.7%	26.9%	27.0%	26.1%
Don't know	 5.3%	5.4%	4.2%	7.0%
I purchase light bulbs only at full price	 3.7%	11.5%	3.4%	1.3%

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Q07. And, which of the following best describes how you make medium screw base light bulb purchases? (Select one)

PG&E customers tend to have more CFL bulbs in their home than any other MSB type. Early Adopters use only about 4 incandescent bulbs in their home compared to approximately 8 for Later Adopters. Likewise, Early Adopters use slightly more LED bulbs (see **Table 10**).

As the average monthly PG&E bill increases, usage of each major type of bulb also increases. Customers paying \$150 or more on their energy bill use approximately 9 incandescent light bulbs compared to only 6 for customers with bills of less than \$100. Moreover, owners typically have more MSB bulbs in their home than renters.

TABLE 10 – NUMBER OF MSBs USED IN HOME

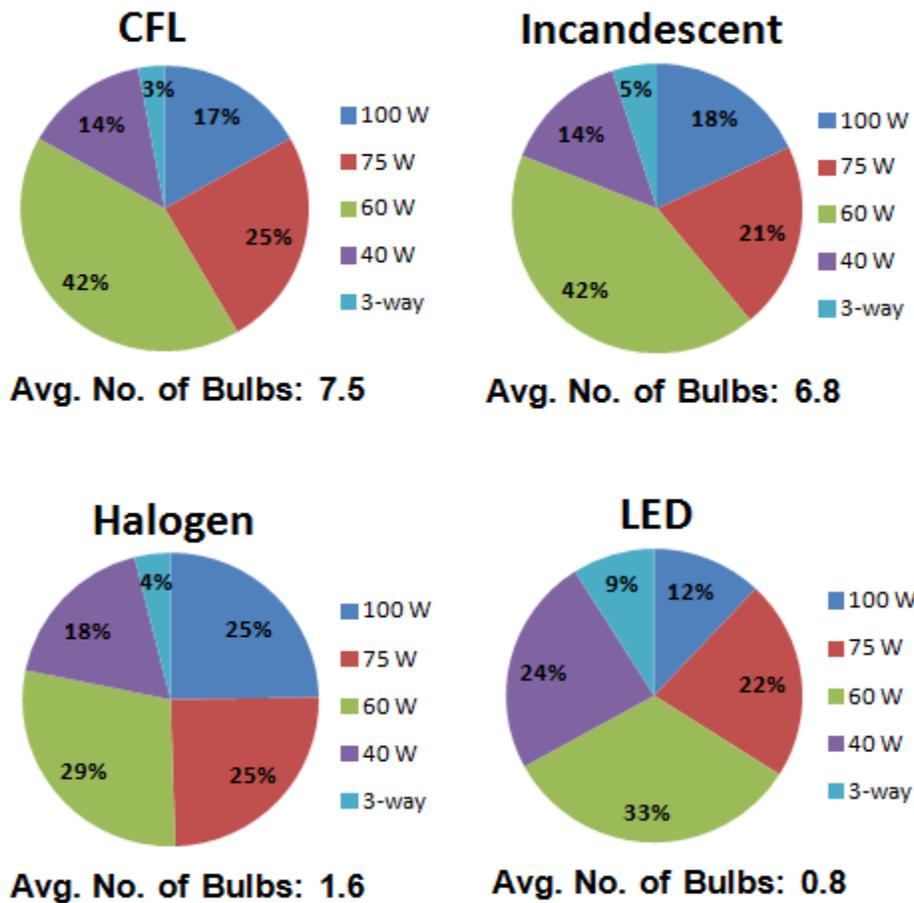
Q03a. Number of MSBs Used in Home (avg. by technology) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
Total Number of MSB Light Bulbs	 17.0	15.6	17.7	16.5
CFL (Compact Fluorescent)	 7.5	7.9	7.7	7.1
Incandescent	 6.8	4.4	7.0	7.3
Advanced incandescent (halogen)	 1.6	1.8	1.9	1.3
LED	 0.8	1.6	0.8	0.5
Other	 0.3	0.0	0.4	0.4

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Q03a. Thinking about all of the fixtures or lamps inside of your home, approximately how many of each of the following medium screw base light bulb types are you using inside of your home? Do not count fixtures or lamps that do not hold bulbs similar to the ones in the image below. (Enter the approximate number of light bulbs in your home for each)

Regardless of MSB type, customers use 60-watt bulbs more often than bulbs of other wattages. Halogen lamps have the highest penetration of 100-watt bulbs. Forty-watt and three-way bulbs are more common among LED products than any other lighting technology (see **Figure 2**).

FIGURE 2 – MSB TYPE BY WATTAGE



Q03b. For each type of medium screw base bulb you have in your home, approximately what percent of them is each of the following wattages? (Enter percentages between 0 and 100 across each row. Each row should add to 100%. Do not include a “%” sign.)

Among both incandescent and CFL users, MSB light bulbs are most commonly found in bedrooms, bathrooms and living rooms. Incandescent bulbs are more often used in the dining room while CFLs are more often used in the kitchen. Regardless of room, halogen bulbs are used considerably less than incandescent and CFL bulbs and are most often found in the kitchen and living room (see **Table 11**).

Note: In the table below, numbers enclosed by a are statistically greater than either the incandescent or CFL group.

TABLE 11 – MSB BULB DISTRIBUTION BY ROOM

Q03c. MSB Bulb Distribution by Room	Incandescent	CFL	Halogen
Master bedroom (including closets)	60.0%	62.9%	17.4%
All other bedrooms (including closets)	55.5%	56.1%	16.0%
Bathrooms	55.2%	52.0%	18.2%
Living room	53.4%	60.1%	25.2%
Dining room	47.2%	36.9%	16.8%
Hallways	45.6%	44.3%	18.8%
Kitchen	36.2%	52.0%	32.2%
Family room	30.8%	37.6%	18.2%
Other room inside your home	29.7%	32.2%	11.8%
Garage	29.5%	28.8%	13.2%
Laundry room	29.0%	30.2%	8.7%
Den or office	27.3%	29.4%	13.4%
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Q03c. For each of the following rooms in your house, please indicate which type(s) of medium screw base bulbs you are using. (Please respond by selecting one or more light bulb types for each room)

The majority of customers, especially Early Adopters, purchase energy-efficient lighting to save money on their energy bills. Late Adopters have a stronger inclination to only replace bulbs when they are broken and are happy with the bulbs they are currently using (see **Table 12**).

Similarly, customers who pay \$100 or more on their energy bills are more inclined to replace a bulb only if it is broken than those who pay less than \$100 for energy consumption. Customers with higher bills also tend to indicate that energy efficient bulbs are too expensive.

TABLE 12 – AGREEMENT WITH LIGHT BULB PURCHASE DRIVERS

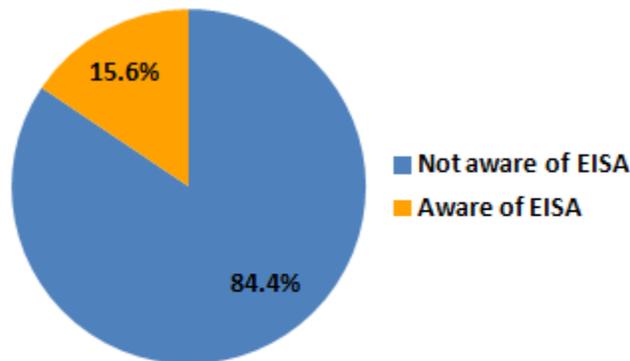
Q10. Agreement With Light Bulb Purchase Drivers (T3B) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
One of the main reasons I purchase energy efficient light bulbs is to save money on my energy bill	58.9%	69.2%	54.9%	60.9%
Energy efficient light bulbs (i.e. CFLs) provide a low-cost way for me to save energy	57.3%	64.6%	53.8%	59.8%
I like to purchase light bulbs that are energy-efficient or green	56.5%	62.3%	56.6%	54.2%
Energy efficient light bulbs last longer than regular bulbs	54.6%	65.4%	52.6%	53.6%
I do not feel I should replace a light bulb unless it is broken	47.8%	42.3%	43.8%	55.5%
I am happy with the light bulbs I am currently using	47.3%	51.5%	42.5%	52.8%
Energy-efficient light bulbs cost too much money	25.6%	35.4%	22.1%	27.2%
The type of light bulb I purchase is the least important thing on my mind	16.1%	24.6%	11.1%	20.2%
I don't understand the benefits of energy-efficient light bulbs	7.4%	20.0%	4.7%	6.7%
There is no difference between energy efficient light bulbs (i.e. CFLs) and non- energy efficient light bulbs (incandescent)	6.8%	19.2%	4.2%	6.2%

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Q10. When thinking about light bulb purchases, how likely are you to agree or disagree with each of the following statements? (Select one for each) (8,9,10 on 0-10 scale)

The majority of PG&E customers are not aware of EISA legislation (see **Figure 3**). However, Early Adopters are more likely to be aware of the legislation than people who adopt later in the product lifecycle.

FIGURE 3 – AWARENESS OF EISA LEGISLATION



Q12. Are you aware of the Energy Independence and Security Act 2007 (EISA) and its impact on the light bulb market in California? (Select one)

Among customers aware of EISA legislation, open-ended responses about what they have heard about the legislation include:

- "...in an effort to conserve and more wisely use our energy sources, California has banned the incandescent bulb and soon we will not be able to purchase them in the state of CA."
- "Incandescent light bulbs will be phased out [/ no longer available / not be sold]"
- "Moves the US towards energy independence. New standards for residential lighting & appliances."

Negative statements about the legislation include:

- "...among other things, [it] phases out incandescent lamps over the next couple of years. Since LEDs are still prohibitively expensive, this means un-dimmable ... CFLs with mercury that don't last nearly as long as claimed and take forever to warm up."
- "That we can only buy dangerous, awful, expensive and short lasting CFLs in the future--phasing out incandescent bulbs which is why I am stockpiling the old bulbs."

DRIVERS TO MSB LIGHT BULB PURCHASE

Stated Purchase Consideration Data

The vast majority of customers stock up on bulbs and purchase them at discount prices. In addition, customers are looking for bulbs that will save them energy and are guaranteed to last a long time (see **Table 13**). Early Adopters have a higher propensity than Late Adopters to:

- Purchase a bulb of a lower wattage than the one they were previously using,
- Consider brand of the bulb when making purchases and
- Buy bulbs that are more expensive than normal.

Owners are more likely than renters to buy multiple bulbs of the same type at once, purchase bulbs on sale and replace a bulb with a different type.

Customers with energy bills of \$100 or greater are more inclined to purchase several bulbs in one trip to the store than customers with bills of less than \$100.

TABLE 13 – MSB PURCHASE CONSIDERATION SET

Q06. MSB Purchase Consideration Set (T2B) by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
Likelihood to purchase several of the same light bulbs at one time	85.1%	84.6%	84.5%	86.0%
Likelihood to purchase a light bulb based on energy saving potential	80.5%	80.8%	81.1%	79.5%
Likelihood to purchase a light bulb which is on sale	79.6%	77.7%	80.2%	79.5%
Likelihood to purchase a light bulb that is guaranteed to last longer	78.3%	80.8%	78.3%	77.4%
Likelihood to purchase a light bulb of a different type (e.g. replacing an incandescent bulb with a CFL)	69.4%	70.8%	69.6%	68.7%
Likelihood to purchase a light bulb of a lower wattage (e.g. replacing a 100-watt bulb with a 75-watt bulb)	59.4%	66.9%	56.6%	60.6%
Likelihood to purchase a light bulb based on the brand of the manufacturer	32.5%	50.0%	31.5%	27.8%
Likelihood to purchase a more expensive light bulb	21.1%	42.3%	21.5%	13.2%

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 Q06. When you think about the medium screw base light bulb purchases you've made at any time in the past, how likely were you to consider each of the following: (Select one for each) (% shows "Somewhat Likely" and "Extremely Likely")

Introduction to ASEMAP Attribute Importance Tables

Using the data collected from the ASEMAP tradeoff exercise, tables were created using Optimal Strategix's online reporting tool, Optimal Strategix Marketing Positioning System (hereafter referred to as "OSMPS"), to graphically show the relative importance of each of the product features that customers consider when purchasing MSB light bulbs. The relative scores are indexed, meaning that a feature with a score of 200 is twice as important as one with a score of 100. Features with a score above 100 are considered more important than average while those with a score lower than 100 are relatively less important. The black vertical line on the table represents an index score of 100.

ASEMAP Drivers to Purchase

Price, wattage and potential dollar savings are the top three considerations for lighting, followed by type of bulb and durability. Late Adopters are more concerned with value (price, dollar savings and durability) and functional features (wattage and light quality). Imitators have the greatest affinity for energy savings and color temperature (see **Table 14**). On the contrary, Early Adopters place more importance on relatively unimportant features such as light bulb warm up time, dimmer switch compatibility, efficiency messaging on bulb packaging and product recommendations (see **Table 15**).

Renters are more concerned about the price of the bulb and whether it is compatible with a dimmer switch while homeowners are influenced more by the type of bulb and the quality of light the bulb emits.

Customers who pay less than \$100 on their PG&E bill hold price and energy stickers to be more important than those who pay \$150 or more. Also, those with higher bills are more concerned about money savings, the durability of the bulb and the quality of light the bulb gives off.

TABLE 14 – DRIVERS TO MSB PURCHASE (1-10)

Drivers by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
The price of the light bulb	191	153	186	211
The wattage of the light bulb	167	159	162	175
The amount of money I can save by using the bulb in my home	162	145	159	170
The type of light bulb (incandescent, CFL, etc.)	161	156	158	169
How long the light bulb lasts	161	141	162	166
Whether the light bulb gives off the same quality light as my current bulb	139	126	136	148
Percentage of energy the light bulb saves	135	134	142	124
The color of the light given off by the light bulb	108	96	115	101
Whether the light bulb has an energy saving label	85	95	82	87
The amount of mercury in the bulb	82	93	82	80

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ASEMAP Attribute Paired Comparisons: When replacing a medium screw base light bulb, which of the two characteristics below is more important to you? By how much more?

TABLE 15 – DRIVERS TO MSB PURCHASE (11-21)

Drivers by D09. Adoption Behaviors	All Respondents N=1,031	Early Adopters N=130	Imitators N=530	Late Adopters N=371
The amount of flicker and hum given off by the bulb	79	82	83	73
Light bulbs come in packages of 2 to 4 instead of sold individually	77	72	76	80
Where the light bulb can be purchased	76	78	74	77
How easy it is to dispose of the light bulb after use	73	72	74	73
The shape of the light bulb	73	73	77	66
The amount of time it takes the light bulb to warm up	66	82	67	60
Whether the light bulb is compatible with a dimmer switch	63	88	65	51
Whether the light bulb has efficiency messaging on its packaging	63	78	62	59
The length of the manufacturer's warranty	56	61	57	52
Whether the brand of the light bulb is recognizable	43	53	41	42
Whether the light bulb is recommended by others	40	64	39	33

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ASEMAP Attribute Paired Comparisons: When replacing a medium screw base light bulb, which of the two characteristics below is more important to you? By how much more?

GENERAL PREFERENCES FOR MSB PRODUCT FEATURES

The OSMPS Preference Simulator uses data derived from the ASEMAP exercise to display preference shares of each of the four major MSB types under different product profile configurations. Volume of bulb purchase was used to weight the shares to obtain unit (volume) shares. Of the 21 product features tested in the ASEMAP exercise, 16 of them were considered in the simulator (see **Table 16**).

Two important caveats to consider when using the Preference Simulator:

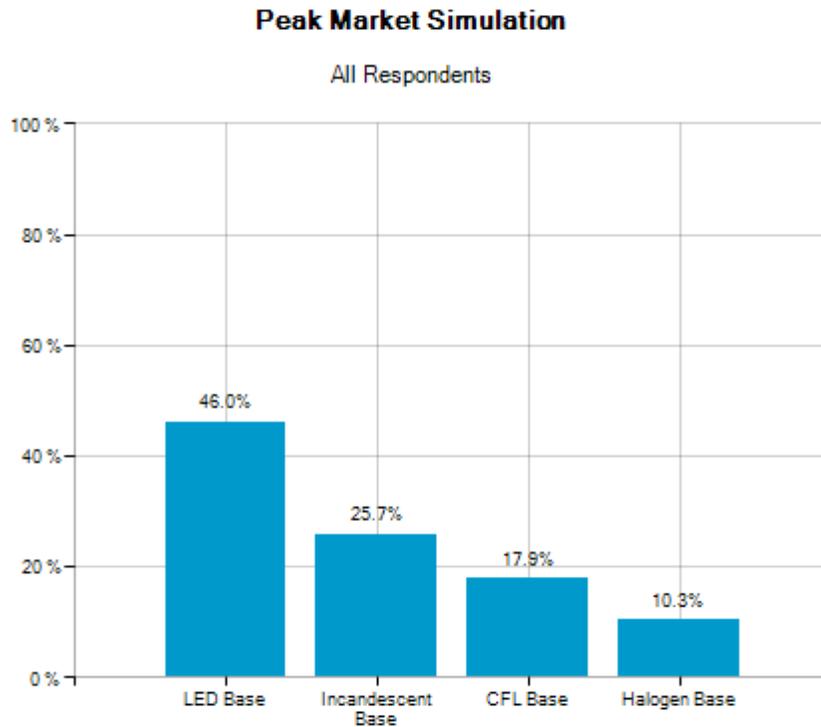
- Outputs may not reflect actual market share due to important marketing considerations (marketing spend, order of entry, etc.) not being included, and
- It is assumed that each brand in the simulation is fully available to all customers and that all brands are treated equally in a specific market, which might not be the case in the real market.

TABLE 16 – MSB PRODUCT PROFILES

Attribute	CFL Base	Halogen Base	Incandescent Base	LED Base
The wattage equivalent of the light bulb	60 watts	60 watts	60 watts	60 watts
Whether the light bulb is compatible with a dimmer switch	Not dimmable	Dimmable	Dimmable	Dimmable
The type of light bulb (incandescent, CFL, etc.)	CFL	Halogen	Incandescent	LED
The amount of mercury in the bulb	Contains mercury	Does not contain mercury	Does not contain mercury	Does not contain mercury
How long the light bulb lasts	5 years	2 years	1 year	20 years
The length of the manufacturer's warranty	2 years	1 year	No warranty	5 years
The price of the light bulb	\$3.50	\$1.99	\$0.99	\$19.99
The amount of money I can save by using the bulb in my home	\$40-\$60	Less than \$20	No energy savings	\$60-\$80
Percentage of energy the light bulb saves	80%	25%	No energy savings	80%
The amount of time it takes the light bulb to warm up	15 seconds	Immediately at full light output	Immediately at full light output	Immediately at full light output
The shape of the light bulb	Twister	A-line	A-line	A-line
The color of the light given off by the light bulb	Cool white	Warm white	Warm white	Cool white
Whether the light bulb has an energy saving label	Energy Star Label	No label	No label	Energy Star Label
How easy it is to dispose of the light bulb after use	Needs to be disposed of at specific recycling locations	Disposed of in the regular garbage	Disposed of in the regular garbage	Disposed of in the regular garbage
Whether the light bulb has efficiency messaging on its packaging	5X more efficient	2X more efficient	No efficiency messaging	Greater than 5X more efficient
The amount of flicker and hum given off by the bulb	Flickers and hums	Does not flicker and hum	Does not flicker and hum	Does not flicker and hum

When the market matures, the LED volume share is could reach 46% (see **Figure 4**). Based on an optimal market scenario, the opportunity for LEDs is the strongest because of its environmental viability and the fact that it has all of the features that customers want.

FIGURE 4 – PEAK MSB MARKET SIMULATION



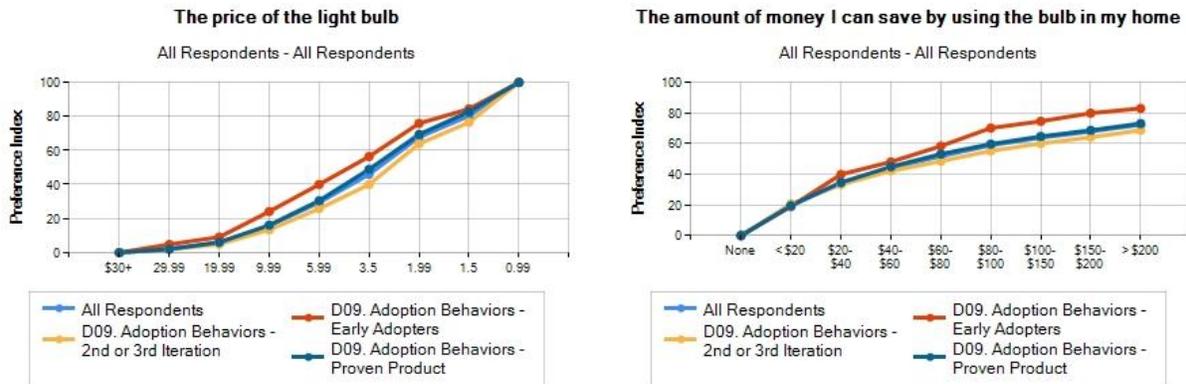
Using the data collected from the ASEMAP desirability rating exercise, charts were created using OSMPS to graphically show respondents’ preferences for each level of each MSB product feature evaluated. Each chart shows each level of an attribute as points on a line. The higher the point on the line, the more preferred the level. In addition, the greater the slope from one level to another, the more consumer preference could be generated by offering the better level.

Note: The text for the ASEMAP desirability rating exercise reads "When replacing a medium screw base light bulb, please rate how desirable each of the following possibilities for [attribute] is to you."

Customers’ preference for an MSB bulb increases the most when the price drops from \$3.50 to \$1.99 (see **Figure 5**).

Going from no savings to any savings at all (less than \$20) causes the largest boost in preference, while diminishing returns come into play as the amount of savings increases thereafter (see **Figure 5**).

FIGURE 5 – PRICE AND MONEY SAVINGS PREFERENCES



Customers' desirability for an MSB bulb increases the most when energy savings achieve 25% with steady gains in preference beyond 25% (see **Figure 6**).

All customers would much rather purchase a bulb with an energy saving label than one with no label. Early Adopters show the strongest preference for bulbs with an energy saving label (see **Figure 6**).

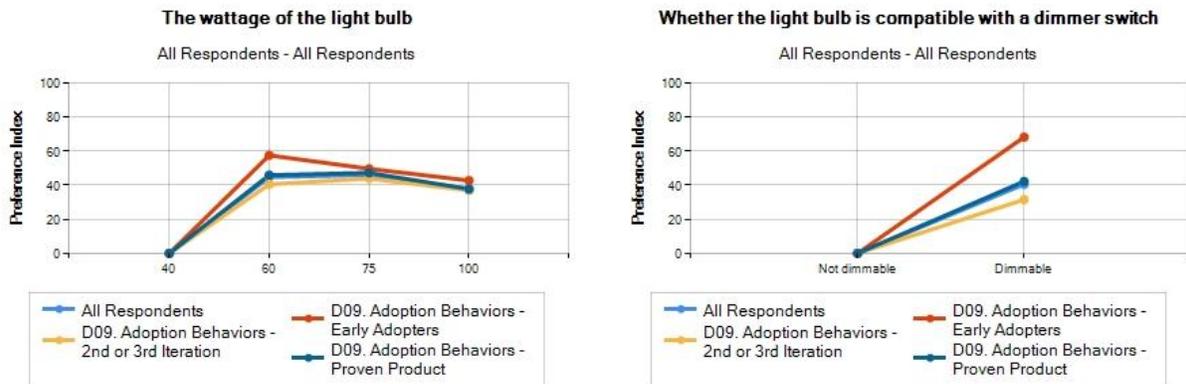
FIGURE 6 – ENERGY SAVINGS AND ENERGY SAVING LABEL PREFERENCES



Early Adopters prefer 60-watt bulbs the most, while 85 and 100 watts are preferred equally by all segments. Customers show little preference for 40-watt bulbs (see **Figure 7**).

Compatibility with a dimmer switch is preferred, with Early Adopters showing the strongest preference (see **Figure 7**).

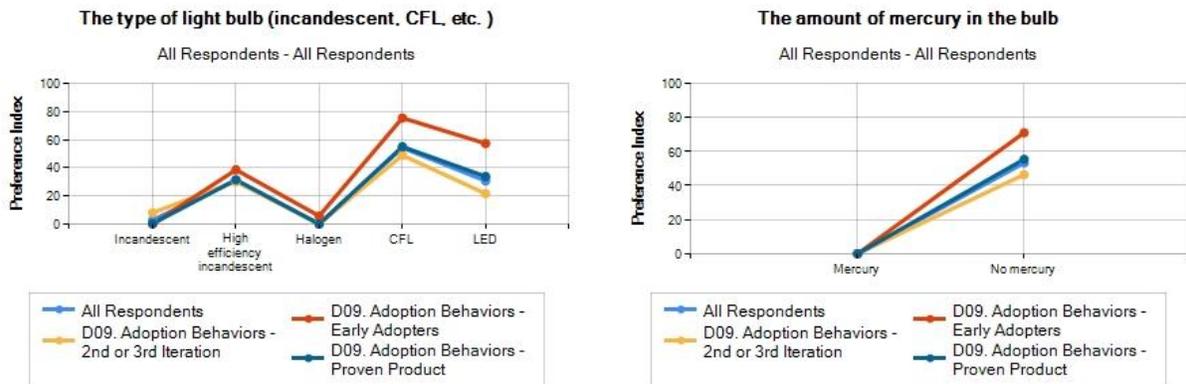
FIGURE 7 – WATTAGE AND DIMMABILITY PREFERENCES



Preference for CFLs is the highest among all customers, and Early Adopters are more likely to prefer efficiency bulbs in general (CFLs, LEDs and high-efficiency incandescents). Incandescent and halogen bulbs are the least desirable MSB types (see **Figure 8**).

Bulbs without any mercury are vastly preferred over those that contain mercury, especially among Early Adopters (see **Figure 8**).

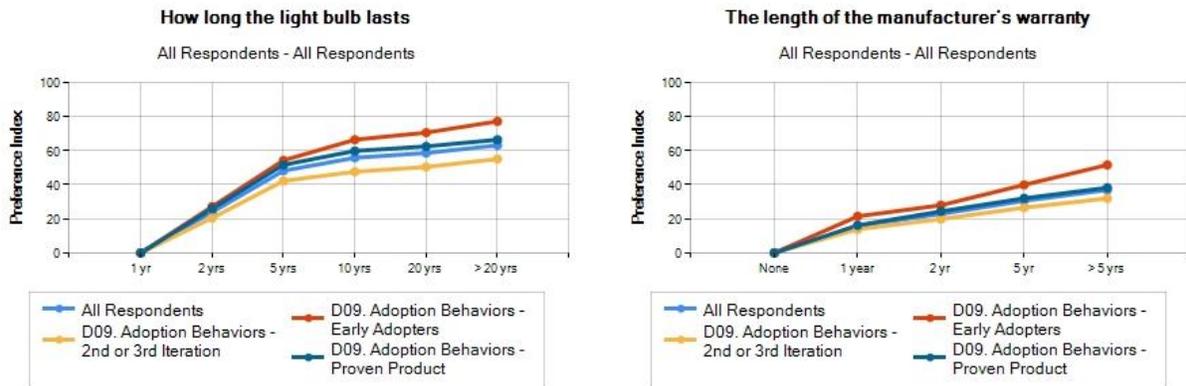
FIGURE 8 – MSB TYPE AND MERCURY CONTENT PREFERENCES



Customers' preference for a bulb rises considerably as its lifetime increases from 1 year to 5 years, with minimal gains in preference for a bulb that lasts longer than 5 years (see **Figure 9**).

Going from no warranty at all to a 1-year warranty causes the largest increase in preference, with steady gains in preference for bulbs with longer warranties (see **Figure 9**).

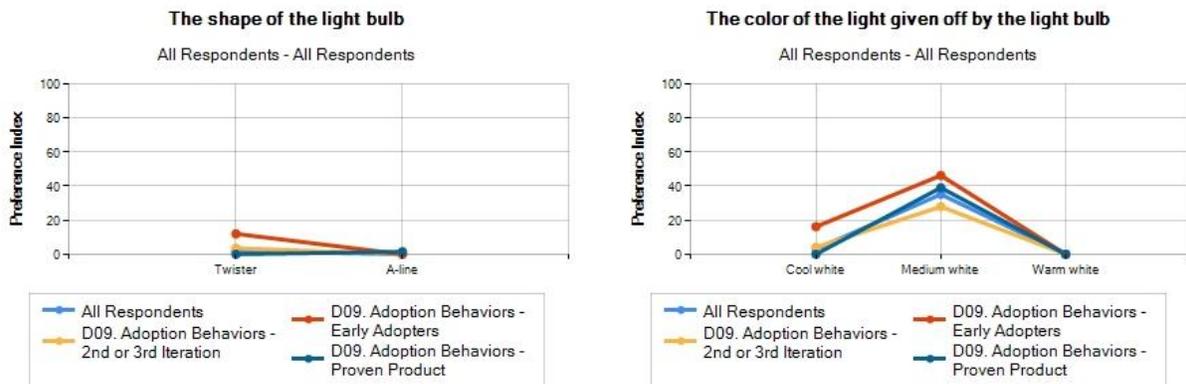
FIGURE 9 – BULB LONGEVITY AND WARRANTY LENGTH PREFERENCES



Despite general indifference toward the shape of a bulb, Early Adopters show a slight preference for twister bulbs (see **Figure 10**).

Regardless of adoption behavior, customers prefer bulbs with medium white color temperature more so than bulbs with cool or warm white temperature. Early Adopters have a slightly stronger preference for cool white bulbs than Later Adopters (see **Figure 10**).

FIGURE 10 – BULB SHAPE AND COLOR PREFERENCES



MSB PRODUCT PROFILES

Introduction to ASEMAP Value Gains Charts

Using the data collected from the study Value Gains Charts graphically illustrate the amount of perceived value each MSB technology can gain or lose if changes to product design were to occur. The levels associated with each of the four major MSB types represent a baseline case and are by default given an indexed score of 0. Levels with negative scores (denoted by red circles) indicate a perception of lost value to the product while levels with positive scores (denoted by green circles) indicate a perception of increased value. Yellow circles indicate the current perceived market offering. The amount of gain or loss for each level is measured as an index to take the importance of the corresponding attribute into account.

Note: The text for the ASEMAP desirability rating exercise reads "When replacing a medium screw base light bulb, please rate how desirable each of the following possibilities for [attribute] is to you."

Description of Economic Value to Customers (EVC)

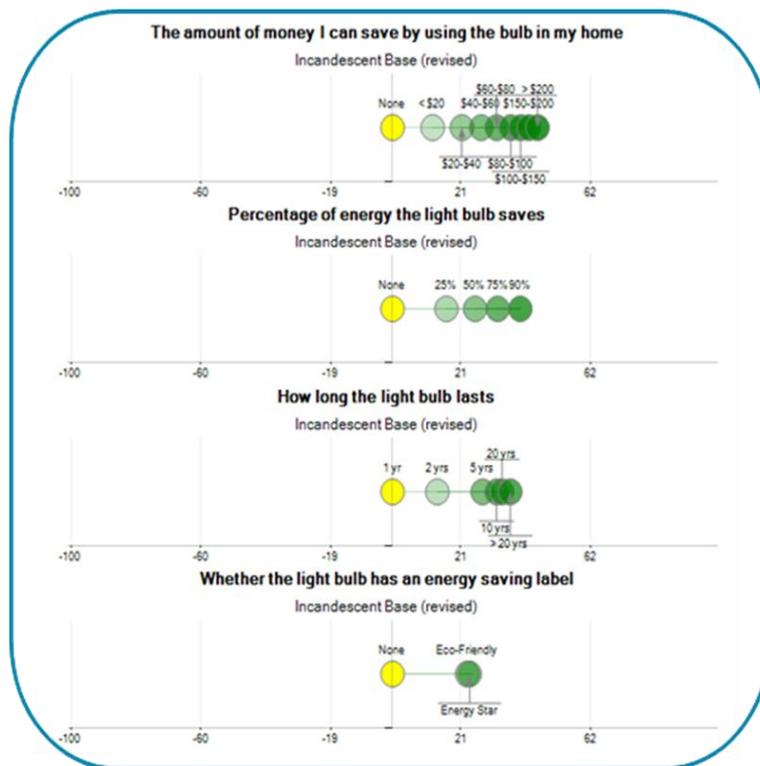
Using the four MSB product profiles, an analysis was conducted to determine the economic value to customers (EVC) of product enhancements. EVC represents the difference between the new price of a product as a result of an enhancement in its features or benefits and the original price (base price) without the improvement. In essence, EVC is the additional amount of money that customers would be willing to forego in exchange for the enhanced product or feature.

For example, if Product X currently sells at \$100, its base price is \$100. If the average lifetime operating cost of Product X is \$50, customers can expect to spend \$150 towards the product over its useful life span. Moreover, if improvements were made to Product X such that its lifetime operating costs dropped to \$25, customers should reasonably be willing to pay \$25 more for the product. Hence, customers would be willing to pay \$125 instead of \$100 for Product X, but because the operating costs are only \$25, not \$50, customers still end up spending the same amount of money (\$150) on the product overall. In this case, the EVC of the enhancement to Product X is \$25.

INCANDESCENT PRODUCT PROFILE

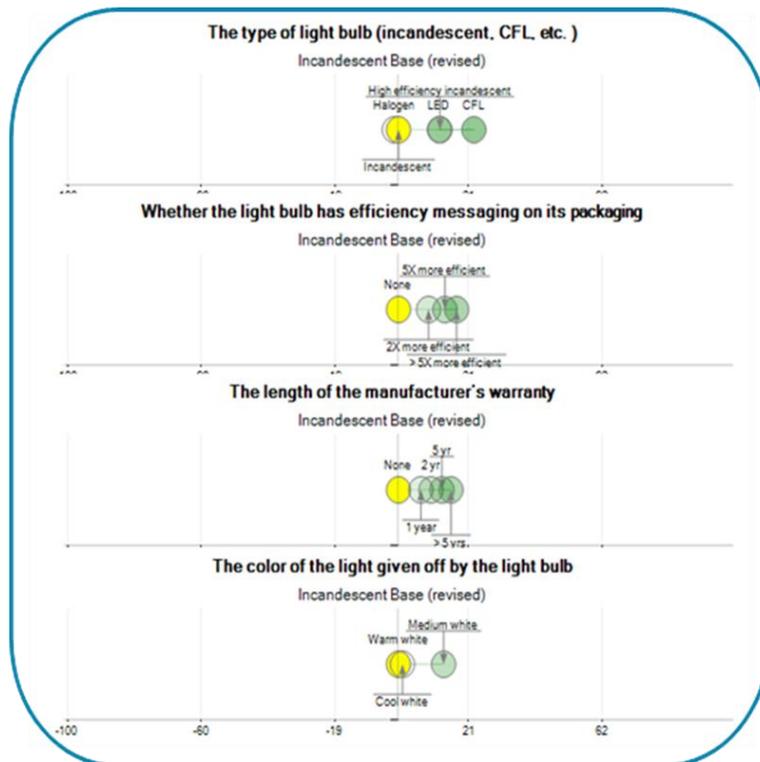
The largest gain in perceived value of incandescent lighting is obtained by messaging that incandescent bulbs will save customers money and energy. Moving from no savings to 25% energy savings and less than \$20 in monetary savings produces the largest increase in perceived value, with slighter gains occurring as savings increase thereafter. Increasing the lifespan of incandescent bulbs from one year to five years causes a dramatic increase in perceived value. Gains beyond five years are marginal. Putting an energy saving label on incandescent bulbs would provide as much added value as messaging a 50% energy savings (see **Figure 11**).

FIGURE 11 – INCANDESCENT VALUE GAINS (1-4)



An incandescent bulb with superior efficiency messaging would not provide as much value as a CFL bulb does on its own. Increasing warranty length does not substantially raise customers' perceptions of incandescent lighting products. However, offering bulbs with medium white color temperature would add value to the incandescent product line (see **Figure 12**).

FIGURE 12 – INCANDESCENT VALUE GAINS (5-8)



Little or no additional value can be added to the incandescent profile in regards to the following attributes: wattage, bulb shape, price, mercury content, flicker and hum, warm up time, ease of disposal and dimmer switch compatibility (see **Figures 13** and **14**). Incandescent bulbs differentiate themselves from other MSB technologies with their very low prices.

FIGURE 13 – INCANDESCENT VALUE GAINS (9-12)

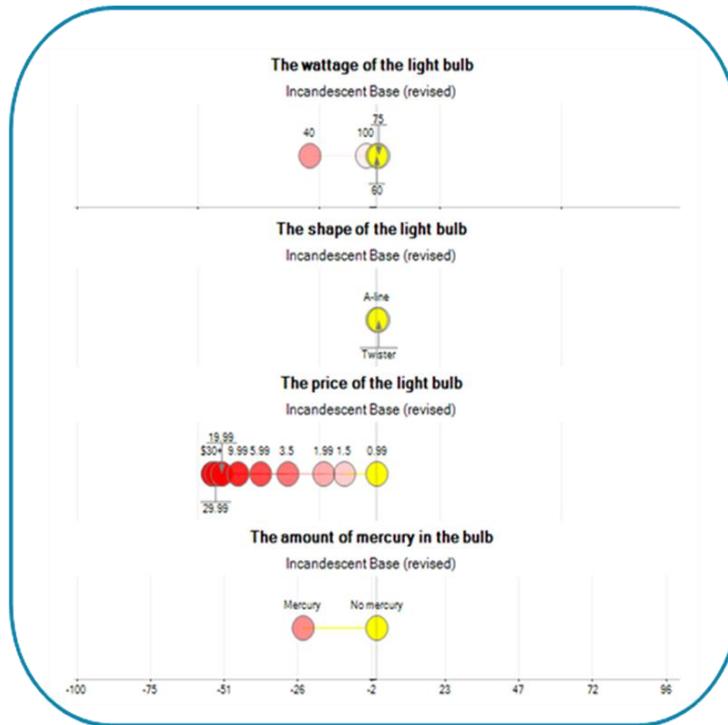
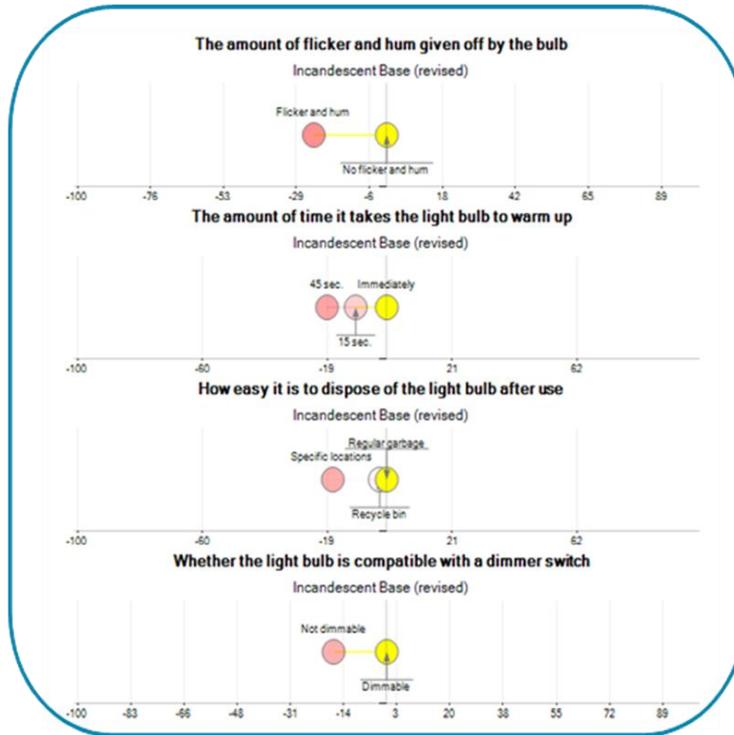


FIGURE 14 – INCANDESCENT VALUE GAINS (13-16)



For incandescent bulbs, the economic value is relatively low for the feature enhancements that have the largest impact on customers. Depending on the enhancements, the EVC for incandescents ranges from \$1.31 to \$1.92 with energy savings and bulb longevity have the greatest impact (see **Table 17**).

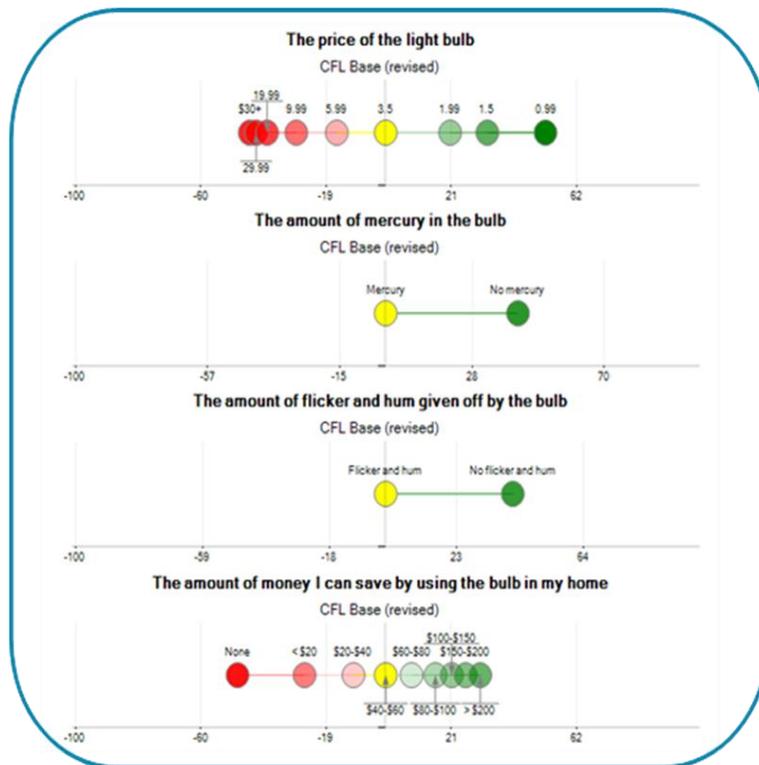
TABLE 17 – INCANDESCENT EVC

Attribute	Incandescent Base	Change	EVC
Base Price:	\$0.99 each		
The amount of mercury in the bulb	The light bulb does not contain mercury	NA	NA
How long the light bulb lasts	1 year	2 years	\$1.72
The length of the manufacturer's warranty	No warranty	1 year	\$1.31
Percentage of energy the light bulb saves	No energy savings	25% more	\$1.92
The color of the light given off by the light bulb	Warm white (yellowish white through red light)	Medium white	\$1.70
The amount of money I can save by using the bulb in my home	No energy savings over the life of the bulb	Less than \$20	\$1.62
Whether the light bulb has efficiency messaging on its packaging	The light bulb package does not have any efficiency messaging	2X more	\$1.42

CFL PRODUCT PROFILE

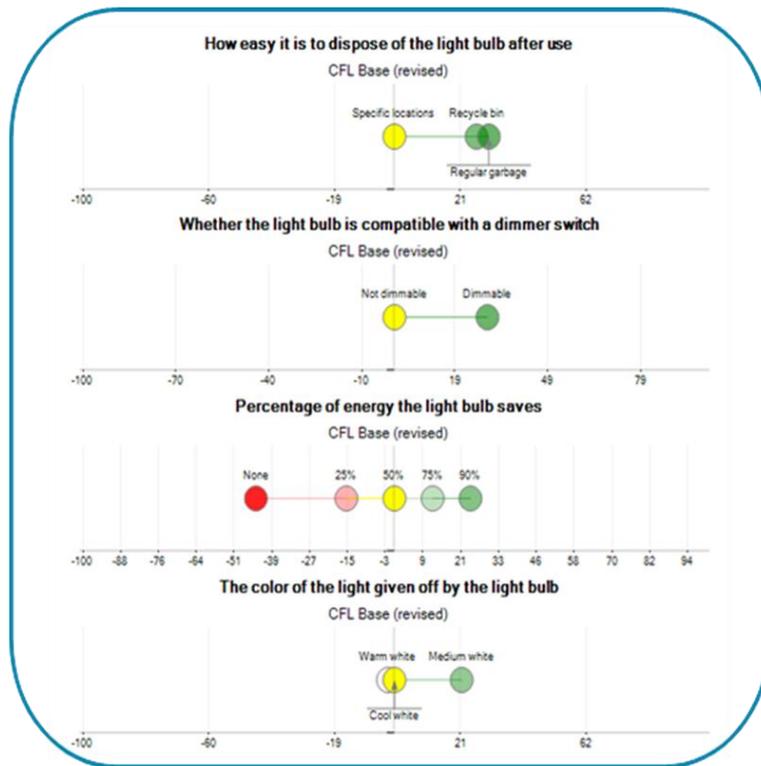
Lowering the price of CFL bulbs to \$0.99 would bring about the largest gain in the product's perceived value, followed closely by significant feature changes (no mercury, no flicker and hum). Dropping the price of CFL bulbs to \$1.99 would add a significant amount of value to the customer though it would not have as much of an impact as would eliminating mercury or flicker and hum. Increasing monetary savings to over \$200 would generate as much additional value as would lowering the price of CFL bulbs to \$1.50 (see **Figure 15**).

FIGURE 15 – CFL VALUE GAINS (1-4)



Disposal in the regular garbage and compatibility with a dimmer switch would cause larger increases in perceived value of CFL bulbs than would saving 90% of energy consumption. In fact, introducing recycle bins as a means of disposal would considerably improve customers' perceptions of CFL products. In addition, a medium white color CFL offering would enhance the perceived value of the CFL product portfolio (see **Figure 16**).

FIGURE 16 – CFL VALUE GAINS (5-8)



CFL products would be more appealing to customers if the bulbs could light up immediately. However, both an increase in bulb longevity to twenty years and a warranty extension to five years have a fairly minor effect on customers' perceptions of CFL products. As efficient as they already are, there is little value to be added by messaging that CFL bulbs are greater than five times as efficient as other MSB types (see **Figure 17**). Also, CFL bulbs have almost no room for improvement in terms of wattage, energy saving label, and bulb shape (see **Figure 18**).

FIGURE 17 – CFL VALUE GAINS (9-12)

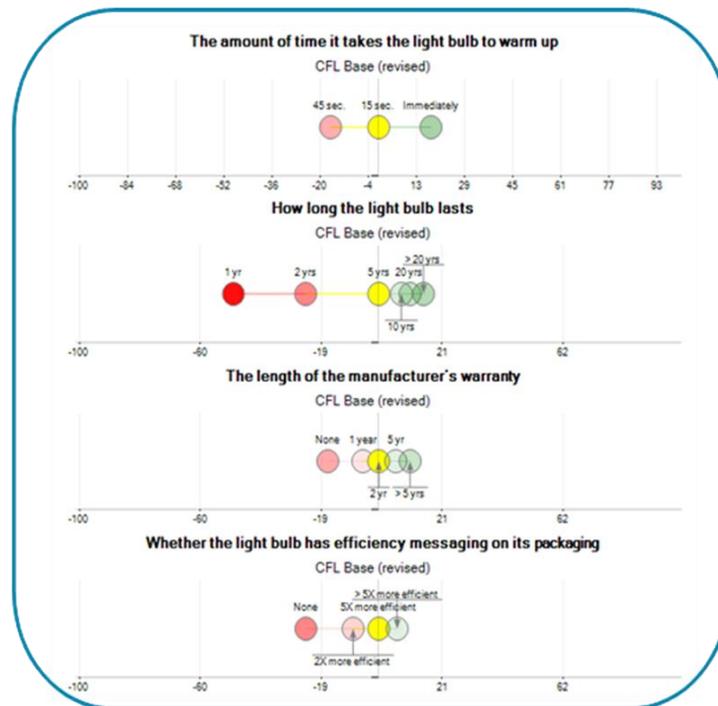
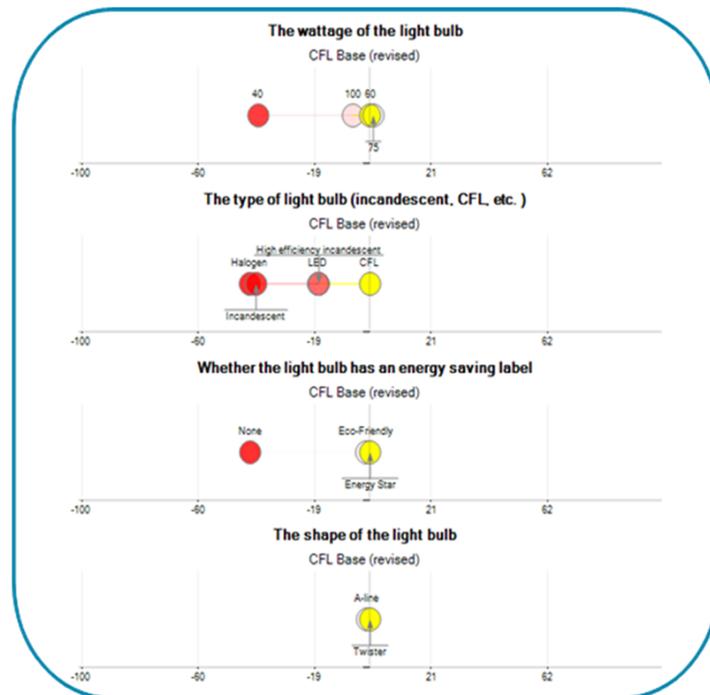


FIGURE 18 – CFL VALUE GAINS (13-16)



Eliminating mercury content in CFLs would have the largest impact on the value customers perceive in this MSB type. Without this improvement, the price of CFLs would need to drop by \$2.28 in order for the same increase in market share to occur as with the improvement. Other enhancements that would increase the value of CFLs include: medium white light, higher energy savings, higher monetary savings over the life of the bulb and longer bulb lifetime (see **Table 18**).

TABLE 18 – CFL EVC

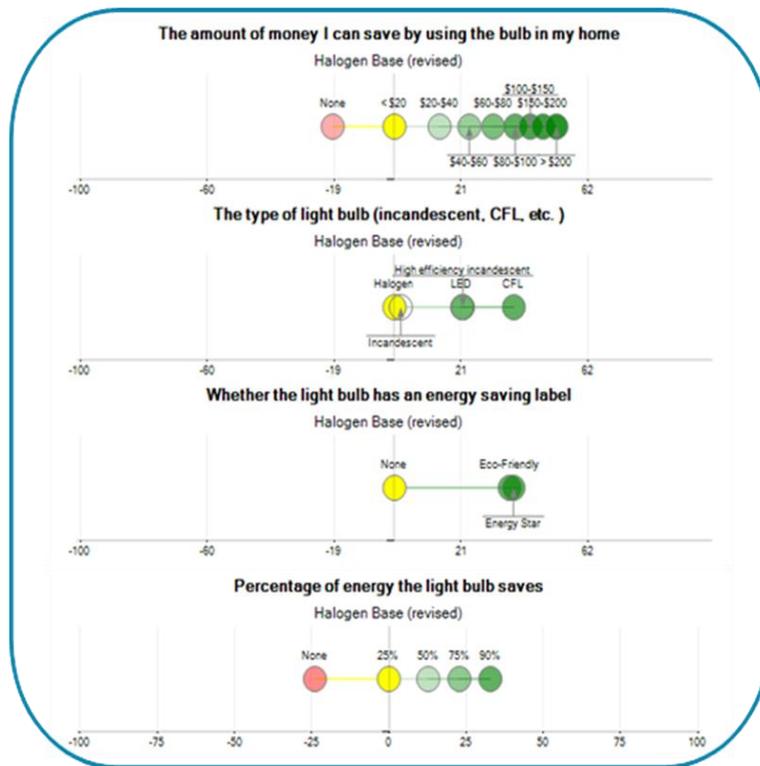
Attribute	CFL Base	Change	EVC	Base Price Value*
Base Price:	\$3.50 each			
The amount of mercury in the bulb	The light bulb contains mercury	No mercury	\$30.41	\$2.27
How long the light bulb lasts	5 years	10 years	\$4.69	\$0.55
The length of the manufacturer's warranty	2 years	5 years	\$4.40	\$0.41
Percentage of energy the light bulb saves	Saves 75% more on energy	90% more	\$5.42	\$0.88
The color of the light given off by the light bulb	Cool white (blueish white light)	Medium white	\$7.77	\$1.54
The amount of money I can save by using the bulb in my home	\$40- \$60 in additional savings over the life of the bulb	\$60 - \$80	\$4.82	\$0.61
Whether the light bulb has efficiency messaging on its packaging	The light bulb package says the bulb is 5X More Efficient	More than 5X more	\$4.47	\$0.45

* Reduction in the Base Price needed to achieve the same market share as if the feature were improved.

HALOGEN PRODUCT PROFILE

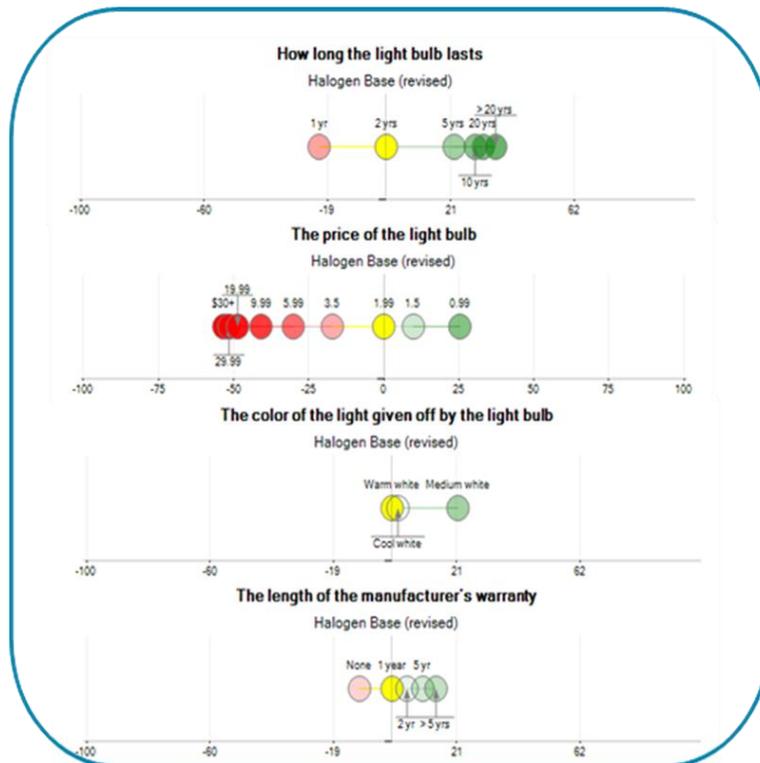
Halogen bulbs need to save customers at least \$80 in energy costs in order to carry as much perceived value as CFL bulbs. Adding an energy saving label to halogen bulbs would also help bridge the gap in perceived value between halogen products and CFL products. To be on par with LED bulbs, halogen bulbs need to save customers between \$40 and \$60 in energy costs. Increasing energy savings to the highest percentage tested (90%) would cause as much of a gain in perceived value as raising the savings amount to \$60 (see **Figure 19**).

FIGURE 19 – HALOGEN VALUE GAINS (1-4)



Increasing the life expectancy to five years and lowering price to \$0.99 would cause equal level of improvements in customers' perceptions of halogen products. Customers do not believe that extending bulb longevity beyond five years would add a substantial amount of value to the halogen product profile. Halogen bulbs emitting medium white color temperature would be an upgrade over the current warm white bulbs. Extending warranty length of bulbs would have a relatively small impact on customers' perceptions of halogen products (see **Figure 20**).

FIGURE 20 – HALOGEN VALUE GAINS (5-8)



Improving efficiency messaging to “5x more efficient” or greater provides only a slight boost in value of the halogen product line. Halogen bulbs already operate at the best or the near best level of the following attributes: wattage, bulb shape, mercury content, flicker and hum, bulb warm-up time, ease of bulb disposal and dimmer switch compatibility (see **Figures 21** and **22**).

FIGURE 21 – HALOGEN VALUE GAINS (9-12)

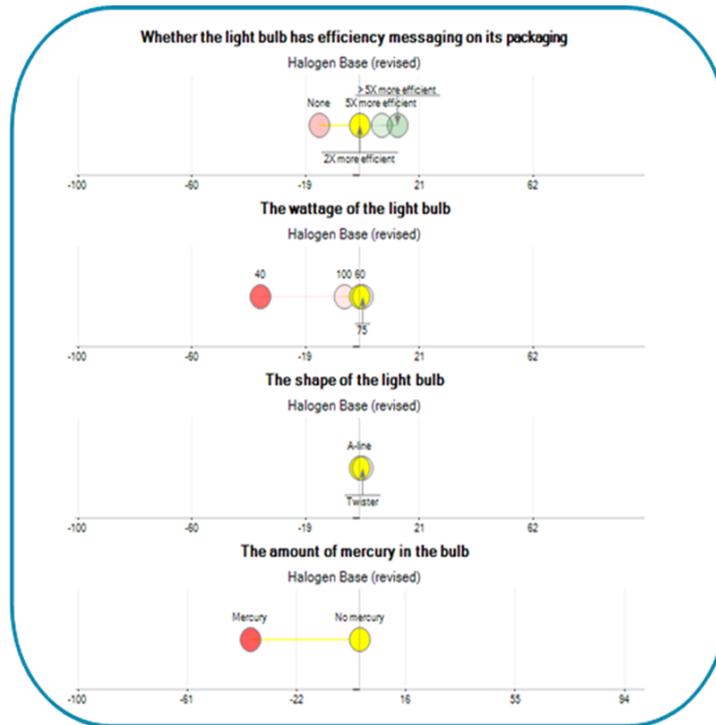
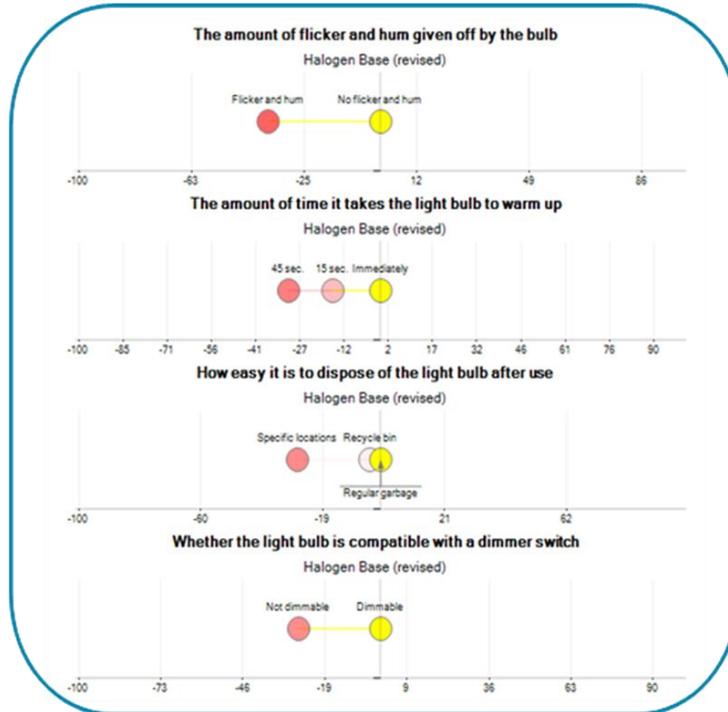


FIGURE 22 – HALOGEN VALUE GAINS (13-16)



Increasing bulb longevity from two to five years would incur the greatest economic value to customers. A change from two to five years could garner as much as an 83 cent increment on a halogen's current price (see **Table 19**).

TABLE 19 – HALOGEN EVC

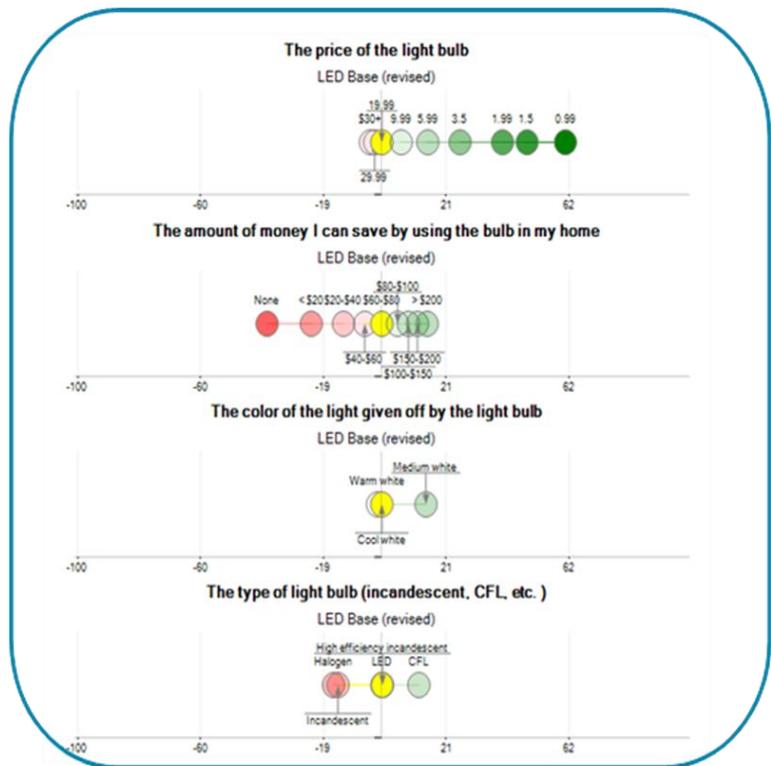
Attribute	Halogen Base	Change	EVC	Base Price Value*
Base Price:	\$1.99 each			
The amount of mercury in the bulb	The light bulb does not contain mercury	NA	NA	NA
How long the light bulb lasts	2 years	5 years	\$4.08	\$0.83
The length of the manufacturer's warranty	1 year	2 years	\$2.38	\$0.22
Percentage of energy the light bulb saves	Saves 25% more on energy	50% more	\$3.11	\$0.58
The color of the light given off by the light bulb	Warm white (yellowish white through red light)	Medium white	\$3.96	\$0.81
The amount of money I can save by using the bulb in my home	Less than \$20 in additional savings over the life of the bulb	\$20 - \$40	\$3.14	\$0.59
Whether the light bulb has efficiency messaging on its packaging	The light bulb package says the bulb is 2X More Efficient	5X more	\$2.61	\$0.35

* Reduction in the Base Price needed to achieve the same market share as if the feature were improved.

LED PRODUCT PROFILE

The perceived value of LED bulbs can be enhanced considerably by dropping price. Decreasing price to \$3.50 per bulb would cause a larger increase in perceived value than would raising the amount of savings to more than \$200. As with other MSB technologies, the LED portfolio can be improved by offering bulbs with medium white color temperature (see **Figure 23**).

FIGURE 23 – LED VALUE GAINS (1-4)



The amount of energy savings is already near optimal for LED bulbs. In addition, little value to the LED profile would be gained through improving length of bulb warranty, bulb longevity, wattage, bulb shape, mercury content, energy saving label and flicker and hum (see **Figures 24 and 25**).

FIGURE 24 – LED VALUE GAINS (5-8)

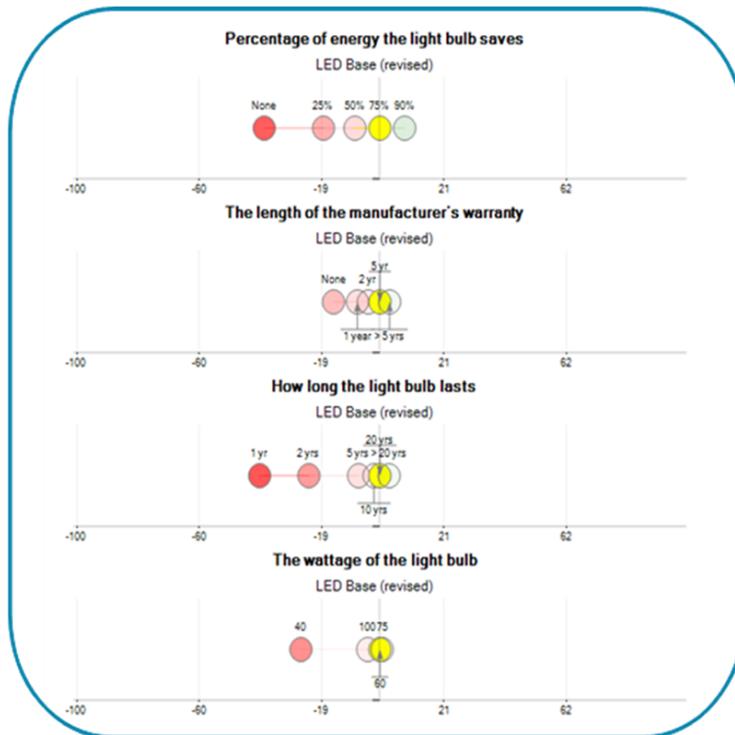
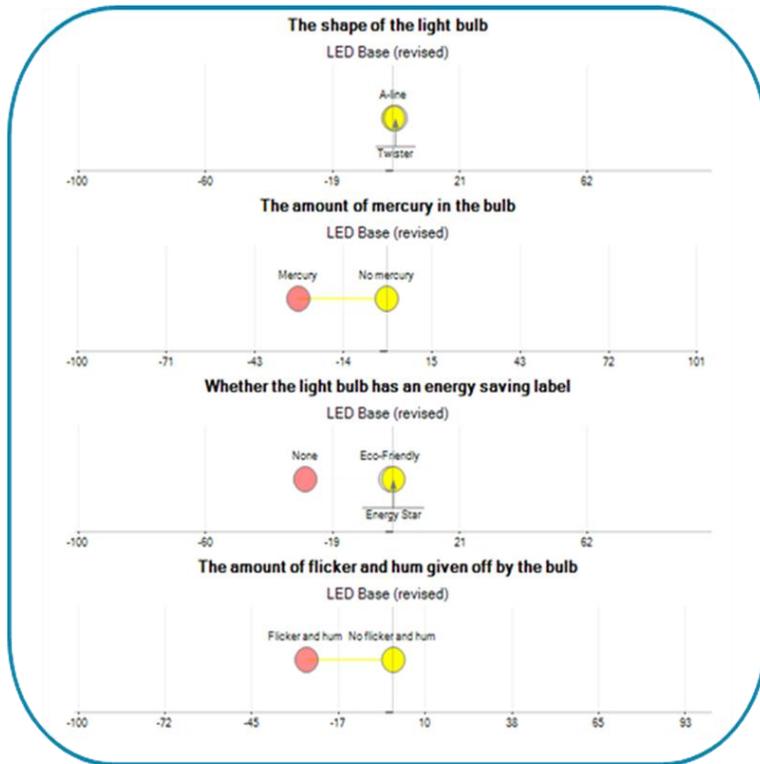
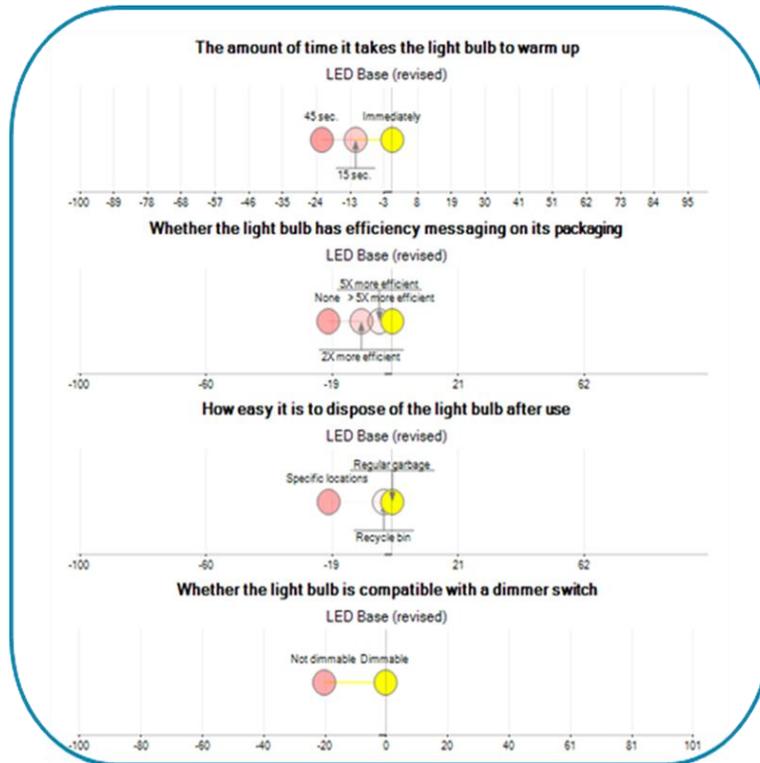


FIGURE 25 – LED VALUE GAINS (9-12)



LEDs differentiate themselves from other MSB types with the best possible efficiency messaging on their packaging. Like halogen and incandescent bulbs, LED bulbs already offer the most desirable levels for bulb warm up time, ease of bulb disposal and dimmer switch compatibility (see **Figure 26**).

FIGURE 26 – LED VALUE GAINS (13-16)



Already having strong features puts LEDs in a unique position in that any feasible enhancement pushes the EVC above the \$30 mark. From a price perspective, light color, the percent of energy saved and the amount of money savings are the enhancements that garner the highest incremental price gain (see **Table 20**).

TABLE 20 – LED EVC

Attribute	LED Base	Change	EVC	Base Price Value*
Base Price:	\$19.99 each			
The amount of mercury in the bulb	The light bulb does not contain mercury	NA	NA	NA
How long the light bulb lasts	20 years	More than 20 years	Greater than \$30	\$4.76
The length of the manufacturer's warranty	5 years	More than 5 years	Greater than \$30	\$5.05
Percentage of energy the light bulb saves	Saves 75% more on energy	90% more	Greater than \$30	\$10.83
The color of the light given off by the light bulb	Cool white (blueish white light)	Medium white	Greater than \$30	\$13.72
The amount of money I can save by using the bulb in my home	\$60- \$80 in additional savings over the life of the bulb	\$80 - \$100	Greater than \$30	\$8.13
Whether the light bulb has efficiency messaging on its packaging	The light bulb package says the bulb is greater than 5X more efficient	NA	NA	NA

* Reduction in the Base Price needed to achieve the same market share as if the feature were improved.

RECOMMENDATIONS

Based on the results of this study, Optimal Strategix Group provided PG&E with recommendations in three interrelated categories: targeting, product rebates / messaging and product optimization.

From a targeting perspective, PG&E should consider the following:

- Target Early Adopters for adoption of new efficiency lighting,
- Highlight the benefits that are important to other segments,
- Highlight that alternatives to incandescent offer equivalent lighting conditions,
- Educate consumers how the life-time savings of energy-efficient light bulbs will overcome higher prices,
- Appealing to consumers' green sensibilities, emphasize the impact that the bulbs they choose have on total CA energy consumption and
- Ladder its lighting program onto other efforts (solar initiative, low income energy) to increase awareness.

Offering rebates to more channels where consumers shop (e.g. convenience stores) is critical to driving adoption. PG&E should tailor its messaging to the MSB technology being rebated as shown in **Table 21**.

TABLE 21 – RECOMMENDED REBATE MESSAGING

MSB Technology	Net Retail Price	Total Energy Savings	Other Benefits
CFL	\$1.99 or less	\$150-\$200	N/A
Halogen	\$1.50	\$40-\$60	N/A
LED	\$5.99	\$150-\$200	N/A

PG&E needs to partner with efficiency lighting manufacturers in order to optimize efficiency lighting alternatives for consumer use. CFLs need to be designed so that they do not contain any mercury, have minimal flicker and hum, and are dimmer compatible. In order to help distinguish halogens from incandescents, an eco-friendly or Energy Star label should be placed on halogen packaging. Halogens should also be made to last five years to increase their energy-saving potential, thereby justifying a price premium over incandescents. With LEDs, price seems to be the only issue. As the cost to design and manufacture these high-tech lamps declines, this barrier will be alleviated and the market will see an increased uptake of the technology.

APPENDIX – SURVEY INSTRUMENT

Engagement Artemis

PG&E Next Generation Light Bulb Optimization

Residential Quantitative Questionnaire



Online Survey Questionnaire Sections

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Respondent Quotas:

- Total Sample: N = 1,000
- Estimated Survey Length with ASEMAP: 30 Minutes

Note: Question numbers may be out of sequence. This is intentional due to changes.

Note: Please maintain variables for sample source, and changes that may occur throughout the survey.

Note: Maintain the attribute value as mentioned against each option. Make sure the values are coded correctly.

Screener

[WELCOME INFO]

We will begin by asking you a few questions to ensure you meet the criteria to participate in this market research study. After answering these questions, you will be informed of your eligibility.

S01. Who is the current provider of electricity at your primary residence? **(Select one)**

Alpine Natural Gas Company	1
Avista Utilities.....	2
City of Long Beach Energy	3
Coalinga	4
Los Angeles Dept. Water & Power (LADWP).....	5
Pacific Gas & Electric Company (PG&E) [CONTINUE]	6
Pacific Corp.....	7
Palo Alto Utilities	8
Sacramento Municipal Utility District (SMUD).....	9
San Diego Gas & Electric (SDG&E).....	10
Southern California Edison (SCE).....	11
Southern California Gas Company (SoCal Gas)	12
Southwest Gas Corporation	13
West Coast Gas.....	14
Other (please specify).....	97
I do not have this service.....	99

[IF S01 = 6 (PG&E), CONTINUE, ELSE TERMINATE]

S02. Have you yourself purchased any medium screw base light bulbs within the past 12 months? By medium screw base light bulbs, we mean bulbs that have a screw cap at the bottom of the bulb that fits into the lamp (see image examples). **(Select one)**



Incandescent



Advanced
Incandescent
(Halogen)



LED



CFL

Yes	1
No [TERMINATE]	0

S03. In the past six months, have you participated in a market research study for any power or electricity company in CA? **(Select one)**

Yes [TERMINATE]1

No0

S04. Do you or any of your immediate family members currently work for any of the following types of companies? **(Select all that apply)**

Advertising [TERMINATE]1

Apparel2

Automotive.....3

Education.....4

Electric Utility [TERMINATE]5

Financial Services.....6

Food and Beverage.....7

Gas Utility [TERMINATE].....8

Healthcare or Pharmaceuticals9

Lighting Manufacturer [TERMINATE]10

Marketing Research [TERMINATE]11

Military12

Public Relations [TERMINATE].....13

Real Estate14

Technology15

Travel.....16

Other (please specify): [CONTINUE].....97

S05. In which of the following counties is your primary residence located? (Select one)

Alameda	Kings	Orange[TERMINATE]	Shasta
Alpine	Lake	Placer	Sierra
Amador	Lassen	Plumas	Siskiyou
Butte	Los Angeles	Riverside[TERMINATE]	Solano
Calaveras	[TERMINATE]	Sacramento	Sonoma
Colusa	Madera	San Benito	Stanislaus
Contra Costa	Marin	San Bernardino	Sutter
Del Norte	Mariposa	San Diego[TERMINATE]	Tehama
El Dorado	Mendocino	San Francisco	Trinity
Fresno	Merced	San Joaquin	Tulare
Glenn	Modoc [TERMINATE]	San Luis Obispo	Tuolumne
Humboldt	Mono [TERMINATE]	San Mateo	Ventura[TERMINATE]
Imperial [TERMINATE]	Monterey	Santa Barbara	Yolo
Inyo [TERMINATE]	Napa	Santa Clara	Yuba
Kern	Nevada	Santa Cruz	

Other (please specify): [TERMINATE] 97

Prefer not to answer [TERMINATE] 99

S06.	As you progress through the study, please ensure your answers are thoughtful and candid. Will you commit to contributing your best effort to a successful study? (Select one)	
	Yes.....	1
	No [TERMINATE].....	0

D01.	Do you rent or own your home? (Select one)	
	Rent.....	1
	Own.....	2

D02.	What age group do you fall under? (Select one)	
	0-18 [terminate]	1
	19-24	2
	25-34	3
	35-44	4
	45-54	5
	55-64	6
	65 or older	7

D03.	Please select your gender. (Select one)	
	Male	1
	Female	2
	Prefer not to answer.....	99

D04.	Which of the following best describes your ethnicity? (Select one)	
	White (but not Hispanic).....	1
	African-American	2
	Asian or Pacific Islander	3
	Hispanic or Latin American	4
	Native American	5
	Mixed race	6
	Other (please specify).....	97
	Prefer not to answer.....	99

[INSURE DEMOGRAPHIC REPRESENTIVITY FOR PG&E / CA MARKET (S05, D01 – D04). CODE IN QUOTA TABLES FOR EACH QUESTION BUT LEAVE THE LIMITS OPEN]

Main Questionnaire

[INTRODUCTION]

Welcome and thank you for taking part in this important study. We expect that this survey will take about 30 minutes to complete.

The study's objective is to learn how consumers like you feel about specific programs and new initiatives around energy conservation. Your feedback will be important in helping companies make products and services to serve you better in the future.

Remember that all the information you provide us is used for reporting purposes only, we will not share your contact information with anyone, and we will only report the survey results in aggregate. We absolutely promise never to try to sell you anything.

Please remember:

While it is preferred that you take the survey in one sitting, **in all but one section** you have the convenience of logging out and picking up from where you left off, if you need to. Please note that you will be notified when entering the one section that needs to be completed in one sitting.

Once you have completed the survey, you will see a screen confirming that your responses have been submitted and that you can close out of the survey.

Section A: Purchase Behaviors

Q01. How aware are you of the following types of medium screw base light bulbs? **(Select one for each)**

	I am not aware of this light bulb type	I have heard of this light bulb type but have never used it	I have used this light bulb type in the past but am not using it now	I am currently using this light bulb type in my home
Incandescent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Advanced incandescent (halogen)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CFL (Compact Fluorescent)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LED	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q02a. Please use your best estimate for the following question.

Approximately, how many of the following fixtures or lamps do you have inside or around your home? **(Enter the approximate number of each fixture or lamp in whole numbers. If you don't have the fixture or lamp type in your home, enter "0")**

[RANDOMIZE, AUTOFILL EACH OPTION WITH 0, ALLOW 0-99]

- Lamp with incandescent bulb (desk, table, or floor) []
- Halogen lighting []
- Track lighting..... []
- Recessed lighting []
- Fluorescent lighting []
- Spot lighting []
- Fan with lighting []
- Ceiling lighting..... []
- Hanging light (chandler, globe etc.)..... []
- Outdoor lighting..... []
- Security lighting []
- Other (please specify)..... []

Total number of lighting fixtures or lamps = [COUNT: INCLUDE IN DATA]

Q02b. Are any of the following fixtures or lamps in your home connected to a dimmer switch? **(Select all that apply)**

[RANDOMIZE IN SAME ORDER AS Q02A, SHOW ONLY THOSE WHERE Q02A > 0]

- Lamp with incandescent bulb (desk, table or floor) 1
- Halogen lighting 2
- Track lighting..... 3
- Recessed lighting 4
- Fluorescent lighting 5
- Spot lighting 6
- Fan with lighting 7
- Ceiling lighting..... 8
- Hanging light (chandler, globe etc.)..... 9
- Outdoor lighting..... 10
- Security lighting 11
- [ENTER OTHER FROM Q02A] 12
- None of the Above [FIXED, EXCLUSIVE]..... 99

Q03a. Please use your best estimate for the following question.

Thinking about all of the fixtures or lamps inside of your home, approximately how many of each of the following **medium screw base light bulb** types are you using inside of your home? Do not count fixtures or lamps that do not hold bulbs similar to the ones in the image below. **(Enter the approximate number of light bulbs in your home for each)**



Incandescent



Advanced Incandescent (Halogen)



LED



CFL

[RANDOMIZE, AUTOFILL EACH OPTION WITH 0, ALLOW 0-99]

- Incandescent..... []
- Advanced incandescent (halogen)..... []
- CFL (Compact Fluorescent)..... []
- LED []
- Other (please specify): [FIXED] []
- Other (please specify): [FIXED] []
- Other (please specify): [FIXED] []

Total number of medium screw base light bulbs = [COUNT: INCLUDE IN DATA]

[IF Q03A = 0 FOR ALL MEDIUM SCREW BASE BULBS, SKIP TO Q04, ELSE CONTINUE]

Q03b. Please use your best estimate for the following question.

For each type of medium screw base bulbs you have in your home, approximately what percent of them is each of the following wattages? **(Enter percentages between 0 and 100 across each row. Each row should add to 100%. Do not include a “%” sign.)**

[RANDOMIZE IN SAME ORDER AS Q03A; SHOW ONLY THOSE WHERE Q03A > 0; ALLOW 0-100 FOR EACH CELL; ROWS SHOULD ADD TO 100% - AUTOFILL BLANKS AS ZEROS AND SHOW COUNT IN LAST COLUMN]

	100-watt Incandescent (or 26-watt CFL)	75-watt Incandescent (or 23-watt CFL)	60-watt Incandescent (or 15-watt CFL)	40-watt Incandescent (or 11-watt CFL)	3-way or Other Wattage	Count
Incandescent	[]	[]	[]	[]	[]	[ROW COUNT]
Advanced incandescent (halogen)	[]	[]	[]	[]	[]	[ROW COUNT]
CFL (Compact Fluorescent)	[]	[]	[]	[]	[]	[ROW COUNT]
LED	[]	[]	[]	[]	[]	[ROW COUNT]
[PIPE OTHER FROM Q03A]	[]	[]	[]	[]	[]	[ROW COUNT]
[PIPE OTHER FROM Q03A]	[]	[]	[]	[]	[]	[ROW COUNT]
[PIPE OTHER FROM Q03A]	[]	[]	[]	[]	[]	[ROW COUNT]

Q03c. Please use your best estimate for the following question.

For each of the following rooms in your house, please indicate which type(s) of medium screw base bulbs you are using. **(Please respond by selecting one or more light bulb types for each room)**

[RANDOMIZE ROOMS. SHOW ONLY LIGHT BULB TYPES WHERE Q03A > 0. ALLOW MULTIPLE SELECTS ACROSS EACH ROW]

Note: Lighting types will not be abbreviated	I don't have this room [EXCL.]	Incand.	Adv. incand. (halogen)	CFL	LED	[PIPE OTHER FROM Q03A]	[PIPE OTHER FROM Q03A]	[PIPE OTHER FROM Q03A]	Some other type of bulb
Living room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kitchen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dining room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Family room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Den or office	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Master bedroom (including closets)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All other bedrooms (including closets)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hallways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bathrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laundry room	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other room inside your home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CODING:	99	1	2	3	4	971	972	973	974

Q04. In the **past 12 months**, approximately how many medium screw base light bulbs have you purchased for your home? If you purchased a package of light bulbs, please estimate the total number of actual bulbs. **(Enter a whole number only, not a range)**

Number of medium screw base light bulbs purchased: [_____] [ALLOW 0-9999]

Don't know..... 98

Q05. How much, on average, do you typically pay for a single medium screw base light bulb for your home? **(Enter the exact dollar amount, in dollars and cents. Do not include a "\$" sign.)**

Average dollar amount: \$[_____] [ALLOW 0-999.99]

Q06. When you think about the medium screw base light bulb purchases you've made at any time in the past, how likely were you to consider each of the following:

(Select one for each)

[GRID, RANDOMIZE ATTRIBUTES]

1	2	3	4	5
Very Unlikely	Somewhat Unlikely	Neither Likely nor Unlikely	Somewhat Likely	Very Likely

- a) Purchasing a light bulb of a lower wattage (e.g. replacing a 100-watt bulb with a 75-watt bulb)
- b) Purchasing a light bulb of a different type (e.g. replacing an incandescent bulb with a CFL)
- c) Purchased a light bulb based on energy saving potential
- d) Purchasing a more expensive light bulb
- e) Purchasing a light bulb which is on sale
- f) Purchasing a light bulb that is guaranteed to last longer
- g) Purchasing several of the same light bulbs at one time
- h) Purchasing a light bulb based on the brand of the manufacturer

Q07. And, which of the following best describes how you make medium screw base light bulb purchases? **(Select one)**

- I purchase light bulbs only when they were on sale..... 1
- I purchase light bulbs only at full price..... 2
- I purchase some light bulbs on sale and some at full price..... 3
- Don't know..... 98

Q08. In the first column of the grid below, please select all the locations where you have purchased light bulbs, and in the second column please **select the one location** where you purchase light bulbs most often. **(Select multiple locations in the first column and one location in the second)**
 [VALIDATE SUCH THAT COLUMN 2 (MOST OFTEN PURCHASE LOCATION) IS ONLY SELECTED IF COLUMN 1 (PURCHASE LOCATION) IS SELECTED]

[RANDOMIZE STORES]	Select all the locations where you purchase light bulbs	Location where you purchase light bulbs most often	CODING
Home improvement store like Home Depot, Lowes, or OSH	<input type="checkbox"/>	0	1
Hardware store like Ace or True Value	<input type="checkbox"/>	0	2
Mass merchandiser like Target, K-Mart, or Wal-Mart	<input type="checkbox"/>	0	3
Club store like Costco or Sam's Clubs	<input type="checkbox"/>	0	4
Department store like Sears	<input type="checkbox"/>	0	5
Grocery store like Safeway or Lucky's	<input type="checkbox"/>	0	6
Drug store like CVS, Rite Aid, or Walgreen's	<input type="checkbox"/>	0	7
Discount / 99 Cent Store	<input type="checkbox"/>	0	8
Lighting store	<input type="checkbox"/>	0	9
Mail-order catalog	<input type="checkbox"/>	0	10
Over the Internet	<input type="checkbox"/>	0	11
Specialty store like Bed Bath and Beyond	<input type="checkbox"/>	0	12
Furniture store like IKEA	<input type="checkbox"/>	0	13
Electronic store like Best Buy or Fry's	<input type="checkbox"/>	0	14
Other (please specify): [_____]	<input type="checkbox"/>	0	97

[LOOP Q09A AND Q09B FOR EACH RESPONSE IN Q03A > 0]

Q09a. You mentioned earlier that you currently have [PIPE RESPONSE FROM Q03A (TYPE)] light bulbs in your home. How likely would you be to replace your [PIPE RESPONSE FROM Q03A (TYPE)] light bulb with a different type of bulb? **(Select one)**

- Extremely Likely 5
- Somewhat Likely 4
- Neither Likely nor Unlikely..... 3
- Somewhat Unlikely 2
- Extremely Unlikely 1

[IF Q09A = 4 OR 5 (LIKELY TO REPLACE WITH DIFFERENT TYPE), ASK Q09B, ELSE LOOP UNTIL ALL Q03A > 0 ARE ASKED, THEN CONTINUE WITH Q10]

Q09b. You mention that you are [PIPE RESPONSE FROM Q09A (LIKELIHOOD)] to replace your [PIPE RESPONSE FROM Q03A (TYPE)] light bulb with a different light bulb type? What light bulb type would you be likely to replace it with? **(Select all that apply)**

[RANDOMIZE IN SAME ORDER AS Q03A]

Incandescent.....	1
Advanced incandescent (halogen).....	2
CFL (Compact Fluorescent).....	3
LED.....	4
[PIPE OTHER FROM Q03A]	97
[PIPE OTHER FROM Q03A]	98
[PIPE OTHER FROM Q03A]	99
Something else (please specify): [FIXED].....	100

Q10. When thinking about light bulb purchases, how likely are you to agree or disagree with each of the following statements? **(Select one for each)**

[GRID, RANDOMIZE ATTRIBUTES]

Completely Disagree 0	1	2	3	4	5	6	7	8	9	Completely Agree 10
0	1	2	3	4	5	6	7	8	9	10

- i) I do not feel I should replace a light bulb unless it is broken
- j) One of the main reasons I purchase energy efficient light bulbs is to save money on my energy bill
- k) I like to purchase light bulbs that are energy-efficient or green
- l) Energy-efficient light bulbs cost too much money
- m) I don't understand the benefits of energy-efficient light bulbs
- n) I am happy with the light bulbs I am currently using
- o) The type of light bulb I purchase is the least important thing on my mind
- p) Energy efficient light bulbs last longer than regular bulbs
- q) There is no difference between energy efficient light bulbs (i.e. CFLs) and non- energy efficient light bulbs (incandescent)
- r) Energy efficient light bulbs (i.e. CFLs) provide a low-cost way for me to save energy

Section B: ASEMAP

[SHOW THIS STATEMENT TO EACH RESPONDENT ON A SEPARATE SCREEN]

Thank you for your responses so far. In this section, you will be shown a list of considerations when deciding which type of light bulb to purchase for your home.

PLEASE NOTE THAT THIS SECTION MUST BE COMPLETED IN ONE SITTING. YOU WILL NOT BE ALLOWED TO RETURN BACK TO THE QUESTIONNAIRE IF YOU LOG OUT DURING THIS SECTION.

If you need to pause and return later, please do so before starting this section. This section will take approximately 10 to 15 minutes to complete.

Click >> to continue.

[PGM NOTE: ASEMAP ATTRIBUTES AND LEVELS ARE SHOWN IN THE FOLLOWING TABLE]

#	Dimension / Attribute	#	Level
	Compatibility		
1	The wattage of the light bulb	1	40 watts
		2	60 watts
		3	75 watts
		4	100 watts
2	Whether the light bulb is compatible with a dimmer switch	1	The light bulb is dimmable
		2	The light bulb is not dimmable
	Technology		
3	The type of light bulb (incandescent, CFL, etc.)	1	Incandescent
		2	High efficiency incandescent
		3	Halogen
		4	CFL
		5	LED
4	The amount of mercury in the bulb	1	The light bulb contains mercury
		2	The light bulb does not contain mercury

Lifetime			
5	How long the light bulb lasts	1	1 year
		2	2 years
		3	5 years
		4	10 years
		5	20 years
		6	More than 20 years
6	The length of the manufacturer's warranty	1	No warranty
		2	1 year
		3	2 years
		4	5 years
		5	More than 5 years
Cost / Price / Savings			
7	The price of the light bulb	1	\$30.00 or more
		2	\$29.99 each
		3	\$19.99 each
		4	\$9.99 each
		5	\$5.99 each
		6	\$3.50 each
		7	\$1.99 each
		8	\$1.50 each
		9	\$0.99 each
8	The amount of money I can save by using the bulb in my home	1	No energy savings over the life of the bulb
		2	Less than \$20 in additional savings over the life of the bulb
		3	\$20 to \$40 in additional savings over the life of the bulb
		4	\$40 to \$60 in additional savings over the life of the bulb
		5	\$60 to \$80 in additional savings over the life of the bulb
		6	\$80 to \$100 in additional savings over the life of the bulb
		7	\$100 to \$150 in additional savings over the life of the bulb
		8	\$150 to \$200 in additional savings over the life of the bulb
		9	More than \$200 in additional savings over the life of the bulb
9	Percentage of energy the light bulb saves	1	No energy savings
		2	Saves 25% more on energy
		3	Saves 50% more on energy
		4	Saves 75% more on energy
		5	Saves 90% more on energy

Bulb Features			
10	The amount of time it takes the light bulb to warm up	1	45 seconds warm up time
		2	15 seconds warm up time
		3	immediately at full light output
11	The shape of the light bulb	1	A-line 
		2	Twister 
Involvement / Endorsements			
12	Whether the light bulb is recommended by others	1	The light bulb is recommended by my electric company
		2	Recommended by a friend/neighbor
		3	The light bulb is recommended by Consumer Reports
		4	Recommended by online user review
		5	The light bulb is recommended by Energy Star
		6	The light bulb appears on a "Top Ten" list
Cosmetics			
13	The color of the light given off by the light bulb	1	Cool white (blueish white light) 
		2	Medium white (neutral white light) 
		3	Warm white (yellowish white through red light) 
Purchasing			
14	Where the light bulb can be purchased	1	At a home appliance store
		2	At a grocery store
		3	At a convenience store
		4	At a hardware store
		5	At a home improvement store
		6	At a mass merchandise store
		7	At a drug store
		8	At a discount store
		9	At a membership club store (Costco, Sam's, etc.)
15	Light bulbs come in packages	1	Single light bulb

	of 2 to 4 instead of sold individually	2	Multiple light bulbs (2-4)
Environmental			
16	Whether the light bulb has an energy saving label	1	No label
		2	Energy Star Label
		3	Eco-Friendly Label
Miscellaneous			
17	How easy it is to dispose of the light bulb after use	1	The light bulb needs to be disposed of at specific locations
		2	The light bulb needs to be disposed of in a recycle bin
		3	The light bulb can be disposed of in the regular garbage
18	Whether the brand of the light bulb is recognizable	1	Recognizable Brand (e.g., GE, Philips, Sylvania)
		2	Brand I do not recognize
19	Whether the light bulb gives off the same quality light as my current bulb	1	A new 23W bulb gives off the same quality light as a 100W bulb
		2	A new 50W bulb gives off the same quality light as a 100W bulb
		3	A new 72W bulb gives off the same quality light as a 100W bulb
20	Whether the light bulb has efficiency messaging on its packaging	1	The light bulb package does not have any efficiency messaging
		2	The light bulb package says the bulb is 2X More Efficient
		3	The light bulb package says the bulb is 5X More Efficient
		4	The light bulb package says the bulb is greater than 5X more efficient
21	The amount of flicker and hum given off by the bulb	1	The light bulb flickers and hums
		2	The light bulb does not flicker and hum

Section C: Program and Technology Awareness

Q12. Are you aware of the Energy Independence and Security Act 2007 (EISA) and its impact on the light bulb market in California? **(Select one)**
 Yes..... 1
 No..... 0

[IF Q12 = 1 (AWARE OF EISA), ASK Q13, ELSE SKIP TO Q14]

Q13. What have you heard about the Energy Independence and Security Act 2007 (EISA) and its impact on the light bulb market in California? **(Please be as specific as possible)**
 [] [CODING NOTE: NOT CODED]

Q14. Do you know of any electric or energy companies that offer discounts to manufacturers or retailers so that you can purchase energy-efficient light bulbs at lower prices from the stores you shop? **(Select one)**
 Yes 1
 No 0

Q15a. Have you heard of the term “wattage” in reference to light bulbs? **(Select one)**
 Yes..... 1
 No..... 0

Q16a. Have you heard of the term “lumens” in reference to light bulbs? **(Select one)**
 Yes [CONTINUE WITH 16B] 1
 No [SKIP TO 16A]..... 0

Q16b. What does the term “lumens” mean to you? **(Please be as specific as possible)**
 [] [CODING NOTE: NOT CODED]

Section D: Attitudes Toward Energy Conservation

Q17. How much do you agree or disagree with each of the following statements about energy conservation and the environment? **(Select one for each)**

[GRID, RANDOMIZE ATTRIBUTES]

Completely Disagree 0	1	2	3	4	5	6	7	8	9	Completely Agree 10
0	1	2	3	4	5	6	7	8	9	10

- s) I am personally concerned about energy conservation
- t) I live a "green" lifestyle
- u) I feel a personal responsibility to help solve the energy problems that we face today
- v) The majority of products in my home are Energy Star-rated
- w) I would pay more for an environmentally-friendly product.
- x) I would trade convenience for a product that is environmentally safe.
- y) I feel I am more environmentally conscious than most people.
- z) While I might be in favor of environmental issues, I am often too busy to think about them.
- aa) I've done a lot to reduce my own energy usage.
- bb) I believe my small energy use changes can create a big impact when combined with the efforts of others.

Q18. How believable are the following statements? **(Select one for each)**

[GRID, DO NOT RANDOMIZE ATTRIBUTES]

1	2	3	4	5
Not at All Believable	Not really Believable	Neither Believable nor Unbelievable	Somewhat Believable	Very Believable

- cc) A new energy efficient 23-watt light bulb gives off the same quality light as a 100-watt bulb
- dd) A new energy efficient 50-watt light bulb gives off the same quality light as a 100-watt bulb
- ee) A new energy efficient 72-watt light bulb gives off the same quality light as a 100-watt bulb

Section E: PG&E Ratings

Q19. Please indicate all of the following rate plans, programs, and rebates that you are aware of being offered by PG&E? **(Select all that apply)**

- Air-Conditioning cycling (SmartAC) 1
- Appliance Rebates or Refrigerator Recycling 2
- Balanced Payment Program 3
- California Solar Initiative (Rebates for Solar Power) 4
- CARE..... 5
- Climate Smart 6
- Compact fluorescent lights, or other energy-efficient lighting 7
- Cool Station Program..... 8
- Duct Sealing and Insulation Rebates 9
- Energy Surveys or Audits 10
- Equipment and Appliance Rebates..... 11
- FERA..... 12
- Low Income Energy Efficiency (weatherization and new appliances 13
- Reach 14
- Smart Energy Analyzer..... 15
- SmartRate 16
- Time of use, or TOU Rate 17
- Winter Gas Savings, or the 10-20 Program 18
- Other (please specify):..... 97
- I am not aware of any of these programs [EXCLUSIVE]..... 98

Q20. Please select all of the PG&E programs you have participated in or are currently participating in? **(Select all that apply)**

[IF Q19=98 (NOT AWARE OF ANY PG&E PROGRAM), AUTOPUNCH CODE 98 (NO PARTICIPATION IN ANY PG&E PROGRAM) AND SKIP TO Q21, OTHERWISE CONTINUE. SHOW ONLY THOSE SELECTED IN Q19]

- Air-Conditioning cycling (SmartAC) 1
- Appliance Rebates or Refrigerator Recycling 2
- Balanced Payment Program 3
- California Solar Initiative (Rebates for Solar Power) 4
- CARE..... 5
- Climate Smart 6
- Compact fluorescent lights, or other energy-efficient lighting 7
- Cool Station Program..... 8
- Duct Sealing and Insulation Rebates 9
- Energy Surveys or Audits 10
- Equipment and Appliance Rebates..... 11
- FERA..... 12
- Low Income Energy Efficiency (weatherization and new appliances 13
- Reach 14
- Smart Energy Analyzer..... 15
- SmartRate 16
- Time of use, or TOU Rate 17
- Winter Gas Savings, or the 10-20 Program 18
- [PIPE OTHER FROM Q19] 97
- I have not participated in any of these programs [EXCLUSIVE]..... 98

Q21. How much do you agree or disagree with each of the following statements about PG&E? **(Select one for each)**

Completely Disagree 0	1	2	3	4	5	6	7	8	9	Completely Agree 10	Don't Know
0	1	2	3	4	5	6	7	8	9	10	98

[RANDOMIZE]

- a) PG&E provides useful information on energy efficiency and conservation
- b) PG&E provides valuable incentives to encourage energy efficiency and conservation
- c) PG&E shows concern for environmental issues
- d) PG&E helps stores offer a wide variety of energy-efficient lighting
- e) PG&E helps to make energy-efficient lighting more affordable and widely available at range of locations
- f) PG&E makes it easier to purchase energy-efficient lighting

Q22. Overall, how satisfied are you with PG&E as your energy provider? **(Select one)**

- Extremely Satisfied 5
 - Somewhat Satisfied 4
 - Neither Satisfied nor Dissatisfied..... 3
 - Somewhat Dissatisfied..... 2
 - Extremely Dissatisfied..... 1
-

Section F: Demographics

The survey is almost finished. These last few questions are for classification purposes only. Again, all information you provide will be kept strictly confidential and reported only in total with other responses.

D05.	Thinking about the last year, what was your average <u>monthly</u> PG&E bill during this past summer? (Type in amount rounded to the nearest whole dollar)	
	\$ [_____] [ALLOW 1-9999]	
	Don't Know [EXCLUSIVE].....	98
	Not applicable [EXCLUSIVE]	99

D06.	What was your average <u>monthly</u> PG&E bill during this past winter? (Type in amount rounded to the nearest whole dollar)	
	\$ [_____] [ALLOW 1-9999]	
	Don't Know [EXCLUSIVE].....	98
	Not applicable [EXCLUSIVE]	99

D07.	Please indicate the highest level of education you have completed. (Select one)	
	Some high school.....	1
	High school.....	2
	Some college.....	3
	Associate's degree	4
	Bachelor's degree	5
	Graduate degree (e.g., PhD, MD, Master's)	6

D08.	Which of the following categories best captures your total annual household income before taxes? (Select one)	
	Less than \$15,000	1
	\$15,000 to less than \$25,000.....	2
	\$25,000 to less than \$35,000.....	3
	\$35,000 to less than \$45,000.....	4
	\$45,000 to less than \$60,000.....	5
	\$60,000 to less than \$75,000.....	6
	\$75,000 to less than \$100,000.....	7
	\$100,000 to less than \$150,000.....	8
	\$150,000 to less than \$200,000.....	9
	\$200,000 or more	10
	Refused	99

D09.	When thinking about your purchase behavior, you typically: (Select one)	
	Are the first to purchase a new product.....	1
	Wait until the 2nd or 3rd iteration of a product	2
	Buy products that have already been proven popular by mass adoption	3

Thank you! This concludes the survey.



REFERENCES

- ¹ West, Jason and Sanders, Marci, Lighting Facts Product Snapshot: LED Replacement Lamps 2010. U.S. DOE
- ² California Compact Fluorescent Lamp (CFL) Market Overview (February 25, 2009). California Informal Working Group on Lighting (IWGL).
- ³ Segmentation Analysis: Medium Screw Base Lighting (2010). Pacific Gas & Electric
- ⁴ Pulliam, Richard (December 9, 2008). California Residential Efficiency Market Share Tracking: Lamps 2007. Itron, Inc.
- ⁵ Lifetime of White LEDs. U.S. DOE Building Technologies Program
<http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lifetime_white_leds_aug16_r1.pdf>
- ⁶ Using Light-Emitting Diodes. U.S. DOE Energy Efficiency & Renewable Energy
<<http://www1.eere.energy.gov/buildings/ssl/comparing.html>>
- ⁷ "Cree Breaks 200 Lumen Per Watt Efficacy Barrier". Cree website press release.
<http://www.cree.com/press/press_detail.asp?i=1265232091259>