DNV·GL

Report

California Residential Replacement Lamp Market Status Report: Upstream Lighting Program and Market Activities in California Through 2013

Prepared for: California Public Utilities Commission, Energy Division
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0. EXECUTIVE SUMMARY

DNV GL developed this report as part of the California Public Utilities Commission (CPUC) Evaluation, Measurement, and Verification (EM&V) Work Order (WO) 13 – Residential Lighting Process Evaluation and Market Characterization. This report reviews and summarizes the results of data collection efforts conducted in support of other 2010-2012 residential and upstream lighting work orders and provides additional context for the results.

0.1 Purpose

The purpose of this report is to provide a status report on the residential replacement lamp market in California, including supply- and demand-side market activities as well as Upstream Lighting Program (ULP) activities as of 2013. The findings presented herein draw heavily from research conducted in support of other work orders (WO) including WO28 – Residential/Advanced/Upstream Lighting Impact Evaluation and WO21 – California Lighting and Appliance Saturation Study.

WO28's research activities in particular gathered detailed data related to the replacement lamp market in California and to ULP activities during the 2010-2012 program. The WO28 impact evaluation did not report on these results because they are not directly relevant to the impact evaluation's objective (i.e., estimating specific impact parameters). This report provides an opportunity to ensure that this valuable information is shared. It is not intended to be a comprehensive review of California's residential and/or upstream lighting markets, historic market activity, or ULP activity, but rather a summary of market- and program-related information gleaned from research conducted primarily for other purposes. The WO13 team also conducted secondary research to help provide the appropriate context for the other results.

0.2 Data Sources

As described above, this report leverages the results of numerous data collection activities and research efforts to provide a status update on California's residential replacement lamp market activities and Upstream Lighting Program activities through 2013. We describe these research efforts in more detail below.

0.2.1 Consumer Telephone Surveys

In support of CPUC EM&V WO28, DNV GL conducted more than 1,500 telephone surveys with residential electric customers of Pacific Gas & Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E) during the second quarters of 2012 and 2013. These surveys address consumer awareness, purchase, installation and storage of various lamp technologies including basic spiral compact fluorescent lamps[1] (CFLs); globe, reflector and dimmable CFLs; LED lamps; and incandescent lamps that comply with the efficacy standards set forth in the Energy Independence and Security Act of 2007 (EISA) and California Assembly Bill 1109 (AB 1109, the California Lighting Efficiency and Toxics Reductions Act). The report also draws upon consumer telephone surveys conducted in support of 2006-2008 ULP evaluation efforts to compare results over time.

[1] The CPUC defines basic CFLs as single-wattage, non-dimmable, bare spiral CFLs of up to (and including) 30 watts and all other CFL and LED lamps as "advanced lamps."

0.2.2 Lighting Retail Store Shelf Surveys

Also for WO28, DNV GL field researchers conducted more than 600 in-store inventories of replacement lamp stock during the summer of 2012, the winter of 2012-2013, and the summer of 2013. Researchers gathered details regarding the manufacturer, model number, lamp technology, lamp shape (form factor), quantity per package, price per package, wattage, lumens, and numerous other characteristics for all screw-based and pin-based replacement lamp models stocked in each store as well as a count of the number of lamp packages in stock for each lamp model. These data allowed us to estimate the percentage of California retail stores stocking lamps with various characteristics, the percentage of total lamp stock comprised by different lamp types, the average number of lamp models per store, and the average price per lamp.

0.2.3 Shopper Intercept Surveys

DNV GL staff intercepted shoppers who were purchasing replacement lamps and conducted brief surveys with them to discuss their purchasing decisions and installation intentions for the newly-purchased lamps. We conducted more than 800 intercept surveys concurrent with the winter 2012-2013 and summer 2013 shelf surveys in more than 40 retail stores. We conducted these surveys in support of WO28.

0.2.4 In-Home Lighting Inventories

In 2012, DNV GL staff conducted nearly 2,000 in-home inventories of all light sockets as well as lamps installed and in storage among PG&E, SCE, and SDG&E customers as part of WO21. For every lamp located on site, researchers recorded details regarding the lamp technology, shape, wattage, and base type. Field researchers also recorded data on light fixtures including the number of fixtures, fixture type, fixture location, control type, the number of sockets per fixture, and the number of lamps installed per fixture. DNV GL analysts compiled and analyzed the onsite data to produce estimates of socket saturation and remaining installation potential for energy-efficient lamps (i.e., CFLs and LED lamps). The report also leverages the results of more than 1,200 in-home lighting inventories that we conducted in 2009 in support of the 2006-2008 ULP impact evaluation and compares saturation of various lamp technologies between 2009 and 2012.

0.2.5 Supplier Interviews

In support of WO28, DNV GL staff conducted 33 in-depth telephone interviews with representatives of lamp suppliers in 2013. Interview participants included 26 representatives of lamp manufacturing organizations and 7 buyers from national retail lighting chains. Supplier representatives shared their perspectives on the influences of the ULP, EISA, and AB 1109 on California's residential replacement lamp market, their predictions regarding how these influences might affect the market going forward, and their views on numerous other topics.

0.2.6 Lamp Choice Model

DNV GL developed a residential consumer Lamp Choice Model as part of WO28. The model relies upon data from the winter 2012-2013 and summer 2013 retail store shelf surveys and in-store shopper intercept surveys to predict the probability that a consumer will choose a particular lamp based on the market context (e.g., the range of lamp technologies and prices available in a particular retail channel). We used the Lamp Choice Model to examine how consumer choices regarding which lamp types to purchase may have differed in 2012 and 2013 under changed regulatory and market conditions.

0.2.7 Other Data Sources

This report also draws upon numerous secondary sources including prior evaluations of California's residential lighting market and the California IOUs' residential and upstream lighting programs as well as other publications. We used these sources to help provide context for the data sources described above. In some cases, earlier sources also enabled us to provide time-series comparisons of results.

0.3 Key Findings

Key findings include:

1. CFL installations increased among consumers between 2009 and 2012, but retail stocking declined—particularly in big box stores—possibly as a result of decreased ULP support for CFLs between 2006-2008 and 2010-2012.
2. Largely driven by changes in big box stores, the overall quantities of replacement lamp stock declined in retail stores between 2012 and 2013, but the diversity of products increased.
3. CFL awareness and purchase rates declined between 2012 and 2013, but awareness and purchase rates for other lamp technologies—including EISA-compliant halogen lamps and LED lamps—held steady or increased. Several factors may be driving these trends.
4. California's LED replacement lamp market was still in its infancy in 2013. Key market barriers included lamp price, lack of availability, and lack of consumer familiarity with LED lamps.
5. Overall average LED lamp prices remained stable between 2012 and 2013 in California retail stores, largely because of a shift away from lamps with the lowest light output and toward lamps in the middle and higher-brightness ranges between years. Within each lumen bin except the lowest (<310 lumens), average LED lamp prices declined.
6. The effects of EISA and AB 1109 on lamp sales and stocking are unclear, but the regulations may have contributed to decreased stocking and sales of CFLs.
7. EISA and AB 1109 drove increases in halogen lamps' market presence between 2012 and 2013, but halogen lamp installations were still low in 2012.
8. As of 2012, there remained substantial potential for additional energy-efficient lamp installations among PG&E, SCE, and SDG&E residential electric customers.
9. Of the CFLs and LED lamps purchased in 2012 and 2013, the majority were acquired to replace inefficient lamp technologies (such as incandescent or halogen lamps) or to fill empty sockets.
10. The quantity of lamps in storage among PG&E, SCE and SDG&E residential electric customers averaged roughly 10 lamps per household in 2009 and 2012, and the share of stored lamps comprised by CFLs versus incandescent lamps changed little between years.

1. INTRODUCTION

This chapter of the report provides an overview purpose and organization of this report.

1.1 Purpose

The DNV GL team developed this report as part of the California Public Utilities Commission (CPUC) Evaluation, Measurement, and Verification (EM&V) Work Order (WO) 13 – Residential Lighting Process Evaluation and Market Characterization. The purpose of this report is primarily to leverage the rich data collected as part of other CPUC work orders (including WO28 – Residential/Advanced/Upstream Lighting Impact Evaluation and WO21 – California Lighting and Appliance Saturation Study) to provide a status report on the residential replacement lamp market in California, including supply- and demand-side market activities as well as Upstream Lighting Program (ULP) activities as of 2013.

In particular, WO28's research activities gathered detailed data related to the replacement lamp market in California and to ULP activities during the 2010-2012 program—for example, during in-depth telephone interviews with lamp supplier representatives, we obtained nuanced perspectives regarding current market status, the ULP's influence on market status, and market predictions. However, the WO28 impact evaluation did not report on these results because they are not directly relevant to estimating specific impact parameters. This report provides an opportunity to ensure that this valuable information is shared. It is not intended to be a comprehensive review of California's residential and/or upstream lighting markets, historic market activity, or ULP activity, but rather a summary of market- and program-related information gleaned from research conducted primarily for other purposes.

1.2 Report Organization

This report is organized into nine chapters following an Executive Summary. Chapter 2 provides an overview of the data sources leveraged in this report, and chapters 3 through 8 summarize important findings. The remaining chapter (Chapter 9) provides DNV GL's conclusions based on the findings described in previous chapters.

Report chapters include the following:

- Chapter 2 describes the data sources leveraged to produce this report.
- Chapter 3 provides an overview of the California replacement lamp market context, including key influences on the market (such as regulations, the California Long Term Energy Efficiency Strategic Plan, and California investor-owned utility [IOU) lighting programs).
- Chapter 4 summarizes the supply side of the California market for residential replacement lamps, including lamp manufacturer and retailer characteristics.
- Chapter 5 describes the demand side of the market, including key characteristics of energy-efficient lamp purchasers and non-purchasers.
- Chapter 6 describes the light sockets[2] in California households as well as lamps installed in those sockets and in storage in those households.

[2] Light sockets are defined as the receptacles into which replacement lamps (light bulbs) are inserted.

- Chapter 7 reviews the remaining installation potential for energy-efficient lamps in California households.
- Chapter 8 provides projections of consumers' choices regarding various lamp technologies under changed regulatory and market conditions.
- Chapter 9 highlights conclusions based on the results presented in chapters 3 through 8.

The report also includes six appendices:

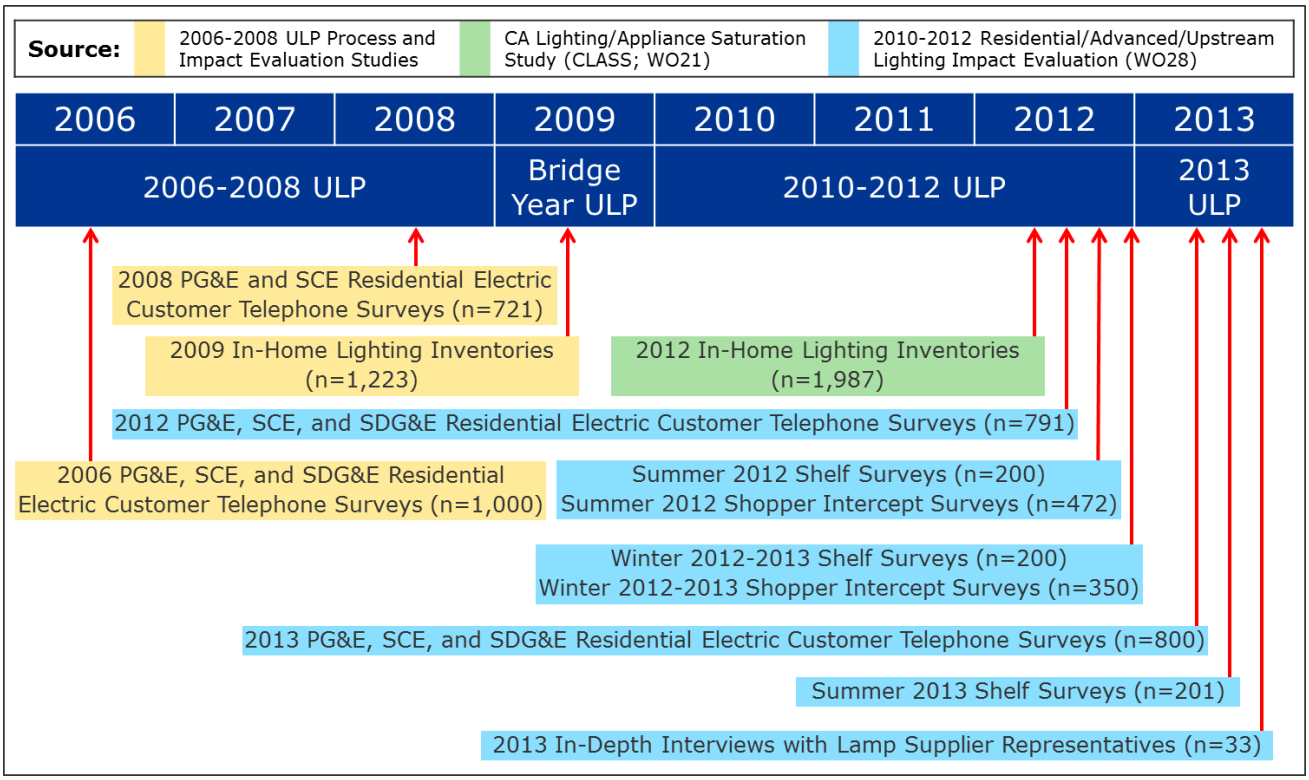
- Appendix A includes the bibliography (references cited) for this study;
- Appendix B includes a memo describing the development and application of sample expansion weights for the 2012 and 2013 shelf survey results.
- Appendix C includes additional results from analyses of California retail lighting shelf survey data from 2012 and 2013;
- Appendix D provides additional market penetration results based on analyses of residential lighting socket inventories conducted in 2009 and 2012; and
- Appendix E includes more detailed results on the remaining installation potential for energy-efficient lamps by IOU service territory as of 2012.
- Appendix F provides the coefficients for the lamp choice model leveraged in Chapter 8: Projected Lamp Technology Choices Under Changed Regulatory and Market Conditions.
- Appendix G includes a summary of reviewer comments on the draft final report as well as the authors' responses to these comments.

2. DATA SOURCES

Below we provide an overview of the data sources leveraged in support of this study. Data sources from 2009 through 2012 include various evaluation and market research efforts performed by DNV GL (formerly DNV KEMA and KEMA, Inc.). Other sources, described in Section 2.1.22.2 below, refer to other published articles, reports and documents, including previous evaluation and market research reports.

As described in Chapter 1 above, the research cited in this report was all conducted in support of other research efforts not directly related to this report. As such, the results described herein address a wide range of time periods. Figure 1 below summarizes the timing of the data collection efforts referenced in this study alongside ULP periods. The differences in timing among data collection efforts makes some of the overall patterns of results difficult to interpret—particularly given the rapid changes in California's residential lighting market over the past several years. We attempt to highlight the relevant time periods for all results presented in the report, but encourage the reader to refer back to this figure to clarify the timing of various research efforts.

Figure 1. Timing of Data Collection Efforts and Upstream Lighting Program Periods, 2006-2013



2.1 2009-2012 DNV GL Data Sources

DNV GL (formerly DNV KEMA and KEMA, Inc.) conducted numerous data collection efforts between 2009 and 2012 in support of impact evaluation and market research efforts for the CPUC. Among these, the data sources leveraged in support of this report include:

- Pacific Gas & Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E) 2012 and 2013 Residential Electric Customer Telephone Surveys (conducted in support of WO28);
- Retail store shelf surveys and shopper intercept surveys conducted in 2012 and 2013 (WO28);
- In-home lighting inventories from 2012 (WO21) and 2009[3];
- In-depth telephone interviews with lamp suppliers (WO28); and
- Lamp choice model (WO28).[4]

2.1.1 PG&E, SCE, and SDG&E Residential Electric Customer Telephone Surveys

As part of WO28, the DNV GL team implemented telephone surveys with residential electric customers of PG&E, SCE, and SDG&E using a Computer Aided Telephone Interviewing (CATI) approach. The surveys addressed awareness, purchase, installation and storage of various energy-efficient lamp technologies. Only respondents who were electric customers of PG&E, SCE, or SDG&E were eligible to complete the survey.

We implemented the survey in two waves: Wave 1 during the second quarter of 2012 and Wave 2 during the second quarter of 2013. Each wave included two survey groups: a general population survey group (Group A) and a supplemental survey group (Group B). For each wave, Group A consisted of approximately 800 completed surveys, and Group B targeted purchasers of lamp types classified as high-impact measures (HIMs) to ensure a minimum number of completed surveys among purchasers of each HIM. These minimum targets included:

- 100 surveys among respondents who had purchased basic spiral compact fluorescent lamps (CFLs)[5] within the three months prior to the date of the survey;
- 100 surveys among respondents who had purchased reflector CFLs since January 1, 2010;
- 50 surveys among respondents who had purchased A-lamp CFLs since January 1, 2010;
- 50 surveys among respondents who had purchased globe CFLs since January 1, 2010; and
- 50 surveys among respondents who had purchased dimmable CFLs since January 1, 2010.

In each of the two survey waves, this approach resulted in approximately 350 completed surveys with purchasers of CFL types that qualified as HIMs.[6]

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3 KEMA, Inc., 2010.

4 We include the model as a "primary data source" as its inputs rely on primary data.

5 The CPUC defines basic CFLs as single-wattage, non-dimmable, bare spiral CFLs of up to (and including) 30 watts and all other CFL and LED lamps as "advanced lamps."

6 For a more detailed description of the telephone survey methods (including a more detailed description of the sampling approach), please refer to the WO28 report (DNV GL, 2014a).

The Group B (supplemental) surveys conducted during each wave excluded respondents who had not purchased any of the CFL HIMs since January 1, 2010. The Group B surveys also excluded some of the general survey questions unrelated to impacts (e.g., awareness of light-emitting diode [LED] lamps or energy-efficient incandescent lamps). As such, the Group B surveys are less useful in terms of characterizing the general population of PG&E, SCE, and SDG&E residential electric customers than the Group A surveys. We thus limit the results presented in this report to the Group A general population survey from each wave.

Table 1 below summarizes the disposition of survey results by IOU service territory by wave for Group A surveys only. Survey results are weighted to the population of residential electric customers in PG&E, SCE and SDG&E territories.

Table 1: Disposition of WO28 General Population (Group A) PG&E, SCE, and SDG&E Residential Electric Customer Telephone Surveys by IOU Service Territory, 2012 and 2013

	Number of Respondents (n)			Percent of Respondents*		
IOU	**2012**	**2013**	**Overall**	**2012**	**2013**	**Overall**
PG&E	303	323	626	38.3%	40.4%	39.3%
SCE	320	323	643	40.5%	40.4%	40.4%
SDG&E	168	154	322	21.2%	19.3%	20.2%
Overall	**791**	**800**	**1,591**	**100.0%**	**100.0%**	**100.0%**

* Note: Results may not total 100 percent because of rounding.

2.1.2 Lighting Retail Store Shelf Surveys and Shopper Intercept Surveys

For WO28, DNV GL conducted shelf inventories of lamps for sale in California retail stores throughout PG&E, SCE and SDG&E service territories. During the shelf inventories, we conducted shopper intercept surveys with consumers who were shopping for lamps. The shelf surveys gathered detailed information regarding all residential replacement lamps stocked in the stores other than linear fluorescent lamps. The shopper intercept surveys focused on shopper purchasing decisions and installation intentions for the newly-purchased lamps.[7]

We conducted the shelf and intercept surveys in two waves: the first wave ran between late November 2012 and mid-February 2013 (Winter 2012-2013) and the second wave ran between May and July 2013 (Summer 2013). We also conducted a separate set of shelf surveys (not in combination with intercept surveys) during the late summer of 2012 (Summer 2012). Our field staff conducted surveys in chain and independent retail stores, including stores that participated in the IOUs' 2010-2012 ULP as well as non-participating stores. Field staff spent a minimum of four hours in each store completing the shelf surveys and attempting to intercept shoppers. Field staff completed surveys opportunistically—that is, with individuals who were shopping during the time periods in which we conducted intercept surveys in specific stores. As such, results from the intercept surveys may not represent the broader population of shoppers purchasing replacement lamps at various stores throughout the year. Nonetheless, given the range in timeframes and store types in

[7] Field researchers also conducted shopper intercept surveys with respondents who were not purchasing lamps (non-purchaser shopper intercept surveys), but the results in this report focus on surveys with lamp purchasers only because these surveys included detailed questions regarding lamp replacement intentions.

which we conducted these surveys, results provide general indications of shopper preferences, price sensitivity, lamp installation intentions, and so on.

The shelf survey sample targeted approximately 200 stores per survey wave. We stratified the sample by retail channel and IOU service territory (for PG&E, SCE, and SDG&E territories) and designed the sample to represent the retail market for residential replacement lamps in these areas. The sample design targeted roughly equal numbers of stores in each retail channel to ensure enough sample points per channel to enable channel-to-channel comparisons.[8]

Table 2 below provides details regarding the number of stores visited during each of the three shelf survey phases, and Table 3 displays the number of lamp purchasers intercepted during the two intercept survey phases.[9] Altogether, field staff conducted 601 shelf surveys and intercepted a total of 822 lamp purchasers.[10]

Table 2: Number of Shelf Surveys Conducted by Retail Channel and Survey Phase, 2012 and 2013

	Survey Phase			
Retail Channel	Summer 2012	Winter 2012–2013	Summer 2013	Overall
Discount	28	29	29	86
Drug	27	29	29	85
Grocery	30	28	28	86
Hardware	28	29	29	86
Home Improvement	29	28	29	86
Mass Merchandise	29	29	29	87
Wholesale Club	29	28	28	85
Total	**200**	**200**	**201**	**601**

Table 3: Number of Intercept Surveys Conducted with Lamp Purchasers by Retail Channel and Survey Phase, 2012 and 2013

	Survey Phase		
Retail Channel	Winter 2012–2013	Summer 2013	Overall
Discount	42	25	67
Drug	13	11	24
Grocery	5	8	13
Hardware	61	33	94
Home Improvement	125	111	236
Mass Merchandise	122	71	193
Wholesale Club	104	91	195
Total	**472**	**350**	**822**

8 For a more detailed description of shelf survey and shopper intercept survey methods (including a more detailed description of the sampling approach), please refer to the WO28 report (DNV GL, 2014a).

9 Note that Table 3 includes all purchasers across all lamp technologies, base types, and lamp shapes. Of the total 822 intercepted lamp purchasers, only 12 reported that they were purchasing lamps with the intent to install them in nonresidential applications (approximately 1% of intercepted purchasers). Interviewers targeted shoppers of MSB lamps in twister, A-lamp, reflector/flood, and globe styles. However, staff did encounter and interview some purchasers of non-MSB lamps (18) as well purchasers outside of the targeted lamp styles (21).

10 For the sake of simplicity, we refer to intercepted shoppers with lamps in their shopping carts or baskets as "purchasers." While each shopper has not yet purchased his or her lamp(s) at the time of the surveys, the expectation was that he or she would do so shortly after we completed the intercept survey.

The DNV GL team applied sample expansion weights to each phase of shelf survey results such that the sample represents the population of retail stores that sell replacement lamps by retail channel in California. We based these results on a telephone sample of 800 retail stores in California stratified by retail channel. Appendix B provides a memorandum describing the development and application of the shelf survey weights.

2.1.3 Household Lighting Inventories

This report includes results from inventories of household lighting (including light sockets, installed lamps, and lamps in storage) in California households in 2012 and 2009. We describe these studies in more detail below.

2.1.3.1 2012 CLASS

The goal of the 2012 California Lighting and Appliance Saturation Study (CLASS) was to gather information about residential building characteristics and to inventory energy-consuming devices found in California households. The 2012 CLASS included approximately 2,000 onsite surveys of single-family, multi-family and mobile home residences in PG&E, SCE, SDG&E, and Southern California Gas Company service territories conducted between May and November of 2012. DNV GL staff merged these data with information from other sources and expanded the sample to represent the population of individually-metered residential customers of the four IOUs to create a database that characterizes residential building characteristics (including appliance and lighting saturations and efficiency levels) as well as demographic information (such as year of home construction, number of residents, annual income, and so on).

The sample frame was comprised of 2010 residential utility account billing data provided by the IOUs. DNV GL staff stratified the sample for the 2012 CLASS into 42 strata defined by electric utility, climate zone group, participation in a low-income rate program, and daily kWh. The final sample consisted of 1,987 households, including 797 in PG&E's electric service territory, 487 in SCE's service territory, and 397 in SDG&E's electric service territory. [11]

In addition to detailed information regarding household appliances and characteristics, field researchers conducted a complete inventory of all of light sockets, lamps installed (in both interior and exterior fixtures), and lamps in storage at participant households. For every lamp located on site, researchers recorded details regarding the lamp technology, shape (form factor), wattage, and base type (medium screw-base, GU base, etc.). Field researchers also recorded data on light fixtures including the number of fixtures; fixture type (table lamp, ceiling fan, etc.); fixture location (room type); control type (on/off switch, dimmer switch, or three-way switch); the number of sockets per fixture, and the number of lamps installed per fixture. DNV GL analysts compiled and analyzed the onsite data from the 2012 CLASS to produce estimates of socket saturation and remaining installation potential for energy-efficient lamps.

DNV GL analysts created a set of sample expansion weights to reduce potential bias in estimates that might be attributed to differences in the distribution of the CLASS participant sample by home ownership and type of residence compared to the U.S. Census population estimates. Analysts used the population estimates in a calibration weight adjustment model that yielded "Census-adjusted weights" for CLASS participants. We

[11] For a more detailed description of CLASS methods (including a more detailed description of the sampling approach), please refer to the WO21 report (DNV GL, 2014b). Section 3.2 of the CLASS report (beginning on page 3-3) details the sampling approach.

used those weights to develop results for this report. Study results based on the Census-adjusted weights are appropriate to describe PG&E, SCE and SDG&E residential electric customer households as of 2012.[12]

2.1.3.2 2009 ULP Metering Study

As part of the 2006–2008 ULP impact evaluation, DNV GL field staff visited a random sample of 1,232 households between 2008 and 2009 to collect complete lighting inventories as part of a broader lamp metering study. The on-site data collected is similar to what we collected for the 2012 CLASS. We allocated sample points proportionally by IOU based on total program savings by IOU territory for the 2006-2008 ULP. By utility, the resultant sample sizes were 1,223 total households including 498 in PG&E's electric service territory, 487 in SCE's service territory, and 248 in SDG&E's electric service territory.[13]

In 2014, DNV GL analysts created a new set of sample expansion weights for the 2009 household lighting inventory results using the same approach as described above for the 2012 CLASS. This weighting approach differs from that which we applied to the 2009 inventory results in the 2006-2008 ULP impact evaluation. We changed the weighting scheme to better represent the PG&E, SCE and SDG&E residential electric customer population according to the U.S. Census, as this approach is more appropriate for market characterization efforts.

2.1.4 In-Depth Telephone Interviews with Lamp Supplier Representatives

For WO28, experienced DNV GL interviewers conducted in-depth telephone interviews with lamp supplier representatives during the third and fourth quarters of 2013.[14] Individual respondents included representatives of lamp manufacturing organizations and buyers from national retail lighting chains. All of the respondents represented organizations that either manufactured or sold replacement lamps discounted by the California IOUs' 2010-2012 ULP according to program tracking data. The complete 2013 sample frame included 30 manufacturing organizations and the 25 retail chains to which manufacturers shipped the largest shares of total 2010-2012 ULP lamps.[15]

Table 4 shows the number of in-depth interviews completed by supplier type (manufacturer versus retail buyer). It also shows the percentage of total 2010-2012 ULP shipments represented by the 33 supplier representatives who completed interviews with us. As shown, manufacturing organizations that participated in the in-depth interviews represent a much larger percentage of total ULP shipments than the retail organizations (98% versus 13%). Given this result, the summaries presented in this report focus primarily on results from interviews with participating manufacturers' representatives.

12 For more complete description of the weighting approach, please refer to Appendix D ("Development of Census-Adjusted Weights") in the CLASS report (DNV GL, 2014).

13 For a more complete description of the study methods (including a more detailed description of the sampling approach), please refer to the final 2006-2008 ULP impact evaluation report (KEMA, Inc., 2010).

14 Throughout the report we use "lamp suppliers" to refer collectively to manufacturers and retailers. When results are applicable only to one group or the other, we refer to the relevant respondent group (lamp manufacturers' representatives or retail lighting buyers).

15 For a more detailed description of the supplier interview methods (including a more detailed description of the sampling approach), please refer to the WO28 report (DNV GL, 2014a).

Table 4: Summary of 2013 In-Depth Telephone Interviews with Participating Lamp Supplier Representatives

Participating Supplier Type	Number of Completed Interviews	% of 2010-2012 ULP Lamp Shipments Represented by Interviewees
Lamp manufacturer	26	98%
Retail lighting buyer	7	13%
Total	**33**	**-**

2.1.5 Lamp Choice Model

The DNV GL team developed a residential consumer Lamp Choice Model as part of CPUC EM&V WO28. The model relies upon data from the winter 2012–2013 and summer 2013 retail store shelf surveys and in-store shopper intercept surveys to predict the probability that a consumer will choose a particular lamp. The intercept surveys collected the information on consumer choices required for the model, while the shelf surveys captured information regarding the context for those choices, including details related to the selected lamp, its intended application, the retail channel in which the lamp was selected, and characteristics of the lamp purchaser. The Lamp Choice Model uses a nested logit model structure to predict consumer choices over a set of discrete alternatives.

Key model features include:

- **Market share predictions.** The model predicts changes in market shares as a response to price changes such as those that incentive programs introduce.
- **Heterogeneous price sensitivities.** Not all consumers have the same price sensitivity. The model design reflects that price sensitivities vary by consumer household income and whether the consumer is making an impulse or planned purchase.
- **Retail channel differences.** The model design recognizes that consumers have price sensitivities and choice sets that vary by retail channel. Specifically, the channels examined in the current study are: discount stores, drug stores, grocery chain stores, grocery independent stores, hardware stores, home improvement stores, mass merchandise stores and membership clubs.

Appendix F provides the coefficients for the Lamp Choice Model. For more background regarding the model, please refer to the WO28 report.[16]

2.2 Other Data Sources

This report also draws upon numerous additional sources in addition to those described above. These include information from the 2009-2012 period gathered by organizations other than DNV GL as well as prior market research regarding residential lighting in California, evaluations of the California IOUs' residential and upstream lighting programs, and other industry publications. Appendix A provides complete citations for all sources cited in this report.

[16] DNV GL, 2014a.

3. MARKET CONTEXT

The purpose of this chapter is to summarize some of the influences on California's market for residential replacement lamps. As of mid-2013, key influences included lamp efficacy regulations, quality standards for CFLs and LED lamps, California's Long-Term Energy Efficiency Strategic Plan, and residential and upstream energy-efficiency programs operated by the California IOUs to support energy-efficient lamp adoption. Each of these elements has influenced California's market and/or the IOUs' market intervention strategies. This chapter introduces these market influences and (where possible) provides a high-level summary of market actor perspectives on them. We address supplier perspectives in more detail in chapter 4 (Market Supply) and consumer perspectives in chapter 5 (Market Demand).[17]

3.1 Lamp Efficacy Regulations

Below we describe two key regulations affecting California's residential replacement lamp market. Both of these regulate lamp efficacy, which is the amount of light produced for each unit of electricity consumed, and is typically measured in terms of lumens (lm)—a measure of lamp brightness—per watt (W). The regulations include the Energy Independence and Security Act of 2007 (EISA) and California Assembly Bill 1109 (the California Lighting Efficiency and Toxics Reductions Act).

3.1.1 EISA

The U.S. Congress passed EISA in 2007, requiring general purpose lamps[18] to meet the efficacy standards shown in Table 5. EISA does not ban incandescent lamps or lamps of specific wattages; these are common misconceptions regarding the legislation. Instead, it establishes minimum efficacy requirements that traditional incandescent lamps cannot meet, effectively pushing the most inefficient lamps out of the market. EISA's efficacy requirements target the most common general purpose lamps; thus, many lamp types are exempt from the standards (including three-way, high light output[19], shatter resistant, rough service, and vibration service lamps).[20]

17 The supplier interviews asked respondents for their perspectives on lamp efficacy regulations, the LED quality specification, and the California IOUs' ULP. The consumer telephone surveys asked respondents about their familiarity with lamp efficacy regulations. Neither data collection effort addressed California's Long-Term Energy Efficiency Strategic Plan or the ENERGY STAR Program, but we describe these nonetheless because of their roles in helping to shape the California IOUs' market intervention strategies.

18 EISA defines a *general purpose lamp* as a standard incandescent or halogen type lamp that is intended for general service applications; has a medium screw base; falls within a lumen range of 310 to 2,600 lumens; and is capable of being operated at a voltage at least partially within 110 and 130 volts. We apply this definition of general purpose lamps throughout this report.

19 High light output lamps are defined by lumen levels greater than 2,600 lumens and are typically represented by 150-300W traditional incandescent bulbs.

20 According to the U.S. EPA (2011), the U.S. Department of Energy (DOE) will monitor sales of exempt lamp types going forward, and if sales increase substantially, the DOE has the authority to apply efficacy standards to those lamp types.

Table 5: Summary of EISA Efficacy Requirements for General Purpose Lamps

EISA Effective Dates	Incandescent Lamp Wattage (W)	Typical Incandescent Light Output in Lumens (lm)	Typical Incandescent Efficacy (lm/W)	EISA Replacement Wattage (W)	EISA Light Output Ranges (lm)	EISA Minimum Efficacy Ranges (lm/W)
1/1/2012	100 W	1690 lm	17 lm/W	72 W	1490-2600 lm	21-36 lm/W
1/1/2013	75 W	1170 lm	16 lm/W	53 W	1050-1489 lm	20-28 lm/W
1/1/2014	60 W	840 lm	14 lm/W	43 W	750-1049 lm	17-24 lm/W
1/1/2014	40 W	490 lm	12 lm/W	29 W	310-749 lm	11-26 lm/W

Source: U.S. Environmental Protection Agency (EPA), 2011.

As demonstrated in Table 5 above, EISA standards are phasing in gradually; the law prohibited manufacture and importation of general purpose lamps above 72 watts with light output ranging from 1490 to 2600 lumens (referred to as "high brightness" throughout this report) into the U.S. as of January 1, 2012.[21] This first step began phasing out many traditional 100 watt incandescent lamps from the market. However, EISA does not regulate 100 watt incandescent lamps that fall outside of the 1490 to 2600 lumen range, creating a loophole that allows extremely inefficient lamps to linger on the market for at least an additional year until EISA affected the next lumen bin (1050-1489 lumens, or medium-high brightness). In other words, the first phase of EISA implemented in January 2012 did not affect traditional 100 watt incandescent lamps with brightness less than 1490 lumens, but the later phases of EISA affected such lamps.

In addition to regulating the manufacture and importation of general purpose incandescent lamps, EISA also includes efficacy standards for reflector lamps and fluorescent tube lamps as well as a second phase of regulations set to start in 2020, which will require at least 45 lumens per watt (lm/W) for all general purpose lamps.[22] However, in December 2011, the U.S. House of Representatives passed a last-minute rider (attached to the omnibus government spending bill) that prevents the U.S. Department of Energy (DOE) from enforcing EISA.[23] This created the potential for phased-out incandescent lamps to continue to enter the U.S. market, but according to the American Lighting Association, all major lamp manufacturers planned to proceed as if enforcement were imminent.[24]

3.1.2 California Assembly Bill 1109

California Assembly Bill 1109 (AB 1109), the California Lighting Efficiency and Toxics Reductions Act, also passed in 2007, required the California Energy Commission (CEC) to develop and implement a strategy that would reduce California's energy consumption related to general purpose indoor lighting by 50 percent by 2018.[25] California adopted the same efficacy standards as EISA, however, the effective dates for AB 1109 are one year earlier than for EISA (Table 6).[26] AB 1109 also requires the state to set up a recycling program for lighting products and prohibits the sale of general purpose lamps that exceed certain levels of hazardous

21 H.R. 6--110th Congress, 2007.

22 *Ibid.*

23 Cardwell, 2011.

24 Enlightenment News, 2012.

25 Huffman, 2007.

26 For example, efficacy standards for 100 Watt incandescent lamps went into effect in California on January 1, 2011, while these standards did not take effect nationally until January 1, 2012.

substances.[27]

Table 6: Timing Comparison of Lamp Efficacy Standards by Light Output Range: EISA (U.S.) and AB 1109 (California)

Affected Light Output Ranges (lm)	Effective Dates of Regulation	
	EISA (United States)	AB 1109 (California)
1490-2600 lm	1/1/2012	1/1/2011
1050-1489 lm	1/1/2013	1/1/2012
750-1049 lm	1/1/2014	1/1/2013
310-749 lm	1/1/2014	1/1/2013

Of the 33 suppliers we interviewed (26 representatives of lamp manufacturing organizations and 7 lighting buyers for national retail chains), all but one was familiar with EISA and/or AB 1109 in mid-2013. Not surprisingly, most supplier representatives report that EISA's most significant market impact has been the gradual phase-out of traditional incandescent lamps. Their perspectives on its other impacts were somewhat mixed. We provide more detail regarding supplier perspectives on these regulations in chapter 4.

Consumer awareness of lamp efficacy regulations is moderate to low, and declined significantly between 2012 and 2013 in California (possibly because the phase-out is no longer "top of mind" for California consumers given that it began a few years prior to the telephone surveys). More than half report that when traditional incandescent lamps are no longer available, they will switch to an alternate lamp technology. We provide more detail on consumer awareness of and reactions to lamp efficacy regulations in chapter 5.

3.2 Lamp Quality Standards

This section summarizes two key quality standards relevant to California's residential market for replacement lamps—the U.S. Environmental Protection Agency's (EPA) ENERGY STAR standard and the CEC's "California Quality" standard for LED lamps.

3.2.1 ENERGY STAR

The U.S. EPA established ENERGY STAR in 1992 as a voluntary program to protect the climate and save individuals and businesses money by promoting energy efficiency. The focus of the ENERGY STAR program was further defined in 2005 when Congress enacted the Energy Policy Act and "established at the Department of Energy and the Environmental Protection Agency a voluntary program to identify and promote energy–efficient products and buildings in order to reduce energy consumption, improve energy security, and reduce pollution through voluntary labelling of or other forms of communication about products and buildings that meet the highest energy efficiency standards."[28]

ENERGY STAR launched its first lighting specification for residential fixtures in 1997 with the goal of offering consumers a more efficient lighting option without compromising performance. In 1999, the U.S. DOE launched the first stand-alone ENERGY STAR specifications for CFLs, setting the first benchmark for energy

[27] California prohibited the same levels of hazardous substances as the European Union pursuant to the Restriction of Hazardous Substances (RoHS) Directive. RoHS took effect in 2006 and restricts the use of six hazardous materials in electronics; lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ether.

[28] U.S. EPA, n.d.(a).

efficiency, quality and performance for CFLs and requiring product testing by an accredited laboratory.[29] Since introducing the first set of specifications, ENERGY STAR has collaborated with the lighting industry and other key stakeholders to introduce numerous revisions focused on a wide range of quality and performance issues including warm-up time, light quality, sound, lamp life, mercury content, and minimum warranty requirements.

As of 2013, there were more than 5,800 ENERGY STAR -qualified CFL models for sale in the U.S. market, approximately three-quarters of which were spiral lamp models.[30] As discussed in Section 3.4 below, the IOUs' energy-efficiency programs required that CFLs must meet ENERGY STAR specifications to qualify for incentives beginning in the earliest years of program activity.

In 2010, DOE introduced the first ENERGY STAR specifications for LED lamps and fixtures, focusing on quality and performance using the lessons learned from its years of experience with the CFL market. To qualify for the ENERGY STAR label, LED lighting products must have:

- Brightness equal to or greater than existing lighting technologies (incandescent or fluorescent) and light is well distributed over the area lighted by the fixture;
- Light output that remains constant over time, only decreasing towards the end of the rated lifetime (at least 35,000 hours or 12 years based on use of 8 hours per day);
- Excellent color quality (i.e., the shade of white light appears clear and consistent over time);
- Efficiency as good as or better than fluorescent lighting;
- Light that comes on instantly when turned on;
- No flicker when dimmed; and
- No off-state power draw (i.e., the fixture does not use power when it is turned off[31]).[32]

As of 2012, there were nearly 1,300 ENERGY STAR –qualified LED lamp models for sale in the United States.[33] By mid-2013, the number of qualified models increased by more than 1,000 models to over 2,300 qualifying LED lamp models.[34] In contrast, there were more than five times as many ENERGY STAR –qualified CFL models available in 2012 (nearly 5,900 models), but this number remained fairly constant between 2012 and 2013. These data demonstrate the rapid expansion of the range of LED lamp models available as compared to the relatively stable numbers of CFL models, which is to be expected given the relative maturity of each product in the market.[35]

3.2.2 "California Quality" LED Lamp Specification

In 2012, the California Energy Commission (CEC) published a voluntary quality specification for LED lamps "to support policymakers and the lighting industry in their collective goal to move consumers away from the

29 U.S. EPA, 2012a.

30 U.S. EPA, 2013. Roughly 12 percent were reflector lamp models (728 models), 6 percent were A-lamp models (367), 4 percent were globe CFL models (262), 2 percent were candle (107), and the remaining 2 percent were comprised of other lamp shapes (58 models).

31 Qualifications include an the exception regarding off-state power draw for external controls. With external controls, fixture power draw should not exceed 0.5 watts in the "off" state.

32 U.S. EPA, n.d.(b).

33 U.S. EPA, 2012b.

34 U.S. EPA, 2013. Seventy-one percent were reflector lamp models, 16 percent were "nonstandard" shapes, 6 percent were A-lamps, 4 percent were globe shaped, 3 percent were decorative (candle shaped), and 1 percent were other LED lamp shapes.

35 The supplier interviews did not address ENERGY STAR's influence on California's residential market for replacement lamps.

inefficient incandescent light of the past century to more efficient LED lighting technology."[36] In that document, the CEC acknowledges that meeting this goal will require not only efficient lamps but also lamps that meet consumer expectations with regard to quality and performance.

Because of the residential sector's high concentration of incandescent lamps, the CEC focused on household applications in which LED lamps are suitable replacements for typical incandescent lamps. As such, the specification applies to screw-base and bi-pin A-lamp, flame-tip, globe, floodlight, and spotlight lamps.[37] It excludes the following products: "colored LED lamps; LED light strips; linear LED pin-based lamps; LED rope lights; LED fully integrated luminaries; LED luminaire housings; or LED light engines not having American National Standards Institute (ANSI) standardized screw bases."[38]

The specifications are based on enhancements to the ENERGY STAR standard with a particular focus on improvements to the color temperature, consistency, and color rendering (with requirements for Color Rendering Index [CRI] greater than or equal to 90); dimmability; length of life/warranty, and light distribution. For light distribution in particular, the specification includes different requirements for omnidirectional lamps (such as A-lamps), floodlights, and spotlights.[39]

The CPUC issued a decision in November, 2012, that required the California IOUs to provide incentives only for LED lamps that meet the "California Quality" specification within one year of the standard's adoption by the CEC.[40] The CEC adopted the standard on December 11, 2012. During the "transition period" of up to one year from that date, the CPUC allowed the IOUs to continue to provide incentives for LED lamps that met the ENERGY STAR standards. After December 11, 2013, compliance with the "California Quality" specification for LED lamps became mandatory for IOU incentive program eligibility.

Most lighting supplier representatives expressed negative reactions to the ULP requirements that LED lamps meet the new CEC lamp specifications starting in 2014. However, a few stated that the requirement represented a positive development. We provide more detail on supplier reactions to the standard in chapter 4.

3.3 California Long-Term Energy Efficiency Strategic Plan

In 2008, the CPUC published the California Long-Term Energy Efficiency Strategic Plan.[41] Relying on input from a broad range of stakeholders, the CPUC developed the plan to guide the state in its efforts related to energy efficiency through 2020. The Plan's primary objectives are to achieve zero net energy homes in California as standard practice by 2020 and zero net energy commercial buildings by 2030.[42] The Strategic Plan is organized around eleven chapters (in addition to an introductory chapter), each of which includes goals and strategies related to a specific sector or end-use. The 2008 version of the Strategic Plan did not include a chapter focused on lighting, but did address some lighting-related issues in the residential and commercial chapters.

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36 CEC, 2012.

37 Base types included in the specification are E12, E17, E26, GU-10, GU-24, G8, G9, and GX5.3. Lamp shapes (form factors) include A-lamp (A); flame-tip (F); globe (B, BA, C, CA, G); reflector lamps (bulged reflector BR20 BR30, and BR40; multifaceted reflector MR; parabolic reflector PAR16, PAR20, PAR30, and PAR38; and reflector R16, R20, R30, R40) and a handful of others.

38 CEC, 2012.

39 Note that the "California Quality" standard defines an additional lamp type not included in the ENERGY STAR specification ("floodlamp").

40 CPUC, 2012.

41 CPUC, 2008b.

42 CPUC, 2008c.

In 2009, CPUC Decision 09-09-047 directed Energy Division to develop a lighting chapter for the Strategic Plan.[43] Energy Division convened a series of stakeholder workshops to obtain input regarding the specific initiatives to include in the chapter, which was adopted by the Commission in late 2010.[44] The lighting chapter is organized around a central vision which suggests that, "By 2020, advanced products and best practices will transform the California lighting market. This transformation will achieve a 60-80 percent reduction in statewide electrical lighting energy consumption by delivering advanced lighting systems to all buildings."[45]

The same CPUC Decision that directed Energy Division to create the lighting chapter also approved the IOUs' proposed energy-efficiency programs for the 2010-2012 cycle. The Decision articulated the CPUC's commitment to "ensuring ratepayer funded utility programs align with the Strategic Plan" and, because IOU representatives were among the stakeholders who participated in the process of developing the lighting chapter, many of the programs included in the 2010-2012 cycle were designed with the lighting chapter in mind.[46] The IOUs described one program in particular—the Statewide Lighting Market Transformation Program (described below in Section 3.4.6)—as "an element of the California IOUs' efforts to actualize the goals contained within the Lighting Chapter of the Strategic Plan."[47] The Lighting Chapter of the Plan helped to shape the IOUs' lighting programs during both the 2010-2012 and 2013-2014 program cycles.[48]

3.4 California IOU Residential Lighting Energy-Efficiency Programs

In this section of the report we provide an overview of the history of the residential lighting programs implemented by California's IOUs, summarize the current residential lighting programs (for the 2013-2014 program cycle), and provide a synopsis of a pending CPUC proceeding that could affect the structure of future residential lighting programs. We broadly characterize the program periods as:

- The first generation of CFL programs in California (1989-1997);
- The era of market transformation programs (1998-2000);
- The era of resource acquisition programs (2001-2008) [49];
- A bridge year (2009);
- The beginning of a shift in program support away from basic spiral CFLs (2010-2012)[50];
- Current programs (2013-2014); and
- Future programs.

43 CPUC, 2009.

44 CPUC, 2010.

45 *Ibid.*, page 1.

46 CPUC, 2009, page 6.

47 SCE, PG&E, and SDG&E, 2013, page 1.

48 Note that the 2012 and 2013 lighting supplier interviews did not elicit supplier perspectives on the Strategic Plan.

49 The CFL Market Effects Study (The Cadmus Group, Inc., *et al.*, 2009) provides detailed information regarding the IOUs' residential lighting energy-efficiency programs through 2008. This report summarizes that information.

50 As described above, "basic CFLs" are defined as single-wattage, non-dimmable, medium screw-base spiral CFLs up to (and including) 30 watt lamps.

3.4.1 First Generation CFL Programs (1989-1997)

In 1989, the California IOUs created the first generation of programs to introduce CFLs to the California marketplace, educate consumers, and generate energy savings. The CA IOUs promoted CFLs to their residential customers through a wide range of programs using direct installation, direct mail coupons, direct mail CFL sales, and incentives to retailers and/or manufacturers.

- **PG&E** focused on direct-mail coupon campaigns and retailer incentives between 1989 and 1991. Together, these programs resulted in sales of more than 340,000 CFLs. In 1991, PG&E began a direct-install CFL campaign (as part of in-home energy audits) and installed nearly 250,000 CFLs in single-family and multifamily homes via this mechanism through 1994. In 1992, PG&E began its first manufacturer buy-down program in non- big box channels (including hardware, grocery, drug, discount, and lighting specialty stores) and sold approximately 500,000 CFLs through 1993. The utility discontinued its manufacturer incentive program in 1994 and replaced it with a consumer education campaign focused on the economic benefits of CFLs.
- **SCE** introduced a $5 manufacturer buy-down program in 1994 which facilitated shipment of over 600,000 CFLs to retailers. Through a similar buy-down program in 1996, SCE offered incentives for an additional 90,000 CFLs through participating retailers. SCE also offered limited marketing support services during this timeframe.
- **SDG&E** distributed more than 200,000 CFLs to customers via direct installation and through customer contacts with field staff between 1990 and 1992. SDG&E also introduced a retail program in 1992, partnering with a CFL manufacturer to sell more than 55,000 CFLs at a $5.99 price point. Between 1990 and 1997, SDG&E's CFL giveaways, direct installations, and ongoing retail efforts resulted in the distribution of almost 1.6 million CFLs to residential customers.

3.4.2 Market Transformation Programs (1998-2000)

Following direction provided by the CPUC in 1997 that the purpose of energy-efficiency programs should be to transform the market for energy-efficient goods and services, the California IOUs developed the California Residential Lighting and Appliance Program to address the barriers to adoption of energy-efficient appliances and lighting products in California. The program focused on the supply-side of the market with goals of increasing production, stocking, promotion, and sales of energy-efficient lighting and appliances. Although limited downstream activities continued, the market transformation programs shifted their emphasis upstream with a more concentrated focus on manufacturer incentives, retailer salesperson training and incentives, cooperative advertising, and in-store merchandising support.

3.4.3 Resource Acquisition Programs (2001 to 2008)

In 2001, spurred by the California energy crisis, the IOUs shifted their residential lighting program focus from long-term market transformation to immediate energy and peak demand savings. In response to this shift in California's energy policy, the IOUs together provided incentives for more than 7 million CFLs in 2001. In 2002, the IOUs continued to push large volumes of CFLs through manufacturer buy-down and point-of-sale (POS) discount programs. Both large and small lighting retailers were eligible to participate in the 2002 program and for the first time, a percentage of the program's budget was earmarked for hard-to-reach targets. The 2002 program provided incentives for another 3.5 million compact fluorescent products (mostly lamps but also a relatively small number of fixtures).

The basic structure of the 2003 and 2004-2005 lighting programs remained largely the same as the 2002 programs. However, in 2004, the Residential Lighting Program and the Home Energy Efficiency Rebate (HEER) Program combined to form the Statewide Single-Family Energy Efficiency Rebate (SFEER) Program in an effort to streamline internal operations for the IOUs. In response to the state's return to energy efficiency as a resource and additional funding for the public goods charge pool, the 2004-2005 programs' budget nearly doubled from the prior program cycle. The majority of the programs' incentives were allocated to the upstream component which paid lighting manufacturers directly. Several manufacturers partnered with grocery store chains, which were responsible for over 40 percent of the upstream incentive dollars during the 2004-2005 programs.

The 2006-2008 programs continued the prior program strategy of offering both manufacturer buy-downs and POS incentives to California's energy-efficient lighting suppliers and, similar to 2004, manufacturer buy-downs comprised the vast majority of CFLs for which the programs provided incentives. The key drivers for the 2006-2008 programs were California's focus on global warming and the passing of an associated Assembly Bill (AB 32), the California Global Warming Solutions Act of 2006, which resulted in the CPUC dramatically increasing the energy savings goals for the state's IOUs.

To achieve the new goals, the IOUs significantly increased their budget allocations to the ULP, which allowed the IOUs to expand the number of retailers participating and offer incentives for a much greater volume of CFLs. The IOUs provided incentives for approximately 56 million CFLs and fixtures during the first two years of the 2006-2008 program period. Evaluation results indicated that the 2006-2008 ULP accounted for more than half (56%) of the expected net kWh savings and 42 percent of the expected net KW reductions across California's entire energy-efficiency portfolio.[51] Estimated statewide annual net savings for the ULP were approximately 1.325 GWh and net peak demand reductions were nearly 134 MW.[52] As expected, screw-base CFLs accounted for the vast majority of savings in the ULP, contributing 92 percent of net energy savings and 96 percent of net peak demand reductions.[53]

3.4.4 Bridge Year (2009)

The 2009 Program was a "bridge year" in between the 2006-2008 programs and 2010-2012 programs with program design and activities continuing with little change from 2006-2008. In D.08-10-027, the CPUC authorized California IOUs to continue to expend funds for 2008 energy-efficiency programs into 2009 to avoid interruptions in the market until the CPUC reached a final decision regarding the next program portfolio proposal.[54] IOUs were authorized to increase program spending proportionally during the bridge year to proposed increases in energy savings goals.[55] For example, if the 2009 IOU energy savings goals were 10 percent higher than annual goals in the 2006-2008 portfolio, average monthly program expenditures were authorized to also be 10 percent higher. The bridge year facilitated the ongoing implementation of programs while giving the CPUC, IOUS, and key stakeholders time to vet the next multiyear portfolio proposal and ensure that it satisfied the goals of California's (then new) Long Term Energy Efficiency Strategic Plan.

51 KEMA, Inc., 2010.
52 *Ibid.*
53 *Ibid.*
54 CPUC, 2008a.
55 *Ibid.*

3.4.5 Beginning of a Shift away from Basic CFL Programs (2010-2012)

After 9 years of supporting mass-market CFL programs that incentivized tens of millions of CFLs, the CPUC issued a decision calling for the IOUs to begin ramping down their traditional CFL programs in the 2010-2012 portfolio. The decision directed the IOUs to focus instead on "new lighting technologies and other innovative programs that focus on lasting energy savings and improved consumer uptake." [56] The CPUC's direction to shift programs away from basic CFLs—which provided low-cost, easy to obtain energy savings that historically constituted the majority of IOU portfolio spending and savings achievements—was largely in response to increased CFL availability, improved lamp quality, declining lamp costs, and dramatically increased consumer uptake (i.e., sales). On top of these positive CFL market developments, improvements in lighting efficacy dictated by state and national legislation (AB 1109 and EISA) further changed the landscape and pushed the need to transition lighting programs away from providing incentives for basic CFLs.

The CPUC required the IOUs to propose separate budgets for three programs during the 2010-2012 period:

- **Residential Lighting Incentive Program for Basic CFLs.** This program was intended to provide incentives for single-wattage, non-dimmable, medium screw-base (MSB) spiral CFLs of less than 30 watts. The basic CFL program initially proposed by the IOUs was essentially a continuation of 2006-2008 residential upstream lighting program activities, including a manufacturer buy-down component with identical incentive levels and a proposed budget of $108 million. The CPUC rejected this initial proposal. Ultimately the CPUC authorized a basic CFL program budget of $78 million, a 28 percent reduction to the IOU's proposed funding level, underscoring the CPUC's direction to shift away from incentives for basic CFLs.
- **Residential Advanced Consumer Lighting Program.** This program was intended to encourage consumers to use high-efficiency specialty lamps versus incandescent specialty lamps. The program focused on products other than basic spiral CFLs (as described above) and included dimmable CFLs, three-way CFLs, other specialty and "super" CFLs, LED lamps, and other lighting products. Similar to the basic CFL program, the advanced program included upstream incentives as well as midstream incentives for products typically purchased by lighting contractors. All together, the IOUs initially proposed an Advanced Lighting Program budget of $78 million that the CPUC determined was insufficient. To offset the reduction in the Basic CFL Program budget, the CPUC authorized a budget of $89 million for the Advanced Lighting Program, a 14 percent increase from the IOUs' initial proposal. The Advanced Consumer Lighting Program and Residential Lighting Incentive Program for Basic CFLs comprised the IOUs' ULP efforts for the 2010-2012 program period.
- **Statewide Lighting Market Transformation Program.** Borne largely from the strategies discussed in the lighting chapter of the Strategic Plan, this non-resource program was intended to establish a statewide, integrated process for the development and testing of market transformation strategies for various lighting technologies. The program included funding for activities such as market research, coordination, and educational outreach intended to inform market actors about new lighting technologies. The IOUs proposed (and the CPUC approved) total funding for the program of approximately $1.5 million for PG&E and SCE; SDG&E did not include a proposal to fund the Statewide Lighting Market Transformation Program.

[56] The information in this section of the report is largely based on CPUC Decision 09-09-047 (CPUC, 2009).

Data collection for the WO28 lamp supplier interviews took place a few months after the end of the 2010-2012 program period. We asked supplier representatives to share their perspectives regarding the ULP's influence on LED lamp sales specifically. Several reps also provided unsolicited perspectives on the ULP's general influence on their market activities—a small number suggested that the program influenced the types of CFL and LED lamps they sold, and a similar number attributed their presence in California's market for residential replacement lamps to the ULP because their business models focus solely on lamp sales through utility incentive programs. Supplier representatives also shared their perspectives on a host of other elements of the ULP; we provide more detail in chapter 4.

3.4.6 Current Programs (2013-2014)

The current programs are part of a two-year program cycle (2013-2014). The IOUs designed the 2013-2014 Statewide Lighting Program to promote energy-efficient lighting products across market segments and delivery channels to help facilitate long-term lighting market transformation. This program is fundamentally the same as the 2010-2012 Basic and Advanced CFL programs combined, albeit with a reduced emphasis on basic CFLs.

The CPUC's direction to phase out support for basic CFLs (which began in the 2010-2012 program cycle) is further demonstrated in the overall budget allocated to lighting. The overall 2013-2014 budget for lighting program is approximately $70 million (roughly $35 million per year).[57] This is a significant reduction from the 2010-2012 lighting program budget which totalled over $168 million over three years (or approximately $56 million per year). The majority of the budget reduction for lighting programs is related to the IOUs' ramping down their incentive support for basic CFLs.

As with the 2010-2012 residential lighting incentive programs, the 2013-2014 Statewide Lighting Programs are also separated into three main components. The IOUs continued their Lighting Market Transformation Program and developed a Primary Lighting Program and Lighting Innovation Program for the 2013-2014 period:

- **Lighting Market Transformation Program.** This program continues in largely the same form in 2013-2014 as in the previous program cycle. The program establishes a process for IOUs to develop and test various market transformation strategies for emerging lighting technologies and technologies already supported by existing energy-efficiency programs. The program provides oversight for new lighting technology advancement to the Primary Lighting and Lighting Innovation programs. Additionally, the Lighting Market Transformation Program will support Codes and Standards Program activities. The two-year statewide budget for the Lighting Market Transformation program is approximately $2.6 million.
- **Primary Lighting Program.** As mentioned above, this program is fundamentally the same as the 2010-2012 Basic and Advanced CFL programs with a reduced emphasis on basic CFLs. The program employs upstream, midstream, and downstream incentives for commercially-viable energy-efficient lighting products including CFLs, LED lamps and fixtures, and dimmable fluorescent ballasts as well as other efficient technologies. The two-year budget for this component of the Statewide Lighting Program is just under $48 million across IOUs for the 2013-2014 program period.
- **Lighting Innovation Program.** The goal of the Lighting Innovation Program is to identify new products or program design elements which have the potential to eventually migrate to the Primary Lighting Program. The Innovation Program is intended to serve as an incubator for the Primary Lighting Program

[57] CPUC, 2013b.

by conducting demonstration or pilot projects and trial studies of lighting measures in the early stages of commercialization. The Lighting Innovation Program will also identify and test promising new program design strategies. The two-year budget for this component of the Statewide Lighting Program is approximately $19 million across IOUs.

3.4.7 Future IOU Programs

In November, 2013, the CPUC opened a Rulemaking to establish a proceeding to accomplish three objectives:

- To fund the current energy-efficiency portfolios through 2015;
- To implement "rolling" energy-efficiency portfolios; and
- To address various related policy issues.[58]

The goal of a "rolling portfolio" approach is to help avoid disruptions to long-running programs (like the Statewide Lighting Program) and to allow program administrators to adjust funding and programs based on the needs of the market rather than the fixed two-year schedule of the current portfolio approval process. This approach is also intended to facilitate long-term planning and investments by administrators and implementers, respectively. As of early 2014, this issue has not yet reached a final decision within the CPUC.

58 CPUC, 2013a.

4. MARKET SUPPLY

This chapter provides an overview of the supply-side of California's market for residential replacement lamps based on available data from in-depth telephone interviews with participating lamp suppliers and retail lighting shelf surveys. We characterize the lamp suppliers active in California's market, detail supplier perspectives on various elements of the supply-side of the market (including market barriers). We also summarize the availability, diversity, and pricing of lamps sold in California retail stores during 2012 and 2013.

This is the first report chapter that begins to introduce results from primary research conducted in support of other CPUC EM&V WOs for the 2010-2012 program cycle (including analyses of program tracking data). Because of the volume of material covered, we include an overview of key findings to highlight noteworthy results from major subsections of the report. We include these key findings as relevant within Chapters 4 through 8 of the report.

4.1 Lamp Suppliers

Below we provide details regarding lamp suppliers (manufacturers and retailers) in general and the suppliers that participated in the 2010-2012 ULP specifically. We also provide supplier representatives' perspectives regarding lamp efficacy regulations, the "California Quality" LED specification, and the ULP on California's residential replacement lamp market.

4.1.1 Lamp Manufacturers

Key findings regarding lamp manufacturers include:

- There were at least 264 lamp manufacturing organizations listed as "ENERGY STAR partners" in mid-2013. Two-thirds of these manufactured LED lamps and more than half manufactured CFLs. Roughly one in five manufacturers produced both lamp technologies.
- The majority of ENERGY STAR LED and CFL manufacturing is concentrated among a small group of 10 to 15 top firms, with more than a hundred manufacturers for each lamp type each representing 2 percent or less of total ENERGY STAR –qualified models in mid-2013.
- More than 30 lamp manufacturers participated in the 2010-2012 ULP.

We provide more details regarding these findings below.

4.1.1.1 Role of Manufacturers

Lamp manufacturers are a major influencer in determining which lamps—the technologies, models, packaging configurations, and so on—will appear in retail stores. Manufacturers typically have close relationships with their retail partners, and retailers typically have close relationships with one key manufacturer or a small number of manufacturers. The manufacturers exert their influence on lamp positioning in the stores (e.g., on an end-cap or in the lighting aisle), how the lamp is priced, and special promotional or marketing efforts specific to an individual model or group of models. A 2012 report[59] suggests that manufacturers typically meet with retailers once a year for "comprehensive product reviews"

[59] D&R International, 2012.

in which they review all of the distinguishing characteristics of each model but may also have less formal discussions throughout the year to address specific issues or special promotional opportunities as they arise.

4.1.1.2 Market Size

A large number of manufacturers are active in the residential replacement lamp market.[60] ENERGY STAR maintains lists of qualified CFLs and LED lamps for sale in the United States and includes details regarding lamp manufacturers.[61] While these lists do not represent all CFLs and LED lamps for sale in the U.S., the data provide a sense of market size and the scale of manufacturing operations for these products. Data from July 17, 2013 lists approximately 264 organizations as "ENERGY STAR partners" for CFLs and/or LED lamps.[62] Of these organizations, 144 manufactured CFLs (55% of partners) and 175 manufactured LED lamps (66%). Approximately 55 ENERGY STAR partners listed in July 2013 manufactured both CFLs and LED lamps (21%).

Table 7 below shows the number of total ENERGY STAR CFL models listed in July 2013 by ENERGY STAR partner. As shown, 13 partners accounted for more than half of all models available (53%). The remaining 131 partners each accounted for less than 2 percent of all CFL models listed. For LED lamps (Table 8), the top eleven partners accounted for more than 40 percent of all LED lamp models listed by ENERGY STAR in July 2013 (42%), and the remaining 164 partners each accounted for less than 2 percent of total models listed at that time.

Technical Consumer Products, Inc. (TCP) appears on both lists of top ENERGY STAR partners in terms of the total number of listed models for which each was responsible. TCP produced the largest number of qualified CFL models among ENERGY STAR partners in mid-2013 (637 models) and the fourth-highest number of LED lamp models (110). The so-called "big three" lighting manufacturers—GE Lighting, OSRAM SYLVANIA, and Philips Lighting Company—also appear on both lists. These three firms are among the top 12 CFL producers and are the top three LED lamp producers. GE produced the largest number of ENERGY STAR qualified LED lamp models among listed partners in mid-2013 (191 models).

60 Note that lamp sales data for California are not available. As such, we rely on other types of information (including details regarding the number of firms active in lamp manufacturing nationally and shipments of program-discounted lamps through the ULP) to provide information regarding market size.

61 Note that there are comparable lists for other lamp technologies (e.g., incandescent lamps).

62 The U.S. EPA defines an ENERGY STAR Partner as "an organization that signed a Partnership Agreement with EPA to manufacture or private label ENERGY STAR qualified products" (U.S. EPA, 2013). As such, it is likely that the count of partners somewhat over-represents the total number of LED lamp manufacturers (since some manufacturers may produce more than one brand). Nonetheless, these data provide an indication regarding the relative market presence of various Lamp manufacturing organizations.

Table 7: Number of ENERGY STAR Qualified CFL Models Available in the U.S by ENERGY STAR Partner, July 2013

	CFL Models Listed	
ENERGY STAR Partner	**n**	**Percent of All Models***
Technical Consumer Products, Inc. (TCP)	637	11%
OSRAM SYLVANIA	336	6%
Globe Electric Inc.	290	5%
Feit Electric	285	5%
Xiamen Topstar Lighting Co., Ltd.	261	4%
The Home Depot	214	4%
Maxlite	192	3%
Lowe's Home Improvement	190	3%
Hengdian Group Tospo Lighting Co., Ltd.	183	3%
Zhe Jiang NVC Lamp Co., Ltd.	140	2%
GE Lighting	134	2%
Philips Lighting Company	130	2%
Fujian Joinluck Electronic Enterprise Co., Ltd.	121	2%
All other partners (n=131; each accounts for <2% total models)	2,777	47%
Total	**5,980**	**100%**

Source: U.S. EPA, 2013.
* Note: Results may not total 100 percent because of rounding.

Table 8: Number of ENERGY STAR Qualified LED Lamp Models Available in the U.S by ENERGY STAR Partner, July 2013

	LED Lamp Models Listed	
ENERGY STAR Partner	**n**	**%**
GE Lighting	191	8%
Philips Lighting Company	175	8%
OSRAM SYLVANIA	133	6%
Technical Consumer Products, Inc. (TCP)	110	5%
Lighting Science Group, Corp	85	4%
Toshiba International Corporation	67	3%
Solais Lighting, Inc.	45	2%
Green Creative	39	2%
Standard Products, Inc.	38	2%
Homelite Technology Co. Ltd	37	2%
Wooree Lighting Holdings Co. Ltd.	37	2%
All other partners (n=164; each accounts for <2% total models)	1,331	58%
Total	**2,288**	**100%**

Source: U.S. EPA, 2013.

4.1.1.3 Lamp Manufacturers in the 2010-2012 ULP

During California's 2010-2012 energy-efficiency program cycle, at least 32 manufacturers sold discounted lamps through the ULP.[63] Of these:

[63] A small quantity of units listed in the ULP tracking data is not associated with manufacturer names. As such, it is possible that the ULP provided incentives to one or more manufacturers that are not listed by name in the tracking data.

- All but three received incentives to sell basic CFLs through the 2010-2012 ULP;
- All received incentives for specialty CFLs;
- Nearly half of the participating manufacturers received incentives for LED products (15 of 32); and
- Three manufacturers received incentives for cold cathode lamps through the 2010-2012 program.

These 32 manufacturers partnered with approximately 2,000 stores including hundreds of independent retailers (primarily in the discount, grocery, and small hardware channels) and dozens of major retail chains.

4.1.2 Lamp Retailers

Key Findings regarding lamp retailers include:

- At least 8 retail channels sell replacement lamps to California consumers (either through the ULP or without program discounts). Through the 2010-2012 ULP, grocery stores received roughly 40 percent of all lamp shipments with another 20 percent each to discount stores and wholesale clubs. Overall, non-big box channels accounted for two-thirds of 2010-2012 lamp shipments through the ULP (67%).
- CFLs represented more than 90 percent of lamps discounted through the 2010-2012 ULP, and nearly two-thirds of these were basic spiral lamps.
- LED replacement lamps represented less than 1 percent of all ULP-discounted units in the 2010-2012 program. These were concentrated in wholesale club stores, and the vast majority of these were reflector lamps (roughly 70,000 units).
- The discount, drug, and grocery channels received nearly two-thirds of all ULP-discounted CFL shipments during the 2010-2012 period. These channels typically do not serve as “destinations” for energy-efficient lamp purchases and dedicate minimal shelf space to replacement lamps. The IOUs have targeted these channels for reaching hard-to-reach customers, and many of the manufacturers that supply these channels reported they would not sell ENERGY STAR CFLs in these channels without support from the ULP—particularly in the case of specialty CFLs.
- The home improvement and small hardware channels received approximately 12 percent of all CFLs shipped to retailers through the 2010-2012 ULP. These channels are typically “destinations” for shoppers who seek energy-efficient lamps, dedicate a good deal of shelf space to replacement lamps, and sell replacement lamps year-round. Most manufacturers would continue to sell ENERGY STAR CFLs through these channels without the ULP discount. Unlike discount, drug, and grocery stores, stores in the home improvement and small hardware channels typically stock LED lamps.
- Participation of home improvement stores in the ULP may be declining as a result of retailer decisions to each move toward a single manufacturer to supply every-day and promotional lamps (rather than separate suppliers) to make their supply more uniform across states and incentive programs.
- Mass merchandise stores, wholesale clubs, and lighting and electronics stores received 23 percent of all CFL shipments through the 2010-2012 ULP. These channels share some characteristics with other channels dominated by large chains, such as the home improvement channel. Most suppliers to the mass merchandise and wholesale channels report that they would continue to supply ENERGY STAR CFLs to these channels in absence of ULP discounts, but this proportion is smaller among suppliers to the lighting and electronics channel. Many of the stores in these channels also stock LED lamps.

We provide more details regarding these findings below.

4.1.2.1 Retail Channel Overview

In California, there are 8 retail channels that typically sell replacement lamps to consumers:

1. **Discount.** Discount stores typically sell products at prices lower than those of traditional retail outlets and may obtain these products through resellers and discount aggregators. Examples of discount chains include 99 Cents Only, Big Lots, and Dollar Tree.
2. **Drug.** Drug stores typically sell over-the-counter medications, first aid supplies, and prescription pharmaceuticals. Many drug stores also sell paper products, beverages, and a selection of grocery dry goods. Examples of drug store chains include CVS, Rite Aid, and Walgreen's.
3. **Grocery.** Grocery stores typically sell perishable and non-perishable food items and stock a small selection of household goods such as paper products and cleaning supplies. This category includes produce markets and convenience stores. Examples of California grocery store chains include Albertson's, Food 4 Less, and Stater Brothers.
4. **Small Hardware.** Small hardware stores sell a variety of home repair, maintenance, and improvement products such as fasteners, tools, and plumbing and electrical supplies, and may stock cleaning products, paint, and lawn and garden products. Some may also stock goods that are regionally appropriate, such as hunting and fishing supplies or swimming pool chemicals. Small hardware stores are similar to home improvement stores except hardware stores are typically much smaller. Examples include Ace Hardware and True Value Hardware.
5. **Large Home Improvement.** Large home improvement stores are a class of hardware stores that typically occupy warehouse-style spaces. They large footprints of over 30,000 square feet and often over 100,000 square feet, many with additional square footage dedicated to outdoor garden centers. The home improvement channel includes chains such as The Home Depot, Lowe's and Orchard Supply.
6. **Mass Merchandise.** Mass merchandisers typically stock a large assortment of goods (including clothing and housewares and sometimes food products and medications) at competitive prices. Stores in this category include large mass merchandise chains as well as smaller "mom and pop" variety stores. Examples of mass merchandise chains include K-Mart, Target, and Wal-Mart.
7. **Wholesale Club.** Wholesale clubs are typically warehouse-style stores that stock a wide variety of grocery and household items at lower prices than typically available in most other retail channels. These chains typically require shoppers to carry membership cards. Examples of wholesale club stores include retail chains such as Costco and Sam's Club.
8. **Lighting and Electronics.** This category groups lighting retailers with electronics retailers. The former typically stock light fixtures, ceiling fans, and replacement lamps, while the latter sell home electronics and appliances. Examples of lighting and electronics stores include retail chains such as Lamps Plus and Best Buy.

The 2010-2012 ULP provided incentives for replacement lamps in each of these retail channels. In addition, the ULP also provided incentives through "other" channels such as retail that do not fit well into the

categories described above—for example, stores that typically sell donated goods such as Goodwill and Salvation Army outlets.

4.1.2.2 Retailers in the 2010-2012 ULP

PG&E, SCE, and SDG&E provided discounts for more than 78 million lighting products through the 2010-2012 ULP. CFLs comprised the vast majority of 2010-2012 ULP shipments at more than 9 out of 10 of all ULP-discounted products shipped (93%), and LEDs comprised another 7 percent. (Note that for LEDs, however, this includes not only replacement lamps but also individual lamps on holiday light strings and plug-in night lights).

Together, CFLs and LED lamps comprised 99.8 percent of all 2010-2012 ULP shipments. When we examine these products by retail channel and lamp shape (Table 9 and Table 10), the data demonstrate that grocery stores received 2 out of every 5 CFLs discounted through the program during the 2010-2012 period (39%) and discount stores received roughly 1 out of every 5 ULP-discounted CFLs (20%). In both cases, nearly two-thirds of the CFL shipments were basic spiral lamps (64%). Wholesale clubs also received roughly one of every five ULP-discounted CFLs (19%), again with the majority comprised by basic spiral lamps (62% of ULP-discounted CFLs shipped to wholesale clubs).

Grocery stores received nearly half of all LED products discounted by the 2010-2012 ULP (48%). Eighty percent of these products were LED holiday lights. The ULP shipped another 36 percent of discounted LED products to large home improvement stores, again with more than 80 percent comprised by holiday lights. The remaining LED products were scattered among the other retail channels. Table 9 shows that the ULP shipped approximately 110,000 LED replacement lamps—all reflectors—during the 2010-2012 period. The dominance of reflector lamps in the ULP likely reflects their dominance in the market—as described in section 3.2.1, more than 70 percent of ENERGY STAR –qualified LED lamps in 2013 were reflector lamps. Not shown in the tables is that these LED replacement lamps represented 2 percent of all LED products shipped and only 0.1 percent of all ULP shipments in that timeframe. Wholesale clubs received the most LED replacement lamps in the 2010-2012 ULP (just over 70,000 LED reflector lamps).

Table 9: Number of Units Discounted by the 2010-2012 ULP by Retail Channel, Technology, and Lamp Shape

		Retail Channel									
Tech	Lamp Shape	Discount	Drug	Grocery	Hardware	Home Improv	Ltg & Electronics	Mass Merch	Wholesale Club	Other/ Unknown	Grand Total
CFL	Basic Spiral	9,239,055	2,405,216	18,096,100	1,970,236	4,045,751	483,575	1,753,983	8,369,776	1,247,165	47,610,857
	A-Lamp	2,830,934	290,860	5,959,541	560,428	465,321	128,577	83,239	717,608	39,881	11,076,389
	Reflector	1,597,019	483,833	3,339,746	677,163	1,105,676	76,306	175,649	3,308,016	55,304	10,818,711
	Globe	414,916	2,000	424,951	42,044	16,604	6,400	31,684	477,426	5,553	1,421,578
	Spiral >30W	97,036	2,160	181,542	20,910	25,848	4,376	26,853	352,776	140	711,641
	3-Way	112,340	0	339,487	56,130	21,391	2,654	3,503	1,583	0	537,088
	Dimmable	387	0	83,602	1,428	101,670	540	9,014	321,072	3,896	521,609
	Other	82,200	0	2,340	163,980	3,552	0	0	672	4,840	257,584
CFL Subtotal		**14,373,887**	**3,184,069**	**28,427,309**	**3,492,319**	**5,785,813**	**702,428**	**2,083,924**	**13,548,928**	**1,356,778**	**72,955,457**
LED	Holiday	0	0	1,974,000	140,160	1,530,000	0	0	0	27,300	3,671,460
	Night Light	226,281	19,848	493,620	8,250	163,978	0	50,328	87,552	896	1,050,753
	Other	0	0	0	0	0	0	0	0	169,710	169,710
	Fixture	0	0	0	0	119,740	0	0	13,956	144	133,840
	Reflector	0	0	270	21,480	16,239	864	1	70,356	540	109,750
LED Subtotal		**226,281**	**19,848**	**2,467,890**	**169,890**	**1,829,957**	**864**	**50,329**	**171,864**	**198,590**	**5,135,513**
Grand Total		**14,600,168**	**3,203,917**	**30,895,199**	**3,662,209**	**7,615,770**	**703,292**	**2,134,253**	**13,720,792**	**1,555,368**	**78,090,970**

Table 10: Percent of CFLs and LEDs Discounted by the 2010-2012 ULP by Retail Channel, Technology, and Lamp Shape

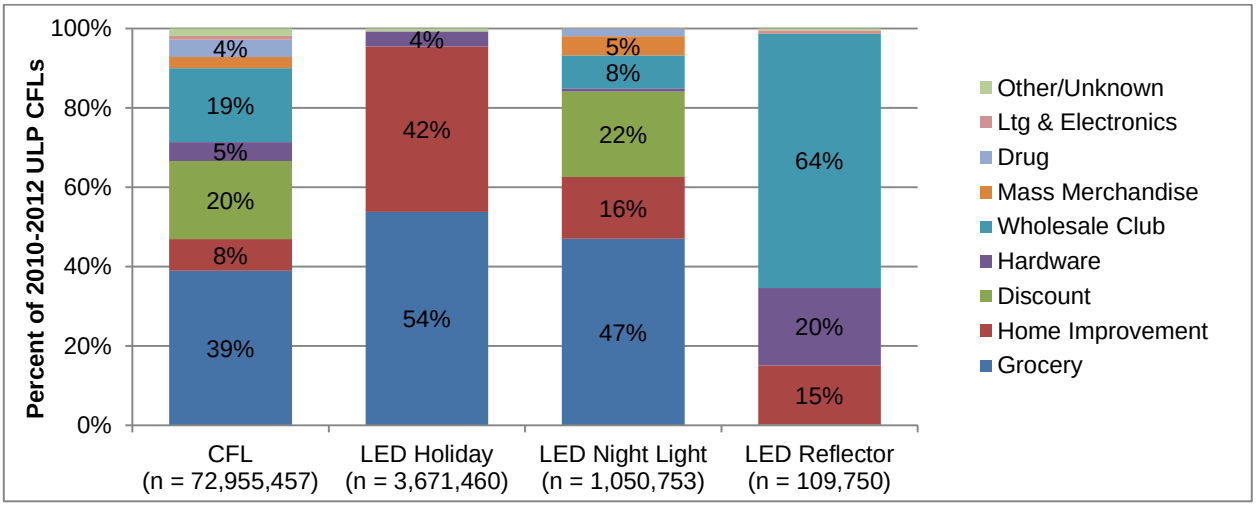
		Retail Channel									
Tech	Lamp Shape	Discount	Drug	Grocery	Hardware	Home Improv	Ltg & Electronics	Mass Merch	Wholesale Club	Other/ Unknown	Grand Total
CFL	Basic Spiral	64%	76%	64%	56%	70%	69%	84%	62%	92%	65%
	A-Lamp	20%	9%	21%	16%	8%	18%	4%	5%	3%	15%
	Reflector	11%	15%	12%	19%	19%	11%	8%	24%	4%	15%
	Globe	3%	0%	1%	1%	0%	1%	2%	4%	0%	2%
	Spiral >30W	1%	0%	1%	1%	0%	1%	1%	3%	0%	1%
	3-Way	1%	0%	1%	2%	0%	0%	0%	0%	0%	1%
	Dimmable	0%	0%	0%	0%	2%	0%	0%	2%	0%	1%
	Other	1%	0%	0%	5%	0%	0%	0%	0%	0%	0%
CFL Total		**20%**	**4%**	**39%**	**5%**	**8%**	**1%**	**3%**	**19%**	**2%**	**100%**
LED	Holiday	0%	0%	80%	83%	84%	0%	0%	0%	14%	71%
	Night Light	100%	100%	20%	5%	9%	0%	100%	51%	0%	20%
	Other	0%	0%	0%	0%	0%	0%	0%	0%	85%	3%
	Fixture	0%	0%	0%	0%	7%	0%	0%	8%	0%	3%
	Reflector	0%	0%	0%	13%	1%	100%	0%	41%	0%	2%
LED Total		**4%**	**0%**	**48%**	**3%**	**36%**	**0%**	**1%**	**3%**	**4%**	**100%**

Source: 2010-2012 ULP tracking data.

Figure 2 below shows the percentage of total ULP-discounted CFL and LED shipments comprised by each retail channel in the 2010-2012 ULP. For CFLs, there were negligible differences between ULP shipments for general purpose versus specialty lamps by channel. Nearly forty percent of ULP CFLs went to grocery stores and a similar percentage was split evenly between discount stores and wholesale clubs (20% each). The ULP shipped 8 percent of discounted CFLs to home improvement stores and the remainder to other retail channels.

For LEDs, there was great variation in how ULP-discounted products were allocated among the retail channels in the 2010-2012 program. LED holiday lights were concentrated in the grocery and home improvement channels (54% and 42% of LED holiday lights, respectively). ULP-discounted LED night lights were also concentrated in grocery stores (47% of 2010-2012 ULP-discounted LED night light shipments), another 22 percent in discount stores, 16 percent in home improvement, and the remaining 15 percent scattered among the other channels. For LED reflector lamps—the only LED replacement lamp type included in the 2010-2012 ULP—nearly two-thirds went to wholesale clubs (64%), 20 percent to hardware stores, and 15 percent to large home improvement stores. Other channels received 1 percent or less of total 2010-2012 ULP-discounted LED reflector lamps.

Figure 2: ULP-Discounted Product Shipments by Product Type and Retail Channel, 2010-2012



Note: Results for each product type may not total 100% due to rounding.
Source: 2010-2012 ULP tracking data.

4.1.2.2.1 Differences between 2006-2008 and 2010-2012 ULP

As stated above, basic spiral CFLs comprised approximately 65 percent of CFL incentives through the 2010-2012 ULP. Table 11 below shows that during the 2006-2008 program period, basic spiral CFLs comprised roughly 87 percent of CFL incentives. The 2010-2012 ULP shipped roughly 72 million CFLs to retailers, representing a decline of nearly one-quarter over 2006-2008 shipment levels (a decline of nearly 22 million CFLs). The table also demonstrates that while basic spiral CFLs comprised the majority of ULP-discounted CFLs in both periods, the 2010-2012 program included more roughly 40 percent fewer basic CFLs than the 2006-2008 program (46 million versus nearly 82 million) and more than twice as many specialty CFLs (25 million versus roughly 12 million).

The quantity of CFLs shipped to non- big box stores declined by a smaller margin between 2006-2008 and 2010-2012 than the quantity of CFLs shipped to big box stores. During the 2010-2012 period, manufacturers shipped roughly 49 million ULP-discounted CFLs to non- big box retailers, roughly 12 million fewer than in 2006-2008 (a 20% drop). The quantity of CFLs shipped to big box stores was roughly 20 million, nearly 10 million fewer than in 2006-2008 (a 30% drop). Percentage-wise, the split in program incentives between big-box and non- big box stores did not change dramatically between years (from 34% big box in 2006-2008 to 31% big box in 2010-2012). These results suggest that the IOUs are continuing to focus their CFL allocations toward non- big box stores.

Table 11: CFL Shipments by CFL Type, Retail Channel, and Program Period (2006-2008 and 2010-2012).

		Retail Channel									
CFL Type	**Program Period**	**Discount**	**Drug**	**Grocery**	**Hardwr**	**Home Improv**	**Ltg & Electronc**	**Mass Merch**	**Wholesl Club**	**Total***	**% of Total**
All CFLs	2006-2008	14,850,098	8,517,458	33,423,097	4,945,630	7,604,978	1,340,526	4,592,340	18,086,886	93,361,013	100%
	2010-2012	14,373,887	3,184,069	28,427,309	3,492,319	5,785,813	702,428	2,083,924	13,548,928	71,598,679	100%
	% Change	-3%	-63%	-15%	-29%	-24%	-48%	-55%	-25%	-23%	-
Basic	2006-2008	14,272,669	6,951,974	30,261,368	4,751,621	6,435,962	1,263,727	3,687,409	13,913,155	81,537,885	87%
	2010-2012	9,239,055	2,405,216	18,096,100	1,970,236	4,045,751	483,575	1,753,983	8,369,776	46,363,692	65%
	% Change	-35%	-65%	-40%	-59%	-37%	-62%	-52%	-40%	-43%	-26%
Specialty	2006-2008	577,429	1,565,484	3,161,729	194,009	1,169,016	76,799	904,931	4,173,731	11,823,128	13%
	2010-2012	5,134,832	778,853	10,331,209	1,522,083	1,740,063	218,853	329,942	5,179,152	25,234,987	35%
	% Change	789%	-50%	227%	685%	49%	185%	-64%	24%	113%	178%

* Total excludes CFLs shipped to “unknown/other” channels: 106,441 in 2006-2008 and 1,356,778 in 2010-2012.
Source: Program tracking data.

4.1.2.3 Retail Channel Characteristics

During the supplier interviews, DNV GL staff asked lamp manufacturers' representatives to characterize the retail channels in which they sold IOU-discounted lamps through the 2010-2012 ULP. Interview results suggested similarities among some of the retail channels. As such, we present the results below by grouping retail channels that share common characteristics to highlight these similarities and minimize redundancy in the findings. Below we characterize three groups of retail channels: (1) discount, drug and grocery stores; (2) home improvement and small hardware stores; and (3) mass merchandise, lighting showrooms, and wholesale clubs.

4.1.2.3.1 Discount, Drug, and Grocery Retail Channels

The discount, drug, and grocery channels represented roughly 63 percent of all ULP-discounted CFLs in the 2010-2012 period. We interviewed representatives of 20 manufacturing firms that supplied approximately 99 percent of total ULP-discounted CFLs to these channels during the 2010-2012 period. During the interviews, supplier representatives suggested that the discount, drug, and grocery channels have a number of characteristics in common when it comes to selling replacement lamps. Some of these shared characteristics include:

- *These channels are not traditional "destinations" for energy-efficient lamp purchases.* Lamp suppliers and retail buyers observed that the discount, drug, and grocery channels—unlike other retail channels such as small hardware and home improvement—are not conventionally known as "destination stores" for lighting purchasers.

    - "We're not a destination for items like [specialty CFLs], nor [are those products] something that we carry on a normal basis," said one retail buyer for a chain of discount grocery stores.

  Thus, consumers who purchase lighting products in these stores are often doing so as an "impulse" purchase because they have spotted a bargain or because it is convenient for them to purchase replacement lamps while they are in the store shopping for its primary product offerings (e.g., food, medications, and personal care items).

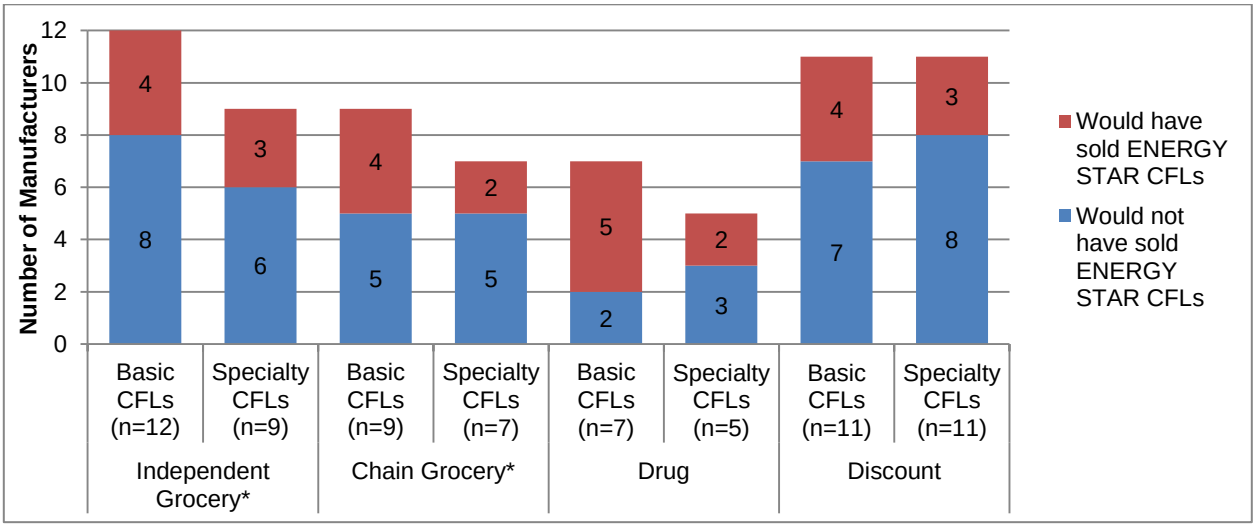
    - In the words of one lighting manufacturer representative, "typically grocery [purchases] are to replace a single lamp that went out or are an impulse buy, rather than a planned purchase to switch out a number of lights like many big box stores."

- *These channels do not allocate a lot of shelf space to replacement lamps.* Because drug and grocery retailers often view lighting as an adjunct to their primary product offerings, they usually allocate only a small amount of retail shelf space to lighting. The suppliers and retail buyers that supplied the discount channel also reported that stores in this channel often do not stock lighting products year-round. Instead, they sell them during seasonal or promotional periods that last four to six months.

- *California's IOU programs have traditionally targeted the discount and grocery channels for reaching hard-to-reach customers:* Interviews participating lighting suppliers in recent years suggest that the ULP has encouraged lamp allocations to discount stores (such as 99-cent stores and dollar stores) and independent or small chain grocery stores that may cater to specific ethnic communities. These allocations, along with some allocations to rural grocery and small hardware stores, were designed to extend the program's access to so-called "hard-to-reach" customers.

- *Many supplier representatives said they would not be selling ENERGY STAR CFLs through discount, drug, and grocery channels without the ULP.* Interviewers asked the participating lighting suppliers who sell ULP-discounted bulbs in these channels whether they would have sold any ENERGY STAR CFLs—basic spiral CFLs and/or specialty CFLs—in these channels in absence of the program. Figure 3 shows that with the exception of manufacturers who sold basic CFLs to drug stores, more than half of the relevant suppliers—and in some cases, nearly three-quarters—said that they would not have sold any ENERGY STAR CFLs through these channels without the ULP.

Figure 3: Number of Participating Manufacturers Supplying the Discount, Drug, and Grocery Channels Who Would and Would Not Have Sold ENERGY STAR CFLs through These Channels in Absence of ULP Discounts by Channel and CFL Shape, 2013 (Supplier Telephone Interviews)



* The "Chain Grocery" channel includes companies with 10 or more store locations participating in the ULP. The "Independent Grocery" channel includes all other grocery retailers.

In explaining their responses, a few lighting manufacturers' representatives said that many grocery and discount stores will not accept ULP-discounted lamps unless they are free of charge.

- "Unless the product is free to them, they won't take it," said one lighting manufacturer's representative. "If you asked them to pay 25 cents [per lamp], they'd rather not receive [them]."
- Another said, "I'd say discount, drug, and grocery … all of those would have been at zero [CFL sales] if it weren't for the program."

A few of the lighting supplier representatives also noted that dollar stores (which comprise a large component of the discount channel) would not be able to sell ENERGY STAR CFLs without the ULP discounts.

- "We definitely would have sold less in the dollar store market because without the rebates, there's no way that you can get the product down to a price point that the dollar stores would bring it in," said one lighting manufacturer representative.
- Another said, "We can't manufacture CFLs for less than a dollar [each], so [without the ULP] the only product offering that would be available at discount stores would probably be incandescent lamps."

In addition to the lighting manufacturers, we also interviewed two lighting buyers who represent retailers in the discount and discount grocery channels.[64] Both of them said that their stores stop selling CFLs when their allocations of ULP-discounted lamps sell out.

In contrast, several lighting supplier representatives said that some drug and grocery stores would continue to sell CFL basic and specialty lamps, even without ULP discounts. However, they noted likely changes such as reduced volume of lamp sales and lamp availability at select stores, particularly for specialty CFLs. These manufacturers' representatives explained:

- One manufacturer's representative said, "When discounts go away, we still sell the bulbs. We carry products based on what customers want, not what the utility funds. The [utility] incentive determines the volume of sales. I won't delete A-19 bulb [from inventory] because there's no [utility] promotion."
- Another said, "Drug [stores] would have had CFL some sales but at probably somewhere around 80 percent less sales without the program. Even though lighting is not a significant item at drug stores, people still will buy CFLs there."
- A third noted, "It depends on the owner of those chain grocery stores and if they are interested, some would probably still do some business with us [without the ULP discount]. Yet, since we offer the [ULP] incentive, they are eager to do business with us."

Figure 2 (above) also shows that, in general, the percentage of supplier representatives who said that their specialty CFL sales would disappear without the ULP is greater than the percentage of suppliers who said that their basic CFL sales would disappear. These suppliers provided two primary explanations:

1. **Specialty CFLs are generally more expensive than basic spiral CFLs.** Without program support, retailers' wholesale costs for specialty CFLs are higher than for basic CFLs. And as mentioned above, retailers in these channels will not pay much to stock replacement lamps.
2. **Specialty CFLs sell more slowly than basic CFLs.** This slower sell-through rate creates challenges for both retailers and the manufacturers that supply lamps to them. As noted, non- big box channels do not allocate a lot of retail space to lighting products in general and this premium on space means that retailers in these channels favor lighting products with quicker sell-through rates. According to one manufacturer's representative, "If [discount stores] had to pay money for the bulbs … let's say 50 cents apiece, and they put them in the store, and they only sold a few, then [these bulbs] have taken away space in their store. They want the bulb to move fast and make some money."

Another manufacturer's representative claimed that a discount grocery chain that participated in the ULP for many years stopped participating because the ULP-discounted lamps were not quick sellers.

- "[This discount grocery retailer] wants to stock a product that moves in and out fast, let's say vegetables and things like that … and they are trying to cut back on general merchandise," he said. "A light bulb is not a fast-moving product."

64 The "Discount grocery" category includes a group of grocery chains that participate in the ULP and share many of the characteristics of discount stores such as selling lighting products only during promotional periods, heavily discounting lamps, and catering to lower-income customers, ethnic minorities, and price-sensitive customers. While stores in this group share many of the characteristics of smaller, independent/ethnic grocery stores, they are large enough (at least 10 participating stores) to be classified in the "chain grocery" channel, but they differ from other stores in the "chain grocery" channel that sell bulbs year-round and may not be as aggressive in their pricing.

A retail buyer for another participating discount grocery chain said that his company will often engage in aggressive discounting of lamps to accelerate sell-through.

- "We were pricing these things aggressively to move them—maybe four for a dollar or three for a dollar —and after a period of time, if sell-through wasn't there, we would just keep going and going and going [i.e., lowering the price]. Four months into it we were practically giving them away just to make sure we were not sitting on the product."

The slower sell-through rate of specialty CFLs also creates challenges for lighting manufacturers, because retailers who are aware of this slower rate will place smaller orders that make it more difficult for the manufacturers to recover their delivery costs.

- "The trucking costs would be way too much to deliver a case [of lamps] per store," said one manufacturer's rep. "When the quantity is too small, it's not cost-effective for us to deliver."

Since LED lamps are typically more expensive than CFLs, it is not surprising that lamp manufacturers also reported that they do not expect LED lamps to sell in discount, drug and grocery channels even with the ULP incentives.

- "At the discount channel, at the independent [grocery] stores … they are not willing to pay an additional few dollars to sell an LED bulb," said one manufacturer's representative.
- "You wouldn't really be able to go to a 99 Cent Store and pick up an LED bulb," said another.

4.1.2.3.2 Home Improvement and Small Hardware Channels

The home improvement and small hardware channels received approximately 12 percent of all CFLs shipped to retailers through the 2010-2012 ULP. These channels are very different from the discount, drug and grocery channels in terms of how they stock and display replacement lamps. They differ in terms of how consumers shop for lamps as well. Some of the characteristics of home improvement and small hardware channels include:

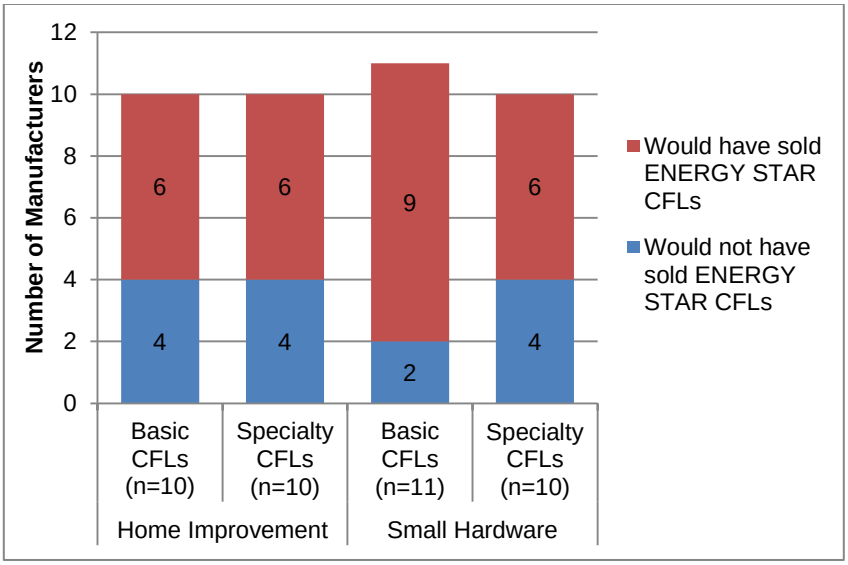
- *These channels are "destinations" for energy-efficient lighting purchases.* Interviewees noted that consumers typically visit the home improvement and small hardware channels because they want to purchase a particular type of lamp or because they have a home improvement project that might require a variety of lighting products. The large size of the lighting sections in home improvement stores in particular makes it less likely that a consumer would purchase a lamp on impulse as they might do in the grocery channel, for example.
    - "They dedicate a purpose to go there," explained one lighting manufacturer's representative (with regard to home improvement and small hardware stores). In these store types, he suggested that customers "don't really go to each aisle to shop around, because if [they] want cleaning tools, [they] just go to that aisle then grab it and go. It's not like grocery store or discount store with people … having a cart and just wandering around for a while."
- *These channels allocate a lot of shelf space to replacement lamps:* As discussed above, discount, drug, and grocery stores—because of space limitations and a desire to quickly sell through most of their products—prefer to limit their lighting displays to the most popular types of replacement lamps. However, as "destination" stores for consumers who may be seeking specific lamp types, home

improvement and small hardware retailers tend to provide a fairly comprehensive range of replacement lamps, even if this means stocking lamp types for which demand is minimal. One lighting buyer who works for a major hardware store chain suggested that his stores "have a deeper breadth of products" because they serve as destinations for hard-to-find products.

- *These channels sell energy-efficient replacement lamps all year long:* Stores in the home improvement and small hardware channels generally stock energy-efficient replacement lamps (such as CFLs and LED lamps) year-round. Stores participating in the ULP often have two categories of energy-efficient lamps: 1) the "promotional" lamps that they sell at a discount through the program; and 2) the "everyday" lamps which usually have a higher price point than the promotional lamps.[65]
- *Different manufacturers may supply promotional lamps and everyday lamps via different distribution methods:* For example, the ULP-discounted promotional lamps are often drop-shipped to chain hardware stores directly from the manufacturer whereas the everyday lamps may originate from warehouses owned by the retailers. These types of retailers also typically insist that the promotional lamps and the everyday lamps have different package sizes and SKUs to reduce confusion in tracking these lamps since the everyday and promotional lamps have different price points and the promotional lamps are subject to ULP rules (e.g., limitations on how many can be included in a single purchase). In addition, many stores market the promotional and everyday lamps differently, with the promotional lamps usually receiving more prominent placement within the store (e.g., on end-caps versus in the aisles) and often with more prominent signage.
- *Only a minority of suppliers in these channels said they would not be selling ENERGY STAR CFLs without the ULP:* In contrast to the discount, drug, and grocery channels where a large majority of the lighting manufacturers said that they stop selling CFLs to these channels when ULP discounts were not available (see Figure 2 above), only four of the lamp manufacturers that serve the home improvement channel and four that serve the small hardware channel said that they stopped selling CFLs in these channels when the ULP discounts are not available. Figure 4 shows their responses.

65 It is important to note that other retail channels besides Hardware and Home Improvement also have both everyday and promotional bulbs although there is more variation within these other channels. For example, as discussed in the previous section, in the Grocery channel the stores in the Discount Grocery subsector of this channel often sell energy-efficient bulbs only when they are ULP-discounted.

Figure 4: Number of Participating Suppliers to the Home Improvement and Small Hardware Channels Who Would and Would Not Have Sold ENERGY STAR CFLs through These Channels in Absence of ULP Discounts by Channel and CFL Shape, 2013 (Supplier Telephone Interviews)



Manufacturers' representatives provided a number of reasons as to why they would continue to sell CFLs in the home improvement and small hardware channels in the absence of the ULP discounts. Some of the reasons they mentioned include:

- Since these are destination stores, lamps in these stores can sell at a higher price point.
- There are fewer of these stores and greater distances between them. Combined with higher prices, the reduced options for alternate shopping destinations make shopper demand curves more inelastic because of the sunk costs of making the trip to such stores.
- Customers who shop in these stores are generally less price-sensitive than customers who shop in the discount channel, drug, and grocery stores.
- Lighting buyers for home improvement chains prefer retail markdowns instead of manufacturer buy-downs for their promotional lamps, and this may narrow the price difference between the promotional and everyday lamps.

While there are many similarities between the home improvement and small hardware channels, there are also some key differences. First, as the names suggest, the stores in the small hardware channel are, on average, much smaller than those in the home improvement channel. Second, the stores in the small hardware channel are often independently-owned while the stores in the home improvement channel are all part of large retail chains. Independent ownership gives the stores in the small hardware channel more flexibility to make deals with lighting suppliers. For example, while many stores in the small hardware channel typically purchase their everyday bulbs from their affiliated brands (ACE, True Value, etc.), they may make their own deals with other manufacturers for promotional lamps to be sold with ULP discounts. In contrast, stores in the home improvement channel are narrowing their choices of lighting suppliers.

Also of note is the declining trend in participation of home improvement stores in the ULP. A representative of one lighting manufacturer attributed this to a recent decision by many so-called "big box" stores to move from a model where everyday lamps and promotional lamps were different types from different suppliers to a new model where they purchase all lamps from the same supplier and their everyday and promotional lamps are the same products.[66] This strategy goes beyond making their everyday and promotional lamps more similar: these chains are also trying to attain greater uniformity in their replacement lamp product lines across states and incentive programs. Such strategic considerations can also impact their participation in the ULP. For example, one lighting manufacturer's representative noted that in 2012, one of the major big box chains dropped some lighting product lines promoted by the ULP – including 42 watt CFLs and certain types of interior CFL fixtures because not enough lighting incentive programs nationwide were promoting the same products.

- "They [a major big box retailer] only wanted to participate with items that could be promoted in enough utilities nationally to make it worth their while," said a manufacturer's representative. "There were just not enough utilities nationally promoting [42 watt CFLs and interior CFL fixtures]. So the national influence … did have a negative impact on participation … in the California Upstream Program."

Some of the lighting suppliers reported that in 2012, some of the IOUs' ULP managers encouraged them to get additional big box chains to participate in the ULP. However, the suppliers reported that there were barriers to accomplishing this. First, as noted, the big box chain stores have recently been standardizing their lamp stock and consolidating their supply among a handful of larger lighting manufacturers.

- "I could not get big chain stores," said a representative of a smaller manufacturer. "[The ULP managers] wanted me to push in the big hardware stores like [a specific home improvement retailer].[67] It's been difficult to get in there. … Big people are already there like the big companies. It's very tough to get in there … for small people like us."

Another barrier to getting additional lighting products into the big box chains is that these stores usually require more advance notice than the smaller chains.

- "We got phone calls [from the IOU program managers] towards the end of the year [2012] like, 'Hey, can you guys do something with [a specific home improvement retailer[68]]?'" said one lighting manufacturer representative. "And, you know, when you get that phone call in September or October, it's a little difficult because … large retailers, they plan nine to ten months out, sometimes even longer. So we do not have the ability to just flip a switch like that. It is not possible unless you have something kind of pre-planned."

4.1.2.3.3 Other Retail Channels

The other retail channels that participated in the 2010-2012 ULP include mass merchandise stores, wholesale clubs, and lighting and electronics stores. These channels received 23 percent of all CFL shipments through the 2010-2012 ULP. Most participants in these channels are large chain retailers that

66 The suppliers we interviewed used the term "Big Box retail" not only to refer to large Home Improvement chains like Home Depot and Costco, but also large retailers in other channels such as Walmart (Mass Merchandise channel) and Costco (Membership Club channel).

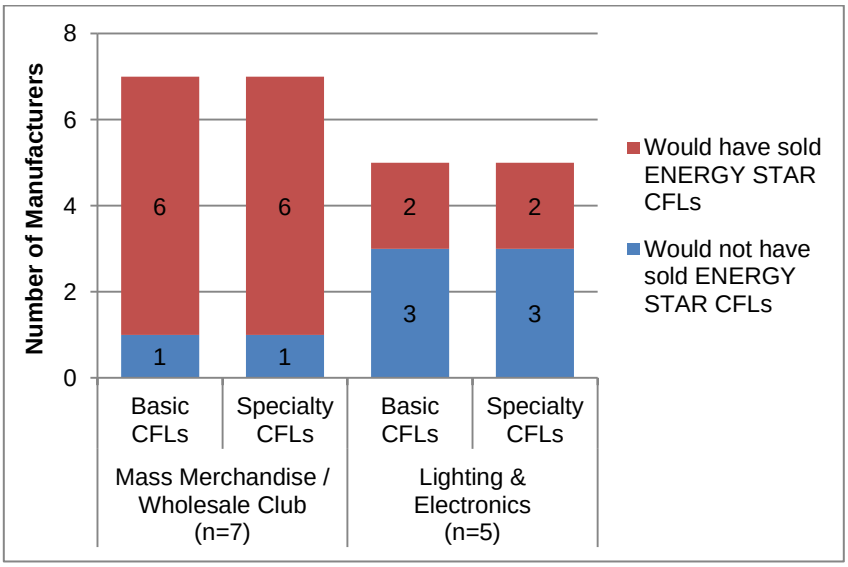
67 Retailer name omitted to protect interview participant anonymity.

68 Retailer name omitted to protect interview participant anonymity.

share some of the characteristics of other channels with large chain stores such as the large home improvement channel. For example, some of the lighting manufacturers stated that the three big box channels—mass merchandise stores, wholesale clubs, and large home improvement stores—are similar in that many have recently made a strategic shift away from promoting lamp types that are different from those they sell on their shelves on an everyday basis.

Such a strategic shift in lighting product procurement greatly limits the number of lighting manufacturers who can supply these retail chains. The smaller, more opportunistic lighting manufacturers, who made short-term "promotional" lighting sales to these large chains through the ULP in past program cycles, are no longer able to make such deals. The lighting manufacturers who can still supply these large retail chains are larger manufacturers who have the capacity to supply the "everyday" (non-ULP) lamps for large retailers. As further evidence of this lack of supplier diversity, in one of the big box channels, a single manufacturer accounted for 97 percent of the ULP-discounted basic CFL shipments and 90 percent of the ULP-discounted specialty CFL shipments during the 2010-2012 program.[69] Figure 5 show that very few manufacturers supplied these channels (7 for mass merchandise and wholesale clubs, and 5 for lighting and electronics stores). For the mass merchandise and wholesale club channels, only one of the 7 manufacturers stated they would not have been able to sell any CFLs through these channels without the ULP. Three of the five suppliers to lighting and electronics stores said the same.

Figure 5: Number of Participating Suppliers to the Mass Merchandise, Wholesale Club, and Lighting/Electronics Channels Who Would and Would Not Have Sold ENERGY STAR CFLs through These Channels in Absence of ULP Discounts by Channel and CFL Shape, 2013 (Supplier Telephone Interviews)



Note: Mass merchandise and wholesale club channels combined to protect interview participant anonymity.

Another attribute that mass merchandise stores and wholesale clubs share with large home improvement stores is that they typically stock LED lamps.

69 Retailer name omitted to protect interview participant anonymity.

- "The majority of them [LED lamps] are sold in big stores like [The] Home Depot, Lowe's, and, of course, Costco," said one lighting manufacturer. "But you don't find these kinds of lamps anywhere else, in regular grocery stores or small hardware stores. I think it is, right now, confined to five or six big major [retailers]."
- According to a manufacturer that supplies a large home improvement retailer, "We moved more LED bulbs [through utility programs] than everybody except Costco."

One supplier representative claimed that at least one of the large mass merchandise chains does not sell LED lamps in all of its stores. According to this representative, the retailer decides on a store-by-store basis whether individual storefronts will stock LED Lamps.

- "Depending on the store location [and] the demographics of the area around the store, they determine which stores will carry LED [lamps] and which stores will not."

Lighting manufacturers also noted some important differences between the home improvement channel and the mass merchandise and wholesale club channels. For example, the representatives did not consider stores in the mass merchandise and wholesale club channels as a "destination" for lighting purchases like large home improvement stores, but rather grouped mass merchandisers and wholesale clubs with other channels in which consumers purchase lighting products on impulse or as convenience purchases, such as grocery stores. This similarity between mass merchandise stores, wholesale clubs, and the grocery channel may not be surprising given that many large mass merchandisers and wholesale clubs also sell grocery items.

Similarities also exist between mass merchandise and drug stores or other non-destination lighting store channels which promote impulse buys:

- Said one manufacturer's representative: "A [specific mass merchandise chain[70]] and a pharmacy, you're there while you're doing your errands, and they both have the impulse buy [items available]. They both have the, 'wow, this is being promoted' items and the 'I've heard about these things, for $1, I'll try it out.' And that's basically making it more comfortable for the consumer to buy into something not at a high-tech gadget place."

In terms of lamp variety, the manufacturers' representatives suggested that mass merchandise stores wholesale clubs may have a wider selection of bulbs than the grocery, drug, and discount chains, but a smaller selection than stores in the large home improvement channel. One manufacturer's representative felt that one wholesale club chain in particular "has a tremendous bulb selection" given that (from his perspective) this chain is "not really a destination for [lighting] at all. They have just about every kind of LED [lamp] and CFL you can imagine on the shelf." Another lighting manufacturer grouped this particular wholesale club chain into the same category as two other chains in the large home improvement channel where sales of ULP-discounted bulbs to non-residential customers (such as contractors and builders) may be higher than in other retail chains.

Two supplier representatives claimed that mass merchandise stores and wholesale clubs have procurement practices that limit the variety of bulbs they sell, particularly with an aim toward greater uniformity in the bulbs they sell.

[70] Retailer name omitted to protect interview participant anonymity.

- According to one manufacturer's representative, "[A wholesale club chain] only wanted to carry what they already carry." He said that "even if you had an item that was going to fit their guidelines, they didn't want to bring another item in." He clarified by stating that "[the] item already had to be … in their stores because they want to carry it nationally. They don't want to have to separate rebated from non-rebated [product]."
- Another said that a specific mass merchandise chain focused its stock on consistent package configurations across lamp technologies. "We typically sell [replacement lamps] in the most common package or format. If we do one-off pack sizes, the customer can't compare. It's for ease of shopping, to be consistent, selling in the most common packages."

The hesitation (or outright refusal) of chains in the mass merchandise and wholesale club channels to conduct off-the-shelf promotions also limits the types of labelling and packaging that they will allow.

- "We're dealing with major retail accounts like [chains in the mass merchandise and wholesale club channels], so we have to utilize what's on the shelf," said one lighting manufacturer representative. "They do not do off-shelf promotions, so when the utilities ask for custom packaging or stickering, a lot of times that's not allowed, because we can't go in and sticker what's on their shelf. So we do other things to give the utility branding recognition, such as point-of-purchase materials on their price signs and on the shelves and things like that."

Some supplier representatives also observed that mass merchandise stores and wholesale clubs tend to focus on replacement lamps that are high-volume sellers and to carry these SKUs year-round.

- One manufacturer's representative mentioned that one of the wholesale club chains has "a rule that they only carry 20 percent of the products that make up 80 percent of the volume." According to this representative, this chain "does a very good job at only carrying the top-selling SKUs."
- According to another, if you enter a store in this chain you will find "a very large selection of very key products. …Of the advanced bulbs, [they stock] a very small amount, maybe the … more popular product … the PAR lamps. But if you wanted to buy like MR16 or any other very specialty bulb, you would not find it at [this wholesale club chain]; you would find it at a hardware store."
- Similarly, a representative of a mass merchandise chain stated their stores carry up to only eight CFL SKUs in the highest selling package sizes.
- Another manufacturer's representative noted that, "[One specific wholesale club chain[71]] does what we call a markdown program. It means they use existing inventory on their shelves" rather than a separate set of products brought in exclusively for the promotion. He noted that "that's the only way [this specific retail chain] works with programs."

Other mass merchandise and whole club chains have conducted off-the-shelf promotions but in limited quantities to ensure the product is sold-through. Comparing mass merchandise to wholesale clubs, a lighting manufacturer representative stated:

- "For [a specific mass merchandise chain[72]], anything that they're going to buy [from the supplier that doesn't fit in with their standard product set] means it doesn't have a place in the planogram set. So if

71 Retailer name omitted to protect interview participant anonymity.

72 Retailer name omitted to protect interview participant anonymity.

it doesn't sell through, they're upset. They're very upset, because it doesn't have a home to go back to. Anytime we ship something in [that type of] promotion, we usually do it in small quantities to ensure that they sell through. Otherwise they're going to have major issues at the end. Same thing with [a specific wholesale club chain[73]]."

4.1.3 Supplier Perspectives on Lamp Efficacy Regulations

We asked respondents whether they were familiar with EISA, and all but one of the 26 interview participants reported that they were familiar with the regulation. This is not surprising since we conducted all of the interviews after the second of EISA's phase-in periods began in January 2013 (when traditional 75-watt incandescent lamps no longer met the minimum efficacy standard). The one representative who was unfamiliar with EISA legislation sold lamps primarily to non-residential and wholesale customers. All six retail lighting buyers who responded to this question reported they were familiar with EISA. Many noted that the phase-out has directly affected their companies' stocking and sales patterns.

We followed the general awareness questions in the supplier interviews by asking about perceptions of the general effects of EISA and AB 1109 on California's replacement lamp market through mid-2013. We followed with more nuanced questions to address the regulations' effects on lamp sales through mid-2013. Next we asked suppliers to describe whether and how the regulations have affected their promotional activities for residential replacement lamps and how they perceive consumer reactions to EISA. We closed by asking suppliers to describe how they expect the regulations to influence the residential replacement lamp market going forward. Key Findings include:

- Supplier representatives reported that the most notable effects of the legislation include the phase-out of traditional incandescent lamps (not surprisingly) and increased manufacturing and/or sales of EISA-compliant incandescent lamps.
- Most manufacturers' representatives suggest that most retailers will have sold through their stock of traditional incandescent lamps by the end of 2014.
- Manufacturers' representatives had mixed perspectives regarding the legislation's effect on CFL sales: nine thought that EISA caused CFL sales to increase. However, ten suggested EISA had caused CFL sales to decrease, primarily because they believed that EISA-compliant incandescent and LED lamps were displacing CFL sales and because IOU incentives for CFLs have decreased (prompting customers to select other lamp types, such as EISA-compliant incandescent lamps or LED lamps). Retailer representatives' perspectives on this issue were similarly mixed.
- The majority of manufacturers' representatives suggested that traditional incandescent lamp sales have decreased as a result of EISA. Regarding EISA-compliant incandescent lamp sales, roughly half reported that the legislation had increased their sales of these products, while the remaining reps were unsure or suggested that the legislation had no effects. Retailer perspectives were mixed regarding the legislation's effects on traditional incandescent lamp sales but all respondents reported that the legislation had increased their sales of EISA-compliant incandescent lamps.
- More than half of manufacturers' representatives who responded to questions regarding EISA's effects on LED lamp sales through mid-2013 suggested that EISA had increased sales of LED lamps (12 representatives). Three-fourths as many reported that EISA had not affected LED lamp sales through

[73] Retailer name omitted to protect interview participant anonymity.

mid-2013 (8 reps). Two retail buyers responded to the questions, and their responses were also mixed (one said EISA had increased sales of LED lamps and the other, that EISA had not affected LED lamp sales).

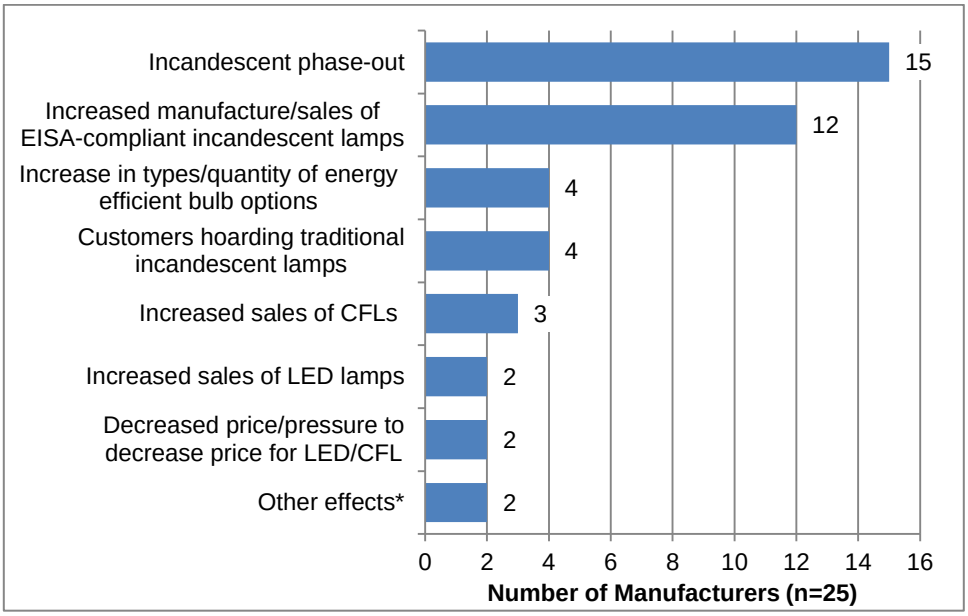
- About half of manufacturers conducted special promotions for replacement lamps as a result of EISA, while the remainder did not. Promoted technologies included LED lamps, CFLs, and energy-efficient incandescent lamps. All three of the retailers who responded to this question stated that they were conducting special lamp promotions as a result of EISA.
- The majority of manufacturers' representatives reported that consumers were either unaware of EISA or indifferent to it. A smaller number reported that consumers were aware but do not understand it, that reactions were negative, or reactions were mixed. Responses among retailers were similar. Among all supplier representatives, a negligible number reported positive consumer reactions to EISA.
- There was an equal split in the number of manufacturers' representatives who reported having seen or heard evidence of consumer hoarding of traditional incandescent lamps and those who did not see or hear such evidence. Among those who reported evidence of hoarding, about half cited direct evidence (such as sales) while the remainder cited secondary evidence (such as media reports). Retailer representatives' responses were similarly split.
- When EISA's final stage is phased in—that is, when it is no longer legal to import or manufacture traditional 60- or 40-watt incandescent lamps—half of the manufacturers' representatives we interviewed suggest that consumers will select EISA-compliant incandescent lamps as alternatives. Roughly one-quarter of manufacturers' representatives suggested that consumers would select another lamp technology (other than incandescent). Responses among retailer representatives were scattered.

4.1.3.1 General Effects of EISA through Mid-2013

The 2013 supplier interviews asked, "What have been the most notable effects of this legislation on the lighting market since it was first implemented in 2012?" Among the 26 lighting manufacturers we interviewed, nearly two-thirds of them (15 manufacturers) mentioned the phase-out of traditional incandescent lamps (Figure 6).

Nearly half of the manufacturers' reps said they saw an increase in consumers selecting EISA-compliant (energy-efficient) incandescent lamps (including halogen products) to replace the phased-out incandescent lamps. Four mentioned that the recent effects of EISA included consumer hoarding of traditional incandescent lamps. Two retail buyers (not shown in the figure) mentioned seeing a peak in hoarding behavior in early 2012 (coinciding with the national phase-out of traditional 100-watt incandescent lamps) and a subsequent decline in this behavior in late 2012 and 2013.

Figure 6: Participating Manufacturer Perceptions of EISA's Effects (through Mid-2013), 2013 (Supplier Telephone Interviews)



[74]

Note: Interview question allowed multiple responses.
* "Other effects" included: increased need for consumer education and lack of consistency in product offerings.

Nearly all of the lighting manufacturers we interviewed agreed that, for the most part, retailers will have sold through their stock of traditional incandescent lamps by 2014. The occasional exception, according to one manufacturer, is small independent discount stores, which may not sell through all of their traditional incandescent lamps by the end of 2014 because they may acquire other retailers' discarded stock of these lamps and continue to sell them.

4.1.3.2 Effects of EISA on Lamp Sales through Mid-2013

This section reviews supplier perspectives of the effects of EISA and AB 1109 on sales of specific lamp technologies—including CFLs, traditional incandescent lamps, lamps that meet the regulations' efficacy requirements (i.e., "EISA-compliant" incandescent lamps), and LED lamps through mid-2013

4.1.3.2.1 CFLs

Twenty-three of 26 lighting manufacturers responded to the question regarding EISA's general effects on CFL sales to date. Of these, 20 reported that EISA had some impact on CFL sales. Within that group, however, their views were split:

- Ten manufacturers' representatives reported that CFL sales have decreased as a result of EISA. They suggested that fewer consumers are selecting CFLs as alternatives to incandescent lamps and are instead choosing EISA-compliant incandescent lamps (6 responses) or LED lamps (4 responses).
- Nine manufacturers' representatives shared the opposite perspective, suggesting that EISA had resulted in *increased* sales of CFLs. All of these firms manufactured CFLs (but it is worth noting that of the ten manufacturers' representatives who reported decreasing CFL sales, six also manufactured

[74] All references to "EISA-compliant incandescent lamps" include halogen lamp technologies.

CFLs.) These nine representatives suggested that consumers are increasingly selecting CFLs as alternatives to traditional incandescent lamps. Five of these respondents clarified they thought the magnitude of the sales increase was small, and two stated that in the longer-term EISA could result in decreased CFL sales.

Of the four remaining manufacturers who described EISA's effects on CFL sales to date, three believed that the legislation has had little or no effect on sales, and the last reported mixed effects of EISA on CFL sales (an initial increase, then a downward trend).

Responses were similarly mixed among lighting retailer representatives. Of the three who responded to the question, one reported no impact on CFL sales through mid-2013, the second reported little impact, and the third was unsure how EISA had affected CFL sales.

4.1.3.2.2 Traditional Incandescent Lamps

When asked what impacts, if any, EISA had specifically on sales of traditional incandescent lamps, all 17 manufacturers who responded to the question reported that the legislation has had some impact.

- Fourteen reported a decrease in traditional incandescent lamp sales because of EISA, which was an intended consequence of the legislation. Half of these respondents suggested that traditional incandescent lamp sales declined sharply, while others reported a slower decline because some store types would continue to sell these lamps or because of "bin jumping" (wherein consumers select lower-wattage traditional incandescent lamps as alternatives to the higher-wattage options that may no longer be available).
- The other three manufacturers' representatives reported increased sales of traditional incandescent lamps because of EISA, with two specifically mentioning consumer stockpiling or hoarding of the phased-out lamps as the reason for increased sales.

We also asked retail lighting buyers what impacts, if any, EISA had on sales of traditional incandescent lamps. Two retail buyers responded to the question in 2013 and provided divergent perspectives: one suggested no impact and the other reported that sales of traditional incandescent lamps had ceased because their stores had eliminated all phased-out lamps from their stock.

4.1.3.2.3 EISA-Compliant Incandescent Lamps

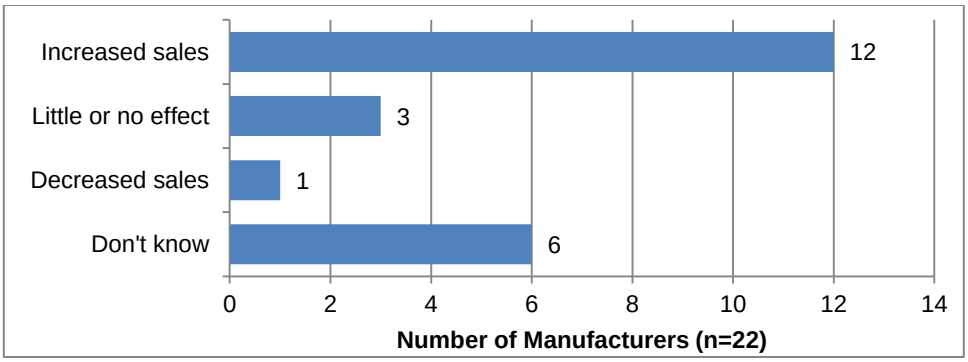
Twenty-two manufacturers' representatives responded when asked what impacts, if any, the EISA legislation had on sales of EISA-compliant incandescent lamps (Figure 7).

- Thirteen said that EISA had some impact on their sales: 12 reported an increase in sales of EISA-compliant incandescent lamps as a result of EISA, and one reported a decrease in sales.
- Three reported that EISA had no effect on sales of EISA-compliant incandescent lamps through mid-2013.
- The remaining 6 were unsure whether the legislation had affected sales of these lamps primarily because they did not manufacture these products.

Of the 12 manufacturers' representatives who reported that EISA had increased sales of EISA-compliant incandescent lamps, the majority attributed this to customers purchasing these lamps as alternatives to traditional incandescent lamps (9 respondents). These respondents explained the increase in EISA-

compliant incandescent lamp sales in terms as a result of positive consumer perceptions of these products ("look and they act just like [traditional incandescent lamps], they're fully dimmable, and they're very cheap") and/or manufacturer promotions specific to EISA-compliant incandescent lamps.

Figure 7 : Participating Manufacturer Perceptions of the Effects of EISA Legislation on Sales of EISA-Compliant Incandescent Lamps (through Mid-2013), 2013 (Supplier Telephone Interviews)



We also asked retail lighting buyers to describe any impacts EISA had on sales of EISA-compliant incandescent lamps through mid-2013. All 3 of the buyers who responded to the question reported that the legislation had resulted in increased in sales of EISA-compliant halogen lamps. One respondent attributed this to a look and feel that is similar to incandescent lamps and the novelty of a new product. Another noted that sales had increased dramatically during 2013 because they only started carrying EISA-compliant incandescent lamps early that year.

4.1.3.2.4 LED Lamps

We asked lighting manufacturers and retailers what impacts, if any, EISA had on LED lamps sales through mid-2013. Of the 21 manufacturers' representatives who responded to the question, more than half (12 representatives) reported that EISA resulted in increased sales of LED lamps. Eight reported that the legislation had no effect on LED lamp sales through mid-2013, but six of these asserted that the increase in LED lamp sales will come later (when prices drop and/or energy-efficiency program incentives for LED lamps increase). The one remaining manufacturer's representative as unsure but did mention that he believed energy-efficiency program incentives would help promote LED lamp sales.

We also asked retail lighting buyers what impacts, if any, EISA had on sales of LED lamps through mid-2013. Of the two respondents, one stated that the legislation had increased LED lamp sales and the other suggested that the legislation had no impact on LED lamp sales through mid-2013.

4.1.3.3 Effects of EISA on Lamp Promotions

During the 2013 interviews, interviewers asked whether EISA had affected the types of lamps, if any, the respondents' companies were promoting in 2013. Of the 13 manufacturers' representatives who responded to the question, roughly half said they were not conducting any promotions specifically as a result of EISA (6 representatives). The other half stated that they were promoting multiple lamp technologies as a result of EISA (7 representatives).

Of the 7 manufacturers' representatives who said that their companies were running special promotions as a result of EISA, five mentioned LED lamps, three mentioned CFLs, and three mentioned EISA-compliant incandescent lamps. Three manufacturers reported that their companies were promoting more than one lamp technology. All three of the retail lighting buyers who responded to the same question reported that they were also promoting multiple lamp technologies (including LED, CFL, and energy-efficient incandescent).

4.1.3.4 Supplier Perceptions of General Consumer Reactions to EISA

We asked respondents whether they would describe consumers' reactions to EISA as positive, negative, or indifferent (Figure 8). Twenty-three lighting manufacturers responded to the question, and their responses were fairly mixed:

- Equal numbers of respondents reported that consumers were either unaware of EISA, indifferent to EISA, or that they perceived little or no consumer reactions to the legislation (5 manufacturers each).
- A smaller number of manufacturers reported that consumers are aware of EISA but do not understand it, that consumer reactions were negative, or that consumer reactions were mixed (3 each).

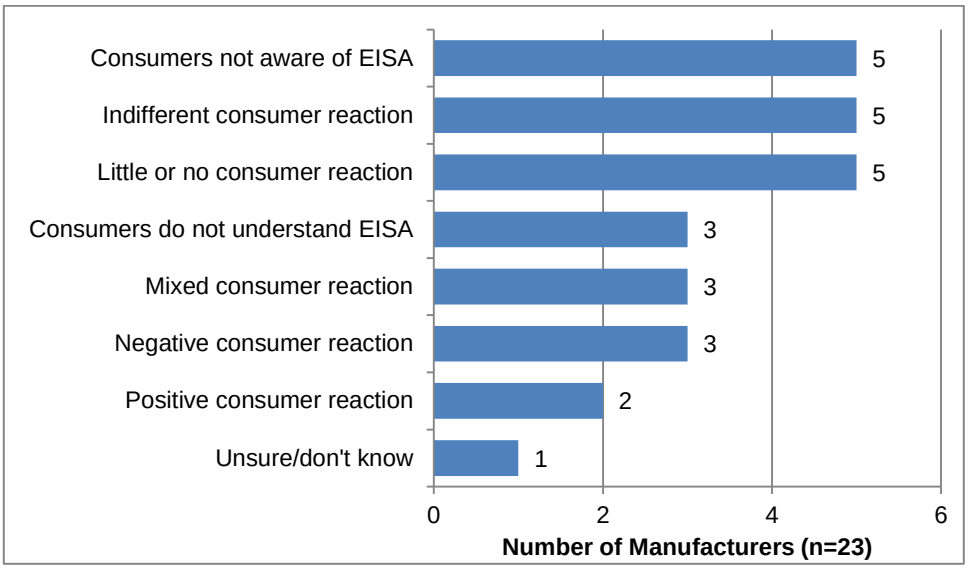
Only two manufacturers' representatives reported positive consumer reactions to the legislation, and the remainder were unsure whether consumer reactions to EISA were positive, negative, or indifferent.

Of the three manufacturers' representatives who mentioned negative reactions among consumers, two mentioned that the media fuelled this negativity (at least in part). For example, one said:

- "I'd say [consumer reactions are] pretty negative because that's the way it's been framed by the media—you know, the government is taking away the old light bulbs."

Of the two who mentioned positive reactions among consumers, one suggested that the reaction was driven by increased environmental awareness (and, assumedly, the perception that the legislation would result in environmental benefits) and the other, that the legislation contributed to lower prices for energy-efficient lamps.

Figure 8: Particpating Manufacturer Perceptions of Consumer Reactions to EISA, 2013 (Supplier Telephone Interviews)



Note: Interview question allowed multiple responses.

We also asked the six retail lighting buyers about their views on whether consumer reactions to EISA had been positive, negative, or indifferent. Of the 3 who responded, two perceived no reaction and the other perceived negative reactions primarily driven by consumer confusion in the market.

4.1.3.5 Supplier Perceptions of Consumer Hoarding of Traditional Incandescent Lamps

Nineteen lighting manufacturers' representatives commented on whether they had seen any evidence of stockpiling or "hoarding" of traditional incandescent lamps among consumers in reaction to EISA. There was an equal split between those who had seen such evidence (9 manufacturers) and those who had not (also 9 manufacturers). Manufacturers' representatives who reported having seen evidence of consumer hoarding were spilt fairly evenly between those who saw direct evidence (such as sharp increases in sales of specific traditional incandescent lamp wattages immediately prior to EISA's implementation for lamps in that wattage category; 4 representatives) and those who saw second-hand evidence (such as media reports or anecdotal reports from individuals; 5 representatives).

Interestingly, four manufacturers' representatives (including one who noted no evidence of consumer stockpiling) mentioned that they had seen evidence of *suppliers* stockpiling traditional incandescent lamps in advance of EISA. Three mentioned retailers stockpiling, and the third mentioned manufacturers stockpiling. Specific comments included:

- "I know retailers … especially when this first started to roll out in California, were stockpiling products. They had warehouses that they were trying to fill up with incandescent product." (This manufacturer representative also noted that retailer stockpiling occurred only toward the beginning of EISA's implementation: "Now, retailers aren't even doing that. They're just … selling through their inventory.")

- "There was a loophole inside the legislation. … Whatever stock I have, I can sell it until it's all gone, so some retailers are stocking it up before the legislation takes effect. … [They] can continue selling [traditional incandescent lamps] until they're all gone."

The manufacturer's representative who mentioned manufacturer stockpiling said he had "hear[d] through the grapevine" that other manufacturers were producing excess quantities of traditional incandescent lamps with the understanding that they can sell whatever was manufactured and imported prior to the phase-out dates included in the legislation.

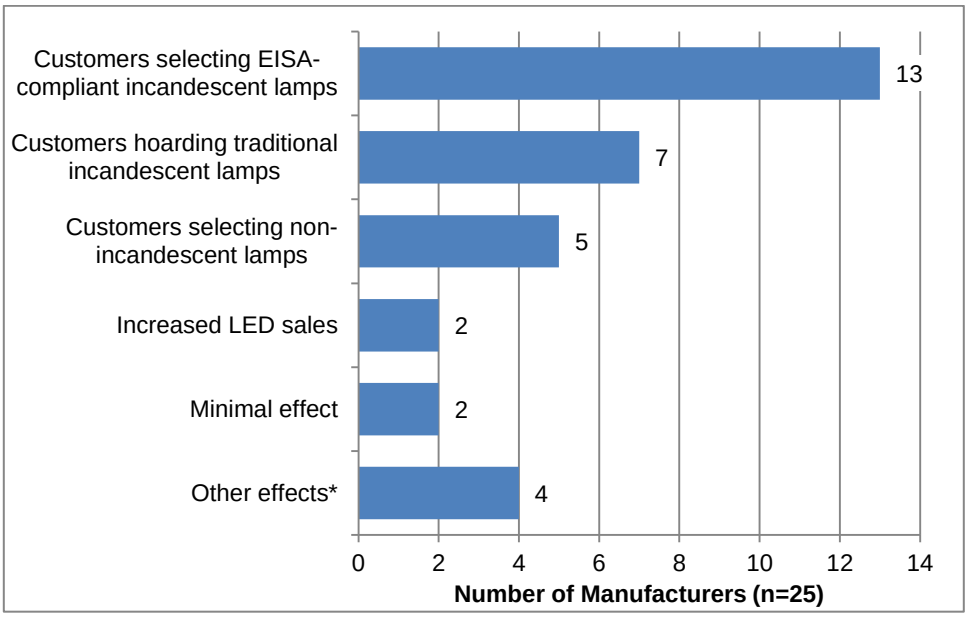
We also asked the retail lighting buyers whether they had seen evidence of consumers stockpiling of traditional incandescent lamps as a result of EISA. Of the five who responded to the question, three reported that they had seen evidence while the other two said they had not. Two of those who reported having seen evidence cited second-hand evidence (such as media reports), while the third cited sales data as evidence of consumer stockpiling.

4.1.3.6 General Effects of EISA's Final Stage

During the 2013 supplier interviews, interviewers reminded respondents that "the next stage in the EISA phase-out of traditional incandescent lamps will begin in 2014 when … 60 Watt and 40 Watt lamps will be phased out" and that the phase-out started in 2013 in California. We refer to this as the "final stage" of EISA. Interviewers then asked respondents to describe the impacts they *have seen or expect to see* as a result of the final stage of EISA. Most of the manufacturer and retailer representatives focused their comments on what they expected to see in the market as the final stage of EISA was implemented.

Of the 26 lighting manufacturers we interviewed, 25 responded to the question (Figure 9). Roughly half of them (13 manufacturers) expected consumers to select EISA-compliant incandescent lamps as alternatives to traditional incandescent lamps as a result of EISA's final stage. Roughly half as many (7 manufacturers) expected that consumers will hoard traditional incandescent lamps as a result of EISA's final stage, and 5 suggested that consumers will select non-incandescent lamps. Three manufacturers suggested that LED sales will increase as a result of EISA's final stage, and two expect that the final stage will have minimal effect on the lighting market.

Figure 9: Participating Manufacturer Perspectives on the Current/Forthcoming Effects of EISA's Final Stage, 2013 (Supplier Telephone Interviews)



Note: Interview question allowed multiple responses.
* "Other effects" included: decreased CFL sales; increased promotion of energy-efficient lamps; need for consumer education; and overall decrease in prices for all lighting options.

Of the six retail lighting buyers interviewed, four responded to the same question with scattered responses. One suggested that EISA-compliant incandescent lamp sales will increase; another suggested that CFL sales will decrease; the third suggested that the final stage of EISA will cause LED lamp sales to decrease; and the fourth expected that the final stage of EISA will result in increased promotion of energy-efficient lighting by suppliers.

4.1.4 Supplier Perspectives on the "California Quality" LED Lamp Standard

As described in Section 3.2.2 above, the IOUs required that LED manufacturers meet the California Quality LED Standard for all LED lamps to be included in the ULP starting in 2014. During the in-depth telephone interviews in 2013, we asked lamp suppliers for their perspectives on this issue. Key findings include:

- Most lighting suppliers' representatives expressed negative reactions to the ULP requirements that LED lamps meet the new CEC lamp specifications. However, a few manufacturers' representatives opined that the requirement represented a positive development, suggesting that the standard will push technological advancement and improve overall LED lamp performance.

4.1.4.1 Detailed Findings

A number of manufacturers' representatives indicated that they would have introduced LED lamps into the ULP sooner if they had not been required to meet the CEC lamp specification.

- One representative of a major lighting manufacturing organization expressed frustration with complying with these specifications because of the challenges associated with maintaining a California-specific product line that is different from the LED lamps they produce to sell in other states.
- Another commented that “it’s really annoying,” and stated that his company needs to “run separate SKUs [stock-keeping units] if we want to compete in or utilize the utility programs [for LED lamps] in California.”

A couple of manufacturers’ representatives reported that when the ULP implemented the CEC standard’s requirements for a higher minimum CRI, they had to hold back some of their LED lamps from sale because the lamps did not meet the new standards.

- One representative mentioned that “the lion’s share of the [LED] products that [we] offer is no longer available to the incentive programs, based upon their definition of what can be incentivized.”
- Another representative mentioned that his firm was “kind of in a holding pattern” as far as ULP participation because most of their LED lamps do not meet the CRI requirement in the CEC standard.

A few manufacturers argued that the ULP requirements that all LED lamps meet the CEC specifications were too draconian. They suggested that the ULP should allow sales of LED lamps intended for specific applications or below a certain price point even if these products do not meet the required performance criteria. Specific comments included:

- “There are … a lot of things that don't make sense about the requirement [that LED lamps meet the CEC specification]. For example … to present an LED bath bar to the California utilities, it has to meet all the CEC requirements and one of them is that it's dimmable. And, you know, there aren't a lot of people with dimmer switches in their bathrooms. And to make it dimmable, I have to increase the retail cost by about 7 dollars, because I have to use a more expensive driver. And so to increase the retail by 7 dollars to chase after a 10-dollar rebate … doesn't make a lot of sense.”
- “The CEC’s CRI spec is great if they had rebate for non-CEC spec that’s lower. …Some customers would take 80 or 85 CRI. Some people would still want that choice, e.g. they do not want 90 CRI and yet want to be efficient with LEDs. They should have a tiered incentive structure. For example, if you have a lamp as an accent, and you turn on at a distance, it doesn’t matter if it’s 90 or 85 CRI. I think the Commission should understand that.”

One of the retail buyers reiterated the second point above, stating that “the CRI requirement is a bad idea” because “it’s not relevant to a consumer.” His impression was that consumers are not aware of the term “CRI” and that “no one needs to have a 90-plus CRI lamp in their house, because … it's a commercial spec, essentially.”

In stark contrast, a couple of manufacturers’ representatives suggested that there were some advantages to the higher CEC standards in terms of pushing technological advancement and improving lamp performance.

- “It is an encouragement for us to advance our technology … when they ask for a higher standard than the current ENERGY STAR standard,” said one representative.
- Another said, “I do agree in a way [with the stricter CEC standards], because when people are paying so much money, and the utilities are giving so much [money in the form of incentives], why can't the

product be top quality?" This rep mentioned that by focusing on high-quality LED lamps, "I do feel that [the IOUs] are *not* making the same mistake as they did for CFLs."

4.1.5 Supplier Perspectives on the Upstream Lighting Program

The supplier telephone interviews specifically addressed the ULP's influence on LED lamp sales, and several supplier representatives offered their perspectives on the program's general market influences as well. We also addressed recent changes in the ULP, the ULP's discontinuation (in some circumstances) of incentives for basic CFLs, and continuity of ULP incentives throughout the 2010-2012 program period. Finally, we asked supplier representatives to describe how they select products for inclusion in the ULP and the role of IOU staff in these decisions, and asked for their suggestions regarding the types of products they'd like to see included in the ULP.

Key findings include:

- The ULP has influenced the types of CFLs and LED lamps sold by some manufacturers. The program was also responsible for the presence of some manufacturers in California's market for residential replacement lamps.
- More than half of the manufacturers' representatives we interviewed suggested that the ULP has affected the LED lamps they offered for sale in California during the 2010-2012 period. Half of these report that the program has influenced the lamp shapes they offered and a slightly smaller number reported that the ULP focused suppliers on lamps that meet the CEC's "California Quality" Standard.
- When asked about recent changes in the ULP, supplier representatives' perspectives were mixed. A handful mentioned challenges meeting the CEC's new "California Quality" Standard or that the program had increased its focus on specialty CFLs. Others mentioned that the program had less money available than in the past, or that the per-lamp incentives were lower than in the past. Several representatives mentioned that the program had, in some instances (e.g., in a specific retail channel or during a specific timeframe), discontinued incentives for basic CFLs and suggested that doing so was premature.
- Three-quarters of manufacturers' representatives reported that there were periods during which ULP discounts were not available during 2013. More than half stopped selling CFLs in California until discounts resumed and cited "missed opportunities" for selling CFLs. A handful of retail buyers offered the same perspective.
- When asked how they chose to sell specific lamps through the 2010-2012 ULP, half of the manufacturers' representatives we interviewed said that they chose the lamps that the IOUs wanted them to sell. Nearly as many mentioned that they chose the lamps that are their biggest sellers and/or that they chose products that the retailers normally stock.
- Half of the manufacturers' representatives said that the IOUs encouraged them to sell one or more specific types of CFLs through the ULP (particularly specialty CFLs), while more than a third mentioned that the IOUs encouraged them to sell specific LED lamp types. Several mentioned that the program discouraged sales of specific CFL types (mostly basic CFLs).

- Only one-fifth of lighting manufacturer representatives were completely satisfied with the range of lamps sold through the 2010-2012 ULP. Half suggested that the ULP should promote LED lamps and one-fifth mentioned that the program should promote basic CFLs. Other responses were mixed, and few retail representatives expressed their perspectives on this issue.

4.1.5.1 Overall Market Influences of the ULP

While the 2013 supplier interviews did *not* include general questions regarding the overall influences of the ULP, roughly half of the manufacturers' representatives volunteered one or more general influences of the program on their activities.

- **Five manufacturers' representatives mentioned that the ULP influenced the types of CFLs and LED lamps they sold.** They explained:
  - "It's a combination of the rebates were available for those products and those are the popular products with the retailers."
  - "We tried to pick a product which is free to the retailers so it's whatever free product is easier for us to sell and easier for the retailer to carry in a larger quantity. So the [IOU] policy is really important here."
  - "We are keeping an eye out to see what's going to be available in the program so we can manufacture or work on products specific to what will be [included]."
- **Four manufacturers' reps attributed their California market presence to the IOU programs because their business models focus solely on utility incentive programs.** As a result, for example, these respondents reported no sales of CFLs or LED lamps during periods when discounts from the ULP were not available. One manufacturer's representative explained:
  - "We only manufacture utility lamps so our business is totally different [from other manufacturers]. If there's no utility program, we don't ship anything."

Manufacturers' representatives also mentioned other influences of the IOU programs in California, including: increasing overall sales for CFLs and LED lamps as a result of discounted lamp prices (1 respondent) and increasing the types of sales channels in which CFLs are offered (1 respondent).

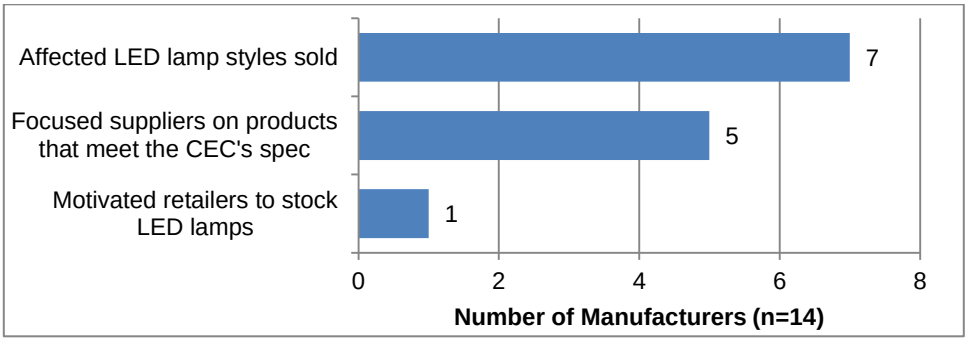
4.1.5.2 Influences of the ULP on LED Lamp Sales

During the 2013 interviews, we asked whether the ULP had influenced LED lamp sales, and if so, how. Of the 23 who responded, more than half (14 respondents) reported that the ULP had some influence on LED lamp sales. When asked to elaborate on the types of influence the ULP had on sales (Figure 10), 7 representatives report that the program affects the shapes (or form factors) of LED lamps sold and 5 responded that the ULP focused suppliers on lamps that meet the CEC's "California Quality" specification. One manufacturer's representative mentioned that the ULP increased his firm's overall lamp sales because it simplified retailers' decisions to stock LED lamps:

- "Because the cost of LED [lamps] is still significantly greater … than a CFL, and certainly [greater] than a low-wattage halogen, the incentives are what really help make the decision for retailers to carry the product, and also to promote the product, and then to keep it on their shelves beyond just the in-and-out promotions."

Finally, only one respondent mentioned what is perhaps the most obvious influence of the ULP on LED lamp sales—the incentives helped lower lamp prices.

Figure 10: Participating Manufacturer Perceptions of ULP Influences on LED Lamp Sales, 2013 (Supplier Telephone Interviews)



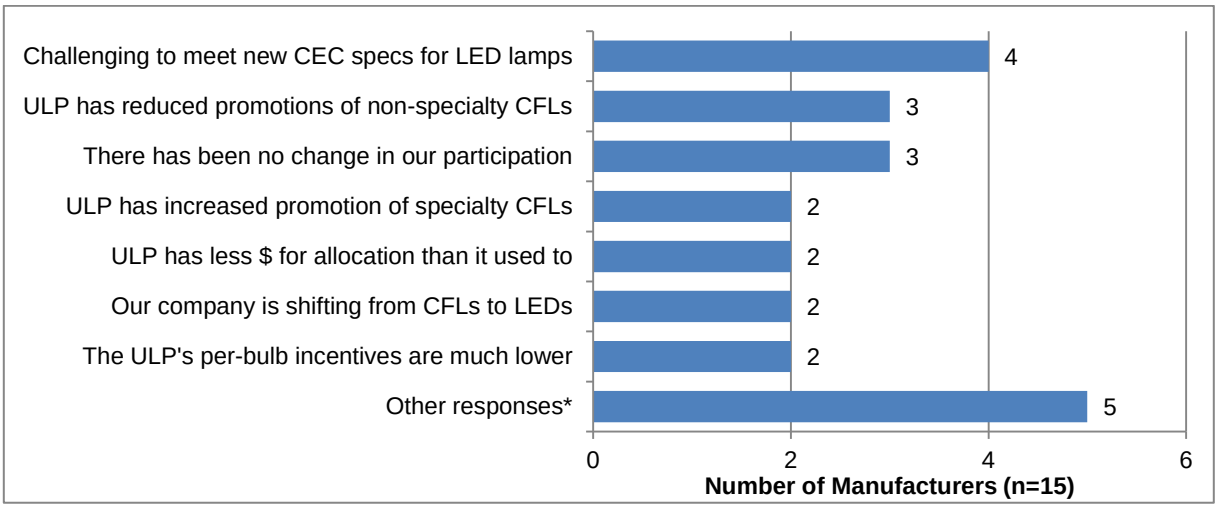
4.1.5.3 Recent Changes in the ULP

The interviews addressed recent changes in the ULP in general. Many representatives mentioned that in some cases, the program had eliminated incentives for basic CFLs. We describe the supplier representatives' perspectives on both of these topics below.

4.1.5.3.1 General Changes

Interviewers asked participating lighting suppliers some general questions regarding whether there had been any recent changes in ULP activities and whether the changes affected their participation in the program. Of the 18 manufacturers' representatives who responded to the question, 15 reported some change in the nature of the program between 2012 and 2013 (Figure 11). The most frequently-mentioned changes included new challenges associated with meeting the California Energy Commission (CEC) specifications for LED lamp quality (cited by 4 respondents) and the ULP's reduced support for basic (i.e., non-specialty) CFLs (3 respondents). We discuss supplier perspectives on the challenges of complying with the new CEC specifications in an earlier section of the report (see Section 4.1.4 above), and we discuss the discontinuation of basic CFL incentives in more detail below.

Figure 11: Recent Changes in the ULP According to Participating Manufacturers, 2013 (Supplier Telephone Interviews)



Note: Interview question allowed multiple responses.
* "Other" responses included difficulties dealing with complicated ULP participation requirements; PG&E has shifted their ULP emphasis to LEDs; incentives for LED nightlights have been eliminated; the ULP has started to get back into Big Box stores; and they decided not to participate in the 2012 ULP out of personal choice.

4.1.5.3.2 Discontinuation of Basic CFL Incentives

During the telephone interviews, we did not explicitly ask supplier representatives for their perspectives regarding incentives for basic CFLs. However, six shared the unsolicited perspective that the program had eliminated subsidies for basic CFLs and that it was premature to do so—especially in hard-to-reach retail channels (based on the belief that shoppers in these channels are more relatively price-sensitive). A number of supplier representatives reported that many grocery and discount stores simply will not stock CFLs unless they can acquire them at a discount through the ULP (as described above in Section 4.1.2.2.1). Some of their comments included:

- "If customers are looking for bare spiral [CFLs], they [discount, grocery stores] don't have it. When [Southern California] Edison only pushed more covered lamps and specialty, there was a majority of stores wanting lower wattage bare [spiral] CFLs because they are better movers. Lower wattage … bare spirals didn't get the [ULP] allocation. If we don't get the allocation, most discount and most grocery stores won't buy these bulbs."
- "I think they should still promote the specialty CFLs and … still some of the 23-watt basic CFLs. Even though the basic CFL has been in the marketplace for a few years, it's about the cycle they [customers] need to replace them again, because CFLs maybe last about five years. Now it's the cycle to replace, and now [the ULPs have stopped] allocating any more basic CFL [incentives]. … The people may switch back [to incandescent lamps] if there's no rebate [for basic CFLs]."

4.1.5.4 Continuity of Upstream Lighting Program Discounts

During the telephone interviews, researchers asked the manufacturers' representatives whether they encountered any periods during the 12 months prior to the interview during which program-discounted CFLs or LED lamps were not available. Three-quarters of the 20 lighting manufacturers who responded to

the question in 2013 reported that there were periods when program-discounted lamps were not available over the course of the previous year (15 respondents), while 3 respondents said that they did not experience any such downtime. (The remaining two manufacturers' representatives were unsure.) Three of the seven retail lighting buyers interviewed in support of the 2010-2012 ULP evaluation also reported periods of time when no program-discounted lamps were available.

Of the 15 lighting manufacturers' representatives who mentioned periods during which ULP incentives were not available, more than half (8 representatives) reported that they stopped selling CFLs in California until IOU program discounts resumed. A different (but overlapping) set of eight manufacturers' representatives said their companies did continue to sell ENERGY STAR CFLs or LED lamps when program discounts were not available, but they reported a range of effects attributed to the absence of IOU incentives such as lower overall sales volume or shift in retail sales channels (including fewer or no sales at grocery stores and/or discount stores). As described in further detail below, suppliers presented a range of reasons for why there were periods when lamps were not available. Major reasons can be grouped into three categories: IOUs initiating programs as late as March or April; allocations running out before year-end; and suppliers requesting incorrect allocation amounts (the latter mentioned only by 2 manufacturers' representatives).

Several of the representatives who mentioned periods during which ULP incentives were not available stated that it was because the IOUs did not initiate their programs until March or April (so they had a down period at the beginning of 2012). Some manufacturers reported IOU programs starting even later than that. One said:

- "A lot of times it was a few months of delay … [the IOUs started the programs] in the second quarter, as late as June."

Some supplier representatives also mentioned product allocations running out after the programs had started, although it was not clear in all cases that these stoppages occurred during the 2010-2012 timeframe or before then. They cited reasons for these stoppages including ULP funds running dry, certain lamps being especially popular, and shifts in program emphasis by specific IOUs. According to the manufacturers' representatives, the consequences of these stoppages included missed opportunities for sales and disappointed retailers. A handful of retail buyers echoed this sentiment; their comments included:

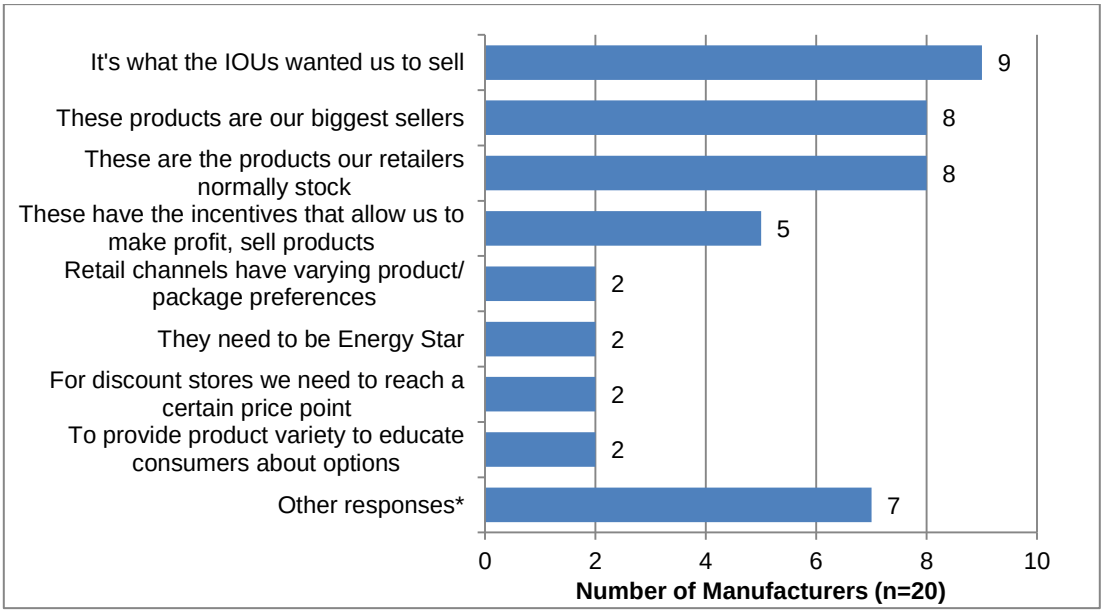
- "All of a sudden [one IOU] cut down dramatically, because they used the funds to do more educational promotions. So then in their territory I got quite a few disappointed customers."
- "There were some periods where we did not have the bulbs in the stores … based on the allocation, we sold through those faster than maybe they anticipated," said a retail buyer for a discount chain. "We could have sold more bulbs."

4.1.5.5 How Manufacturers Select Products to Include in the ULP

Although the ULP limited sales of certain lamp types (such as basic CFLs) by eliminating or reducing incentives for them, the 2010-2012 program continued to provide incentives for a wide variety of lamps. Thus, lamp manufacturers still had some latitude in terms of which types of energy-efficient lamps they chose to sell through the program during the 2010-2012 period.

After reviewing with the suppliers the types and quantities of lamps they sold through the ULP during the 2010-2012 period, interviewers asked them to explain why they chose to sell those particular lamp types through the ULP. Of the 20 manufacturers' representatives who responded to the question, nearly half mentioned that they chose the lamps that the IOUs wanted them to sell (9 representatives; Figure 12). Nearly as many manufacturers' representatives mentioned that they chose the products that are their biggest sellers (8 representatives) and/or that they chose the products that their retailers normally stocked (also mentioned by 8 representatives). Other responses varied as shown in the figure.

Figure 12: Participating Manufacturer Rationale for Choosing Which Lamp Types to Sell Through the ULP, 2013 (Supplier Telephone Interviews)



Note: Interview question allowed multiple responses.
* "Other reasons" included: "some consumers want a brighter bulb;" "because we like to package different lamp types together;" "this is a product niche where we feel we can be competitive;" "chain stores like a house brand at a significant discount;" "multipack size has been reduced due to evaluation results showing delayed installation;" "it wasn't my decision;" unspecified pricing reasons.

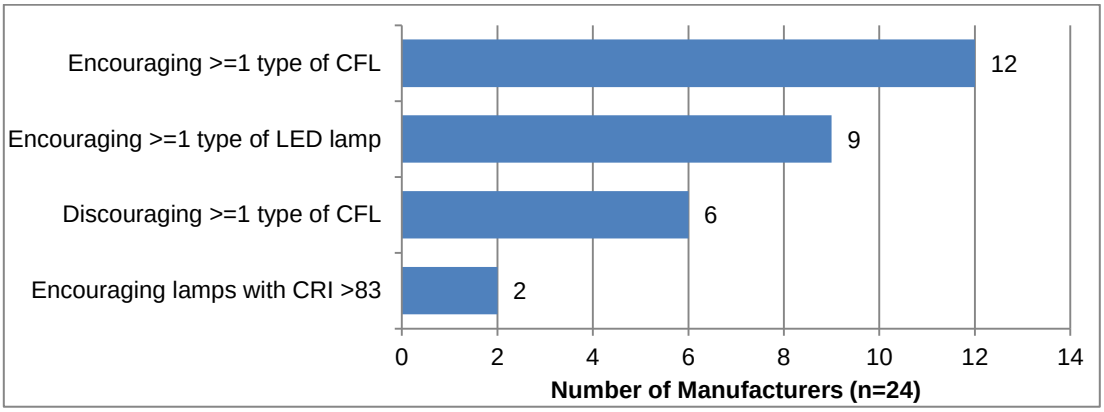
4.1.5.6 IOU Influence on Manufacturer Selections of Products to Include in the ULP

IOU program staff also played a role in determining which products to include in their incentive programs. Interviewers asked participating lamp suppliers whether there were any particular lamp types that IOU program staff encouraged them to sell through the 2010-2012 ULP. Among the 24 manufacturers who responded to the question, responses included a wide range of lamp technologies and shapes (Figure 13). (Note that some manufacturers' representatives mentioned more than one lamp technology and/or shape.)

- Half of the manufacturers' representatives stated that the ULP encouraged them to sell one or more types of CFLs (12 representatives).
- Nine manufacturers' representatives stated that the ULP encouraged them to sell one or more types of LED lamps.

- Six manufacturers' representatives stated that the ULP *discouraged* them to sell one or more types of CFLs. Five of these representatives mentioned that the program specifically discouraged basic CFLs, and two stated that the program was discouraging CFLs in general.
- Two manufacturers' representatives mentioned that the ULP encouraged them to sell lamps with a minimum CRI of 83.

Figure 13: Types of Lamps Encouraged by the 2010-2012 ULP According to Participating Manufacturers, 2013 (Supplier Telephone Interviews)



Note: Interview question allowed multiple responses.

Among the 12 representatives who mentioned that the ULP encouraged them to sell one or more types of CFLs:

- Seven manufacturers' representatives mentioned that the program encouraged specialty CFLs in general;
- Six mentioned covered CFLs (A-lamps and/or globes) specifically;
- Five mentioned high-wattage CFLs (e.g., 42 watt lamps); and
- Five mentioned CFL reflector lamps and/or spotlights.

Among the representatives who mentioned that the ULP encouraged them to sell one or more types of LED lamp (9 representatives):

- Seven manufacturers' representatives mentioned that the program encouraged LED lamps in general—the same number of respondents who specifically mentioned specialty CFLs;
- Three representatives mentioned LED spotlights, specifically; and
- Two mentioned omnidirectional LED lamps.

In answering this question, a few of the representatives expressed discontent with the fact that the program had reduced its incentives for certain lamp types such as basic CFLs. Please refer to Section 4.1.5.3.2 above for further discussion on this topic.

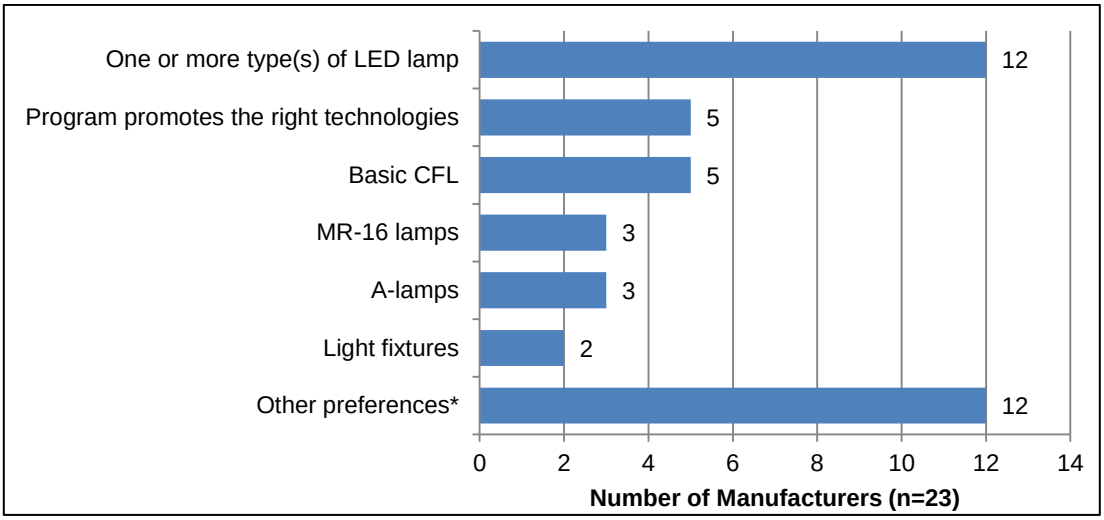
4.1.5.7 Manufacturer Suggestions for Products to Include in the ULP

We asked the suppliers whether they thought the ULP was promoting the right kinds of lighting products and 23 representatives responded. Only about a fifth of the lighting manufacturer representatives were completely satisfied with the range of lighting products being promoted by the ULP (5 representatives). By far, the most common suggestion was that the ULP should promote one or more types of LED lamps (mentioned by 12 representatives). They suggested that the program should promote the following types of LED lamps:

- LED lamps in general (no specific type or form factor mentioned; 3 representatives);
- LED spotlights (3 representatives);
- LED lamps that do not meet the new CEC standard (3 representatives);
- LED lamps that meet the CEC standard (2 representatives); and
- Omnidirectional LED lamps (1 representative).

Figure 14 illustrates the wide range of lamp types suggested for inclusion in the ULP (including LED lamps). Five manufacturers' representatives suggested that the program should offer more incentives for basic CFLs, and three each mentioned MR-16 lamps and/or A-lamps. Two mentioned light fixtures, and other responses among the lamp manufacturers we interviewed were mixed.

Figure 14: Participating Manufacturer Perspectives Regarding Product Types that the ULP Should Be Promoting, 2013 (Supplier Telephone Interviews)



Note: Interview question allowed multiple responses.
Figure combines responses to two different questions: 1) "Do you agree with an emphasis on these products [products previously identified by the respondent as being promoted by the ULP]?" and 2) "Are there certain types of the energy-efficient lighting products that you think the California Upstream Lighting Program should be promoting that they are not currently promoting?"
* "Other preferences" included more promotion of A19 induction lamps, candelabra lamps, ceiling fans, CFL A-lamps, EISA-compliant incandescent lamps, G10 lamps, PAR lamps, R-lamps, Reveal-brand lamps, and specialty CFLs in general; and less promotion of R-30 or LED lamps.

Of the seven lighting buyers we interviewed, only two had opinions on whether the ULP should change the

lighting products it promotes. One retail buyer suggested that the ULP should stop requiring that LED lamps meet the CEC specifications, while the other supported a greater focus on holiday light exchanges (in which customers trade in strings of traditional incandescent holiday lights for LED holiday lights).

4.1.6 Supplier Perspectives on Future CFL Sales

Interviewers asked the 33 lighting supplier representatives to describe their expectations for U.S. CFL sales in 2013 and beyond. In summary:

- Among the 25 manufacturers' representatives who responded to the question, about one-third expected no change in CFL sales, while a similar fraction expected sales to decrease (9 each). Roughly half as many expected increased CFL sales (4 representatives), and the remainder were unsure (3 representatives).
- Four of the five retail lighting buyers who responded to the question reported that they expect some change in CFL sales, but their perspectives on the directionality of these changes were mixed.

4.1.6.1 Detailed Findings

When asked to describe their expectations for future CFL sales in the U.S., most of the 25 representatives who responded to the question suggested that CFL sales would either stay the same or decrease in the latter half of 2013 or beyond (9 respondents each; Figure 15).

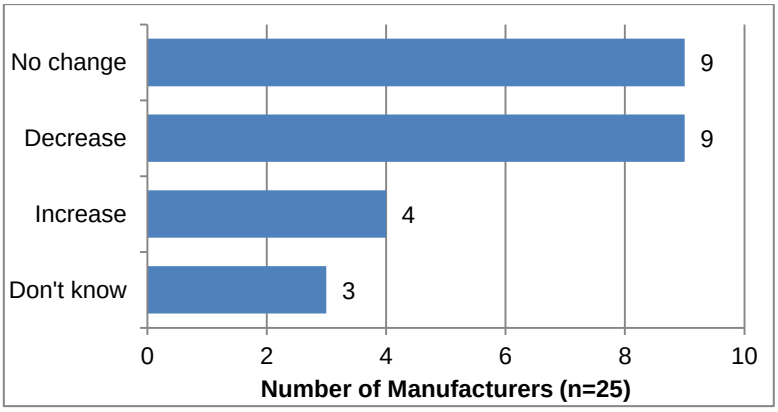
- **Approximately one-third of manufacturers' representatives reported that they expect no change** in CFL sales in the near future (9 respondents), but most also reported that they expect sales to decrease over the longer term as a result of declining LED lamp prices and erosion of utility incentives for CFLs.
    - "[CFL sales] haven't really decreased that much yet, but I'm sure once the price point of LEDs comes down and you're able to buy an LED for under $5, I think that will change ... and I think that will happen in 2014."

  Another expected the decline in CFL sales to begin in 2015.
- **Another third reported that they expect CFL sales to decrease** in the future (9 representatives). When asked to explain the rationale for their expectations, the most-cited reason was competition from EISA-compliant incandescent lamps and (to a lesser extent) LED lamps.
    - "LEDs are playing a role in the decline of CFLs, especially in the advanced or specialty category where LEDs really outperform CFLs. However, [the EISA-compliant incandescent lamp] is really going to be the big driver. They look and they act just like an incandescent, they're fully dimmable, and they're very cheap."

  Other reasons cited with regard to an anticipated decline in CFL sales include a decline in utility incentives and manufacturer strategies that are shifting from CFL to LED lamp production.
- **Four manufacturers' representatives reported that they expect U.S. CFL sales to increase**, but three of these expected only a short-term increase followed by a decrease in CFL sales.
- **Three representatives were unsure what might happen with CFL sales**. Two of these respondents mentioned that this will depend on what happens with utility incentive programs (i.e.,

whether or not they continue to support CFL sales and if so, to what extent).

Figure 15: Participating Manufacturers' Expectations Regarding Future CFL Sales, 2013 (Supplier Telephone Interviews)



We also asked participating retail lighting buyers about their expectations for U.S. CFL sales in the future. Four of five retail lighting buyers who responded expect some change in sales. Two respondents indicated that they expect CFL sales to decrease, one had mixed expectations (increased sales for some specialty CFLs but decreased sales for basic CFLs), and the fourth was unsure. As with manufacturers' representatives, retail buyers also expressed that the availability of utility incentives for CFLs would determine CFL sales but the two respondents who mentioned this had different conclusions: one expected utility programs to increase their support for CFLs while the other expected utility programs to decrease support for CFLs.

4.2 Lamp Availability

Below we present details replacement lamp availability in California retail stores based on lamp stocking data from retail store shelf surveys conducted during summer 2012 and summer 2013.[75] Based on these data, there are two key indicators of lamp availability: the percentage of stores that carry a particular lamp technology and/or shape, and the percentage of total lamps comprised by each lamp technology or shape. The sections below review these results. Each section (percentage of stores and percentage of lamps) compares lamp availability in 2012 and 2013 in the following order, by:

- Lamp technology;
- Lamp technology and retail store category (big box versus non- big box);
- Lamp technology, retail store category, and lamp shape for typical replacement lamp types (A-Lamp replacements, reflectors, and globes);
- Availability of IOU discount, lamp shape, and store category for MSB CFLs; and
- EISA lumen bin and store category for MSB incandescent and halogen A-lamps.

75 For ease of reference, the report refers to the summer 2012 and summer 2013 shelf surveys as the 2012 and 2013 shelf surveys throughout Chapter 4.

4.2.1 Percentage of Stores

Section 4.2.1 provides details regarding the percentage of California retail stores stocking each lamp technology and shape. Key findings include:

- At least four out of five California retail stores that sold residential replacement lamps in 2013 sold basic and advanced CFLs and incandescent lamps. Nearly two-thirds sold halogen lamps (up significantly from less than half of stores in 2012) and one-third sold LED lamps (up significantly from just over one-fourth of stores in 2012).
    - The percentage of big box stores stocking LED lamps increased significantly between 2012 and 2013, so much so that a higher percentage stocked LED lamps in 2013 than incandescent or halogen lamps.
    - Non- big box stores lagged far behind big box stores in terms of the percentage that stocked LED lamps in 2013 (only one-fourth compared to nearly all big box stores).
    - The percentage of non- big box stores stocking halogen lamps also increased significantly.
- Across all MSB A-lamp replacement technologies—that is, spiral-style CFLs along with CFL, LED, incandescent, and halogen A-lamps—a higher percentage of big box stores stocked each replacement technology than non-big box stores.
    - The percentage of non-big box stores stocking halogen lamps increased significantly between 2012 and 2013 (from nearly 30% to over 50% of stores).
- A higher percentage of big box stores stocked CFL, LED, incandescent and halogen reflector lamps than non-big box stores.
    - There was a significant increase in the percentage of big box stores stocking LED reflector lamps between 2012 and 2013 (from just over 40% of stores to more than two-thirds), but LED reflector lamps were still stocked by roughly 25 percent fewer big box stores than the other reflector technologies.
- Among globe lamps, CFL and incandescent lamps were present in nearly 9 out of 10 big box stores in 2013 but only 3 to 5 out of 10 non- big box stores.
    - There was a significant increase in the percentage of big box stores stocking halogen globes from 2012 to 2013 (from less than 40% to nearly two-thirds of stores), nearly 13 times the percentage of non- big box stores that stocked halogen globes in 2013.
    - Roughly 40 percent of big box stores stocked LED globes in 2013 compared to less than 5 percent of non- big box stores.
- In 2012, more than 40 percent of stores stocked at least one IOU-discounted lamp and 50 percent did so in 2013.
    - The percentage of big box stores that stocked IOU-discounted CFLs dropped by half between 2012 and 2013, while the percentage of non- big box stores that stocked IOU-discounted lamps increased by twenty-five percent in the same timeframe. This may reflect the 2001-2012 ULP's reduced funding compared to the 2006-2008 program period, the ULP's continued

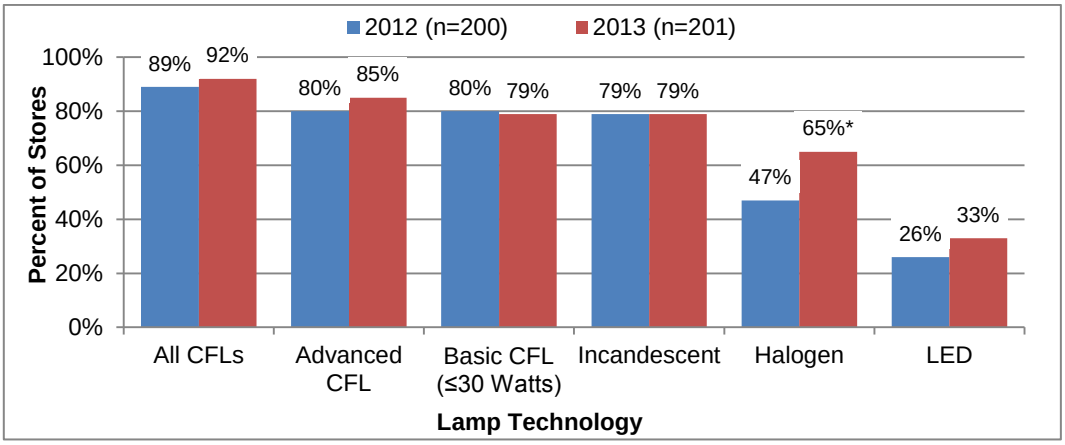
focus on non- big box channels (see Table 11 in section 4.1.2.2.1 above), the longer lifetime of CFLs (resulting in less frequent need to replace spent lamps), and/or the faster sell-through rate of IOU-discounted products in big box stores versus non- big box stores.

- In 2013, nearly all big box stores that stocked replacement lamps for residential use stocked at least one EISA-compliant model. In non-big box stores, the percentage increased from over a third of stores in 2012 to over three-quarters of stores in 2013.

4.2.1.1 By Technology

Figure 16 shows the percentage of stores across all channels that carried a range of lamp technologies in 2012 and/or 2013, including any CFLs, advanced (or "specialty") versus basic CFLs specifically, incandescent lamps, halogen lamps, and LED lamps. The only significant difference between years was in the percentage of stores carrying halogen lamps. In 2012, only 47 percent of California retail stores that stock replacement lamps stocked halogen lamps, compared to 65 percent in 2013. For other lamp technologies, roughly 90 percent of stores stocked CFLs in both years; 80 percent of stores carried incandescent lamps, and between one-quarter and one-third of stores carried LED lamps.

Figure 16: Percentage of Stores Carrying Lamps by Technology, 2012 and 2013 (Retail Store Shelf Surveys)

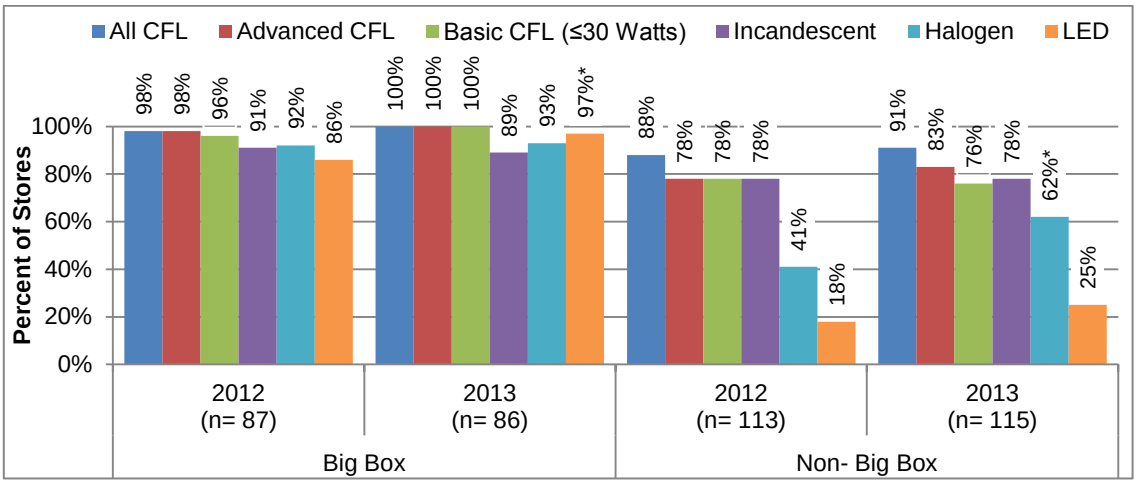


* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.1.2 By Technology and Store Category

Figure 17 shows the percentage of big box and non- big box stores that carried different lamp technologies in 2012 and 2013. As shown, a higher percentage of big box stores versus non- big box stores stocked each lamp technology in both shelf survey phases. All big box stores carried both basic and advanced CFLs in 2013. The only significant changes between years were an increase in the percentage of big box stores carrying LED lamps (from 86% of stores in 2012 to 97% in 2013) and an increase in the percentage of non- big box stores carrying halogen lamps (from 41% in 2013 to 62% in 2013). Interestingly, 2013 results suggest that a higher percentage of big box stores stocked LED lamps than incandescent or halogen lamps, but non- big box stores lag far behind big box stores in terms of the percentage that stock LED lamps and/or halogen lamps.

Figure 17: Percent of Stores Carrying Lamps by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.1.3 By Technology and Shape (MSB Lamps)

This section compares lamp availability by technology, store category, and year for typical replacement lamp types (A-lamps and spirals, reflectors, and globes).

4.2.1.3.1 MSB A-Lamp Replacements

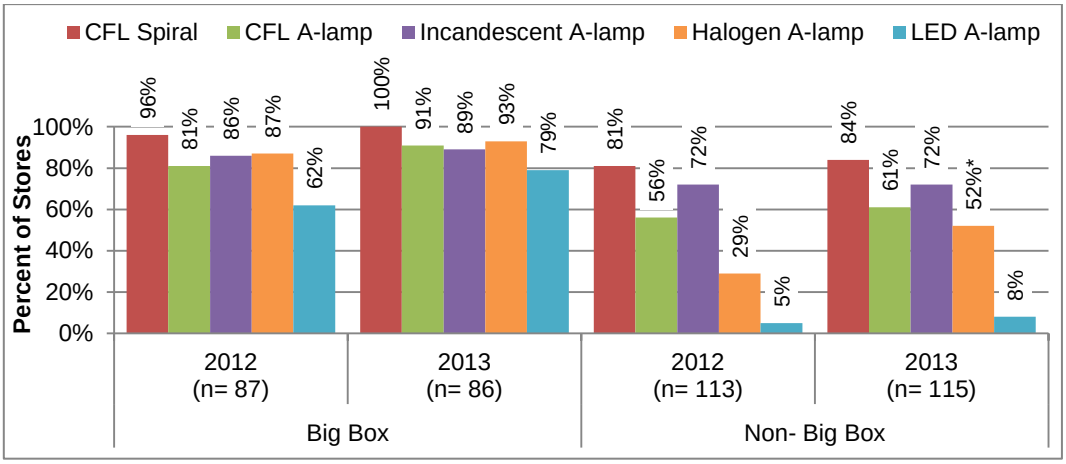
Figure 18 shows the percentage of big box and non- big box stores carrying A-lamp replacements including spiral CFLs as well as CFL, incandescent, halogen, and LED A-lamps by technology. As shown, a larger percentage of big box stores carried each A-lamp replacement technology in each year versus non-big box stores, particularly LED lamps (and, to a lesser extent, halogen lamps). Within the big box category, approximately 4 out of 5 stores (or more) stocked each A-lamp replacement technology in 2013. There were no significant differences in the percentage of stores stocking each A-lamp replacement technology within big box category between 2012 and 2013.

Within non- big box stores, a greater percentage of stores stocked spiral CFLs and/or incandescent A-lamps than the other A-lamp replacement technologies. Between 2012 and 2013, the percentage of non-big box stores stocking halogen A-lamps increased from less than one in three stores (29%) to more than half of stores (52%), a statistically significant change. There were no other significant changes in availability of A-lamp replacement technologies in the non- big box category within this timeframe.

The increased availability of CFL spirals and A-lamps between years is somewhat of an interesting contrast with supplier perspectives that CFL sales are likely to decline or stay the same in the future (of 25 respondents, 9 manufacturers' representatives said they expect CFL sales to decline and another 9 expect sales to stay about the same; see Section 4.1.6 above). However, note that the percentage of stores stocking each of the other A-lamp replacements either stayed the same (incandescent lamps in non- big box stores) or increased (all other cases) between 2012 and 2013. These results suggest that even as the number of stores offering each product type increased, the competition for sales among these technologies may have also increased, possibly resulting in stagnating or reduced sales of individual

technologies.

Figure 18: Percent of Stores Carrying A-Lamp Replacements by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

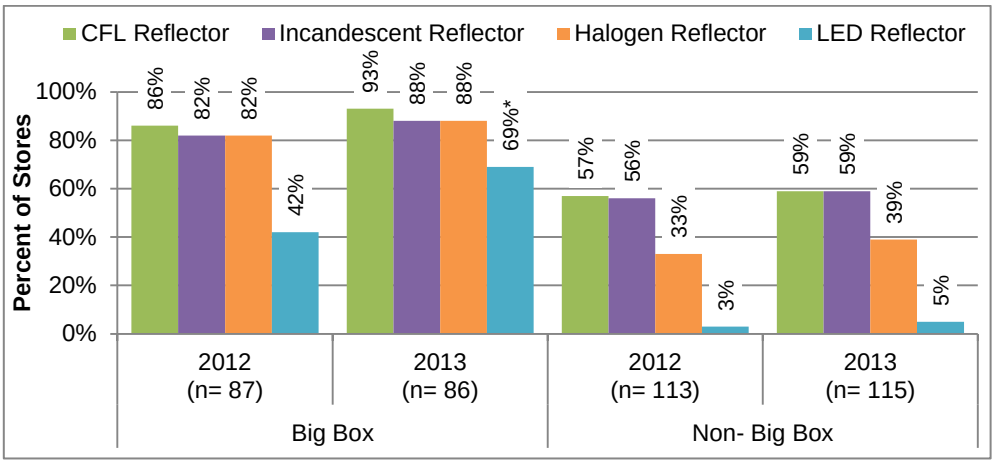


* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.1.3.2 MSB Reflector Lamps

Figure 19 shows the percentage of big box and non- big box stores carrying MSB reflector lamps by technology. As shown, the percentage of big box stores carrying LED reflector lamps increased significantly between years (from 42% of stores in 2012 to 69% of stores in 2013), the only significant change within this store category between years. Roughly 9 out of 10 big box stores carried CFL, incandescent, and halogen reflector lamps in 2013 with little change from 2012. Within the non- big box category, there were no significant changes in the percentage of stores stocking each reflector lamp technology, with roughly 4 out of 5 stores stocking CFL and incandescent reflectors in both years, one in three stocking halogen reflectors, and one in twenty stocking LED reflector lamps.

Figure 19: Percent of Stores Carrying MSB Reflector Lamps by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

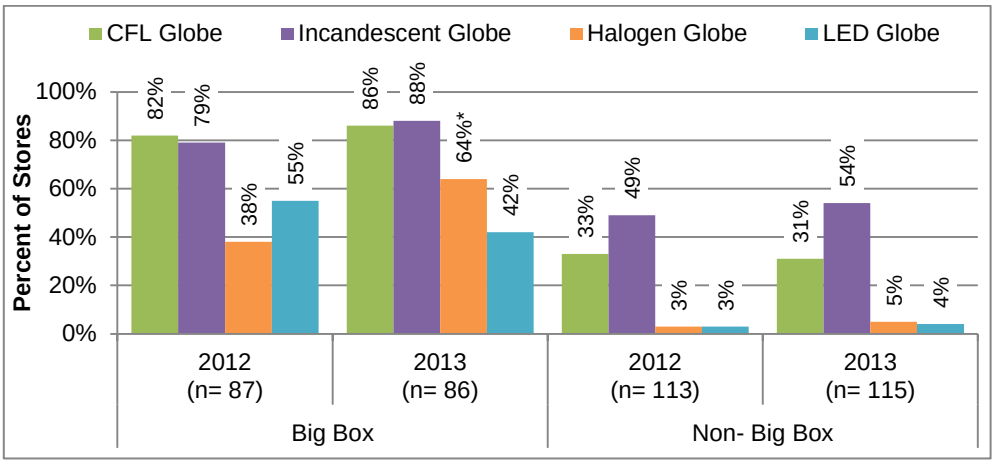


* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.1.3.3 MSB Globe Lamps

Figure 20 shows the percentage of big box and non- big box stores carrying MSB globe lamps by technology in 2012 and 2013. As shown, a much higher percentage of big box stores stocked each globe technology in each year as compared to non- big box stores. Roughly 9 out 10 big box stores stocked CFL and incandescent globes in both years, and roughly half of big box stores carried LED globes. There was a significant increase in the percentage of big box stores that stocked halogen globes between 2012 and 2013 (from 38% to 64% of stores), the only statistically significant change between years in this store category. Among non- big box stores, the percentage of stores stocking each globe lamp technology remained relatively flat (i.e., there were no statistically significant changes between years). Roughly half of non- big box stores carried incandescent globes in both years, and one-third carried CFL globes. Less than 5 percent of non- big box stores carried halogen or LED globe lamps in either year.

Figure 20: Percent of Stores Carrying MSB Globe Lamps by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.1.4 By Availability of IOU Discount

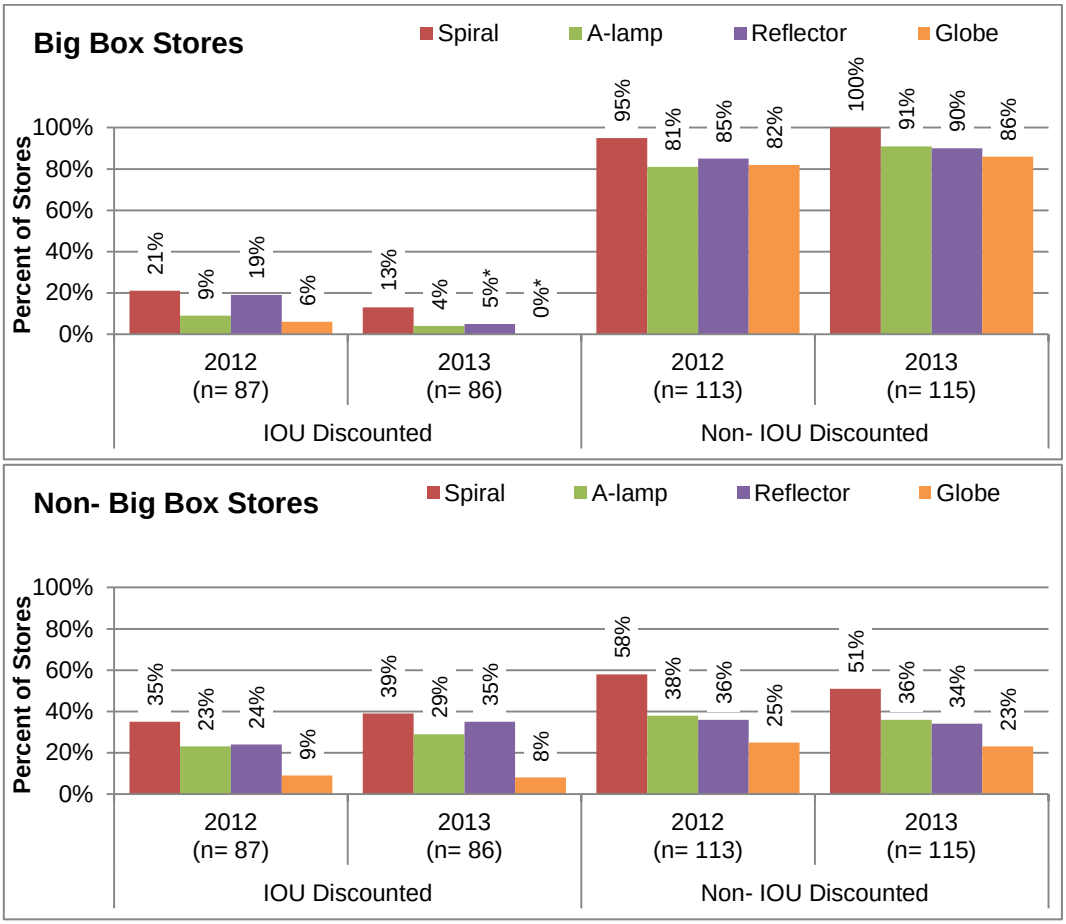
In 2012, 42 percent of the stores in our shelf survey sample stocked at least one IOU-discounted lamp. In 2013, this increased to 50 percent of stores. When we examine these results by store category, we see opposite trends in participation: half as many big box stores stocked IOU-discounted lamps in 2013 as in 2012 (14% versus 28%, respectively), but the percentage of non- big box stores that stocked IOU-discounted lamps increased between years (from 44% in 2012 to 55% in 2013).

Figure 21 shows the percentage of stores carrying IOU-discounted and non- IOU-discounted MSB CFLs by lamp shape (spiral, A-lamp, reflector, and globe) by store category. Results suggest that:

- A slightly higher percentage of non- big box stores stocked each CFL shape with IOU-discounts than big box stores. This may be explained in part by poor labelling of IOU-discounted CFL packages in big box stores: several shelf survey researchers reported difficulty identifying IOU-discounted lamps in big box stores, and a handful of manufacturers mentioned this issue during the supplier telephone interviews.
- In the big box category, across years, the percentages of stores that stocked each IOU-discounted CFL shape were substantially smaller than the percentages of stores that stocked these same CFL shapes without clearly-labelled IOU discounts. In non- big box stores, a greater percentage of stores stocked non- IOU-discounted CFLs versus IOU-discounted CFLs for each CFL shape in each year, but the gap between the two was far smaller for non- big box stores than for big box stores.

The percentages of big box stores stocking clearly-labelled IOU-discounted reflectors and globe lamps were significantly smaller in 2013 than in 2012. These results may reflect the 2001-2012 ULP's continued focus on non- big box channels (see Table 11 in section 4.1.2.2.1 above) and/or the faster sell-through rate of IOU-discounted products in big box stores versus non- big box stores.

Figure 21: Percent of Stores Carrying IOU-Discounted and Non- IOU-Discounted MSB CFLs by Store Category and Lamp Shape, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.1.5 By EISA Lumen Bin

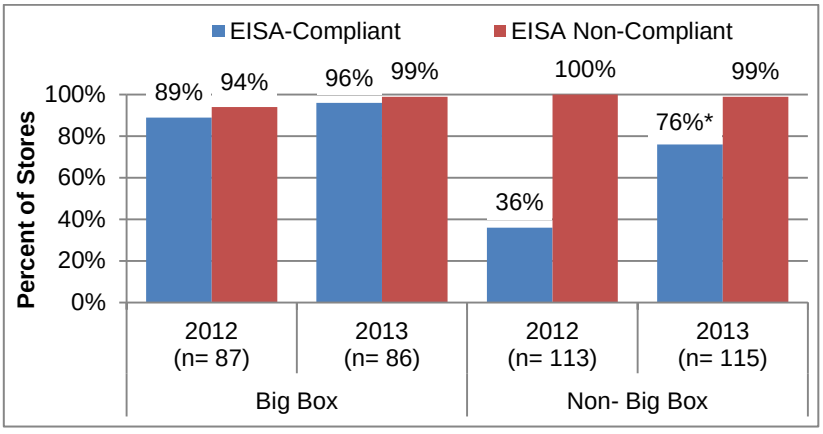
Field researchers collected data on the light output (measured in lumens) for all lamp models in California retail stores during the 2012 and 2013 shelf surveys whenever this information was available. We then categorized all incandescent lamp models (including halogen lamps) for which light output was available into the same lumen bins defined by EISA and AB 1109.[76] All together, these data allowed analysts to categorize lamp models as "compliant" with each stage of EISA (i.e., the lamp model met the maximum wattage requirements specified by EISA for each lumen bin) or non-compliant (i.e., the lamp model had higher wattage than required by EISA within its lumen bin). Figure 22 shows the percentage of big box and non- big box stores that carried EISA-compliant and non-compliant incandescent lamps during 2012 and 2013.

[76] The relevant bins include 1490-2600 lumens (lamps with high light output), 1050-1489 lumens (medium-high light output), 750-1049 lumens (medium-low), and 310-749 lumens (low light output); see Section 3.1 above for more details on EISA, AB 1109, and the relevant lumen bins.

As shown, nearly all stores stocked lamps that did not comply with EISA in one or more lumen bins during both 2012 and 2013 within big box and non-big box stores. And while the percentage of big box stores that stocked at least one EISA-compliant lamp model remained at approximately 9 or 10 out of 10 stores, the number of non- big box stores that stocked at least one EISA-compliant lamp model increased from only 36 percent of stores in 2012 to 76 percent of stores in 2013. These results suggest that the non- big box stores may be further behind the big box stores in terms of incorporating EISA-compliant lamps into their stock, possibly a result of the higher price point associated with these lamps and the lower price points associated with key channels within the non- big box category (such as discount and drug stores). The high percentages of stores stocking EISA non-compliant lamps may reflect that these stores have not yet sold through their existing stock of these products.

Because EISA and AB 1109 gradually phase out inefficient lamps over time according to lumen bins, results are more meaningful when examined within the lumen bins regulated by EISA. Appendix C provides additional detail regarding the percentage of stores carrying EISA-compliant and non-compliant lamps by lumen bin (high, medium high, medium low, and low) and year in Table 47 through Table 50**.** The appendix also provides details regarding the availability of MSB CFLs and LED lamps by lumen bin, lamp shape, and year in Table 51 through Table 58. At a high level, results suggest that a larger percentage of stores in each store category typically stocked EISA-compliant lamps in the higher lumen bins—those affected first by the legislation—than in the lower bins, which are affected by later years of EISA's phase-in process.

Figure 22: Percent of Stores Carrying EISA-Compliant and Non-Compliant Incandescent and Halogen Lamps by Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.

4.2.2 Percentage of Lamps

The percentage of total lamps observed in retail stores is another indicator of the relative availability of different lamp technologies. Below we repeat the series analyses shown in Section 4.2.1 based on the percentage of lamps available in California retail stores. Key findings include:

- CFL share of total lamp stock across California retailers dropped significantly between 2012 and 2013 while incandescent and halogen lamp share increased significantly. The increased incandescent lamp share was largely driven by non- big box channels, which increased by more than a quarter between

years (while incandescent share in big box channels actually decreased by a small but significant margin).

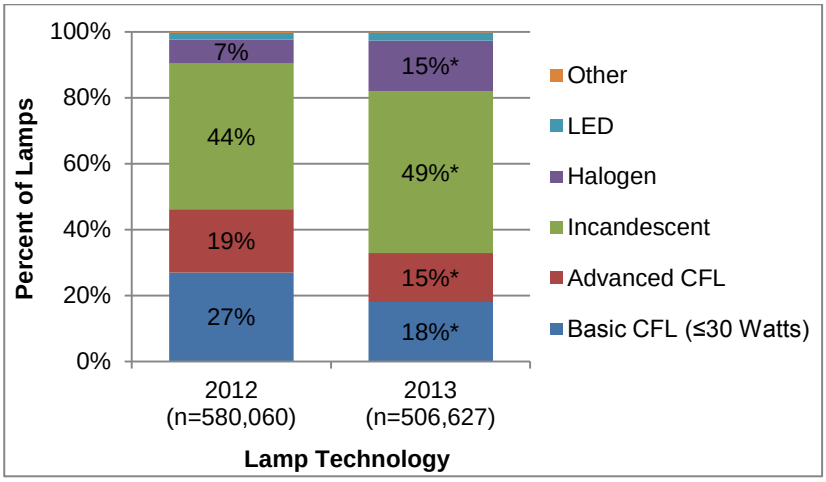
- In terms of absolute stocking volumes (un-weighted quantities of lamps stocked among 33 stores visited in 2012 and 2013 by shelf survey researchers), results suggest a 24 percent decline in the total quantity of lamps stocked. Incandescent lamp stock actually declined slightly, but incandescent share of overall lamp stock increased between years across channels because of the large decrease in CFL quantities stocked. These results are largely driven by dramatic declines in CFL stock (and smaller declines in LED lamp quantities) in wholesale clubs in particular.
- Among MSB A-lamp replacements, spiral-style CFLs comprised the greatest share of total lamp stock in big box and non-big box stores in 2012, but lost significant share to halogen A-lamps in big box stores and halogen and incandescent lamps in non-big box stores between years.
    - There was a 60-percent drop in the share of MSB A-lamp replacement stock comprised by incandescent lamps in big box stores between 2012 and 2013. Halogen lamps replaced the majority of these lamps, and CFL A-lamps picked up a small share as well.
- MSB incandescent reflector lamps gained substantial share in big box stores between 2012 and 2013, while incandescent and halogen lamps gained significant share in non-big box stores, both at the expense of MSB reflector CFLs.
- CFLs lost a significant portion of their total share of MSB globe lamps in non- big box stores and (to a lesser extent) in big box stores. Incandescent lamps picked up all of the slack in non- big box stores and most in big box stores. Halogen lamps also gained a small share of total MSB globe stock in big box stores between 2012 and 2013.
- Of all MSB CFLs stocked by California retailers, half were IOU-discounted in 2012 and 37 percent in 2013. The majority of big box MSB CFL stock was not IOU-discounted in either year, but in non-big box stores, the majority of MSB A-lamps and reflector lamps were IOU-discounted in both years, along with roughly half of MSB spiral CFLs and between roughly 30 and 45 percent of MSB globe CFLs. These results likely reflect the IOUs' focus on non-big box channels for 2010-2012 ULP incentives.
- The share of incandescent and halogen lamp stock comprised by EISA-compliant lamps increased significantly in both store categories between 2012 and 2013. While big box stock was dominated by EISA-compliant lamps in 2013, the opposite was true in the non- big box channels.

4.2.2.1 By Technology

Figure 23 shows the percentage of lamps stocked by technology across all California retail stores that sold replacement lamps to consumers in 2012 and 2013. In 2012, CFLs had the largest share of total lamp stock across all stores at 46 percent, followed by incandescent lamps at 44 percent. In 2013, incandescent lamps had the largest share of total lamp stock at 49 percent (a significant increase over 2012). In the same timeframe, and the share of lamp stock comprised by CFLs dropped significantly to a third of all stock across California retail stores. These results may reflect the decreasing quantities of CFL incentives included in the ULP. Halogen lamps more than doubled their share of lamp stock between 2012 and 2013 (from 7% to 15%, a statistically significant change) in California, while the share comprised by LED lamps remained unchanged between years at 2 percent of all lamps.

It is worth noting that although the share of total lamp stock comprised by LED lamps did not change between years, the share of LED lamp stock shifted among lumen bins. Lamps in the two lowest lumen bins still dominated retail store stock, but the share of LED lamp stock comprised by lamps in the medium and higher lumen bins increased slightly between 2012 and 2013. LED lamps in the lowest lumen comprised 51 percent of all LED lamp stock across retail channels in 2012 but only 15 percent in 2013. Conversely, lamps in the 3 highest lumen bins comprised approximately one-third of LED lamp stock in 2012 (32%) but nearly half in 2013 (46%). Nonetheless, lamps in the two highest lumen bins (1490-2600 and 1050-1489 lumens) were still minimally available in 2013 (see Table 122 in Appendix C).

Figure 23: Percent of Lamps Stocked by Technology, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

One theory behind the increased share of incandescent lamps between 2012 and 2013 is that retailers began stockpiling traditional incandescent lamps in advance of the phase-out required by EISA. Another is that CFL share declined as the availability of IOU program incentives for CFLs continues to decrease—particularly for basic CFLs. Another theory is that it was not only the lamp composition that changed in retail stores, but also the overall quantity of lamps stocked. Certainly, the overall quantity of lamps counted by shelf survey researchers declined between 2012 and 2013 by more than 70,000 lamps (as shown in Figure 23 above), but because researchers did not visit the same set of stores in each year, this comparison has limited use.

A more useful comparison, however, is in the absolute (un-weighted) quantity of lamps stocked by technology among the stores common to both the 2012 and 2013 shelf survey visits. The number of overlapping stores is relatively small (33 stores of the 200 visited in each period, or 16 to 18% of stores visited per period[77]), but results suggest that the total quantity of lamps stocked by these common stores declined by about one-quarter between years (24%; see Table 12). These results suggest that retailers are decreasing their overall space allotments to replacement lamps. This change in quantities varied dramatically by technology, suggesting a decline in CFL stocking quantities of nearly half (46%) and an

[77] For further details regarding the 33 "common stores," please see Table 56 in Appendix B.

increase in halogen lamp quantities of almost three-quarters (73%). Interestingly, despite the gain in share of overall lamp stock comprised by incandescent lamps (shown in Figure 23 above), data from the 33 common stores suggests that the quantity of incandescent lamps actually declined slightly between years (by 14%).

Table 12: Lamp Stock Quantity Comparison by Lamp Technology: 33 Common Stores, 2012 and 2013 (Retail Store Shelf Surveys)

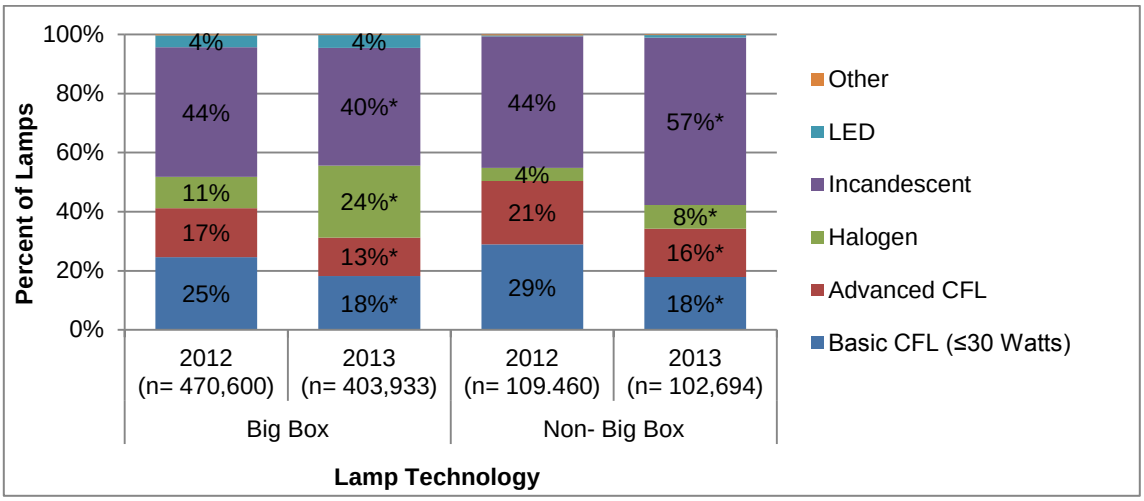
	Quantity of Lamps				
Metric	**Incand**	**CFL**	**Halogen**	**LED**	**Overall**
2012 Lamp Stock	32,126	58,904	7,842	8,391	107,263
2012 Share	30%	55%	7%	8%	100%
2013 Lamp Stock	27,672	31,852	13,591	8,054	81,169
2013 Share	34%	39%	17%	10%	100%
Change (2012 to 2013)	**-4,454**	**-27,052**	**5,749**	**-337**	**-26,094**
% Change (2012 to 2013)	**-14%**	**-46%**	**73%**	**-4%**	**-24%**

Note: Lamp quantities/shares in this table are un-weighted.

4.2.2.2 By Technology and Store Category

Figure 24 adds the dimension of store category to the technology-level results shown above. These results provide further details regarding the loss in share of lamp stock comprised by CFLs and gain in share comprised by incandescent and halogen lamps between 2012 and 2013. CFLs had the majority share of lamp stock in non- big box stores in 2012 (51%), but this share dropped to just over one-third of all lamps stocked in non- big box stores in 2013 (34%) while the incandescent share jumped from 45 percent to 57 percent. Halogen lamp share of total lamps stocked in non- big box stores remained small but doubled between years from 4 percent to 8 percent of all lamps stocked. In both years, incandescent lamps comprised the largest share of total lamp stock in big box stores and non-big box stores, but incandescent lamp share of total stock decreased in big box stores and increased in non- big box stores. The share of total lamps comprised by halogen lamps in big box stores more than doubled from 2012 to 2013 (from 11% to 24%) while the CFL share declined by roughly a quarter (from 41% to 31%). In both store categories, there were small but statistically significant shifts in share of total lamp stock away from advanced CFLs and toward basic CFLs.

Figure 24: Percent of Lamps Stocked by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

We returned to the un-weighted lamp stocking quantities among the 33 stores common to both the 2012 and 2013 shelf survey visits to further examine results by retail store category (big box versus non- big box). Results suggest that the overall decline in lamp stock is largely a result of declining stock in big box stores (Table 13). Changes in big box stocking volumes between years (an overall decline of nearly 26,000 lamps) accounted for the vast majority of the overall change in volume across store categories (an overall decline of just over 26,000 lamps). These results are logical given that lamp stocking volumes in big box stores tend to be far larger than the volumes stocked by non- big box stores. The data also suggest that big box stores drove the overall decline in CFL quantities and increase in halogen lamp quantities.

Table 13. Lamp Stock Quantity Comparison by Lamp Technology: 33 Common Stores, 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	Metric	Quantity of Lamps				
		Incand	CFL	Halogen	LED	Overall
All Stores	2012 Lamp Stock	58,904	8,391	7,842	32,126	107,263
(n=33)	2012 Share	55%	8%	7%	30%	100%
	2013 Lamp Stock	31,852	8,054	13,591	27,672	81,169
	2013 Share	39%	10%	17%	34%	100%
	Change (2012 to 2013)	**-27,052**	**-337**	**5,749**	**-4,454**	**-26,094**
	% Change (2012 to 2013)	**-46%**	**-4%**	**73%**	**-14%**	**-24%**
Big Box	2012 Lamp Stock	56,710	8,305	6,948	24,156	96,119
(n=20)	2012 Share	59%	9%	7%	25%	100%
	2013 Lamp Stock	29,349	7,823	12,527	20,476	70,175
	2013 Share	42%	11%	18%	29%	100%
	Change (2012 to 2013)	**-27,361**	**-482**	**5,579**	**-3,680**	**-25,944**
	% Change (2012 to 2013)	**-48%**	**-6%**	**80%**	**-15%**	**-27%**
Non- Big Box	2012 Lamp Stock	2,194	86	894	7,970	11,144
(n=13)	2012 Share	20%	1%	8%	72%	100%
	2013 Lamp Stock	2,503	231	1,064	7,196	10,994
	2013 Share	23%	2%	10%	65%	100%
	Change (2012 to 2013)	**309**	**145**	**170**	**-774**	**-150**
	% Change (2012 to 2013)	**14%**	**169%**	**19%**	**-10%**	**-1%**

Note: Lamp quantities/shares in this table are un-weighted.

When we examined these results at the retail channel level (Table 14), it is clear that the wholesale club channel in particular is largely responsible for the overall decline in lamp stocking volume (both within the big box category and across both store categories). For CFLs and LED lamps, the declines in wholesale club stocking quantities were more than twice the overall volume of decline in other retail channels. Home improvement stores also had a large drop in CFL stocking quantities within these 33 stores. While halogen lamp stock in wholesale clubs declined between years, results suggest that the overall increase in the quantity of halogen lamps stocked was driven by large home improvement and, to a slightly lesser extent, by mass merchandise stores.

Table 14. Lamp Stock Quantity Comparison by Lamp Technology and Retail Channel: 33 Common Stores, 2012 and 2013 (Retail Store Shelf Surveys)

		Retail Channel							
Lamp Technology	Metric	Discount (n=4)	Drug (n=4)	Grocery (n=2)	Small Hardware (n=3)	Home Improv (n=6)	Mass Merch (n=5)	Wholesale Club (n=9)	Overall (n=33)
All Lamps	2012 Lamp Stock	3,738	1,763	404	5,239	38,857	12,020	45,242	107,263
	2012 Share	3%	2%	0%	5%	36%	11%	42%	100%
	2013 Lamp Stock	2,202	2,531	1,066	5,195	32,170	15,382	22,623	81,169
	2013 Share	3%	3%	1%	6%	40%	19%	28%	100%
	Change (2012 to 2013)	**-1,536**	**768**	**662**	**-44**	**-6,687**	**3,362**	**-22,619**	**-26,094**
	% Change	**-41%**	**44%**	**164%**	**-1%**	**-17%**	**28%**	**-50%**	**-24%**
Incandescent	2012 Lamp Stock	3,365	1,049	375	3,181	17,903	6,253	0	32,126
	2012 Share	10%	3%	1%	10%	56%	19%	0%	100%
	2013 Lamp Stock	1,745	1,506	989	2,956	13,977	6,499	0	27,672
	2013 Share	6%	5%	4%	11%	51%	23%	0%	100%
	Change (2012 to 2013)	**-1,620**	**457**	**614**	**-225**	**-3,926**	**246**	**0**	**-4,454**
	% Change	**-48%**	**44%**	**164%**	**-7%**	**-22%**	**4%**	**-**	**-14%**
CFL	2012 Lamp Stock	373	583	20	1,218	15,737	4,179	36,794	58,904
	2012 Share	1%	1%	0%	2%	27%	7%	62%	100%
	2013 Lamp Stock	457	694	50	1,302	9,692	4,206	15,451	31,852
	2013 Share	1%	2%	0%	4%	30%	13%	49%	100%
	Change (2012 to 2013)	**84**	**111**	**30**	**84**	**-6,045**	**27**	**-21,343**	**-27,052**
	% Change	**23%**	**19%**	**150%**	**7%**	**-38%**	**1%**	**-58%**	**-46%**
Halogen	2012 Lamp Stock	0	117	9	768	4,551	1,409	988	7,842
	2012 Share	0%	1%	0%	10%	58%	18%	13%	100%
	2013 Lamp Stock	0	275	27	762	7,278	4,493	756	13,591
	2013 Share	0%	2%	0%	6%	54%	33%	6%	100%
	Change (2012 to 2013)	**0**	**158**	**18**	**-6**	**2,727**	**3,084**	**-232**	**5,749**
	% Change	**0%**	**135%**	**200%**	**-1%**	**60%**	**219%**	**-23%**	**73%**
LED	2012 Lamp Stock	0	14	0	72	666	179	7,460	8,391
	2012 Share	0%	0%	0%	1%	8%	2%	89%	100%
	2013 Lamp Stock	0	56	0	175	1,223	184	6,416	8,054
	2013 Share	0%	1%	0%	2%	15%	2%	80%	100%
	Change (2012 to 2013)	**0**	**42**	**0**	**103**	**557**	**5**	**-1,044**	**-337**
	% Change	**0%**	**300%**	**0%**	**143%**	**84%**	**3%**	**-14%**	**-4%**

Note: Lamp quantities/shares in this table are un-weighted.

4.2.2.3 By Technology and Shape (MSB Lamps)

This section compares lamp availability in terms of the percentage of total lamps by technology, store category, and year for typical MSB replacement lamp types (A-lamps and spirals, reflectors, and globes). Taken together, MSB CFL, incandescent, halogen, and LED lamps in these shapes comprised 75 percent of all lamps stocked across all lamp technologies, base types, and shapes in California retail stores that stocked replacement lamps in 2012 and 70 percent in 2013.

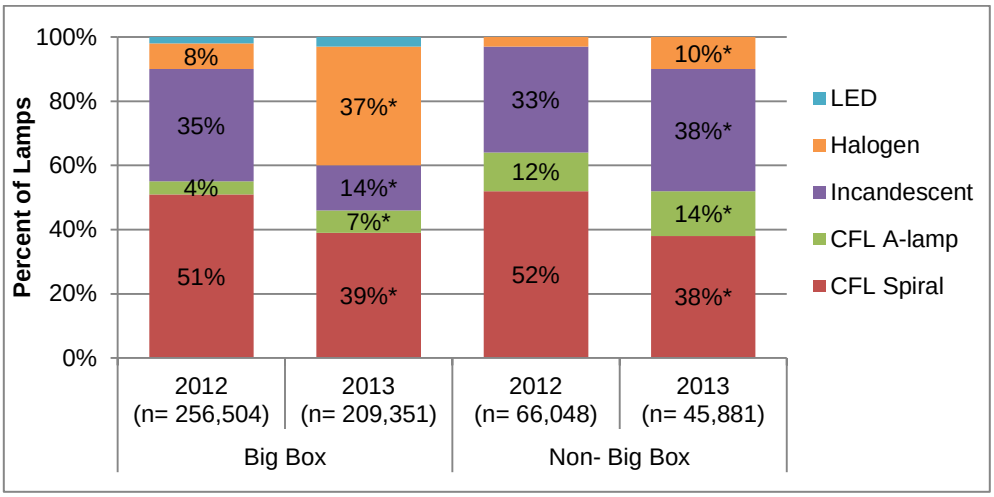
4.2.2.3.1 MSB A-Lamp Replacements

MSB CFL, incandescent, halogen, and LED A-lamp replacements—that is, spiral-style CFLs as well as CFL, incandescent, halogen, and LED A-lamps—comprised more than half of lamp stock across California retail stores in 2012 and 2013 (56% and 52%, respectively). Figure 25 shows the proportion of MSB A-lamp replacements by technology and store category in 2012 and 2013. In both store categories, spiral CFLs comprised the majority of MSB A-lamp replacement lamps stocked in 2012. In big box stores, the greatest shift between years for A-lamp replacements was in the share of total lamp stock comprised by halogen lamps (which increased from 8% to 35% of MSB A-lamp replacements) at the expense of spiral CFLs (which dropped from 51% to 39% of total MSB A-lamp replacements) and incandescent lamps (which dropped from 35% to 14%). Nationally, the National Electrical Manufacturers Association (NEMA) reported an uptick in halogen A-lamp shipments between 2012 and 2013 along with a decline in shipments of incandescent and CFL A-lamps.[78] Interestingly, the NEMA data also suggest a dramatic increase in LED lamp shipments between 2012 and 2013, but the stocking data do not reflect this in California.

In non- big box stores, halogen A-lamps increased from 3 percent of A-lamp replacements stocked in this store category in 2012 to 10 percent in 2013. The proportion of incandescent A-lamps also increased from 33 percent in 2012 to 38 percent in 2013, while spiral CFLs dropped from 52 percent to 38 percent of all lamps stocked in non- big box channels.

78 NEMA, 2014.

Figure 25: Percent of MSB A-Lamps and MSB Spiral CFLs Stocked by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

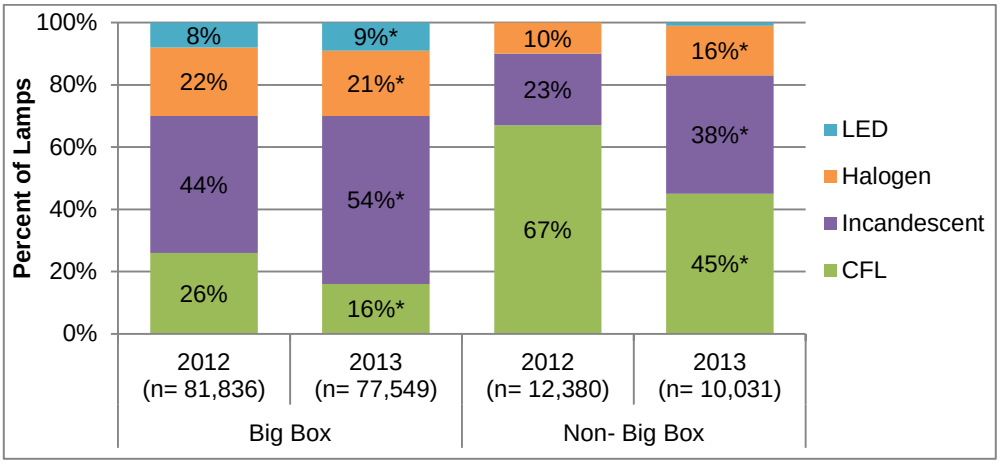


* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

4.2.2.3.2 MSB Reflector Lamps

MSB CFL, incandescent, halogen, and LED reflector lamps comprised 13 percent of all lamps stocked in California retail stores in both 2012 and 2013. Figure 26 shows the proportion of MSB reflector lamps stocked by technology and store category in 2012 and 2013. Incandescent MSB reflector lamps comprised the largest share of reflector lamps stocked in big box stores in 2012 (44%) and in 2013 (54%). In big box stores, the share of MSB reflectors comprised by CFLs dropped by 10 percentage points (from 26% to 16% of MSB reflector stock), while the share of incandescent lamps increased by 10 percentage points (from 44% to 54%). A similar same trend was apparent in non- big box stores, in which the CFL share of MSB reflector lamp stock dropped by 22 percentage points (from 67% to 45%) while incandescent lamp share increased by 15 percentage points (from 23% to 38%). The remainder of the loss in CFL share was made up by MSB halogen reflector lamps, which increased from 23 percent of all MSB reflector lamps stocked in non- big box stores in 2012 to 16 percent in 2013. LED MSB reflector lamps comprised 1 percent or less of MSB reflector lamp stock in both store categories in both years.

Figure 26: Percent of MSB Reflector Lamps Stocked by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



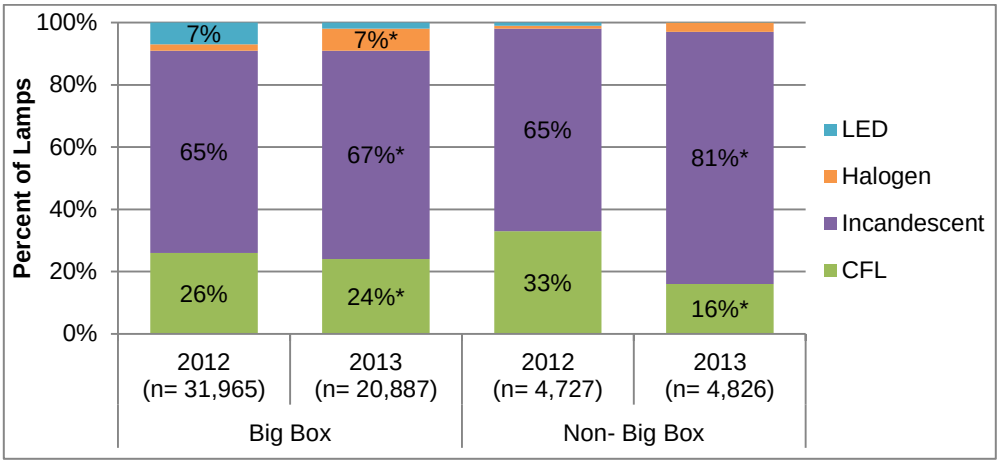
* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

4.2.2.3.3 MSB Globe Lamps

MSB CFL, incandescent, halogen, and LED globe lamps comprised 6 percent of all lamps stocked in California retail stores in 2012 and 5 percent in 2013. Figure 27 shows the proportion of MSB globe lamps stocked by technology and store category in 2012 and 2013. Incandescent lamps comprised the vast majority of MSB globe lamps stocked in big box and non- big box stores in both periods. In big box stores, there was a small (but statistically significant) shift in total MSB globe lamp stock away from CFLs (down 2 percentage points between years) and toward incandescent lamps (up two percentage points). Interestingly, the share of stock comprised by LED lamps and halogens swapped between 2012 and 2013 in big box stores, with 7 percent of 2012 MSB globe lamp stock comprised by LED lamps and 2 percent by halogen, and the opposite in 2013 (2% of stock comprised by LED lamps and 7% by halogen lamps).

In non- big box stores, the CFL share of MSB globe lamp stock declined by 17 percentage points between 2012 and 2013 (from 33% of stock to 16%), while incandescent lamp share of MSB globe lamp stock increased by nearly the same margin (16 percentage points, from 65% to 81% of total MSB globe lamp stock). LED lamps comprised about 1 percent of MSB globe lamps stocked in non- big box stores in 2012 and 3 percent in 2013.

Figure 27: Percent of MSB Globe Lamps Stocked by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

4.2.2.4 By Availability of IOU Discount

Of all MSB CFLs stocked in California retail stores in 2012, shelf survey results suggest that fully half of these lamps were IOU-discounted (50%). In 2013, this dropped by nearly a quarter to 37 percent of stores. Roughly two-thirds of MSB CFLs stocked in non- big box stores in 2012 were IOU-discounted (66%), compared to 60 percent in 2012. In big box stores, 21 percent of MSB CFLs were IOU-discounted in 2012, but this percentage dropped by four-fifths in 2013 to only 4 percent of MSB CFLs.

When examined further by lamp shape (Figure 28), results suggest that the vast majority of MSB spiral CFLs in big box stores were not IOU-discounted in 2012 and 2013. Nearly a quarter of MSB spiral CFLs stocked in big box stores were IOU-discounted in 2012, compared to only 4 percent in 2013.[79] In non- big box stores, IOU-discounted CFLs comprised the majority of CFLs stocked in MSB spiral, A-lamp, and reflector shapes in 2012 and MSB A-lamp and reflector shapes in 2013.

Between 2012 and 2013, the share of IOU-discounted spiral CFLs stocked in big box stores dropped from 24 percent to 4 percent of all MSB spiral lamps stocked in these channels, a statistically significant change. The same trend was apparent among MSB A-lamps, for which IOU-discounted lamps declined from 9 percent of A-lamps stocked in big box stores to only 1 percent, and reflectors, for which IOU-discounted lamps dropped from 19 percent of all A-lamps stocked in these channels to only 10 percent. These results may reflect the 2001-2012 ULP's continued focus on non- big box channels (see Table 11 in section 4.1.2.2.1 above) and/or the faster sell-through rate of IOU-discounted products in big box stores versus non- big box stores.

Among non-big box stores, the share of total MSB lamp stock comprised by IOU-discounted CFL A-lamps declined between 2012 and 2013 (from 58% to 49% of all MSB A-lamps stocked in these channels) and reflector lamps (from 87% to 71%), but increased for globe lamps (from 30% of all globes with IOU discounts in 2012 to 44% in 2013). The share of MSB CFL A-lamps in non-big box stores comprised by

[79] As mentioned previously, poor labeling of IOU-discounted packages in big box stores may help explain this apparent low proportion of IOU-discounted CFLs in big box stores.

IOU-discounted lamps did not change between 2012 and 2013.

Figure 28: Percent of IOU-discounted and Non- IOU-discounted MSB CFLs Stocked by Lamp Shape and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

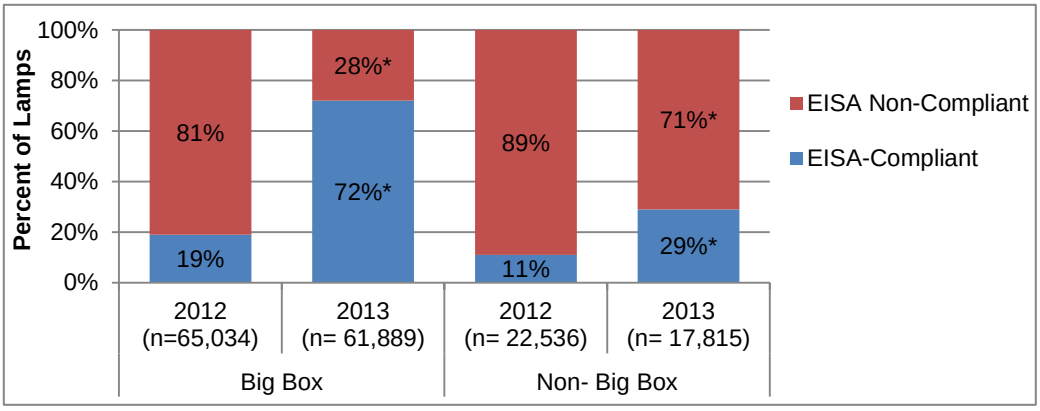
4.2.2.5 By EISA Lumen Bin

Figure 29 shows the proportion of incandescent and halogen lamp stock comprised by EISA-compliant and EISA non-compliant lamps by store category in 2012 and 2013. In 2012, only one in five halogen and incandescent A-lamps were EISA-compliant in big box stores, but nearly three-fourths of halogen were EISA-compliant in big box stores in 2013. Non- big box stores also saw growth in the proportion of EISA-compliant lamps stocked from 11 percent in 2012 to nearly 30 percent in 2013. When examined in more detail (by lumen bin), results suggest that the share of EISA-compliant versus non-compliant lamps is growing over time in all lumen bins. For further detail, please refer to Table 61 through Table 68 in Appendix C. Table 69 through Table 84 in Appendix C provide detail on MSB CFLs and LED lamps by lumen bin, lamp shape, and year.

As shown in the Appendix tables referenced above, for LED lamps in particular, two-thirds of replacement lamps available in California retail stores in 2013 were in the two lowest lumen bins (<310 lumens and 310-749 lumens). These lamps are roughly equivalent to traditional 40 Watt and 60 Watt incandescent

lamps in terms of light output. This suggests that consumers seeking brighter LED lamps may have had difficulty finding these lamps in California retail stores that sold replacement lamps during 2013.

Figure 29: Percent of EISA-Compliant and Non-Compliant Incandescent and Halogen Lamps Stocked by Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



* Difference from prior study period is statistically significant at the 95 percent level of confidence.
Note: Results may not total 100 percent because of rounding.

4.3 Lamp Diversity

This section examines lamp diversity in terms of the average number of lamp models available per store by lamp technology and lamp shape following the same pattern used above for lamp availability (i.e. by technology, by technology and store category, and so on). Key findings include:

- California big box stores had roughly four and a half times the lamp diversity (in terms of the average number of lamp models per store) than non- big box stores in both 2012 and 2013.
- Retailers stocked more incandescent lamp models per store, on average, than other lamp technologies (roughly 31 to 32 per store) in both 2012 and 2013. Retailers stocked less than two-thirds as many CFL models per store (and more advanced CFL models than basic), and half as many halogen models as CFL. In 2013, stores stocked less than 3 LED lamp models, on average.
- There was no change in the average number of basic CFL models stocked between years in big box stores and negligible changes in non- big box stores. In big box stores, the number of advanced CFL models increased by an average of 7 per store and the number of LED models increased by 2. Due to the comparatively large number of non- big box stores in California, non- big box stores tend to drive the overall trends in average number of lamp models per store by technology.
- Among MSB A-lamp replacement technologies, the overall number of models increased in both big box and non- big box stores. Changes in non- big box stores were limited to an average of two models or fewer among the technologies, while in big box stores, the average number of MSB incandescent lamp models decreased while halogen lamp models increased. MSB CFL A-lamps increased by an average of 3 models per big box stores, but number of MSB spiral CFLs remained constant in these channels (25).

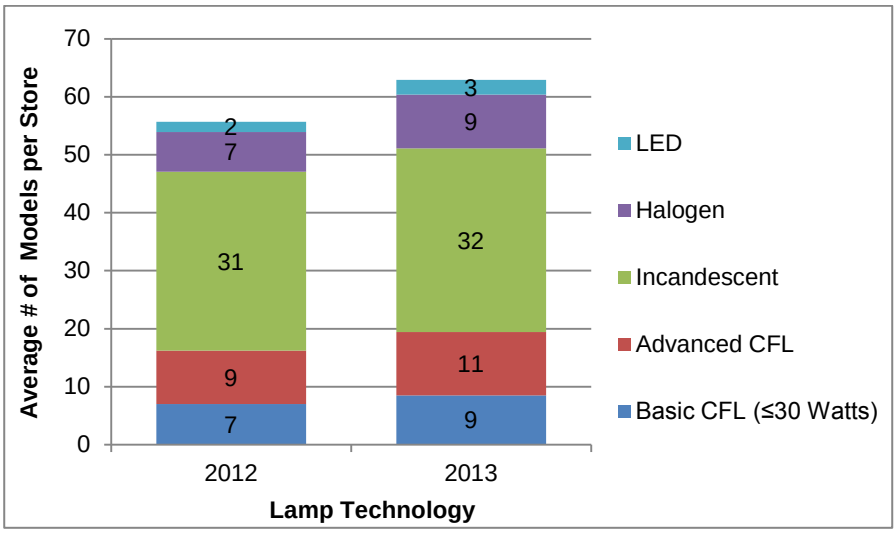
- There were fewer MSB reflector lamp models available per store in 2012 and 2013 than MSB A-lamp replacements. Changes between years were limited to only a model per technology in big box stores, and no change in non- big box stores.
- The average number of MSB globe lamp models per big box store remained steady between years, but incandescent lamp diversity declined by an average of 3 models per store while MSB CFL and halogen globes each increased by one model. There was a slight decline in the average number of MSB globe models in non-big box stores driven by the loss of an average of 1 incandescent lamp model per store.
- IOU-discounted MSB spiral CFL diversity declined in both store categories between 2012 and 2013, with an average of less than one IOU-discounted MSB spiral, A-lamp, reflector, and globe CFL model per store in both categories in 2013. Diversity was higher among MSB CFLs without IOU discounts.
- Diversity among EISA-compliant incandescent and halogen lamp models increased between years while diversity of non-compliant models decreased in both store categories between years. Big box stores actually had greater diversity among EISA-compliant models in 2013 than among non-compliant models.

4.3.1 By Technology

Figure 30 shows the average number of lamp models per technology across all California retail stores that sold replacement lamps to consumers in 2012 and 2013. The largest change in the average number of models stocked per store was in CFLs, which increased by approximately 3 models per store (from approximately 16 to 19).[80] For halogen lamps, the average number of models stocked per store increased by nearly as many (2.5 models, increasing from 6.8 to 9.3 per store, on average). The average number of LED lamp models per store increased by 0.7 models, nearly the same margin of increase as among incandescent lamp models (0.8 models per store, on average).

[80] Note that although there was an increase in the number of CFL models stocked per big box store, there was a notable decline in the quantity of CFLs stocked in big box stores (see Figure 23 for details).

Figure 30: Average Number of Lamp Models per Store by Technology, 2012 and 2013 (Retail Store Shelf Surveys)



See Table 81 in Appendix C for the number of lamp models by technology and year.

4.3.2 By Technology and Store Category

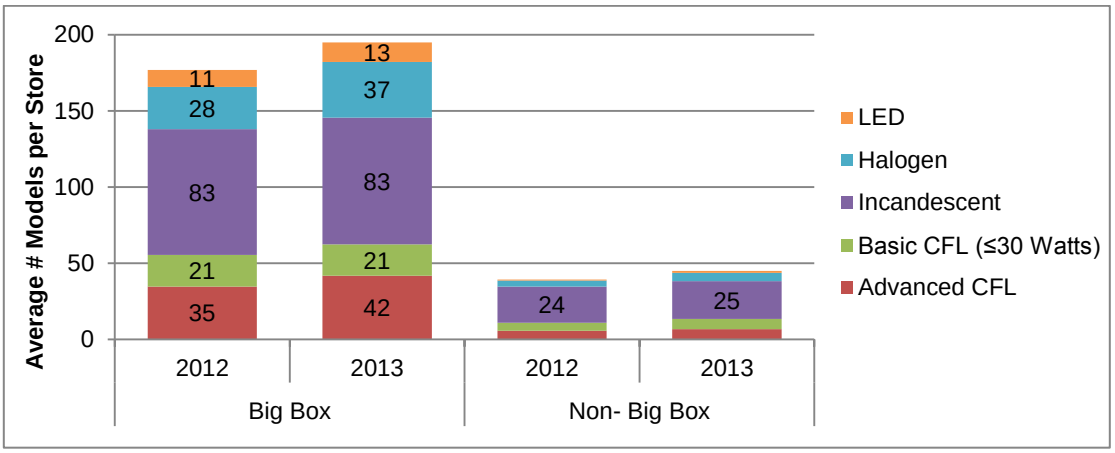
When further examined by retail store category, the data suggest an average of more than 230 lamp models per big box store in both 2012 and 2013, and an average of roughly 50 to 60 models per store in non- big box channels. In both years, big box stores had more diversity among their incandescent lamp stock than across all lamp stock in non-big box stores; the same was true for CFLs.

Figure 31 shows that the average number of advanced CFL and halogen lamp models per store increased dramatically between years in big box stores. The average number of halogen models per big box store increased by 9 (from 28 to 37) between 2012 and 2013 and advanced CFLs by 7 models (from 35 to 42). At the same time, the diversity of these two technologies increased by an average of one or two models per non-big box store.

Incandescent lamps had the greatest number of models per store in both store categories in 2012 and 2013 with little to no change between years (83 models per store in big box and 24 to 25 models per store in non-big box). The same is true of basic CFLs in big box stores, with an average of 21 models per store in in both years. Among non-big box stores, however, the average number of basic CFL models per store increased from 5 in 2012 to 7 in 2013.

The average number of LED lamp models increased by 2 per big box store between 2012 and 2013 (from 11 to 13) but remained at approximately 1 model per store in non-big box.

Figure 31: Average Number of Lamp Models per Store by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



See Table 82 in Appendix C for the number of lamp models by technology, store category, and year.

4.3.3 By Technology and Shape (MSB Lamps)

This section compares lamp diversity by technology, store category, and year for typical MSB replacement lamp types (A-lamps and spirals, reflectors, and globes).

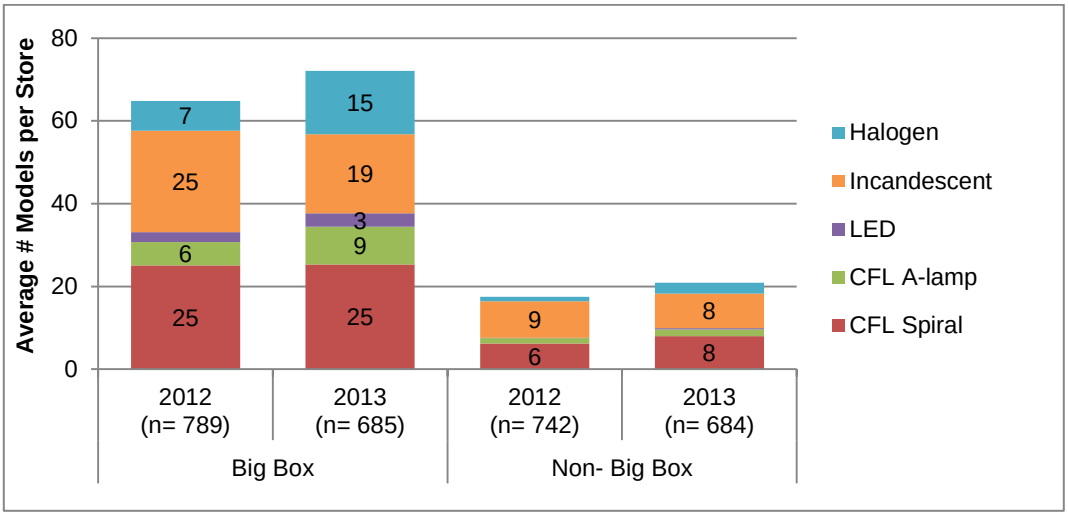
4.3.3.1 MSB A-Lamp Replacements

Figure 32 shows the average number of MSB spiral and A-lamp models per store by store category in 2012 and 2013. In both store categories, the average number of models per store for each A-lamp replacement type increased between 2012 and 2013 except for incandescent A-lamps.

In big box stores, there were the same number of spiral CFL models per store, on average, as incandescent A-lamp models in 2012 (25 each), and while the average number of spiral CFL models remained constant between years, the number of incandescent A-lamp models dropped from 25 in 2012 to 19 in 2013. Halogen A-lamps (including EISA-compliant models) picked up an average of 8 lamp models per big box store during the same period (from 7 in 2012 to 15 in 2013). Together, these results may reflect the influence of EISA and AB 1109 in California retail stores. There were 2 MSB LED A-lamp models per big box store in 2012 and 3 in 2013.

In non- big box stores, there were more incandescent MSB A-lamp models per store than CFL spiral models per store in 2012 (9 compared to 6), but this levelled out in 2013 (8 models each per store, on average). There were very few LED A-lamp models in non- big box stores in 2012 and 2013 (less than 1 model per non- big box store, on average, in both years).

Figure 32: Average Number of MSB A-Lamp and Spiral CFL Models per Store by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



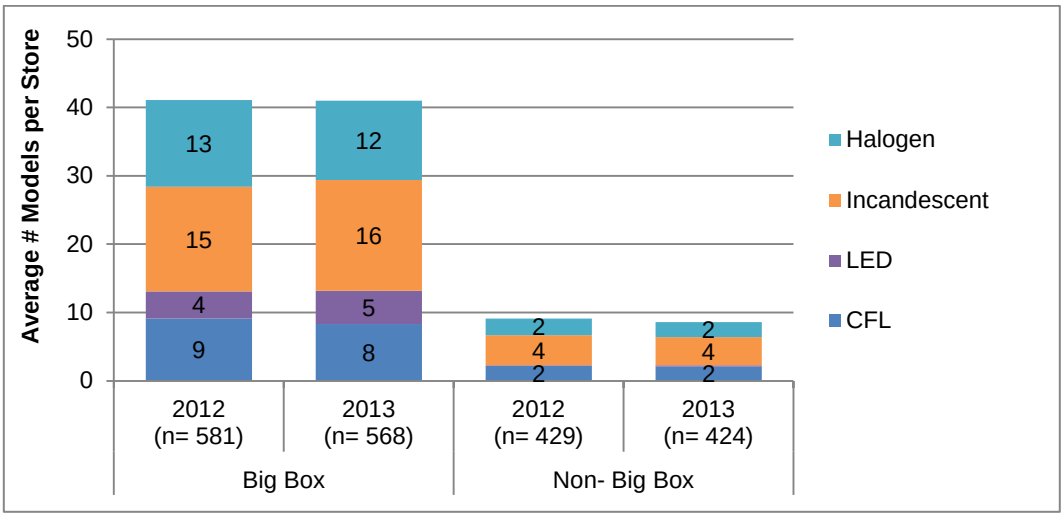
See Table 88 in Appendix C for the number of MSB A-lamp and MSB spiral CFL models by technology, store category, and year.

4.3.3.2 MSB Reflector Lamps

Figure 33 shows the average number of MSB reflector models per lamp technology by store category and in 2012 and 2013. In big box stores, incandescent reflector lamps had the greatest model number diversity in 2012 (15 models per store) and 2013 (16 models per store). Changes between years among stores in the big box category were minimal, with halogen lamps and CFLs each losing an average of 1 lamp model per store (dropping from 13 to 12 models for halogens and 9 to 8 for CFLs), while incandescent lamps and LED lamps each gained an average of one model per store (increasing from 15 to 16 for incandescent lamps and 4 to 5 for CFLs).

In non- big box stores, there were more incandescent reflector models per store than for other reflector lamp technologies in 2012 and 2013 (more than 4 incandescent reflector models per store). There were no changes in the average number of reflector lamp models stocked in non-big box stores by technology between 2012 and 2013, with roughly 4 incandescent models, 2 halogen models, 2 CFL models, and only 0.1 to 0.2 LED reflector lamp models per non- big box store.

Figure 33: Average Number of MSB Reflector Models per Store by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



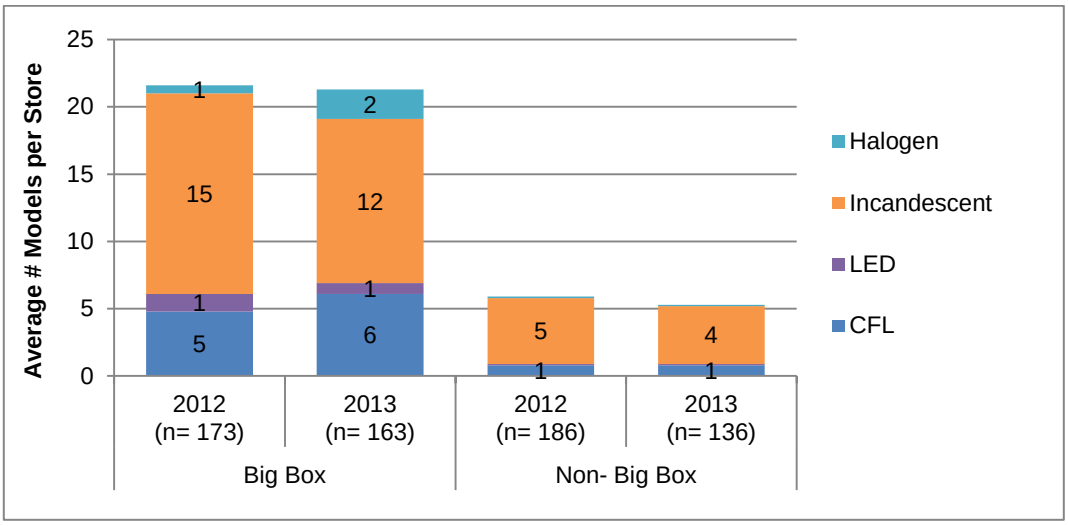
See Table 89 in Appendix C for the number of MSB reflector lamp models by technology, store category, and year.

4.3.3.3 MSB Globe Lamps

Figure 34 shows the average number of MSB globe models per store by store category and lamp technology in 2012 and 2013. Incandescent lamps showed the greatest model number diversity among globe lamps in 2012 and 2013 in both store categories. However, the greatest change between years was in incandescent globe lamps in big box stores, which declined by an average of 3 models per store between years (from 15 to 12) while the number in non- big box stores dropped only 1 per store, on average (from 5 to 4).

There were roughly 5 CFL globe models per big box store in 2012 and 6 CFL globe models per big box store in 2013. In non- big box stores, there was less than one CFL globe model per store in 2012 and 2013. LED globe models averaged 1 per big box store in 2012 and in 2013 and less than one per non- big box store in 2012 and 2013.

Figure 34: Average Number of MSB Globe Models per Store by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

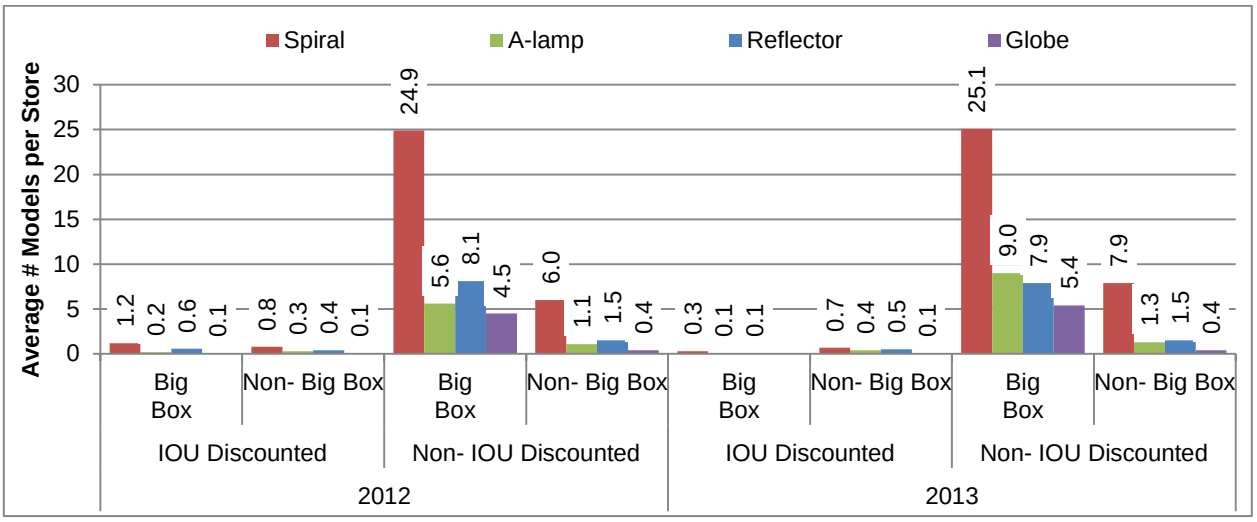


See Table 90 in Appendix C for the number of MSB globe lamp models by technology, store category, and year.

4.3.4 By Availability of IOU Discount

Figure 35 shows the average number of IOU-discounted and non- IOU-discounted MSB CFL models per store by lamp shape and store category in 2012 and 2013. There was little model number diversity among IOU-discounted MSB spiral, A-lamp, reflector, and globe CFLs in big box and non- big box stores in 2012 and 2013. Only spiral CFLs in 2012 big box stores had an average of more than one IOU-discounted model per store. There was less than one model number per store for IOU-discounted MSB A-lamp, reflector, and globe CFLs in big box and non- big box stores in 2012. There was less than one model per store for all IOU-discounted MSB lamp shapes in big box and non- big box stores in 2013. It is difficult to determine whether the low diversity among IOU-discounted lamps (particularly in big box stores) is a reflection of poor labelling of IOU-discounted lamps or a more accurate representation of IOU-discounted lamp diversity in California retail stores that sold replacement lamps to consumers in 2012 and 2013.

Figure 35: Average Number of IOU-Discounted and Non- IOU-discounted MSB CFL Models[81] per Store by Lamp Shape and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



See Table 91 in Appendix C for the number of CFL models by lamp shape, store category, and year.

4.3.5 By EISA Lumen Bin

Table 15 shows the average number of EISA-compliant and EISA non-compliant incandescent and halogen lamp models per store by store category in 2012 and 2013. On average, there were more EISA non-compliant lamp models per big box store (2.2) than EISA-compliant lamp models (0.9) in 2012. In 2013, the opposite was true: big box stores had more EISA-compliant lamp models per store (2.0) than EISA non-compliant lamp models (1.3). There were more EISA non-compliant lamp models than EISA-compliant models per non- big box store in both 2012 and 2013, though the number of EISA-compliant lamp models per store more than tripled from 2012 (1.0) to 2013 (3.1).

For details on the number of EISA-compliant and non-compliant incandescent and halogen lamp models per store by lumen bin (high, medium high, medium low, and low), please see Table 92 through Table 94 in Appendix C. For details on the number of MSB CFL and LED lamp models per store by lumen bin and lamp shape, please see Table 95 through Table 102 in Appendix C.

[81] Note that the same CFL model could have been sold with and without the IOU discount in the same retail channel, so some models are counted as both IOU-discounted and non-IOU-discounted models.

Table 15: Average Number of EISA-Compliant and Non-Compliant Incandescent and Halogen Lamp Models per Store by Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

		Average # Models per Store	
Year	Store Category	EISA-Compliant	EISA Non-Compliant
2012	Big Box	0.9	2.2
	Non- Big Box	1.0	4.8
2013	Big Box	2.0	1.3
	Non- Big Box	3.1	3.9

See Table 103 in Appendix C for the number of EISA-compliant and non-compliant lamp models by technology, store category, and year.

4.4 Lamp Pricing

This section examines lamp pricing in terms of the average price per lamp by lamp technology and lamp shape and presents results in the same order in which Sections 4.2.1 and 4.2.2 present results for lamp availability and Section 4.3 presents results for lamp diversity. Unless otherwise stated, prices represent the final purchase price after any discounts (IOU discounts and/or others). Key findings include:

- LED lamp prices averaged just under $15 per lamp in 2012 and 2013, more than three times as expensive as other technologies. Halogen lamps were about 10 cents more expensive, on average, in 2013 than CFLs (both over $3) and incandescent lamps were about 70 cents less expensive than basic CFLs.
- Average lamp prices increased between years across all stores for all lamps except halogen and LED lamps.
- Although the average price per LED lamp remained almost the same in 2013 and 2014 (approximately $15 per lamp), there was a decline in average price per lamp within each lumen bin other than the lowest (less than 310 lumens). Although low- and medium-low brightness LED lamps still dominated retail store shelves in 2012 and 2013, the availability of more expensive, higher-lumen LED lamps increased between years, which drove the overall price for LED lamps in 2013.
- Average prices for MSB A-lamp replacements increased for all technologies in non- big box stores but average prices for halogen lamps dropped by 40 cents in big box stores and CFL A-lamp prices stayed about the same (changing by only 2 cents per lamp). LED A-lamp prices declined by more than $2 per lamp in big box stores between years and increased by nearly as much in non- big box stores.
- With the exception of LED lamps, MSB reflector lamp prices ranged from $4 to $8 in big box stores in 2013 and from $3 to $11 per lamp in non- big box. Changes in average MSB reflector lamp price were greatest in the big box channel, where LED lamps dropped by more than $6 per lamp, halogen reflectors increased by more than $1, and CFLs increased by about 70 cents.
- MSB globe prices increased in big box stores between 2012 and 2013 with the exception of halogen lamps (which declined by an average of $1.50 per lamp), while MSB globe lamp prices in non- big box stores declined across technologies with the exception of CFLs (which increased by an average of about $1.50 per lamp).

- Across both store categories, IOU-discounted lamp prices were lower for all MSB CFL shapes than prices without IOU discounts. The greatest difference in average IOU-discounted versus non-discounted CFL price in both store categories during 2013 was among reflector CFLs, where IOU-discounted prices averaged nearly $3 less per lamp in big box stores and nearly $7.50 per lamp less in non- big box.
- EISA-compliant CFL and halogen lamp prices were more expensive in both store categories than non-compliant models in 2012. This was also true among non- big box stores in 2013 (although the gap between the two narrowed somewhat), but average prices for compliant and non-compliant lamps were within 2 cents of one another in big box stores (around $1.50 per lamp).

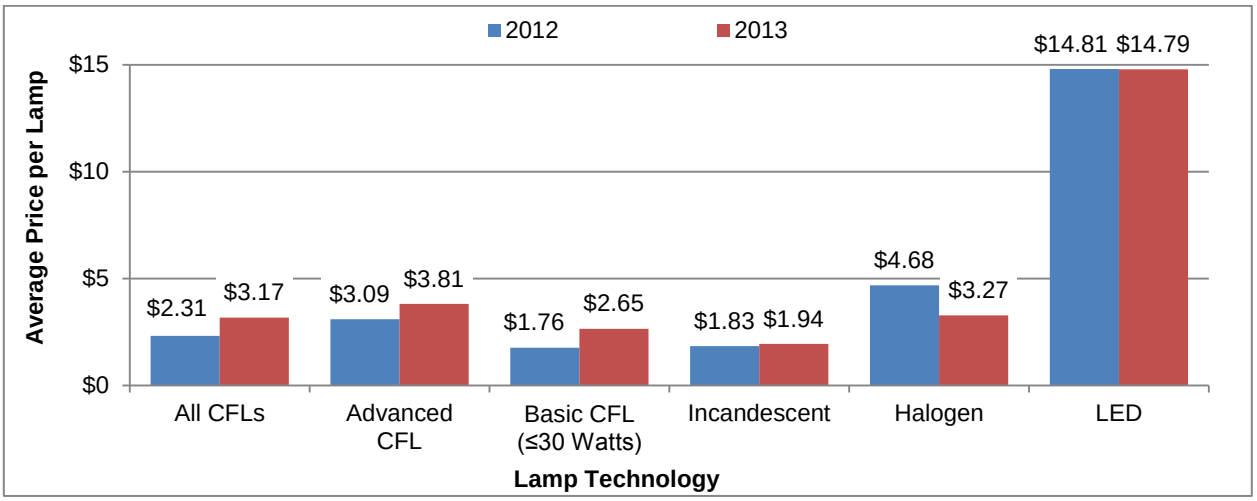
4.4.1 By Technology

Figure 36 shows the average price per lamp by lamp technology in 2012 and 2013. Average lamp prices for CFLs and incandescent lamps increased between years, while prices for LED lamps remained stable and halogen lamps dropped in price.

LED lamps had the highest average price at nearly $15 per lamp in both years. Although the average price per LED lamp remained almost the same in 2013 and 2014, there was a decline in average price per lamp within each lumen bin other than low-brightness lamps (less than 310 lumens). Although low- and medium-low brightness LED lamps still dominated retail store shelves in 2012 and 2013, the availability of medium and higher-lumen LED lamps increased between years. The higher-lumen lamps are more expensive, on average, than lower-brightness lamps—for example, in 2013, the average price for medium high brightness LED lamps (1050-1489 lumens) was nearly $10 higher than in the next-highest lumen bin (750-1049 lumens). High brightness LED lamps (1490-2600 lumens) averaged more than $2 higher per lamp than medium high brightness LED lamps. LED lamps in the lowest lumen bin were least expensive, and these comprised 51 percent of all LED lamp stock across retail channels in 2012 but only 15 percent in 2013. The shift in proportion of total LED lamp stock comprised by brighter lamps drove the overall price for LED lamps in 2013 (see Table 121 and Table 122 in Appendix C).

Halogen lamps were the next most expensive lamp technology in 2012 after LED lamps ($4.68 per lamp) but dropped by nearly a third to an average price of $3.27 per lamp in 2013, which was lower than the average price for advanced CFLs ($3.81 per lamp in 2013). Overall average CFL prices (including basic and specialty lamps) increased by 86 cents between years. Although basic spiral MSB CFLs were about $0.07 per lamp less expensive than incandescent lamps in 2012, incandescent lamps were generally less expensive, on average, than advanced CFLs in both 2012 and 2013.

Figure 36: Average Price per Lamp by Lamp Technology, 2012 and 2013 (Retail Store Shelf Surveys)



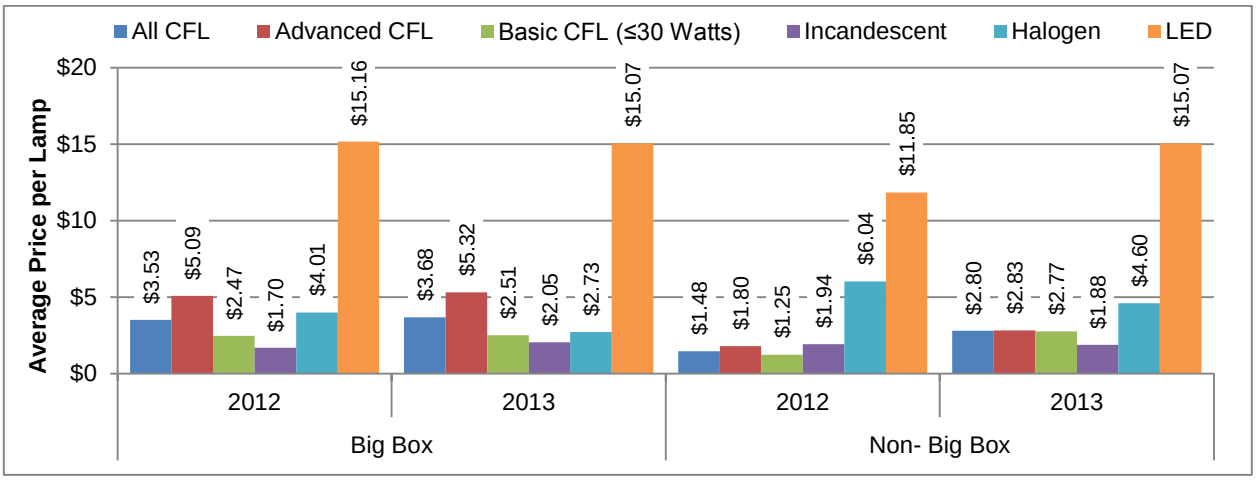
See Table 60 in Appendix C for the number of lamps by technology and year.
Note: "All CFLs" includes both "Advanced CFL" and "Basic CFL (≤30 Watts)."

4.4.2 By Technology and Store Category

Figure 37 shows the average lamp price by lamp technology and store category in 2012 and 2013. The most notable change between 2012 and 2013 was a drop in the average price for halogen lamps; the price per halogen lamp dropped more than $1.25 in big box stores (32% decline) and nearly $1.50 in non- big box stores (24% decline). Also noteworthy is that the average LED lamp price increased be more than $3.00 in non-big box stores (27% increase) while remaining relatively stable in big box stores (dropping by only $0.07 between years). One might theorize that the price change in big box stores results from increased diversity of products available (because there is great variation in LED lamp price across manufacturers and styles)—however, this is unlikely given that the number of LED lamp models increased from 0.5 to only 1.2 between 2012 and 2013. The change is more likely a result of modest shifts in the types of LED lamps stocked by non- big box stores (including slightly more reflector lamps—one of the more expensive lamp shapes [see Figure 39 below]—in 2013 than in 2012).

The average price of CFLs remained relatively stable in big box stores with a $0.15 increase between 2012 and 2013 (4% increase), but CFL prices went up by $1.32 in non- big box stores (89% increase). Also noteworthy was the change in incandescent lamp pricing: in big box stores, the price per lamp increased by $0.35 (21% increase) but in non- big box stores, the price per incandescent lamp remained fairly steady between years (dropping by only $0.06, a 3% decrease).

Figure 37: Average Price per Lamp by Lamp Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



See in Table 104 in Appendix C for the number of lamps by technology, store category, and year.
Note: "All CFLs" includes both "Advanced CFL" and "Basic CFL (≤30 Watts)."

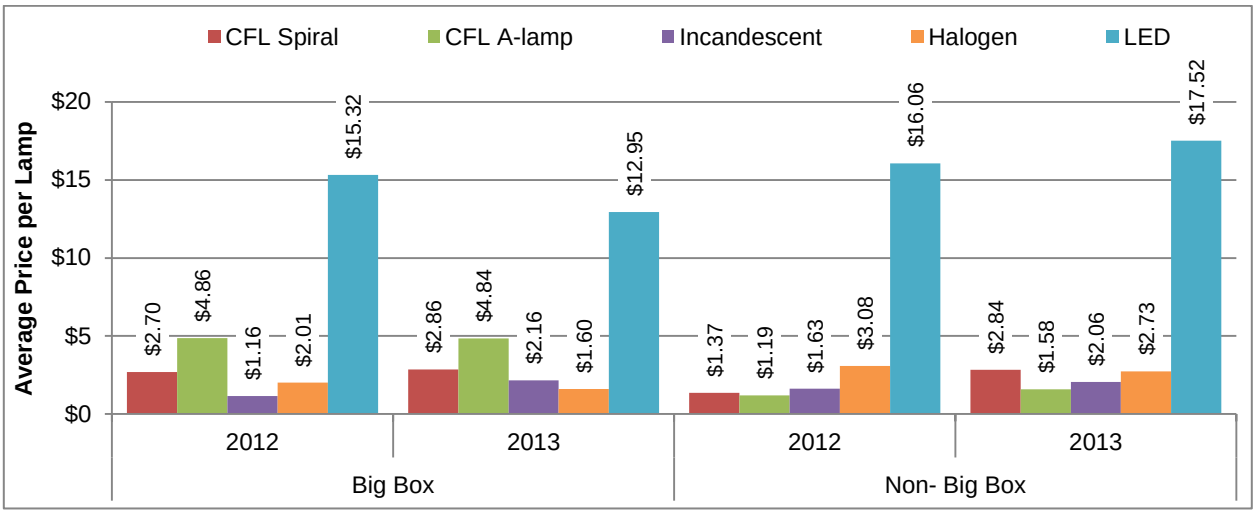
4.4.3 By Technology and Shape (MSB Lamps)

This section compares lamp pricing by technology, store category, and year for typical MSB replacement lamp types (A-lamps and spirals, reflectors, and globes).

4.4.3.1 MSB A-Lamp Replacements

Figure 38 shows the average MSB spiral and A-lamp price by lamp technology and store category in 2012 and 2013. The average spiral CFL price more than doubled in non- big box stores with an increase of nearly $1.50 per lamp between 2012 and 2013 (107% increase). Spirals also increased by $0.16 per lamp in big box stores during the same period (6% increase). The price of LED A-lamps dropped by $2.37 per lamp in big box stores (15% decline), but increased by nearly $1.50 per lamp in non- big box stores (9% increase). The price of incandescent A-lamps went up by $1.00 per lamp in big box stores between 2012 and 2013 (86% increase) and by $0.43 per lamp in non-big box stores (26% increase). The price per halogen A-lamp dropped in big box stores by $0.41 and non- big box stores by $0.35 between 2012 and 2013 (by 20% and 11%, respectively).

Figure 38: Average Price per MSB A-Lamps and MSB Spiral CFLs by Lamp Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

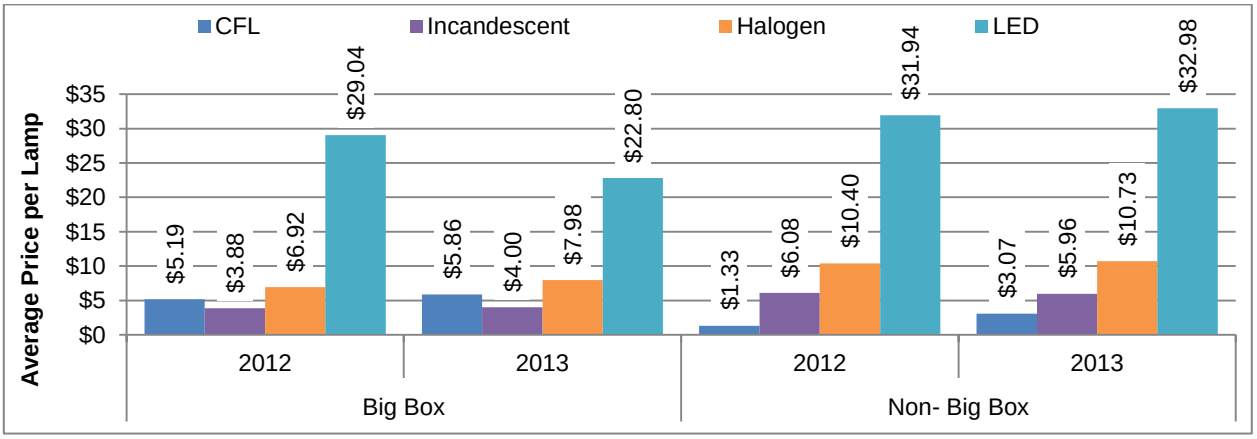


See Table 105 in Appendix C for the number of MSB A-Lamp and MSB spiral CFLs by technology, store category, and year.

4.4.3.2 MSB Reflector Lamps

Figure 39 shows the average MSB reflector lamp price by lamp technology and store category in 2012 and 2013. Reflector CFLs more than doubled in price per lamp in non- big box stores with an increase of $1.74 per lamp between 2012 and 2013 (131% increase) and increased by $0.67 per lamp in big box stores (13% increase). The price of LED reflector lamps dropped by $6.24 per lamp in big box stores from 2012 to 2013 (21% decline), but increased by more than $1.00 per lamp in non- big box stores (3% increase). The price per halogen reflector lamp increased in big box stores by $1.06 (15% increase) and non- big box stores by $0.33 (3% increase). The price of incandescent reflector lamps went up slightly in big box stores by $0.12 per lamp (3% increase), and decreased slightly in non- big box stores by $0.12 per lamp between 2012 and 2013 (2% decrease).

Figure 39: Average Price per MSB Reflector Lamp by Lamp Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



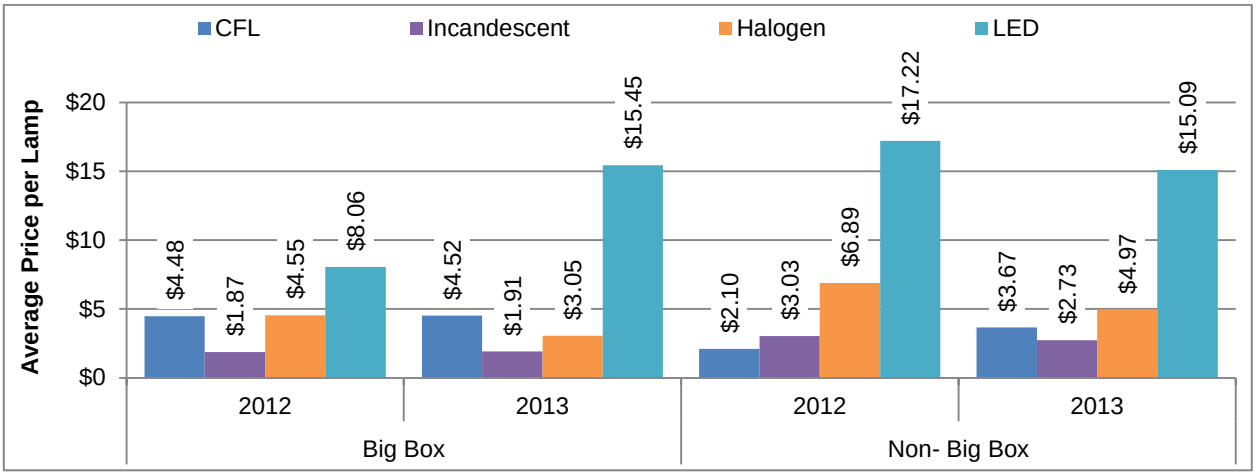
See Table 101 in Appendix C for the number of MSB reflector lamps by technology, store category, and year.

4.4.3.3 MSB Globe Lamps

Figure 40 shows the average MSB globe lamp price by lamp technology and store category in 2012 and 2013. LED globe lamps nearly doubled in price per lamp, increasing by $7.39 in big box stores (92% increase), but dropped by $2.13 per lamp in non- big box stores (12% decline). This increase in average price of LED globe lamps in big box stores was driven by the availability of those lamps in wholesale clubs, which stocked the lion's share of globe LED lamps available in 2012 (74% of all LED MSB globe lamp stock was in membership stores in 2012) and had the lowest average price for these lamps. In contrast, MSB LED globe lamps comprised only 7 percent of total LED MSB globe lamp stock in 2013.

Globe CFLs increased by $0.04 per lamp (1% increase) in big box stores from 2012 to 2013, and increased in non- big box stores by $1.57 per lamp (75% increase). The price per halogen globe lamp decreased in big box stores by $1.50 (33% decline) and non- big box stores by $1.92 (28% decline) between 2012 and 2013. The price of incandescent globe lamps went up slightly in big box stores by $0.04 per lamp (2% increase), and decreased modestly in non- big box stores by $0.30 per lamp (10% decline) between 2012 and 2013.

Figure 40: Average Price per MSB Globe Lamp by Lamp Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



See Table 107 in Appendix C for the number of MSB reflector lamps by technology, store category, and year.

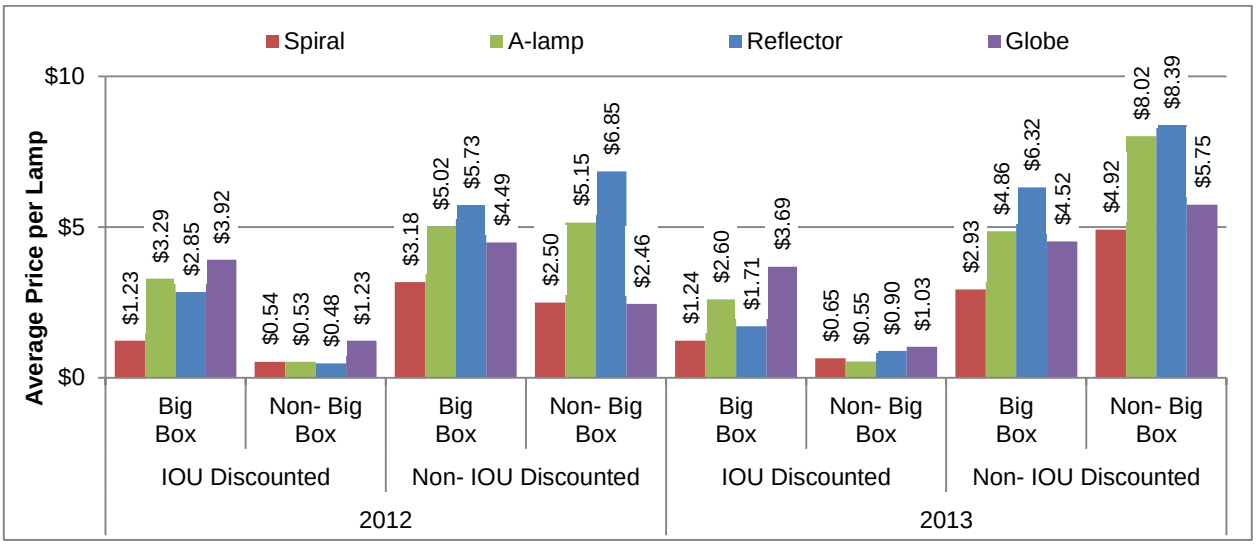
4.4.4 By Availability of IOU Discount

Figure 41 shows the average price per IOU-discounted and non- IOU-discounted MSB CFL by lamp shape and store category in 2012 and 2013. In both years, IOU-discounted lamps were less expensive than non-IOU discounted lamps in both store categories, and prices were lower in big box stores than in non- big box stores whether IOU-discounted or not. In both years, average IOU-discounted lamp prices were highest for globe CFLs in both store categories and lowest for spiral CFLs in big box stores and A-lamp CFLs in non- big box stores. Among non- IOU-discounted CFLs, prices were highest for reflector lamps in both years in both store categories, and lowest for spiral CFLs.

In 2012, the difference in price between IOU-discounted and non- IOU-discounted spiral CFLs was the same in big box and non- big box stores ($1.95 to $1.96 higher than for non- IOU discounted spirals). In 2013, the price gap narrowed in big box stores (to a difference of approximately $1.69 between IOU-discounted and non-discounted spiral CFLs) but increased by more than 4 dollars in non- big box stores (to an average price per lamp of $4.27 *more* for non-IOU discounted spiral CFLs than for IOU-discounted spirals). The grocery channel drove the overall increase in average price for non-IOU discounted MSB spiral CFLs in non- big box stores, as grocery stores comprised two-thirds of non- big box stock for this lamp type in 2012 and nearly half in 2013. The average price for non- IOU discounted MSB spiral CFLs jumped from $1.51 per lamp in grocery stores in 2012 to $4.74 per lamp in 2013. The reasons for this price spike in non-IOU discounted spiral CFLs in grocery stores are unclear. Across all four MSB CFL shapes and both store categories, spiral CFLs in big box stores are the only case in which the price gap between IOU-discounted and non-discounted lamps decreased between 2012 and 2013.

Reflector CFLs consistently had the greatest gap in prices across all CFL shapes between IOU-discounted and non- IOU-discounted lamps in both store categories and in both years. These gaps were smaller in big box stores than in non- big box stores, and were wider in 2013 than in 2012 in both store categories.

Figure 41: Average Price per IOU-Discounted and Non- IOU-Discounted MSB CFLs by Lamp Shape and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)



See Table 108 in Appendix C for the number of IOU-discounted and non-discounted MSB CFLs by lamp shape, store category, and year.

4.4.5 By EISA Lumen Bin

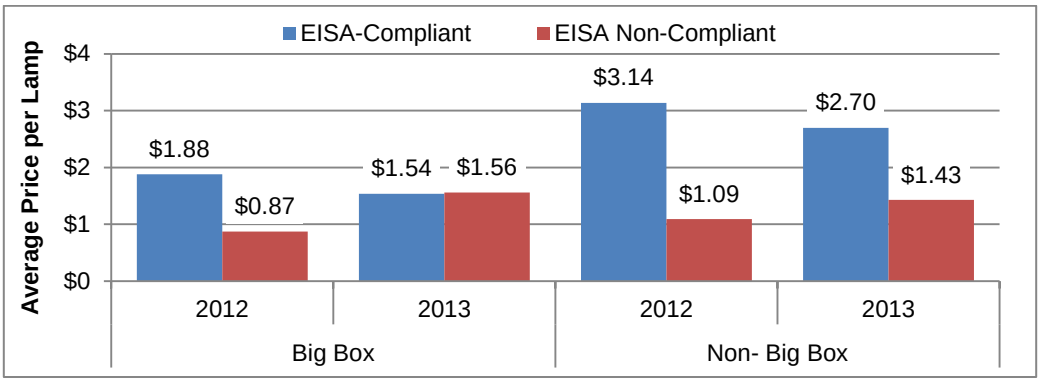
Figure 42 shows the average price per EISA-compliant and EISA non-compliant incandescent and halogen lamp by store category in 2012 and 2013. In big box stores in 2012, EISA-compliant incandescent and halogen lamps were approximately $1.00 more expensive, on average, than non-compliant lamps ($1.88 versus $0.87), but prices levelled out in big box stores in 2013 with prices for both compliant and non-compliant lamps averaging just over $1.50 apiece.

In 2012, both EISA-compliant and non-compliant incandescent and halogen lamps were more expensive in non- big box stores than in big-box stores. But in 2013, the average price for non-compliant lamps in non- big box stores was approximately 13 cents lower per lamp than in big box stores ($1.43 versus $1.56).

With the exception of big-box stores in 2013, EISA-compliant lamps were more expensive than non-compliant lamps across both store categories and time periods. However, the price gap has narrowed in non- big box stores from an average of $2.05 per lamp in 2012 ($3.14 for compliant and $1.09 for non-compliant lamps) to an average difference of $1.27 in 2013 ($2.70 for compliant lamps and $1.43 for non-compliant).

For details on the average price of EISA-compliant and non-compliant incandescent and halogen lamps by lumen bin (high, medium high, medium low, and low lumens), please see Table 109 through Table 112 in Appendix C. For details on the average price of MSB CFLs and LED lamps by lumen bin and lamp shape, please see Table 113 through Table 120 in Appendix C.

Figure 42: Average Price per EISA-Compliant and EISA Non-Compliant Incandescent/Halogen Lamp, 2012 and 2013 (Retail Store Shelf Surveys)



See Table 123 in Appendix C for the number of EISA-compliant and non-compliant lamps by store category and year.

4.5 Market Barriers

During the 2013 supplier interviews, we asked suppliers to comment on the current market barriers for residential replacement lamps in California. Most of the supplier representatives reported very few or no market barriers. Numerous manufacturers reported that barriers existing in prior years had diminished dramatically or had been entirely eliminated by 2013.

The most significant market barrier reported in 2012 was the shortage of rare earth minerals, essential components in CFL production. In the words of one manufacturer's representative:

- "China had about 95 percent of the world's rare earth minerals [in 2012], and restricted the volume and output, which restricted CFL manufacturing capabilities. Everything made with the fluorescent was affected and it forced probably every single manufacturer to raise [CFL] prices."

By 2013, there was no longer an issue with rare earth mineral supplies. Several manufacturers attributed the change to increased Chinese production and newly discovered rare earth mineral deposits in locations such as Greenland. LED lamp production does not require these minerals and was not affected by the shortage. One manufacturer hypothesized that because the shortage increased CFL prices, LED lamp sales may have benefited in the short-term because of the narrowed price gap between CFLs and LED lamps.

Other market barriers that that increased CFL production costs in the past—such as high labor costs and competition for manufacturing facilities in China—were no longer issues in 2013. One manufacturer's representative mentioned that in 2012, CFL manufacturing took about three weeks longer than the prior year, but new Chinese production facilities constructed by late 2012 and early 2013 had largely eliminated this issue.

In 2013, the majority of supplier representatives suggested that while supply-side market barriers were largely eliminated, demand-side barriers remained strong. One manufacturer summarized this view by stating, "Price is still the biggest barrier of all." Others commented that price and consumer awareness of new technologies are remaining barriers in the residential replacement lamp market.

5. MARKET DEMAND

This chapter of the report summarizes the demand-side of California's residential market for replacement lamps, including consumer awareness of various lamp technologies and details regarding lamp purchases and consumers' purchasing decisions. The chapter also reviews consumer familiarity with EISA. Finally, the chapter discusses lamp disposition in the households of PG&E, SCE, and SDG&E residential electric customers.

5.1 Lamp Awareness and Purchases

Section 5.1 reviews awareness of various lamp technologies among PG&E, SCE, and SDG&E residential electric customers over time and by key demographic variables including education level, primary household language, and respondent age. Key findings include:

- CFL awareness and purchase rates declined between 2012 and 2013. Awareness of LED lamps and energy-efficient (EISA-compliant) incandescent lamps remained steady. LED lamp awareness was similar to that of CFLs in 2013, and nearly 1 in 5 consumers reported having purchased one or more LED lamps prior to the 2013 survey.
- Higher levels of education were associated with greater awareness and purchases of LED lamps during the 2013 telephone surveys. Higher levels of education were also associated with higher CFL purchase rates, but not with higher awareness of CFLs. There were no differences in awareness or purchase rates for energy-efficient incandescent lamps by education level.
- Households in which the primary spoken language was English were associated with greater awareness of all three lamp technologies (CFLs, LED lamps, and energy-efficient incandescent lamps) but were only associated with higher purchase rates for LED lamps.
- There were no differences in awareness of the three lamp technologies by age group, but a greater proportion of survey respondents aged 55 or older reported having purchased energy-efficient incandescent lamps than respondents younger than age 55. There were no differences in purchase rates for CFLs or LED lamps by age group.

5.1.1 Awareness and Purchases by Technology

The general population (Wave A) components of the 2012 and 2013 WO28 PG&E, SCE, and SDG&E Residential Electric Customer Telephone Surveys included questions to address general awareness of CFLs, LED lamps, and EISA-compliant incandescent lamps (to which we referred in the survey as "energy-efficient incandescent lamps"). The surveys included an unprompted question to gauge awareness of these lamp types ("Can you start by telling me what kinds of energy-efficient light bulbs you've heard of?"). If respondents did not mention CFLs, LED lamps, or energy-efficient incandescent lamps in response to the unprompted awareness question, the survey followed with prompted awareness questions that provided brief descriptions of each technology and asked respondents whether they were aware of each one.[82]

[82] The prompted awareness questions were as follows. For CFLs: "Compact fluorescent light bulbs – also known as CFLs – come in many shapes and sizes. The most common type of CFL is made with a glass tube bent into a spiral and fits in a regular light bulb socket. Have you ever heard of them?" For LED lamps: "Have you heard of LEDs? They are also known as Light Emitting Diodes and are the most efficient light bulbs available today." For energy-efficient incandescent lamps: "Have you ever heard of energy-efficient incandescent bulbs? These bulbs usually come in different wattages than regular incandescents, such as 29 Watts, 42 Watts, 53 Watts, or 72 Watts."

Among respondents who reported awareness of LED lamps (prompted or unprompted), we asked whether they had ever purchased LED lamps. The surveys follow the same approach for energy-efficient incandescent lamps. For CFLs, however, the surveys take a somewhat different approach. Because the surveys were designed to support the 2010-2012 impact evaluation of the IOUs' ULP, questions focused on CFL purchases during the program period (i.e., between January 1, 2010 and December 31, 2012). As such, the surveys did not ask respondents whether they have *ever* purchased CFLs and instead asked about CFL purchases during the 2010-2012 program period only (or in the 3 previous months for basic spiral CFLs).

To estimate the percentage of the general population that has purchased CFLs at any time, we have combined respondents who reported that they purchased CFLs during the program period with those who currently have CFLs installed in their homes (purchased at any time). Because it is possible that a small proportion of the population has purchased and installed CFLs in the past but no longer has CFLs installed in their homes, this approach may underrepresent the purchaser base by a small margin. It is also possible that some proportion of the population has CFLs installed but did not purchase them (e.g., received them as gifts), so this approach may slightly over-represent the purchaser base. However, this approach is applied consistently between the 2012 and 2013 results, so results from these two periods should be comparable with one another and provide directional indications of any change in CFL purchase rates between years.

Based on results from the questions described above, Figure 43 shows the percentage of PG&E, SCE, and SDG&E residential electric customers who were aware of each technology (CFLs, LED lamps, and energy-efficient incandescent lamps) and the percentage of customers who purchased each technology based on 2012 and 2013 survey results. Results suggest that the percentage of customers who were aware of CFLs declined by a statistically significant margin between 2012 and 2013 (from 96% to 87%), as did the percentage that reported having purchased CFLs (from 57% to 51%, respectively). While there is no concrete explanation for declining awareness of CFLs, several theories exist; we discuss these in greater detail in Section 5.2.1 below.

Coupled with declining awareness, the declining CFL purchase rate may suggest that consumers are shifting their focus away from CFLs and toward the other energy-efficient replacement lamp technologies currently available on the California retail market (as the decline in CFL purchase rate mirrors the increase in LED lamp purchase rates between 2012 and 2013). This may also reflect the 2001-2012 ULP's reduced funding compared to the 2006-2008 program period or the longer lifetime of CFLs (resulting in less frequent need to replace spent lamps). For energy-efficient incandescent lamps, survey results suggest that awareness remained steady between 2012 and 2013 (at 57% and 61%, respectively) and that the percentage of PG&E, SCE, and SDG&E residential electric customers who had purchased these types of lamps also remained steady (at 13% in both years).[83]

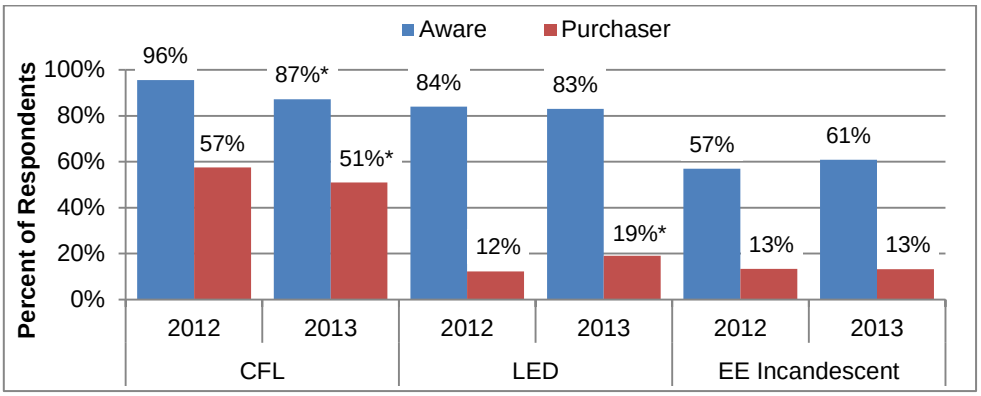
For LED lamps, while the percentage of customers who were aware of these lamps remained unchanged between 2012 and 2013 (84% and 83% of the population, respectively), the percentage who had purchased LED lamps increased by a statistically significant margin between 2012 and 2013 (from 12% to 19%).[84] Telephone survey results from 2008 suggest that approximately 55 percent of California

83 As described above in section 4.2.2.3.1, national CFL sales were down modestly from 2012 to 2013 while energy-efficient incandescent lamp sales increased dramatically during this same period. See NEMA, 2014 for more details.

84 Statistical significance is reported at the 90 percent level of confidence throughout this section of the report.

residents were familiar with LED lamps at that time.[85] The difference in awareness between 2008 and 2012 is statistically significant.

Figure 43: Replacement Lamp Awareness and Purchases Among PG&E, SCE, and SDG&E Residential Electric Customers, 2012 and 2013 (Consumer Telephone Surveys)



2012 n = 791; 2013 n = 800.
* Difference from prior study period is statistically significant.

5.1.2 Awareness and Purchases by Technology and Demographics

DNV GL staff analyzed the 2013 general population component of the WO28 telephone surveys for differences in awareness and purchase rates for CFLs, LED lamps, and energy-efficient incandescent lamps by key demographic variables.[86] These variables included respondent education level, whether English is spoken as the primary language in the home, and respondent age. Below we report on statistically significant differences in lamp awareness and purchase rates across key respondent groups.

5.1.2.1 By Education Level

- **Awareness.** The population segment whose highest level of education is all or part of high school or vocational/technical school were significantly less likely to be aware of LED lamps than the segment that has completed college degrees or a higher level of education. [87]
    - Approximately 92 percent of 2013 survey respondents who had college degrees or higher levels of education are aware of LED lamps compared to only 69 percent of respondents whose highest level of education was all or part of high school or vocational school.
    - There were no statistically significant differences in results regarding awareness of CFLs or energy-efficient incandescent lamps by education level.

85 The Cadmus Group, Inc., *et al.*, 2009.

86 Note that this section relies upon the same method for estimating CFL purchase rates as described above (i.e., respondents who had purchased CFLs since January 1, 2010 as well as respondents who had at least one CFL installed in their homes at the time of the survey).

87 Of the 800 survey respondents, 747 provided information regarding their education levels. For respondents whose highest level of education is all or part of high school or vocational/technical school, n=152; for respondents whose highest level of education is "some college," n=170; and for respondents with a college degree or higher level of education, n=425.

- **Purchases.** The segment of the population whose highest level of education was all or part of high school or vocational/technical school was less likely to be aware of CFLs or LED lamps than the population segments that had completed higher levels of education.
    - Approximately 61 percent of respondents who had college degrees or higher in 2013 had purchased CFLs, as had 52 percent of respondents whose highest level of education was some college. Both of these results were significantly higher than the proportion respondents whose highest level of education was all or part of high school or vocational school who had purchased CFLs (34%).
    - The LED lamp purchase rate was significantly higher among respondents who had college degrees or higher levels of education in 2013 than among respondents whose highest level of education was all or some high school or vocational school (14% versus 22%, respectively).
    - There were no statistically significant differences in purchase rates for energy-efficient incandescent lamps by education level.

5.1.2.2 By Primary Household Language

- **Awareness.** Households in which the primary language was English were more likely to be aware of CFLs, LED lamps and energy-efficient incandescent lamps in 2013 than households in which the primary spoken language was not English.[88]
    - Thirty-two percent of households whose primary language was not English in 2013 were unaware of CFLs as compared to only nine percent of English-speaking households.
    - Similarly, 35 percent of households whose primary language was not English were unaware of LED lamps as compared to only 14 percent of English-speaking households in 2013.
    - Finally, households whose primary language was not English in 2013 were significantly less aware of energy-efficient incandescent lamps than English-speaking households (49% versus 37% unaware, respectively).
- **Purchases.** Households in which the primary language was English were more likely to have purchased CFLs than households in which the primary language was not English.
    - A smaller percentage of households who did not primarily speak English had purchased CFLs as compared to English-speaking households (30% versus 55%, respectively).
    - There were no statistically significant differences in purchase of LED lamps or energy-efficient incandescent lamps based on primary language spoken in the home.

5.1.2.3 By Respondent Age

- **Awareness.** There were no statistically significant differences in awareness of CFLs, energy-efficient incandescent lamps, or LED lamps among respondents of different age groups.[89]

88 All survey respondents provided details regarding whether English is the primary language spoken in their households (n=800). For respondents for whom the primary language spoken in the household is English, n=702; for respondents for whom the primary language spoken in the household is not English, n=98.

89 Of the total 800 survey respondents, 112 provided their ages. For respondents under age 55, n=40; for respondents aged 55 or older, n=72.

- **Purchases.** Respondents aged 55 or older at the time of the 2013 surveys were more likely to have purchased energy-efficient incandescent lamps than respondents under age 55 (19% versus 3%, respectively).
    - There were no statistically significant differences in purchase of CFLs or LED lamps based on respondents' ages.

5.2 CFL Awareness, Purchases, Storage, and Disposal

This section of the report reviews CFL awareness, purchase, and storage rates across all CFL shapes over time and by CFL shape (spiral, reflector, A-lamps, and globes) in 2012 and 2013 specifically. Key findings include:

- Overall awareness of CFLs declined among PG&E, SCE, and SDG&E residential electric customers between 2012 and 2013 (from 96% to 86% of customers). The underlying reasons for the decline are unclear but may include confusion or loss of CFLs as "top of mind" technologies due to the expanding range of available lamp technologies, a decline in market attention toward CFLs, the declining presence of CFLs on retail store shelves, or other reasons.
    - When examined by lamp shape, awareness of CFL spirals and A-lamps—the two most common CFL shapes—also declined between 2012 and 2013. (Awareness did not change between years for reflector or globe-shaped CFLs.)
- CFL purchase rates also declined between 2012 and 2013 among PG&E, SCE, and SDG&E residential electric customers. These results mirror the decline in CFL stock as a percentage of total lamp stock in California retail stores during the same timeframe.
- Reasons for the decline in CFL purchase rates may overlap with those described above for CFL awareness and may also include a natural decline in purchase rates as consumers' in-home supply of CFLs (both installed and in storage) increases over time, or the possibility that consumers are purchasing other lamp technologies instead of CFLs.
    - When examined by lamp shape, CFL purchases declined between 2012 and 2013 for spirals and A-lamps but increased by small but statistically margins for CFL reflectors and globes. These results align with the shrinking gap between the percentage of total CFL stock in California retail stores comprised by specialty versus basic CFLs between 2012 and 2013.
- Roughly 80 percent of CFL purchasers in PG&E's, SCE's, and SDG&E's electric service territories reported that they were storing CFLs in 2012 and 2013, up significantly from roughly 60 percent of purchasers in 2006 and 2008.[90]
    - The average number of CFLs installed among CFL purchaser households nearly doubled between 2006 and 2013 (from 6.8 per household to 13.3) according to consumer self-reports, while the number of CFLs in storage among purchasers more than doubled in the same timeframe (from 2.5 to 5.5). Because these results are based on self-reported information from consumers, however, the exact quantities are less reliable than results from the in-home inventories (see in chapter 6 below).

[90] Note that 2008 results do not include SDG&E customers.

- When asked why they were storing CFLs, more than half of CFL purchasers in 2006, 2008, 2012 and 2013 reported that it was so they would have CFLs on hand in case installed lamps burned out.

- Roughly half of the 2013 survey respondents who had CFLs installed said they had to dispose of one or more CFLs in the past. More than a third of these simply threw the CFLs away with their regular household trash, and a smaller percentage reported proper disposal.

5.2.1 CFL Awareness and Purchases Over Time

As described above, the 2012 and 2013 consumer telephone surveys addressed awareness of CFLs, LED lamps and energy-efficient incandescent lamps. For CFLs, data are also available from previous evaluation reports regarding awareness rates among residential customers. While the phrasing of survey questions is not entirely consistent from year to year, each survey phase addressed general awareness of CFLs. Figure 44 shows significant increases in awareness of CFLs between 2001 and 2003 and again between 2003 and 2006. The awareness rate held steady through 2012 before declining by a significant margin from 96 percent of the respondent population in 2012 to 87 percent in 2013.

As far as an explanation for this declining awareness, there are several theories.

- As newer energy-efficient lamp technologies compete for wallet-share, they also compete for mind-share. As a result, CFLs may no longer be top-of-mind for some consumers, which could result in declining awareness of CFLs.

- Related to the point above, the expanding range of lamp technologies may be causing confusion among purchasers, particularly given that many CFL shapes increasingly resemble incandescent lamps (i.e., with the spiral shape "hidden" inside a reflector or globe cover). This confusion could also result in declining awareness for CFLs.

- The heightened market attention to CFLs in previous years—such as Wal-Mart's goal of selling 100 million CFLs in 2007[91] and the California IOUs' providing incentives for nearly 100 million CFLs during the 2006-2008 program cycle[92]— has waned, which could contribute to declining awareness of CFLs.

- As the range of lamp options expands, there is less retail shelf space available for each lamp technology. This decline in visibility of CFLs at the retail level (concurrent with increased visibility of LED lamps and energy-efficient incandescent lamps) may also be contributing to declining awareness.

While the explanation for the trend is unclear, recent studies in other regions of the U.S. have shown similar declines – for example, CFL awareness declined from 98 percent of the residential population in the Pacific Northwest (Idaho, Montana, Oregon, and Washington) in 2012 to 90 percent in 2013, a statistically significant change.[93] Similarly, the percentage of the Massachusetts general population who reported awareness of CFLs declined significantly between 2010 and 2012 (from 94% to 87%).[94]

91 Wal-Mart, 2006 and 2007.
92 KEMA, Inc., 2010.
93 DNV KEMA, 2013a.
94 NMR Group, 2012.

Results for CFL purchase rates among PG&E, SCE, and SDG&E residential electric customers over time are more difficult to compare given the challenges related to question phrasing in the 2012 and 2013 surveys described above. In the earlier studies, purchase rates demonstrate trends similar to those of awareness rates, with significant increases in 2003 and 2006. Although not directly comparable to earlier study results, the CFL purchase rates reported in the 2012 and 2013 surveys (based on CFL purchases since January 1, 2010 and respondents with 1 or more CFLs installed in their homes) show a decline between 2012 and 2013 just as with awareness rates. These results mirror the decline in CFL stock as a percentage of total lamp stock in California retail stores during the same timeframe (see section 4.2.2 above). In the same Pacific Northwest study as mentioned above, CFL purchase rates also declined between 2012 and 2013 (from 77% to 70%).[95] In the aforementioned Massachusetts study, the percentage of customers who reported that they had ever used CFLs dropped from 78 percent in 2010 to 64 percent in 2012.[96]

The reasons for declining purchase rates are also unclear and could be similar to the reasons for declining CFL awareness rates. Another possibility is that CFL purchase rates are gradually tapering off as consumers purchase and install more CFLs. An earlier study[97] noted the number of CFLs purchased by PG&E and SCE customers declined annually between 2006 and 2008 and suggested that possible explanations may have included "the increased number of bulbs that consumers have in storage as well as the efforts by some IOUs participating in the ULP to discourage use of the larger multi-packs.[98]"Given their long lifetimes relative to incandescent lamps, consumers may be purchasing fewer CFLs because they do not feel they need more CFLs (i.e., because they already have several installed and in storage). Consumers may also be shifting toward purchases of other lamp technologies instead of CFLs. Section 5.3 (Lamp Purchasing Decisions) provides more detail regarding consumers' motivations for purchasing—and not purchasing—CFLs.

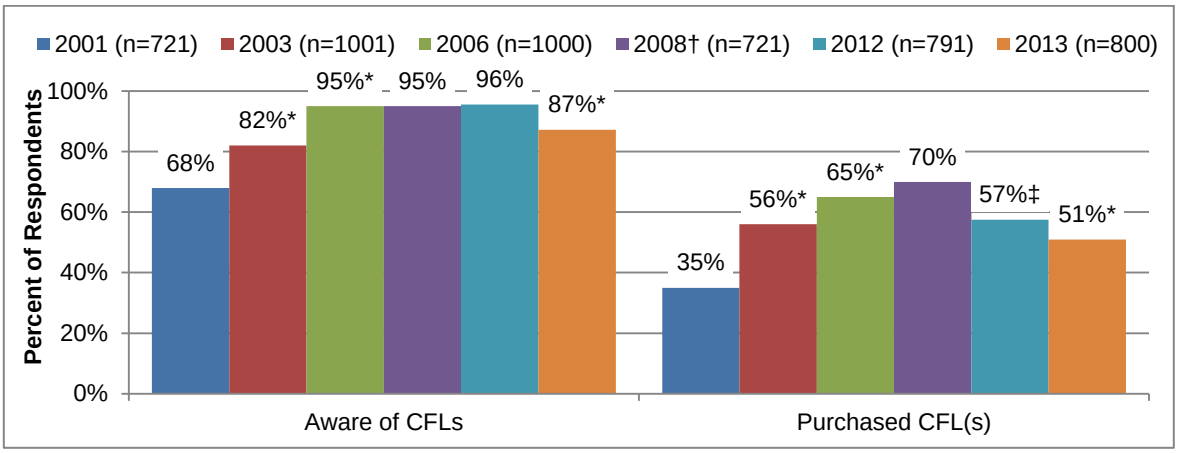
95 DNV KEMA, 2013a.

96 NMR Group, 2012. Note that the study does not address whether respondents have "ever purchased" CFLs and instead asks whether respondents have ever used of CFLs. These two groups (CFL users and CFL purchasers) are not exactly the same, but may be considered rough approximations that are useful for comparison.

97 KEMA, Inc., 2009a.

98 *Ibid*., page 6-6.

Figure 44: CFL Awareness and Purchases Among PG&E, SCE, and SDG&E Residential Electric Customers Over Time, 2001—2013 (Consumer Telephone Surveys)

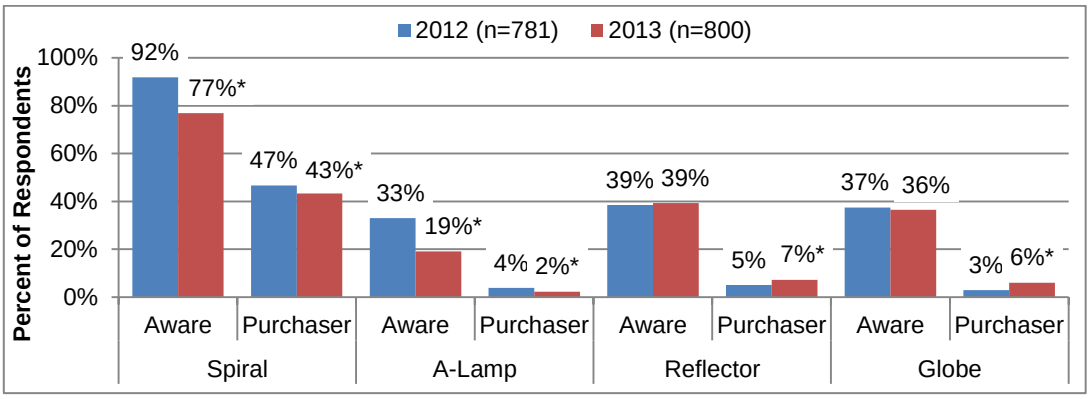


* Difference from prior study period is statistically significant.
† PG&E and SCE customers only.
‡ Results not comparable with prior study periods.
2001—2008 data sources: KEMA, Inc., 2009a; Itron and KEMA Inc., 2007; KEMA-XENERGY and Quantum Consulting, 2003; and XENERGY Inc., 2002.

5.2.2 CFL Awareness and Purchases by Lamp Shape

The general population components of the 2012 and 2013 surveys of PG&E, SCE, and SDG&E residential electric customers included unprompted and prompted questions to identify whether respondents were aware of specific CFL shapes. These shapes included the four CFL HIMs: spiral, reflector, A-lamp and globe. The survey also included questions to identify purchasers of these lamps (subject to the same limitations described above). Figure 45 below provides an overview of CFL awareness and purchase rates in 2012 and 2013 in the respondent population by lamp shape. As shown, awareness and purchase rates both declined by statistically significant margins between 2012 and 2013 for spiral CFLs and A-lamps (the two most common CFL shapes). Awareness remained unchanged between years for reflector and globe CFLs, while the purchase rates for these technologies increased by small but statistically significant margins between years (from 5% to 7% for reflector CFLs and from 3% to 6% for globe CFLs).

Figure 45: CFL Awareness and Purchases Among PG&E, SCE, and SDG&E Residential Electric Customers by Lamp Shape, 2012 and 2013 (Consumer Telephone Surveys)

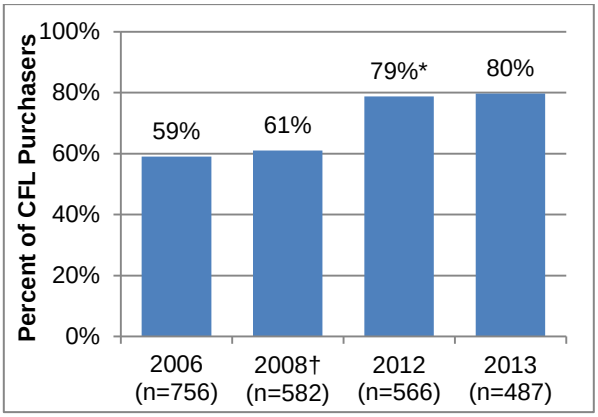


* Difference from prior study period is statistically significant.

5.2.3 CFL Storage Over Time

Figure 46 shows that four out of five CFL purchasers were storing CFLs as of 2013, up significantly from only 3 out of 5 purchasers in 2008. There were no statistically significant changes in the percentage of CFL purchasers in PG&E's, SCE's, and SDG&E's electric service territories who were storing CFLs between 2006 and 2008 or between 2012 and 2013.

Figure 46: Percent of CFL Purchasers Storing 1 or More CFLs Among PG&E, SCE, and SDG&E Residential Electric Customers, 2006, 2008, 2012 and 2013 (Consumer Telephone Surveys)



* Difference from prior study period is statistically significant.
† PG&E and SCE customers only.
2006 and 2008 data sources: Itron and KEMA Inc., 2007 and KEMA, Inc., 2009a.

During the same period (from 2006 to 2013), the number of CFLs in storage among CFL purchaser households increased from an average of 2.5 CFLs to an average of 5.5 CFLs (Table 16).[99] The average number of lamps in storage increased between 2006 and 2008 and again between 2008 and 2012 by

[99] It is important to note that these data are based on consumer self-reports from telephone surveys. As such, the point estimates are less reliable than the directionality of changes between years.

statistically significant margins. The same pattern was apparent in the average number of CFLs installed among CFL purchasers between 2006 and 2013. While the overall number of installed and stored lamps increased in this timeframe, the number of CFLs in storage remained in the narrow range of approximately 35 to 41 percent of the number of CFLs installed. In other words, in 2006, 2008, 2012, and 2013, there were roughly two and a half to three times as many CFLs installed as in storage in CFL purchaser households.

Table 16: Average Number of CFLs Installed and in Storage Among CFL Purchasers in PG&E, SCE, and SDG&E Residential Electric Service Territories, 2006, 2008 and 2013 (Consumer Telephone Surveys)

	Among CFL Purchasers			
Year	Average # CFLs Installed	Average # CFLs in Storage	Stored CFLs as % of Installed CFLs	n
2006	6.8	2.5	37%	756
2008†	10.3*	3.6*	35%	582
2012	13.5*	4.9*	36%	566
2013	13.3	5.5	41%	487

* Difference from prior study period is statistically significant.
† PG&E and SCE customers only.
2006 and 2008 data sources: Itron and KEMA Inc., 2007 and KEMA, Inc., 2009a.

When asked why they were storing extra CFLs, the majority of CFL purchasers in 2006, 2008, 2012, and 2013 stated that it was so they would have some on hand if an installed bulb burned out. The percentage of purchasers who cited this reason declined significantly from 2006 to 2008, and again from 2008 to 2012, but was cited by more than half of purchasers across the four study periods. In 2012 and 2013, roughly fifteen percent of CFL purchasers stated that they were storing CFLs because they purchased more than they needed, down significantly from 2008. Other responses were mixed.

Table 17: Reasons for Storing CFLs Among CFL Purchasers in PG&E, SCE, and SDG&E Residential Electric Service Territories Who Were Storing CFLs, 2006, 2008 and 2013 (Consumer Telephone Surveys)

	% of Purchasers			
Reasons	2006	2008†	2012	2013
So I have them on hand if a bulb burns out	77%	70%*	54%*	62%
Purchased more CFLs than I needed	19%	23%	16%*	14%
Bought them on sale	6%	11%*	9%	7%
Can't / won't use them in certain applications	3%	4%	1%	2%
Other reasons†	7%	13%*	27%*	24%
Don't know	2%	1%	0%	2%
Overall	**460**	**582**	**429**	**377**

Note: Interview question allowed multiple responses.
* Difference from prior study period is statistically significant.
† PG&E and SCE customers only.
2006 and 2008 data sources: Itron and KEMA Inc., 2007 and KEMA, Inc., 2009a.

5.2.4 CFL Disposal

During the consumer telephone survey, interviewers asked respondents who currently had CFLs installed in their homes at the time of the 2012 survey[100] whether they ever had any CFLs that they needed to dispose. Approximately half of the respondents said they had (50%; n=942). More than one-third reported that they simply threw their unwanted CFLs in the trash (38%;). A slightly smaller proportion reported that they disposed of their unwanted CFLs properly—by taking them to a recycling center, taking them to a community hazardous waste disposal center, or returning them to a retail store. Four percent of respondents who disposed of one or more CFLs placed them into their standard household recycling bin.

Table 18: How Respondents Disposed of CFLs Among PG&E, SCE, and SDG&E Residential Electric Customers with One or More CFL(s) Installed and Who Have Disposed of One or More CFLs, 2012 (Consumer Telephone Surveys)

Response	Percent of Respondents (n=493)
Threw them away / Threw them in the trash	38%
Took them to a recycling center	14%
Took them to a community hazardous waste disposal center	11%
Returned them to a retail store	9%
Haven't disposed of them yet	7%
Put them in the standard glass/paper/plastic recycling bin	4%
Gave them away	2%
Other response	9%
Don't know	7%

Note: Survey question allowed multiple responses.

Interviewers also asked respondents who had CFLs installed in their homes at the time of the 2012 survey whether they had seen or heard information regarding how they should dispose of CFLs (n=942), and approximately 42 percent reported that they had. Of these, one-fourth of respondents reported that they had seen or heard that CFLs must be recycled (25%; Table 15). This proportion represents only 12 percent of the population of PG&E, SCE, and SDG&E residential electric customers. More than a third of respondents mentioned that CFLs contain harmful materials (i.e., that they contain mercury, are considered hazardous waste, or contain dangerous materials).

[100] The 2013 survey did not include the battery of questions related to CFL disposal.

Table 19: What Respondents Have Seen or Heard Regarding Proper CFL Disposal Among PG&E, SCE, and SDG&E Residential Electric Customers with One or More CFL(s) Installed and Who Have Seen or Heard Information Regarding CFL Disposal, 2012 (Consumer Telephone Surveys)

Response	Percent of Respondents (n=418)
CFLs need to be recycled	25%
CFLs contain harmful/dangerous materials	16%
Do not throw CFLs into the trash	16%
CFLs contain mercury	14%
CFLs should be returned to a retail store	10%
CFLs are hazardous waste	8%
CFLs need to be taken somewhere to dispose of them	7%
CFLs need to be wrapped in paper/plastic before being thrown away	4%
Other response	11%
Don't know	8%

Note: Survey question allowed multiple responses.

5.3 Lamp Purchasing Decisions

Section 5.3 reviews lamp purchasing decisions including the reasons cited by consumers for choosing specific lamp technologies (CFLs or LED lamps), reasons for not selecting alternative lamp technologies, and timing of lamp purchasing decisions (i.e., planned versus impulse purchases). Key findings include:

- A greater percentage of CFL purchasers and LED lamp purchasers both cited energy savings as their reasons for choosing their respective lamp technologies more than any other reason. More LED lamp purchasers cited length of lamp life or dimmability as reasons for purchasing LED lamps than CFL purchasers cited these reasons for purchasing CFLs, but more CFL purchasers cited low prices or prior experience with the technology as reasons for purchasing CFLs than LED lamp purchasers cited these as reasons for purchasing LEDs.
- Lamp shoppers who did *not* purchase LED lamps cited lamp price far more often than any other reason (more than half of LED non-purchasers) followed by a lack of familiarity with the technology. Reasons cited by CFL non-purchasers as reasons for *not* selecting CFLs were more scattered.
- Three-quarters of intercepted lamp purchasers during the 2012 and 2013 shopper intercept surveys told interviewers that they had planned to purchase replacement lamps that day, while one-quarter of shoppers made "impulse purchases." Impulse purchasing was lowest among halogen and incandescent lamp purchasers (16-18% of purchasers said they hadn't planned to buy replacement lamps while shopping on the day we interviewed them) and highest among LED lamp purchasers (35%).

5.3.1 Reasons for Purchasing CFLs or LED Lamps

During the in-store shopper intercept surveys fielded in 2012 and 2013, field researchers asked CFL purchasers why they chose CFLs. We also asked LED lamp purchasers why they chose LED lamps. Respondents could provide multiple reasons for their choices if they wished.

Figure 46 combines results among CFL and LED lamp purchasers and shows the top reasons CFL purchasers provided for purchasing CFLs and the top reasons LED lamp purchasers provided for

purchasing LEDs across the 2012 and 2013 survey results.[101] As shown, approximately two-thirds of respondents in both groups cited energy savings as a reason for choosing their selected technology. A similar proportion of PG&E and SCE customers cited energy savings as their reason for choosing CFLs in 2006 (66%) and in 2008 (68%).[102]

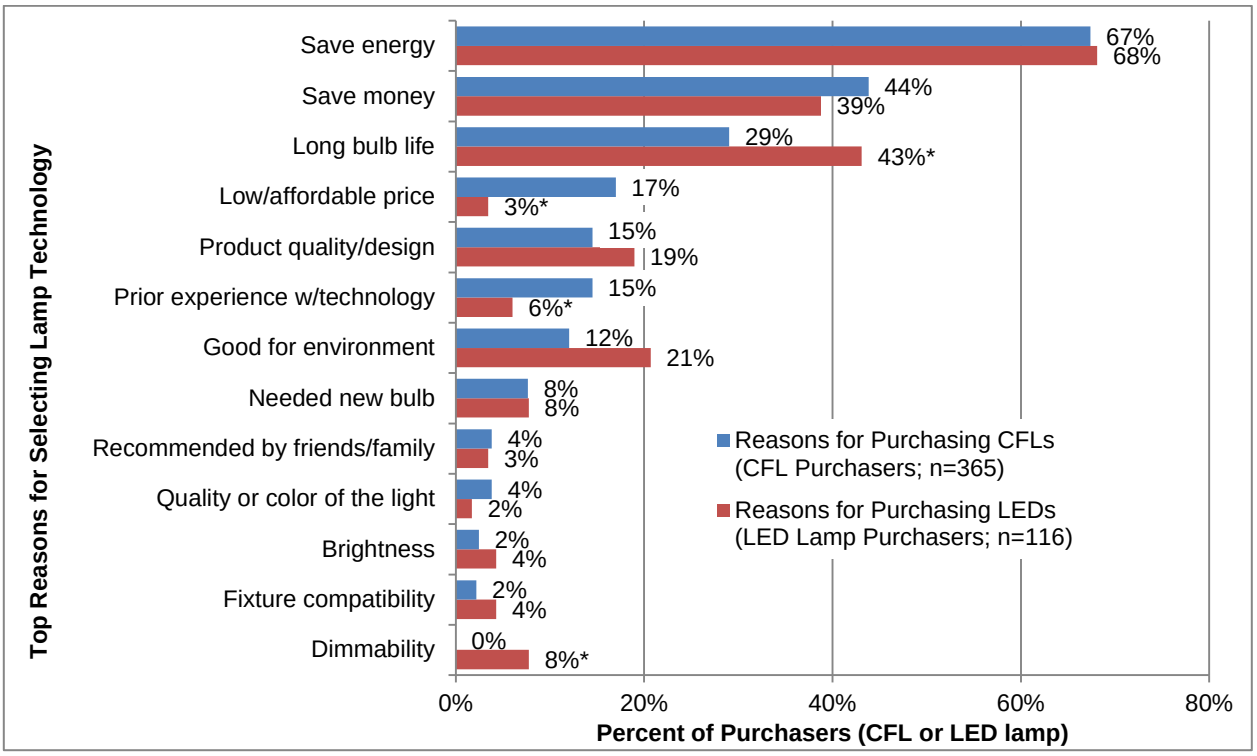
Similar proportions also mentioned money savings (44% of CFL purchasers and 39% of LED lamp purchasers), but while money savings was the second most frequently-cited reason among CFL purchasers, it was the third most frequently-cited among LED lamp purchasers. A significantly greater percentage of LED lamp purchasers cited the length of lamp life as a reason for purchasing LED lamps (43%) than CFL purchasers cited lamp life as a reason for purchasing CFLs (29%). Other noteworthy differences in the reasons provided by CFL purchasers versus LED lamp purchasers include:

- **Low or affordable price.** Not surprisingly (given that LED lamps are typically more expensive than CFLs), a significantly higher proportion of CFL purchasers mentioned this as the reason for their purchase than LED lamp purchasers (17% versus 3%, a statistically significant difference).
- **Prior experience with the technology.** Again, not surprisingly—given the relatively recent market introduction of LED lamps as compared with CFLs—a significantly greater percentage of CFL purchasers mentioned prior experience with the lamp technology than LED lamp purchasers (15% versus 6%, a statistically significant difference).
- **Dimmability.** The percentage of LED lamp purchasers who mentioned dimmability as a reason for purchasing LED lamps was significantly greater than the percentage of CFL purchasers who mentioned this as a reason for purchasing CFLs (8% versus 0%, a statistically significant difference). In fact, none of the CFL purchasers mentioned dimmability as a reason for purchasing CFLs.

101 To keep the size of the figure manageable, we show only the reasons cited by at least 4 percent of respondents in either group (CFL purchasers or LED lamp purchasers).

102 KEMA, Inc., 2009a.

Figure 47: Top Reasons for Choosing CFLs (Among CFL Purchasers) and Top Reasons for Choosing LED Lamps (Among LED Lamp Purchasers), 2012-2013 (Shopper Intercept Surveys)



* Difference from CFL Purchaser results is statistically significant at the 95 percent level of confidence.
Note: Survey questions allowed multiple responses.

5.3.2 Reasons for Not Purchasing Alternative Technologies

During the shopper intercept surveys, field researchers asked lamp purchasers who purchased any lamp technology other than CFLs (e.g., incandescent, halogen, or LED) why they did not choose CFLs. Researchers also asked purchasers who selected technologies other than LED lamps (e.g., incandescent, halogen, and CFL) why they did not choose LEDs. These questions were constrained by the availability of the alternate technology in the particular store in which the shoppers were intercepted—for example, we did not ask non-LED purchasers why they didn't choose LED lamps if LED lamps were not available in the retail channel in which they were shopping. Of purchasers who selected neither CFLs nor LED lamps, field researchers asked both questions.

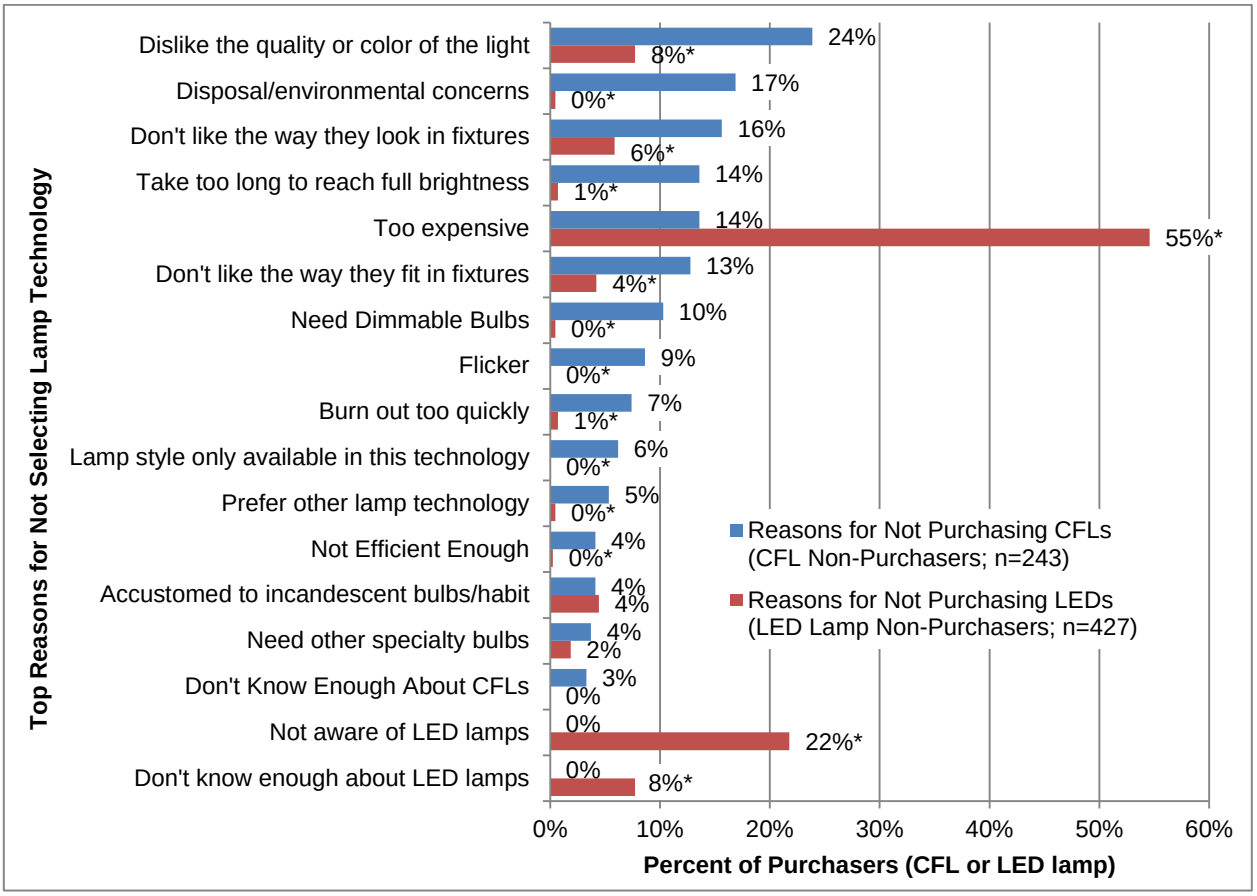
Figure 48 combines the responses to both questions across 2012 and 2013 shopper intercept survey results.[103] Results suggest that in most cases, respondents who did not choose CFLs had very different reasons for their selection than respondents who did not choose LED lamps; there were statistically significant differences in the vast majority of top responses provided by CFL non-purchasers versus LED lamp non-purchasers.

Among purchasers who did not select CFLs, the most frequently-cited reason was that they dislike the quality or color of the light (24%), while only 8 percent of respondents who did not purchase LED lamps

[103] Again, to keep the figure size manageable, we show only the reasons cited by at least 4 percent of respondents in either group (respondents who did not purchase CFLs and respondents who did not purchase LED lamps).

mentioned this reason. The most frequently-cited reason among LED lamp non-purchasers for not selecting LED lamps is that they are too expensive (55%), while this reason was provided by only 14 percent of CFL non-purchasers as reasons for not choosing CFLs. Another striking difference in results between CFL non-purchasers and LED non-purchasers is that 22 percent of LED non-purchasers stated that they did not purchase LED lamps because they are not aware of them. Obviously, none of the CFL non-purchasers cited a lack of awareness of LED lamps as a reason for not purchasing CFLs.

Figure 48: Reasons for Not Choosing CFLs (Among CFL Non-Purchasers) and for Not Choosing LEDs (Among LED Lamp Non-Purchasers), 2012-2013 (Shopper Intercept Surveys)



* Difference from Reasons for Not Purchasing CFLs is statistically significant at the 95 percent level of confidence.
Note: Survey questions allowed multiple responses.

5.3.3 Planned Versus Impulse Purchases

During the shopper intercept surveys, DNV GL field researchers asked lamp purchasers whether or not they came to the store specifically to buy lamps. As shown in Table 20, more than three-quarters of purchasers suggested that they planned to purchase replacement lamps when intercepted for the surveys, while approximately one-quarter made unplanned or "impulse" purchases.

One-third of all purchasers planned to purchase lighting and chose to purchase CFLs (32%), which represents the largest group of respondents. Another one-fourth of all purchasers planned to purchase lamps and chose to purchase incandescent lamps (25%). Of all purchasers who reported that they

planned to buy replacement lamps during the shopping occasion when they were intercepted ("planned purchase" shoppers), the majority purchased CFLs (43%), and another third of "planned purchase" shoppers chose incandescent lamps (32%). Twelve percent of "planned purchase" shoppers chose LED lamps.

Among intercepted shoppers who had lamps in their shopping carts or baskets but reported that they did not plan to purchase lamps during that shopping occasion—"impulse purchasers"—half purchased CFLs (50%). One in five impulse purchasers chose LED lamps, and another one in five chose incandescent lamps. Another 9 percent of impulse purchasers chose halogen lamps.[104]

Table 20: Total Planned Versus Impulse Purchases by Lamp Technology, 2012-2013 (Shopper Intercept Surveys)

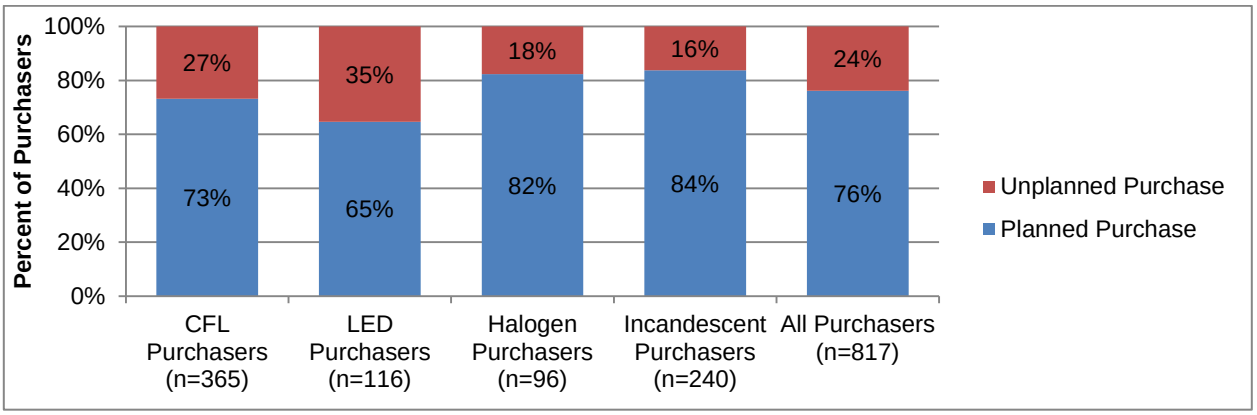
Planned to Purchase Bulb(s)?	Lamp Technology Purchased	Number of Purchasers	Number of Packages Purchased	% of Total Purchasers*	% of Purchasers by Purchase Type*
Yes	CFL	267	269	32%	43%
	LED	75	76	9%	12%
	Halogen	79	80	10%	13%
	Incandescent	201	207	25%	32%
Subtotal – Planned Purchases		***622***	***632***	***76%***	***100%***
No	CFL	98	101	12%	50%
	LED	41	42	5%	21%
	Halogen	17	17	2%	9%
	Incandescent	39	39	5%	20%
Subtotal – Impulse Purchases		***195***	***199***	***24%***	***100%***
Total		**817**	**831**	**100%**	**-**

* Results may not total 100 percent because of rounding.

As described above, approximately three-quarters of all intercepted shoppers planned to purchase replacement lamps and one-quarter made impulse purchases (76% and 24%, respectively). When we examine the customer composition—planned versus impulse purchasers—for each technology (Figure 49), results suggest a similar split among CFL purchasers: three-quarters reported that they planned to purchase replacement lamps and one-quarter reported that they did not (73% and 27%, respectively). A slightly larger percentage of LED lamp shoppers purchased the LED lamps on impulse (35%), while less than one in five halogen and incandescent lamp purchasers bought those lamp types on impulse (18% and 16%, respectively). The relatively high proportion of impulse purchases for LED lamps suggests a degree of openness among shoppers to try the new technology—perhaps if lamps catch their attention and/or if the price is acceptable.

[104] Given the relatively small sample sizes associated with halogen and LED lamp purchasers, caution should be taken when interpreting these results.

Figure 49: Planned Versus Impulse Purchasers by Lamp Technology, 2012-2013 (Shopper Intercept Surveys)



Results may not total 100 percent because of rounding.

5.4 Lamp Installation Intentions

During the shopper intercept surveys, field researchers identified purchasers of the following types of lamps:

- Spiral, A-lamp, reflector, and globe CFLs (all high impact measures [HIMs]); and
- Light-emitting diode (LED), incandescent, or halogen lamps of equivalent shapes (A-lamp, reflector, and globe lamps).

Researchers also identified whether each purchaser intended to install his or her new lamps in residential or non-residential applications. If the purchaser planned to install the lamp(s) in residential applications, field researchers then asked whether purchasers intended to install those lamps within the next week. If so, researchers asked detailed follow-up questions to gather information regarding the lamp technologies that purchasers intended to replace with their new lamps for up to two lamps per purchaser. Based on this approach, key findings include:

- Ninety percent of intercepted shoppers were purchasing CFL HIMs or incandescent, halogen, or LED lamps of equivalent shapes for residential use and planned to install them within one week of their purchases.
- Nearly 9 out of 10 incandescent lamps were purchased by shoppers intending to use them as replacements for other incandescent lamps.
- Two out of 5 CFLs were purchased with the expectation of replacing other CFLs, and shoppers expected that half would replace incandescent lamps.
    - A higher percentage of reflector CFLs were purchased with the expectation of replacing installed incandescent lamps (nearly 3 out of 5), while less than half of other CFL shapes were purchased with the intention of replacing incandescent lamps. Spiral style CFLs had the highest CFL-to-CFL replacement expectations (44% of purchased spiral CFLs were intended to replace installed CFLs).

- There were no significant demographic differences (shoppers by household income and by education) in terms of which shoppers intended to replace CFLs and which intended to replace incandescent lamps.

- Nearly half of LED lamps were purchased with the intention of replacing incandescent lamps, and more than a third with the intention of replacing CFLs.
  - A higher percentage of LED A-lamps were purchased with the intention of replacing incandescent lamps (57%) than other LED reflectors (42%) or globes (31%). More than half of LED globes were purchased with the intention of replacing installed CFL globes (but note that sample sizes were small).

- Nearly 2 out of 3 halogen lamps were purchased with the expectation of replacing incandescent lamps and only one in 5 with the intention of replacing other halogen lamps.

5.4.1 Planned Lamp Installations within One Week of Purchase

During the shopper intercept surveys, field researchers found that more than 90 percent of purchasers were acquiring CFL HIMs or incandescent, halogen, or LED lamps of equivalent shapes for residential use[105] and planned to install them within one week of their purchase—753 respondents representing approximately 1,220 lamps. Table 21 below provides details on the distribution of these lamps by technology and shelf survey phase. As shown, during the Winter 2012-2013 phase, incandescent lamps represented 35 percent of purchases as defined above (i.e., will be installed in residential applications within the next week). This percentage dropped by half to only 17 percent during the Summer 2013 phase. Purchases of all other types of lamps increased between the two phases, most notably in the LED lamp category.

An important caveat for these results is that these intercept surveys represent snapshots in time, as field researchers cannot predict exactly where and when they will encounter lamp purchasers. That is, while these shopper intercept surveys were conducted over the course of numerous hours in the retail stores, they may not represent the full suite of purchases that occur in these locations over time. The results are also un-weighted and thus do not represent (for example) the distribution of lamp sales across retail channels. While these results may not be statistically representative of lamp purchases in PG&E, SCE, and SDG&E territories over time, the data serve as directional indicators of the technologies and lamp types that consumers in these markets are purchasing and what technologies they might be replacing.

[105] The data presented in this report are not intended to provide estimate the share of lamps installed in residential versus non-residential applications. The 2010-2012 ULP impact evaluation report (WO28) estimated that approximately six to seven percent of upstream CFLs were installed in nonresidential applications. This estimate was based on onsite lighting inventory data collected for as part of the Commercial Saturation Study (CSS; WO24) and CLASS (WO21), not on shopper intercept survey results. For further detail regarding the split between residential and non-residential upstream CFLs, please refer to the WO28 impact evaluation report (DNV GL, 2014a).

Table 21: Lamps that Shoppers Planned to Install in Residential Applications within One Week of Purchase by Lamp Technology and Data Collection Period, 2012 and 2013 (Shopper Intercept Surveys)

	Number of Lamps			Percent of Lamps*		
Technology	Winter 2012-2013	Summer 2013	Overall	Winter 2012-2013	Summer 2013	Overall
Incandescent	249	87	336	35%	17%	28%
CFL	322	251	573	45%	49%	47%
LED	62	111	173	9%	22%	14%
Halogen	76	62	138	11%	12%	11%
Total	**709**	**511**	**1,220**	**100%**	**100%**	**100%**

* Note: Results may not total 100 percent because of rounding.

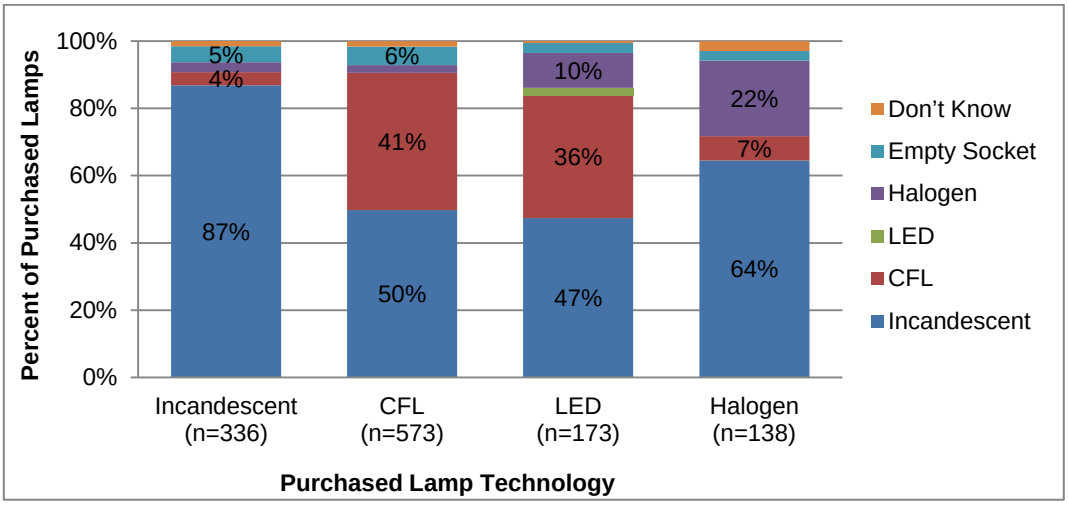
5.4.2 Lamp Technologies to be Replaced

Among respondents who purchased the relevant lamp types and planned to install them within one week, field researchers administered a battery of questions to gather information regarding the lamp technologies that purchasers intended to replace with their new lamps. Responses revealed that in some cases, shoppers were purchasing lamps to fill empty sockets (rather than to replace existing installed lamps). Figure 50 provides an overview of the results based on the type of lamp technology purchased by intercepted consumers. The x axis shows the lamp technology purchased (i.e., incandescent, CFL, LED, and halogen lamps), and the different colors within each stacked bar along represent the lamp technology that the consumer intended to replace with the new lamp (with light blue representing cases in which the lamps will be installed in empty sockets).

Results suggest that half of the CFLs purchased with the intention of being installed in one week were bought with the intention of replacing incandescent lamps, and 41 percent with intentions of replacing other CFLs. Results were similar among LED purchases, with 47 percent of LED lamps purchased with the intention of replacing incandescent lamps and 36 percent with the intention of replacing CFLs. Approximately 10 percent of the LED lamps were purchased with the intention of replacing other LED lamps. Roughly 87 percent of incandescent lamps were bought with the intention of replacing other incandescent lamps. This represents the highest proportion of lamps across the four lamp technologies that were purchased with the intention of replacing incandescent lamps, followed by halogen lamps (at 64%).

Approximately 7 percent of halogen lamps were purchased with the intention of replacing CFLs, and approximately 4 percent of incandescent lamps were purchased with the intention of replacing CFLs. Within each lamp technology, intercepted purchasers acquired 3 to 6 percent of lamps with the intention of filling empty sockets.

Figure 50: Existing Installed Lamps (and Empty Sockets) as a Percentage of Purchased Lamps by Lamp Technology, 2012-2013 (Shopper Intercept Surveys)



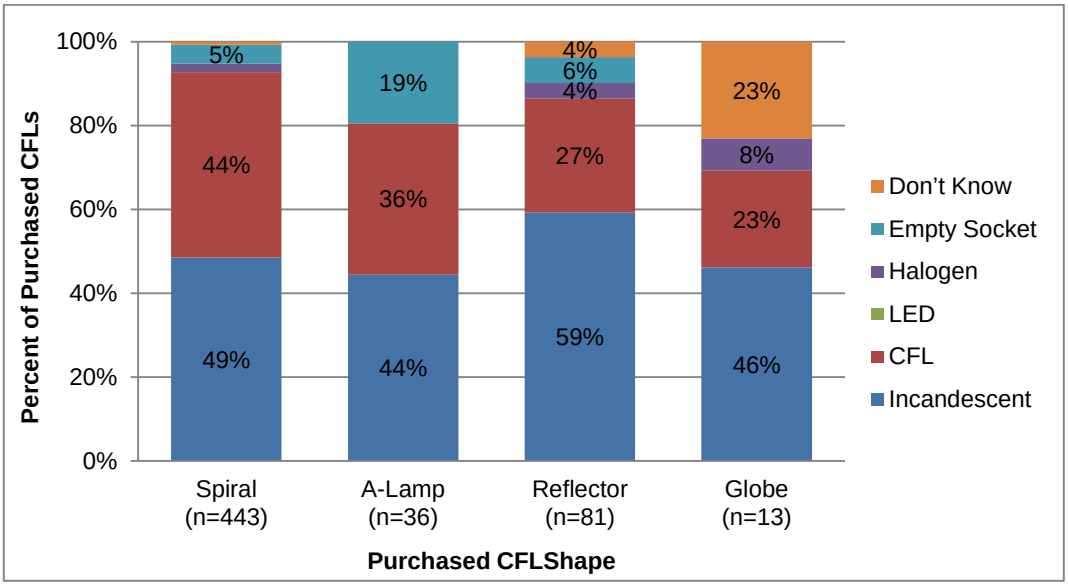
Note: Results may not total 100 percent because of rounding.

5.4.2.1 Technologies to be Replaced with CFLs

Figure 51 provides additional detail regarding installation intentions for CFLs purchased by intercept survey respondents who planned to install them in residential applications within one week. The x axis shows the CFL shape purchased (i.e., spiral, A-lamp, reflector, and globe shapes), and the different colors within each stacked bar represent the lamp technology that the shopper intends to replace with the new CFL (again, with light blue representing cases in which the lamps will be installed in empty sockets).

Figure 50 above showed that approximately 41 percent of the CFLs purchased by intercepted lamp shoppers were bought with the intention of replacing other CFLs. Results in Figure 51 suggest that CFL-to-CFL replacement intentions are highest among purchasers of spiral CFLs, with 44 percent of spiral CFLs purchased with the intention of replacing other CFLs (of any lamp shape) followed by A-lamps (with 36% of CFL A-lamps purchased with the intention of replacing other CFLs). These results suggest that greater energy savings may be obtained with CFL reflectors than spiral CFLs or CFL A-lamps, because a larger percentage of reflector CFLs (59%) are purchased with the intention of replacing incandescent lamps. However, given that there is little known regarding the actual rate of reversion to incandescent lamps for current CFL installations, caution should be taken in interpreting the results in this manner. Note that the sample size for globe CFLs is particularly small (n=13) and thus, caution should also be taken in interpreting or applying results for this CFL shape in particular.

Figure 51: Existing Installed Lamps (and Empty Sockets) as a Percentage of Purchased CFLs by CFL Shape, 2012-2013 (Shopper Intercept Surveys)

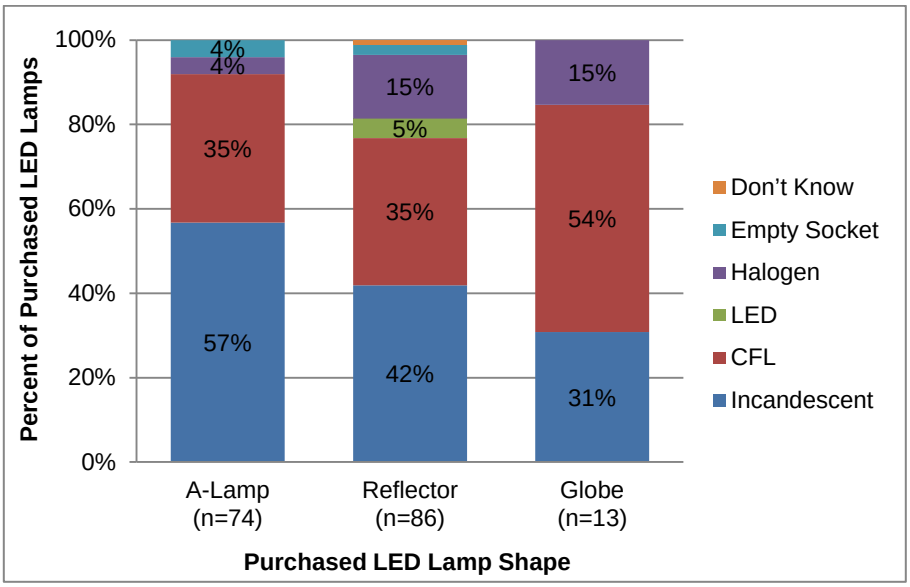


Note: Results may not total 100 percent because of rounding.

5.4.2.2 Technologies to be Replaced with LED Lamps

Figure 52 provides the same information as in Figure 51 above except for newly-purchased LED lamps instead of CFLs. Results suggest that for A-lamp and reflector LED lamps, more than one-third of these lamps were purchased with the intention of replacing CFLs. A higher percentage of LED A-lamps were purchased with the intention of replacing incandescent lamps than LED reflectors (57% versus 42%, respectively). However, when intentions involving replacement of halogen lamps are also considered along with these results, the data suggest that similar proportions of LED A-lamps and LED reflector lamps are purchased with the intention of replacing incandescent or halogen lamps (approximately 61% and 57%, respectively). Note that the sample size for LED globe lamps is particularly small (n=13) and thus, caution should be taken in interpreting or applying result for this LED lamp shape.

Figure 52: Existing Installed Lamps (and Empty Sockets) as a Percentage of Purchased LED Lamps by LED Lamp Shape, 2012-2013 (Shopper Intercept Surveys)



Note: Results may not total 100 percent because of rounding.

5.5 Consumer Awareness of EISA

The 2012 and 2013 consumer telephone surveys included three questions to gauge consumer awareness of the Energy Independence and Security Act of 2007 (EISA), including:

- Are you aware of any legislation in the United States that may affect the availability of certain types of light bulbs?
- The U.S. government adopted legislation that will phase out most traditional incandescent bulbs by 2014. Before today, were you aware of this legislation?
- As part of this legislation, California began phasing traditional 100-Watt incandescent light bulbs out of retail stores at the beginning of 2011. Before today, were you aware that traditional 100-Watt incandescent bulbs are being phased out in California?

Key findings include:

- Awareness of legislation that will affect lamp availability declined among PG&E, SCE, and SDG&E residential electric customers between 2012 and 2013 to 29 percent of respondents, but there were no changes in awareness of legislation that will phase out most traditional incandescent lamps by 2014 or that traditional 100-watt incandescent lamps are being phased out of the market (which remained at roughly 40% and 35% of respondents, respectively).
- More than half of customers plan to switch to a different lamp technology when traditional 100-watt incandescent lamps are no longer available.

5.5.1 Awareness of EISA

As shown in Table 22 below, there were no statistically significant changes in awareness with regard to the latter two questions above between 2012 and 2013. However, there is a significant difference between 2012 and 2013 results in terms of consumer awareness of legislation that will affect lamp availability: 37 percent of 2012 survey respondents were aware compared to only 29 percent in 2013. The reason for this decline in general awareness of the legislation is unclear, but it's possible that awareness has begun to decline because the legislation was first implemented in California several years ago (in 2011) and thus may no longer be top-of-mind among respondents. Results suggest that the overall trend was driven by declining awareness among PG&E and SDG&E electric service customers in particular, as awareness in among SCE electric service customers did not change between 2012 and 2013 (35% in 2012 and 34% in 2013).

Table 22: Awareness of EISA and its Implications Among PG&E, SCE, and SDG&E Residential Electric Customers, 2012 and 2013 (Consumer Telephone Surveys)

	Percent of Respondents Who Are Aware	
Aware…	**2012 (n=791)**	**2013 (n=800)**
…of legislation that will affect lamp availability?	37%	29%*
…of legislation that will phase out most traditional incandescent lamps by 2014?	43%	40%
…that traditional 100-watt incandescent lamps are being phased out?	32%	35%

* Difference from prior study period is statistically significant.

5.5.2 Availability of Traditional 100-Watt Incandescent Lamps

The 2012 and 2013 consumer telephone surveys also asked respondents whether they shopped for any traditional 100 watt incandescent lamps since 2011, and if so, what types of lamps they ultimately purchased. Roughly 20 percent of respondents reported that they had shopped for any traditional 100 watt incandescent lamps in both survey phases. Of these, 58 percent of 2012 respondents reported that they were ultimately able to purchase them. In 2013, this percentage declined to less than half of customers: only 48 percent of 2013 respondents who reported having shopped for traditional 100 watt incandescent lamps since 2011 ultimately purchased them. Of those who shopped for but did not ultimately purchase traditional 100 watt incandescent lamps, at least three out of five reported that they did not purchase the lamps in both survey phases because they were unable to find them.

5.5.3 Purchasing Plans When Traditional Incandescent Lamps Are No Longer Available

The survey also asked respondents what they planned to do when traditional 100 watt incandescent lamps are no longer available—would they switch to a new lamp type, or keep using traditional incandescent lamps but switch to a lower wattage? As shown in Table 23, there were no statistically significant differences in results between 2012 and 2013 across the three electric IOU service territories. In both years, just over half of respondents reported that they plan to switch to a new type of light bulb when traditional 100 watt incandescent lamps are no longer available, and roughly one-fourth reported that they will continue to use traditional incandescent lamps but switch to a lower wattage.

Table 23: Planned Action When Traditional 100 Watt Incandescent Lamps are No Longer Available Among PG&E, SCE, and SDG&E Residential Electric Customers, 2012 and 2013 (Consumer Telephone Surveys)

	Percent of Respondents	
Planned Action	**2012 (n=791)**	**2013 (n=800)**
Switch to a new type of light bulb	56%	54%
Keep using traditional light bulbs but switch to a lower wattage	27%	31%
Other response	14%	10%
Don't know	11%	9%
Overall	**100%**	**100%**

6. MARKET PENETRATION

This section of the report provides an overview of the number and distribution of light sockets among households in PG&E, SCE, and SDG&E electric service territories ("the study area") in California in 2009 and 2012 as well as details regarding lamp installation and storage in those households. In this section, percentages represent the total weighted number of sockets or lamps across all California households that receive electric service from PG&E, SCE, and SDG&E (calculated via a ratio estimation approach). Analysts calculated average household socket counts (by technology, base type, etc.) by weighting total socket counts across the weighted number of households in each reporting category. Appendix D provides additional market penetration data tables.

6.1 Sockets per Household

Between 2009 and 2012, the average number of light sockets per household among PG&E, SCE and SDG&E residential electric customers decreased by roughly 1 socket per household across all housing types (from an average of 47.8 per household in 2009 to 46.7 in 2012). Table 24 shows the total number of household sockets, the percentage of total sockets, and the average number of sockets per household by dwelling type among PG&E, SCE, and SDG&E residential electric customers in 2009 and 2012. The largest change between years was a 15-percent increase in the total number of sockets comprised by multifamily households, which likely reflects the increasing number of multifamily units available in California over the past several years (see, e.g., Cassidy Turley, 2013).

Despite this increase, single family homes still comprised the largest share of total household sockets in the study area in 2012 (more than 80%). In 2012, the average number of sockets per household was 46.7, down by approximately 1 from 2009. The average number of sockets per household decreased by 4 in mobile homes (from roughly 39 to 35) and by 3 in single family homes (from roughly 59 to 56 lamps), but increased by approximately 3 lamps per household in multifamily homes (from approximately 22 to 25 lamps, on average). In 2009, approximately 3 percent of household sockets were empty (nearly 16 million sockets) and in 2012, 2 percent were empty (more than 11 million sockets). Appendix D provides further detail regarding technology by dwelling type and installation location by dwelling type (in Table 124 and Table 125, respectively).

Table 24: Total Households, Total Sockets, Percent of Sockets, and Average Number of Sockets per Household by Dwelling Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)

	2009				2012			
Dwelling Type	Total Households (Millions)	Total Sockets (Millions)	% of Total Sockets	Avg # Sockets per Household	Total Households (Millions)	Total Sockets (Millions)	% of Total Sockets	Avg # Sockets per Household
Single Family	6.9	401.9	85.4%	58.6	7.0	389.6	83.5%	56.0
Multifamily	2.8	60.7	12.9%	21.7	2.8	69.8	15.0%	24.7
Mobile Home	0.2	8.1	1.7%	39.3	0.2	7.3	1.6%	34.8
Total	**9.9**	**470.7**	**100.0%**	**47.8**	**10.0**	**466.7**	**100.0%**	**46.7**

Number of households in sample: 2009 = 1,232; 2012 = 1,987.
Note: Column values may not sum to "Total" because of rounding.

6.2 Lamp Installation

This section reviews characteristics of the lamps installed in households in PG&E, SCE, and SDG&E electric service territories during 2009 and 2012. We also explore details regarding the household locations and fixtures in which lamps are installed and the types of controls associated with them. Key findings include:

- There was little change in the total quantity of lamps installed in PG&E, SCE, and SDG&E electric service territories between 2009 and 2012 or in the average number of lamps installed per household. While incandescent remained the dominant lamp technology in 2012, the number of incandescent lamp installations decreased while the number of CFLs increased, both by roughly 4 lamps per household, on average.
- Incandescent lamps comprised more than half of all lamps installed in each household location in 2012 except in kitchens and exterior locations. Incandescent lamps represented less than half of lamps controlled by on/off switches in 2012 (47%) but 3 out of 5 lamps controlled by 3-way switches and almost 7 out of 10 lamps controlled by dimmer switches. CFLs comprised a third of lamps with on/off or 3-way controls but only 5 percent of those controlled by dimmer switches, likely a result of quality issues associated with dimmable CFLs.
- LED lamps comprised a negligible share of installed lamps in 2012, but LED lamp installations increased fifteen-fold between 2009 and 2012. LED lamps represented very small shares of lamps installed in all room types but in kitchens, they comprised a noteworthy 3 percent of all installed lamps.
- Within each lamp technology, one lamp shape typically dominates among installed lamps: for incandescent lamps, A-lamps are the dominant shape; for CFLs, spirals; for fluorescents, linear tubes; and for halogens, reflectors. Across all technologies, A-lamps represented roughly one-fourth of all lamps installed in the study area in 2012, with spiral lamps—all of which are CFLs—a close second (23% of installed lamps).
- Six household locations—bathrooms, bedrooms, kitchens, living rooms, exterior areas, and hallways—represented 4 out of 5 lamps installed in 2012. Six fixture types—wall-mounted fixtures, ceiling-mounted fixtures, recessed fixtures (e.g., ceiling cans), floor and table lamps, suspended fixtures, and ceiling fans—accounted for more 9 out of 10 installed lamps in 2012.
- A-lamp replacements (CFL spirals and incandescent, CFL, and LED A-lamps) represented roughly half of all lamps installed in 2012 (48%). Spiral CFLs and incandescent A-lamps each represented roughly 10 to 11 lamps, on average, installed in study-area households in 2012. Roughly one-quarter of A-lamp replacement lamps were installed in bedrooms in 2012 (24%). Nearly half were installed in ceiling-mounted and wall-mounted fixtures (24% each).
- Incandescent, CFL and LED reflector lamps together represented 14 percent of all lamps installed in the study area in 2012, or roughly 7 per household. One quarter of these were installed in kitchens (25%) and four out of 5 were installed in recessed fixtures (e.g., recessed cans; 79%). On/off switches controlled roughly 80 percent of reflector lamps installed in 2012 compared to more than 90 percent for A-lamp replacements and globe lamps; dimmer switches controlled 20 percent of reflector lamps installed in 2012.

- Globe lamps (including incandescent, CFL, and LED globes) represented 8 percent of all lamps installed in 2012, or roughly 3 to 4 lamps per household. Nearly three-quarters of these were installed in bathrooms (74%) and three-quarters were installed in wall-mounted fixtures (76%) such as bath bars.

6.2.1 Lamp Installation by Technology

Table 25 shows the total number of lamps installed in the study area in 2009 and 2012 as well as the percentage of total lamps and average number of lamps installed per household by lamp technology. On average, the total number of lamps installed per household was roughly 46 in each year. As shown, the number of incandescent lamps installed among PG&E, SCE, and SDG&E residential electric customers declined by nearly a third between 2009 and 2012 (from 56% of all installed lamps to 49%), offset by a concurrent increase in CFLs from 22 percent of lamps installed in 2009 to 30 percent of lamps installed in 2012 (an increase of more than one-third). The average number of incandescent lamps per household dropped by 4 lamps (from roughly 26 to 22 lamps), while the average number of CFLs installed per household increased by roughly 3 lamps. The number of LED lamps installed in 2012 remained low compared to other technologies (roughly 5.5 million lamps installed) but increased more than fifteen-fold over 2009. Halogen lamp installations increased by approximately 2 million overall but still comprised less than 10 percent of all installed lamps in 2012 and an average of 4 lamps per household.

Table 25: Total Lamps and Average Number of Lamps Installed per Household by Technology Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)

	2009			2012		
Technology	Total Lamps (Millions)	% of Total Lamps	Avg # Lamps per Household	Total Lamps (Millions)	% of Total Lamps	Avg # Lamps per Household
Incandescent	254.2	55.9%	25.8	223.1	49.0%	22.3
CFL	101.6	22.3%	10.3	136.0	29.9%	13.6
Fluorescent	55.9	12.3%	5.7	50.7	11.1%	5.1
Halogen	37.4	8.2%	3.8	39.5	8.7%	4.0
LED	0.4	0.1%	0.04	5.5	1.2%	0.5
Other	5.6	1.2%	0.6	0.5	0.1%	0.1
Total	**455.0**	**100.0%**	**46.2**	**455.4**	**100.0%**	**45.6**

Number of households in sample: 2009 = 1,232; 2012 = 1,987.
Note: Column values may not sum to "Total" because of rounding.

6.2.2 Lamp Installation by Technology and Lamp Shape

This section provides an overview of lamp installation by technology and lamp shape across all technologies and shapes identified among PG&E, SCE, and SDG&E customers as well as for key lamp technology/lamp shape combinations.

6.2.2.1 All Technologies

In both 2009 and 2012, one lamp shape dominated installations within each technology except for LED lamps. Reflectors accounted for roughly 40 percent of all halogen lamps installed in both years, A-lamps for roughly half of all incandescent lamps installed, spirals for roughly three-quarters of all CFLs installed, linear tubes for more than 90 percent of all fluorescent lamps installed (Table 26 and Table 27). Across all

technologies, the percentage of installed lamps comprised by A-lamps decreased by nearly 4 percentage points (from 29 to 25 percent of all installed lamps), while the percentage of spiral lamps installed—all CFLs—increased by nearly 7 percentage points (from 16 to 23 percent of installed lamps).

LED A-lamps comprised less than 0.1 percent of all installed lamps in 2009 but increased to nearly 23 percent of LED lamps in 2012. Up from roughly 17 percent in 2009, reflector LED lamps comprised more than 42 percent of all LED lamps in 2012 (likely as a result of their dominance in the LED lamp market; see section 3.2.1 above). Because of fairly low penetration of LED lamps in 2012 (and even lower penetration in 2009), LED lamp installations were more scattered among different lamp shapes and there were larger shifts between 2009 and 2012 in the shapes of LED lamps installed than among lamp shapes within other technologies.

The number of installed halogen lamps increased by roughly 6 percent between years, with changes of less than 2 percent between years within most halogen lamp shapes. Given the influx of EISA-compliant halogen lamps into California's market as a result of AB 1109, it is somewhat surprising that a larger percentage of halogen lamps are not comprised by A-lamps and that the share of A-lamps among halogen lamps actually declined between years. The reasons for this change are unclear.

Table 26: Percentage of Total Lamps Installed by Technology and Lamp Shape Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

Lamp Shape	2009						
	Incand	CFL	Fluor	Halogen	LED	Other	Overall
A-lamp	50.0%	2.5%	0.0%	2.2%	0.0%	2.7%	28.7%
Spiral	0.0%	72.4%	0.0%	0.0%	0.0%	0.0%	16.2%
Reflector	15.3%	7.6%	0.0%	39.6%	17.4%	8.9%	13.6%
Linear Tube	0.7%	3.3%	90.4%	11.3%	0.0%	0.8%	13.2%
Decorative	20.0%	1.8%	0.0%	0.0%	24.2%	0.0%	11.6%
Globe	13.7%	3.9%	0.0%	0.0%	0.0%	1.3%	8.6%
MR-16	0.0%	0.0%	0.0%	27.1%	2.3%	0.0%	2.2%
U-Bend	0.0%	7.5%	0.5%	0.0%	0.0%	0.1%	1.7%
Bi-Pin	0.0%	0.0%	0.0%	18.6%	27.5%	0.0%	1.6%
Circline	0.0%	0.0%	8.1%	0.0%	0.0%	0.0%	1.0%
Bullet or Post	0.0%	0.8%	0.0%	0.0%	0.0%	0.3%	0.2%
Other	0.3%	0.2%	1.0%	1.2%	28.6%	85.8%	1.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
n	**254,164,281**	**101,567,373**	**55,939,277**	**37,404,976**	**362,276**	**5,552,554**	**454,990,737**

Note: Column values may not sum to "Total" because of rounding.

Table 27: Percentage of Total Lamps Installed by Technology and Lamp Shape Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

Lamp Shape	2012						
	Incand	CFL	Fluor	Halogen	LED	Other	Overall
A-lamp	48.4%	3.4%	0.0%	1.6%	22.5%	71.2%	25.2%
Spiral	0.0%	77.3%	0.0%	0.0%	0.0%	0.0%	23.1%
Reflector	16.0%	8.8%	0.0%	40.7%	42.1%	6.5%	14.5%
Linear Tube	0.2%	0.9%	91.2%	8.5%	4.1%	1.7%	11.3%
Decorative	21.1%	1.1%	0.0%	1.2%	12.0%	0.6%	10.9%
Globe	13.8%	2.7%	0.0%	0.0%	3.0%	0.0%	7.6%
MR-16	0.0%	0.0%	0.0%	25.5%	0.0%	3.6%	2.2%
U-Bend	0.0%	5.1%	2.8%	0.0%	0.0%	0.0%	1.8%
Bi-Pin	0.0%	0.0%	0.0%	19.8%	0.0%	0.0%	1.7%
Circline	0.0%	0.0%	6.0%	0.0%	0.0%	0.0%	0.7%
Bullet or Post	0.4%	0.7%	0.0%	0.0%	0.0%	0.0%	0.4%
Other	0.1%	0.0%	0.0%	2.7%	16.3%	16.5%	0.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
n	**223,125,879**	**136,034,233**	**50,744,685**	**39,477,453**	**5,487,016**	**524,192**	**455,393,458**

Note: Column values may not sum to "Total" because of rounding.

6.2.2.2 Key Technologies and Lamp Shapes, 2012

Table 28 below shows the total number of installed lamps, the percentage of total, and the average number of lamps installed per household by technology and lamp shape in 2012. As shown, the total and average number of incandescent A-lamps and spiral CFLs installed are similar, with roughly 3 million more incandescent A-lamps installed than spiral CFLs, and roughly 1 more incandescent A-lamp installed per household, on average, compared to spiral CFLs. Together, A-lamps of all technologies and spiral CFLs represented nearly half of all lamps installed per household among PG&E, SCE and SDG&E residential electric customers in 2012 (48%, or roughly 220 million lamps). Reflectors represented 14 percent of all installed lamps (approximately 66 million lamps) and globes, another 8 percent (nearly 35 million lamps).

As described in previous chapters of this report, CFL spirals, A-lamps, reflectors, and globes were considered high-impact measures (HIMs) in the impact evaluation of the 2010-2012 ULP. Across all technologies, these lamp shapes represented two-thirds of all installed lamps in 2009 (67%) and roughly 70 percent of all installed lamps in 2012. As such, throughout the remaining sections of Chapter 6, we provide additional detail on lamp installations not only at the technology level but also for these key lamp shapes by technology (under the heading of "Key Technologies and Lamps Shapes"). We include spiral CFLs with A-lamp technologies in an "A-lamp replacement" category since spiral CFLs and A-lamps may be used interchangeably.

Table 28: Total Lamps and Average Number of Lamps Installed per Household by Lamp Shape Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)					% of Total Lamps Installed					Avg # Lamps Installed per Household				
Lamp Shape	**Inc**	**CFL**	**LED**	**Other**	**Over-all**	**Inc**	**CFL**	**LED**	**Other**	**Over-all**	**Inc**	**CFL**	**LED**	**Other**	**Over-all**
A-Lamp	108.0	4.7	1.2	1.0	115.0	50%	2%	0%	1%	29%	10.8	0.5	0.12	0.1	11.5
Spiral	0.0	105.1	0.0	0.0	105.1	0%	72%	0%	0%	16%	0.0	10.5	0.00	0.0	10.5
Reflector	35.7	11.9	2.3	16.1	66.0	15%	8%	17%	15%	14%	3.6	1.2	0.23	1.6	6.6
Globe	30.8	3.6	0.2	0.0	34.6	14%	4%	0%	0%	9%	3.1	0.4	0.02	0.0	3.5
Other	48.6	10.7	1.8	73.6	134.7	21%	14%	83%	83%	33%	4.9	1.1	0.2	7.4	13.5
Total	**223.1**	**136.0**	**5.5**	**90.7**	**455.4**	**100%**	**100%**	**100%**	**100%**	**100%**	**22.3**	**13.6**	**0.55**	**9.1**	**45.6**

Note: Column values may not sum to “Total” because of rounding.

6.2.3 Lamp Installation by Technology and Location

This section provides an overview of lamp installation by technology and installation location (both indoors and outdoors). We first provide the information across all technologies and shapes identified among PG&E, SCE, and SDG&E customers in 2009 and 2012 and then for key lamp technology/lamp shape combinations (A-lamp replacement lamps, reflector lamps, and globe lamps) in 2012.

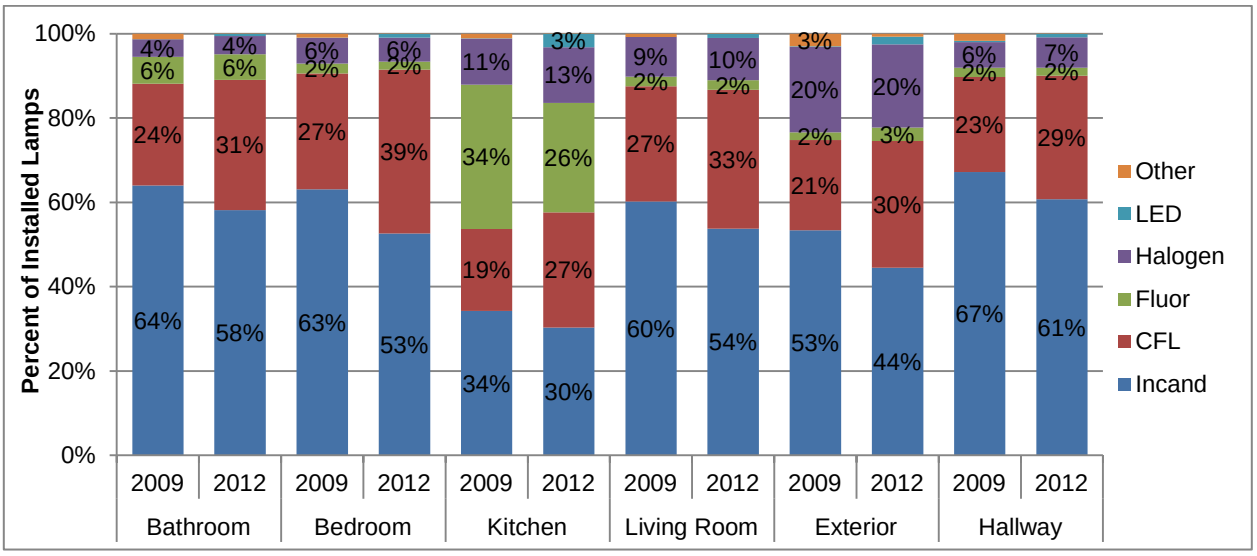
6.2.3.1 All Technologies

Figure 53 shows the distribution of installed lamps by technology in six installation locations during the 2009 and 2012 study periods. Together, these six locations—bathrooms, bedrooms, kitchens, living rooms, exterior areas, and hallways—represented three-quarters of all lamps installed in 2009 and 80 percent of all lamps installed in 2012. As shown, incandescent lamps represented more than half of all installed lamps across locations in both years except in kitchens, where incandescent lamps represented roughly one-third of installed lamps, and in exterior locations in 2012, where incandescent lamps represented two out of every 5 installed lamps.

CFLs comprised a greater share of installed lamps in 2012 than in 2009 in all installation locations, with the smallest increase in offices of 20 percent over the number of lamps installed in 2009 and the largest increase in garages of nearly 50 percent (not shown in figure; see Table 126 in Appendix D). The decline in incandescent lamp share has increased. The decline in the share of incandescent has not been offset solely by CFLs, however—in kitchens, for example, halogen lamps and LED lamps also made small gains in share of installed lamps between 2009 and 2012. These lamp technologies also exhibited small increases in share in other installation locations.

Fluorescent lamps and CFLs both comprised a similar percentage of total installed lamps installed in kitchens in 2012 than in 2009, representing a decline in fluorescent share and increase in CFL share of installed lamps in kitchens between years. In 2012, fluorescent lamps comprised a larger share of total installed lamps in kitchens than in any other household location. Also noteworthy regarding kitchens is that in 2012, LED lamps comprised approximately 3 percent of all installed lamps, more than in any other installation location and up from only 0.9 percent of kitchen lamps in 2009.

Figure 53: Percentage of Total Lamps Installed by Lamp Technology and Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)



See Table 126 in Appendix D for number of lamps installed by technology, location and study period.
Note: Results may not total 100 percent because of rounding.

6.2.3.2 Key Technologies and Lamp Shapes, 2012

This section provides details on lamp installations by household location for A-lamp replacement lamp types (including incandescent A-, LED, and CFL A-lamps as well as spiral CFLs). We also provide details regarding incandescent, CFL, and LED reflector and globe lamps.

6.2.3.2.1 A-Lamp Replacements

Table 29 shows the total number of A-lamp replacement lamps installed in the study area in 2012 as well as the percentage of total lamps and average number installed per household by installation location.[106] There were 219 million A-lamp replacements installed in study-area households in 2012, averaging over 29 per household. Roughly one-quarter of A-lamp replacement lamps were installed in bedrooms in 2012 (24% of all A-lamp replacement lamps). As shown, while incandescent A-lamps and spiral CFLs were the dominant technologies in terms of total quantity installed in 2012 (108 and 105 million, respectively), there were few differences in their distribution by location with the exception of kitchens, in which 11 percent of spiral CFL were installed but only 7 percent of incandescent A-lamps. Note that Table 127 in Appendix D provides these results for 2009.

106 Note that in addition to the incandescent, CFL, and LED A-lamps and spiral CFLs shown in the table, there were roughly 650,000 halogen A-lamps installed in 2012.

Table 29: Total A-Lamp Replacement Lamps and Average Number of A-Lamp Replacements per Household by Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)					% of Total Lamps Installed					Avg # Lamps Installed per Household				
Location	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all
Bathroom	17.2	0.8	18.1	0.2	36.3	16%	18%	17%	18%	17%	1.8	0.1	1.9	0.02	3.81
Bedroom	26.3	1.2	25.1	0.3	52.9	24%	26%	24%	21%	24%	2.7	0.1	2.6	0.03	5.44
Kitchen	7.8	0.5	11.1	0.1	19.5	7%	11%	11%	9%	9%	0.9	0.1	1.3	0.01	2.33
Living Room	14.5	0.7	15.2	0.1	30.5	13%	15%	14%	11%	14%	1.6	0.1	1.7	0.01	3.37
Exterior	11.2	0.4	10.8	0.2	22.7	10%	9%	10%	18%	10%	1.3	0.0	1.3	0.03	2.67
Hallway	9.3	0.3	8.3	0.1	18.0	9%	7%	8%	7%	8%	1.1	0.0	1.0	0.01	2.20
Dining Room	6.5	0.1	4.5	0.1	11.2	6%	3%	4%	6%	5%	1.5	0.0	1.1	0.02	2.63
Garage	3.1	0.1	3.1	0.0	6.4	3%	2%	3%	0%	3%	0.9	0.0	0.9	0.00	1.78
Office	3.5	0.3	3.2	0.1	7.1	3%	6%	3%	7%	3%	1.2	0.1	1.1	0.03	2.40
Other	8.6	0.2	5.6	0.0	14.5	8%	5%	5%	3%	7%	1.4	0.0	0.9	0.01	2.41
Total	**108.0**	**4.7**	**105.1**	**1.2**	**219.1**	**100%**	**100%**	**100%**	**100%**	**100%**	**14.5**	**0.6**	**13.7**	**0.17**	**29.04**

Note: Column values may not sum to "Total" because of rounding.

6.2.3.2.2 Reflector Lamps

In 2012, there were nearly 50 million reflector lamps installed in study-area households, averaging 6.5 reflector lamps per household (Table 30). Nearly three-quarters of these were incandescent lamps. Roughly one-fourth of all reflector lamps installed in the study area in 2012 were installed in kitchens, representing more than 12 million lamps or 1.5 lamps per household, on average. Living rooms and hallways each comprised roughly 16% of all installed lamps (8 million lamps each). Note that Table 128 in Appendix D provides these results for 2009.

Table 30: Total Reflector Lamps and Average Number of Reflector Lamps per Household by Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
Location	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Bathroom	4.3	0.6	0.1	5.1	12%	5%	4%	10%	0.5	0.1	0.01	0.5
Bedroom	3.6	1.1	0.1	4.9	10%	10%	6%	10%	0.4	0.1	0.01	0.5
Kitchen	7.1	3.9	1.2	12.3	20%	33%	51%	25%	0.9	0.5	0.14	1.5
Living Room	6.0	1.8	0.3	8.0	17%	15%	12%	16%	0.7	0.2	0.03	0.9
Exterior	4.1	1.4	0.2	5.8	12%	12%	10%	12%	0.5	0.2	0.03	0.7
Hallway	5.9	1.9	0.2	7.9	17%	16%	7%	16%	0.7	0.2	0.02	1.0
Dining Room	1.3	0.3	0.0	1.5	4%	2%	1%	3%	0.3	0.1	0.00	0.4
Garage	0.5	0.2	-	0.7	1%	2%	-	1%	0.1	0.1	-	0.2
Office	1.2	0.4	0.1	1.6	3%	3%	5%	3%	0.4	0.1	0.04	0.6
Other	1.7	0.3	0.1	2.1	5%	2%	4%	4%	0.3	0.0	0.02	0.3
Total	**35.7**	**11.9**	**2.3**	**49.9**	**100%**	**100%**	**100%**	**100%**	**4.7**	**1.5**	**0.30**	**6.5**

Note: Column values may not sum to "Total" because of rounding.

6.2.3.2.3 Globe Lamps

As shown in Table 31, there were nearly 35 million globe lamps installed in study-area households in 2012, averaging roughly 4 per household. Nearly three-quarters of these were installed in bathrooms and nearly 90 percent were incandescent lamps (roughly 31 million lamps). Note that Table 129 in Appendix D provides these results for 2009.

Table 31: Total Globe Lamps and Average Number of Globe Lamps per Household by Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
Location	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Bathroom	23.2	2.5	0.0	25.7	75%	70%	14%	74%	2.4	0.3	0.00	2.7
Bedroom	1.7	0.3	0.0	1.9	5%	7%	12%	6%	0.2	0.0	0.00	0.2
Kitchen	1.0	0.2	0.0	1.2	3%	5%	4%	3%	0.1	0.0	0.00	0.1
Living Room	1.6	0.3	0.0	1.9	5%	8%	7%	6%	0.2	0.0	0.00	0.2
Exterior	0.5	0.1	0.1	0.7	2%	3%	33%	2%	0.1	0.0	0.01	0.1
Hallway	1.6	0.0	0.0	1.6	5%	1%	11%	5%	0.2	0.0	0.00	0.2
Dining Room	0.9	0.1	0.0	1.0	3%	3%	2%	3%	0.2	0.0	0.00	0.2
Garage	0.1	0.0	0.0	0.1	0%	0%	7%	0%	0.0	0.0	0.00	0.0
Office	0.2	0.0	0.0	0.3	1%	1%	11%	1%	0.1	0.0	0.01	0.1
Other	0.2	0.0	-	0.2	1%	1%	-	1%	0.0	0.0	-	0.0
Total	**30.8**	**3.6**	**0.2**	**34.6**	**100%**	**100%**	**100%**	**100%**	**3.5**	**0.4**	**0.02**	**3.9**

Note: Column values may not sum to “Total” because of rounding.

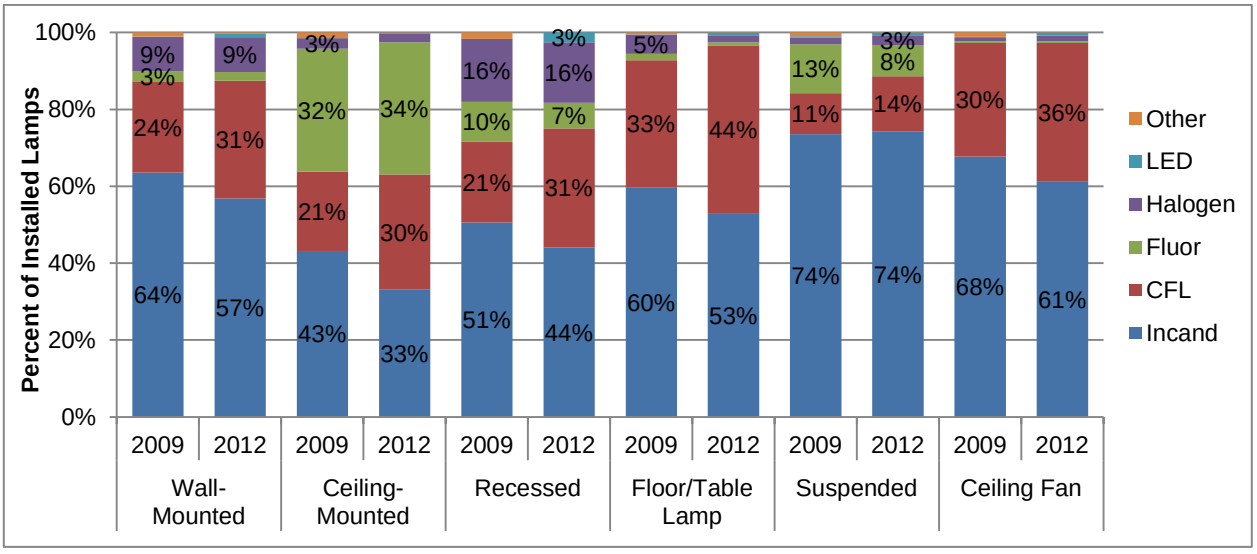
6.2.4 Lamp Installation by Technology and Fixture Type

This section provides an overview of lamp installation by technology and fixture type. We first provide the information across all technologies and shapes in the study area for 2009 and 2012 and then for key lamp technology/lamp shape combinations (A-lamp replacement lamps, reflector lamps, and globe lamps) in 2012.

6.2.4.1 All Technologies

Six fixture types accounted for more 9 out of 10 installed lamps per household in both 2009 and 2012, including wall-mounted fixtures, ceiling-mounted fixtures, recessed fixtures (e.g., ceiling cans), floor and table lamps, suspended fixtures, and ceiling fans. In these fixture types, roughly one-third to three-quarters of all installed lamps were incandescent lamps (Figure 54). The fixture type in which incandescent lamps comprised the smallest share among these 6 was ceiling-mounted lamps (in which fluorescent lamps and CFLs each comprised roughly one-third of all lamps installed in 2012) and the fixture type in which incandescent lamps comprised the largest share—and the only fixture type in which incandescent lamp share did not decline between years—was suspended fixtures (74%). In 2012, CFLs comprised more than a third of lamps installed in floor or table lamps (44%) and ceiling fans (36%). LED lamps comprised less than 2 percent of all installed lamps in each of these 6 fixture types in 2012 except in recessed cans, where LED lamps comprised 3 percent of all lamps installed.

Figure 54: Percentage of Total Lamps Installed by Lamp Technology and Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)



See Table 130 in Appendix D for number of lamps installed by technology, fixture type, and study period.
Note: Results may not total 100 percent because of rounding.

6.2.4.2 Key Technologies and Lamp Shapes, 2012

This section provides details on lamp installations by fixture type for A-lamp replacement lamp types (including incandescent A-lamps, LED A-lamps, CFL A-lamps, and spiral CFLs) as well as incandescent, CFL, and LED reflector and globe lamps.

6.2.4.2.1 A-Lamp Replacements

Roughly half of all lamps installed in households that received electric service from PG&E, SCE, and SDG&E in 2012 were installed in ceiling-mounted and wall-mounted fixtures (24% each), totaling more than 105 million lamps (Table 32). In these fixture types, there was a fairly even split in the share of lamps comprised by incandescent A-lamps and spiral CFLs. In wall-mounted fixtures, LED A-lamps comprised a larger share of all installed lamps than any other A-lamp replacement type (32%). The LED share of A-lamp replacements installed in wall-mounted fixtures was larger than in any other fixture type. Despite this, however, LED A-lamps represented only about 400,000 of the 219 million A-lamp replacement lamps installed in 2012 (or an average of only 0.04 per household). Note that Table 131 in Appendix D provides these results for 2009.

Table 32: Total A-Lamp Replacement Lamps and Average Number of A-Lamp Replacements per Household by Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)					% of Total Lamps Installed					Avg # Lamps Installed per Household				
Fixture Type	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all
Ceiling-Mounted	26.6	0.7	25.8	0.2	53.3	25%	16%	25%	14%	24%	2.7	0.1	2.58	0.02	5.33
Wall-mounted	25.1	1.1	25.5	0.4	52.1	23%	23%	24%	32%	24%	2.5	0.1	2.55	0.04	5.21
Floor/Table Lamp	21.3	1.2	20.8	0.2	43.4	20%	25%	20%	16%	20%	2.1	0.1	2.08	0.02	4.35
Ceiling Fan	15.5	0.7	13.2	0.2	29.6	14%	15%	13%	16%	14%	1.5	0.1	1.32	0.02	2.96
Suspended	9.2	0.4	5.3	0.1	15.0	9%	10%	5%	11%	7%	0.9	0.0	0.53	0.01	1.51
Recessed	4.3	0.3	8.6	0.1	13.2	4%	6%	8%	10%	6%	0.4	0.0	0.86	0.01	1.33
Torchiere	1.6	0.1	2.7	0.0	4.4	1%	2%	3%	2%	2%	0.2	0.0	0.27	0.00	0.44
Desk Lamp	0.7	0.1	1.0	0.0	1.8	1%	2%	1%	1%	1%	0.1	0.0	0.10	0.00	0.18
Garage door	1.0	0.0	0.3	0.0	1.3	1%	0%	0%	0%	1%	0.1	0.0	0.03	0.00	0.13
Track Lighting	0.3	0.0	0.8	0.0	1.2	0%	0%	1%	0%	1%	0.0	0.0	0.08	0.00	0.12
Hard-wired	0.5	0.0	0.2	0.0	0.7	0%	0%	0%	0%	0%	0.0	0.0	0.02	0.00	0.07
Plug-in	0.2	0.0	0.1	0.0	0.3	0%	0%	0%	0%	0%	0.0	0.0	0.01	0.00	0.03
Under Counter	0.2	0.0	0.1	0.0	0.2	0%	0%	0%	0%	0%	0.0	0.0	0.01	0.00	0.02
Other	1.7	0.0	0.8	0.0	2.5	2%	1%	1%	0%	1%	0.2	0.0	0.08	0.00	0.25
Total	**108.0**	**4.7**	**105.1**	**1.2**	**219.1**	**100%**	**100%**	**100%**	**100%**	**100%**	**10.8**	**0.5**	**10.53**	**0.12**	**21.93**

Note: Column values may not sum to “Total” because of rounding.

6.2.4.2.2 Reflector Lamps

Table 33 shows that nearly 4 out of 5 reflector lamps installed in study-area households in 2012 were installed in recessed fixtures (such as recessed cans), nearly 40 million lamps. Another 10 percent of reflector lamps were installed in wall-mounted fixtures and 4 percent in track lighting (roughly 4.6 and 2 million lamps, respectively). Wall-mounted fixtures comprised a slightly larger share of installed reflector CFLs than other lamp technologies (83%) versus incandescent lamps and LED lamps (78% and 75%, respectively). Note that Table 132 in Appendix D provides these results for 2009.

Table 33: Total Reflector Lamps and Average Number of Reflector Lamps per Household by Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
Location	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Recessed	27.9	9.9	1.7	39.5	78%	83%	75%	79%	2.8	1.0	0.17	4.0
Wall-mounted	3.4	1.1	0.1	4.6	10%	10%	4%	9%	0.3	0.1	0.01	0.5
Track Lighting	1.8	0.3	0.0	2.1	5%	3%	2%	4%	0.2	0.0	0.00	0.2
Ceiling-Mounted	0.9	0.3	0.0	1.2	2%	3%	0%	2%	0.1	0.0	0.00	0.1
Ceiling Fan	0.6	0.1	-	0.7	2%	0%	-	1%	0.1	0.0	-	0.1
Floor/Table Lamp	0.3	0.1	0.1	0.4	1%	1%	2%	1%	0.0	0.0	0.01	0.0
Suspended	0.3	0.0	0.0	0.4	1%	0%	2%	1%	0.0	0.0	0.00	0.0
Under Counter	0.1	-	0.2	0.3	0%	-	8%	1%	0.0	-	0.02	0.0
Desk Lamp	0.1	0.0	0.0	0.2	0%	0%	1%	0%	0.0	0.0	0.00	0.0
Hard-wired	0.0	0.0	0.1	0.2	0%	0%	5%	0%	0.0	0.0	0.01	0.0
Torchiere	0.0	0.1	0.0	0.1	0%	0%	1%	0%	0.0	0.0	0.00	0.0
Plug-in	0.0	0.0	-	0.1	0%	0%	-	0%	0.0	0.0	-	0.0
Garage door	0.0	-	-	0.0	0%	-	-	0%	0.0	-	-	0.0
Other	0.2	-	0.0	0.2	1%	-	0%	0%	0.0	-	0.00	0.0
Total	**35.7**	**11.9**	**2.3**	**49.9**	**100%**	**100%**	**100%**	**100%**	**3.6**	**1.2**	**0.23**	**5.0**

Note: Column values may not sum to "Total" because of rounding.

6.2.4.2.3 Globe Lamps

More than three-quarters of the globe lamps installed in households in the study area in 2012 were installed in wall-mounted fixtures, representing more than 26 million lamps or an average of 2.6 per household (Table 34). Less than one-tenth as many globe lamps were

installed in any other fixture type. Note that Table 133 in Appendix D provides these results for 2009.

Table 34: Total Globe Lamps and Average Number of Globe Lamps per Household by Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
Location	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Wall-mounted	23.7	2.7	0.1	26.4	77%	74%	44%	76%	2.4	0.3	0.01	2.6
Ceiling-Mounted	2.1	0.1	0.0	2.1	7%	2%	0%	6%	0.2	0.0	0.00	0.2
Ceiling Fan	1.7	0.3	0.0	2.0	5%	8%	15%	6%	0.2	0.0	0.00	0.2
Suspended	1.8	0.2	-	2.0	6%	6%	-	6%	0.2	0.0	-	0.2
Floor/Table Lamp	1.0	0.3	0.0	1.3	3%	8%	18%	4%	0.1	0.0	0.00	0.1
Recessed	0.2	0.1	0.0	0.3	1%	2%	13%	1%	0.0	0.0	0.00	0.0
Desk Lamp	0.1	0.0	0.0	0.1	0%	0%	5%	0%	0.0	0.0	0.00	0.0
Torchiere	0.1	0.0	-	0.1	0%	0%	-	0%	0.0	0.0	-	0.0
Under Counter	0.1	-	-	0.1	0%	-	-	0%	0.0	-	-	0.0
Garage door	-	-	0.0	0.0	-	-	2%	0%	-	-	0.00	0.0
Hard-wired	0.0	0.0	0.0	0.0	0%	0%	3%	0%	0.0	0.0	0.00	0.0
Plug-in	-	-	-	-	-	-	-	-	-	-	-	-
Track Lighting	0.0	-	-	0.0	0%	-	-	0%	0.0	-	-	0.0
Other	0.0	0.0	-	0.0	0%	0%	-	0%	0.0	0.0	-	0.0
Total	**30.8**	**3.6**	**0.2**	**34.6**	**100%**	**100%**	**100%**	**100%**	**3.1**	**0.4**	**0.02**	**3.5**

Note: Column values may not sum to “Total” because of rounding.

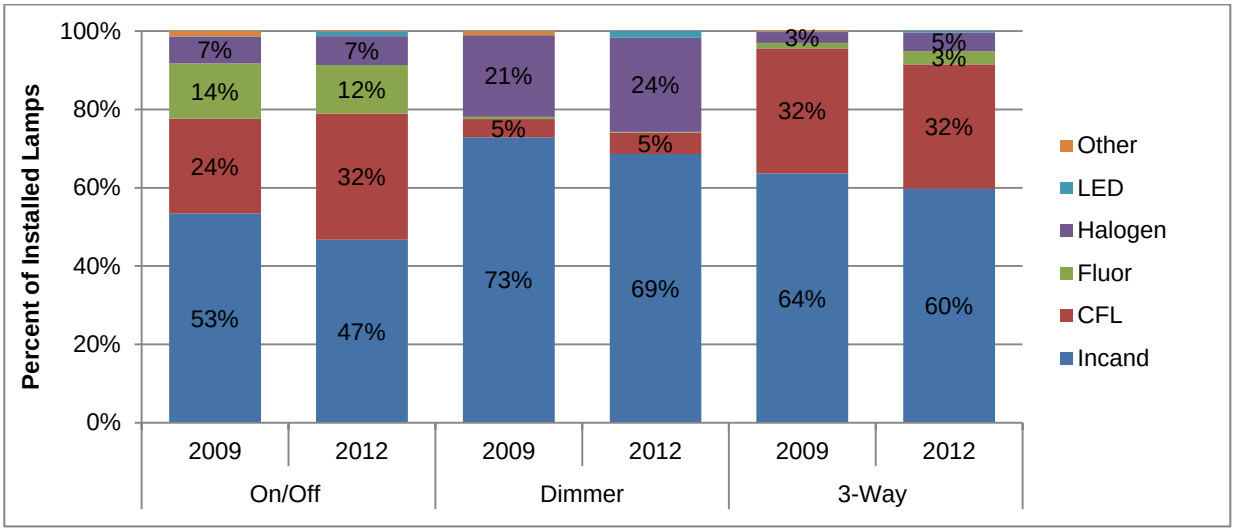
6.2.5 Lamp Installation by Technology and Control Type

This section provides an overview of lamp installation by lamp technology and control type (on/off switch, dimmer switch, or 3-way switch). We first provide the information across all technologies and shapes in the study area for 2009 and 2012 and then for key lamp technology/lamp shape combinations in the most recent study period only (2012).

6.2.5.1 All Technologies

As shown in Figure 55, the percentage of total lamps controlled by each of the control types decreased for incandescent lamps between years. Among lamps controlled with on/off switches, incandescent lamps comprised 53 percent of installed lamps in 2009 and 47 percent in 2012, and the loss in share was largely picked up by CFLs, which increased from 24 percent of installed lamps controlled by on/off switches in 2009 to 32 percent in 2012. On/off switches were the only control type for which incandescent lamps comprised less than half of controlled lamps in 2012. Among lamps controlled by dimmer switches and 3-way switches, the percentage of lamps comprised by CFLs did not change between years (5% and 32%, respectively), but the share of incandescent lamps still decreased. For lamps controlled by dimmer switches, the share of lamps comprised by incandescent lamps declined by 4 percentage points between years, offset by a small increase in the share comprised by halogen lamps. Incandescent lamps also declined from 64 percent of lamps controlled by 3-way switches in 2012 to 60 percent in 2012, with the change offset by small increases in the share of halogen and fluorescent lamps.

Figure 55: Percentage of Total Lamps Installed by Lamp Technology and Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)



See Table 134 in Appendix D for number of lamps installed by technology, control type, and study period.
Note: Results may not total 100 percent because of rounding.

6.2.5.2 Key Technologies and Lamp Shapes, 2012

This section provides details on lamp installations by control type for A-lamp replacements as well as incandescent, CFL, and LED reflector and globe lamps.

6.2.5.2.1 A-Lamp Replacements

More than 9 out of 10 A-lamp replacement lamps installed in study-area households in 2012 were controlled by on/off switches, representing nearly 200 million lamps and an average of 20 lamps per household (Table 35). A-lamp replacement lamps controlled by dimmer switches and 3-way switches each represented approximately 10 million installed lamps in 2012, roughly 4 to 5 percent each of all installed A-lamp replacement lamps and an average of 1 each per household. Roughly 96 percent of CFL A-lamps and spiral lamps were controlled by on/off switches compared to somewhat smaller percentages for incandescent and LED A-lamps (86% and 91%, respectively). Eight and 9 percent of incandescent and LED A-lamps, respectively, were controlled by dimmer switches, compared to only 1 and 2 percent of spiral CFLs and CFL A-lamps, respectively. Note that Table 135 in Appendix D provides these results for 2009.

Table 35: Total A-Lamp Replacements and Average Number of A-Lamp Replacements per Household by Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)					% of Total Lamps Installed					Avg # Lamps Installed per Household				
Control Type	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all
On/Off	93.4	4.5	100.4	1.1	199.5	86%	96%	96%	91%	91%	9.4	0.4	10.1	0.11	19.97
Dimmer	8.6	0.1	1.1	0.1	9.9	8%	2%	1%	9%	5%	0.9	0.0	0.1	0.01	0.99
3-Way	6.0	0.1	3.6	0.0	9.7	6%	2%	3%	0%	4%	0.6	0.0	0.4	0.00	0.97
Total	**108.0**	**4.7**	**105.1**	**1.2**	**219.1**	**100%**	**100%**	**100%**	**100%**	**100%**	**10.8**	**0.5**	**10.5**	**0.12**	**21.93**

Note: Column values may not sum to "Total" because of rounding.

6.2.5.2.2 Reflector Lamps

As shown in Table 36, of the nearly 50 million reflector lamps installed in households that received electric service from PG&E, SCE and SDG&E in 2012, more than 4 out of 5 were controlled by on/off switches (roughly 40 million lamps, or an average of 4 per household). Roughly 9 million reflector lamps were controlled by dimmer switches, representing 18 percent of installed reflector lamps or roughly 1 per household. Less than one million reflector lamps were controlled by 3-way switches. Of the reflector CFLs installed, more than 90 percent were controlled by on/off switches and only 8 percent by dimmer switches. Among incandescent and LED reflectors, dimmer switches

controlled roughly 20 percent of installed lamps. These results may reflect ongoing challenges with dimmability for CFLs. Note that Table 136 in Appendix D provides these results for 2009.

Table 36: Total Reflector Lamps and Average Number of Reflector Lamps per Household by Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
Control Type	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
On/Off	27.7	10.8	1.8	40.3	78%	91%	78%	81%	2.8	1.1	0.18	4.0
Dimmer	7.6	0.9	0.5	8.9	21%	8%	20%	18%	0.8	0.1	0.05	0.9
3-Way	0.4	0.2	0.0	0.7	1%	2%	1%	1%	0.0	0.0	0.00	0.1
Total	**35.7**	**11.9**	**2.3**	**49.9**	**100%**	**100%**	**100%**	**100%**	**3.6**	**1.2**	**0.23**	**5.0**

Note: Column values may not sum to "Total" because of rounding.

6.2.5.2.3 Globe Lamps

Of the nearly 35 million globe lamps installed in study-area households in 2012, more than 90 percent were controlled by on/off switches (94%), representing nearly 33 million lamps or roughly 3 globe lamps per household (Table 37). The vast majority of installed globe lamps were incandescent lamps (31 million, or roughly 3 per household). On/off switches controlled nearly all CFL and LED globe lamps (99 and 98%, respectively), while dimmer switches controlled roughly 6 percent of incandescent globes. Note that Table 137 in Appendix D provides these results for 2009.

Table 37: Total Globe Lamps and Average Number of Globe Lamps per Household by Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
Control Type	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
On/Off	28.7	3.6	0.2	32.5	93%	99%	98%	94%	2.9	0.4	0.02	3.3
Dimmer	1.8	0.0	0.0	1.8	6%	0%	2%	5%	0.2	0.0	0.00	0.2
3-Way	0.3	0.0	-	0.3	1%	1%	-	1%	0.0	0.0	-	0.0
Total	**30.8**	**3.6**	**0.2**	**34.6**	**100%**	**100%**	**100%**	**100%**	**3.1**	**0.4**	**0.02**	**3.5**

Note: Column values may not sum to "Total" because of rounding.

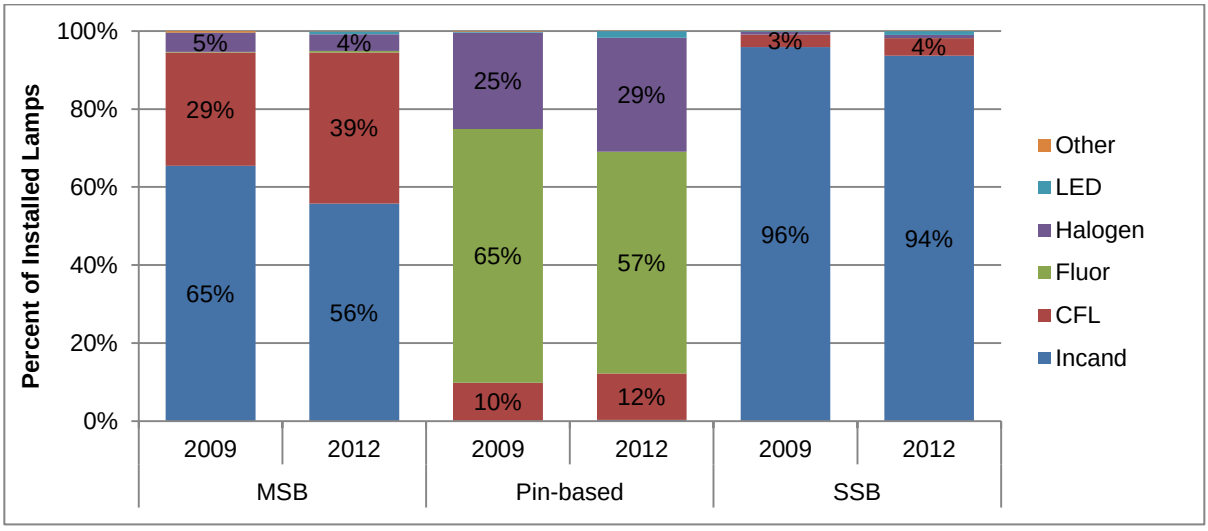
6.2.6 Lamp Installation by Technology and Base Type

This section provides an overview of lamp installation by lamp technology and base type (medium screw-base, pin-base, and small screw-base). We first provide the information across all technologies and lamp shapes in the study area for 2009 and 2012 and then for key lamp technology/lamp shape combinations in 2012 only.

6.2.6.1 All Technologies

MSB lamps comprised roughly 70 percent of all lamps installed in 2009 and 2012, while pin-based lamps comprised roughly 20 percent and SSB lamps another 10 percent. As shown in Figure 56, the share of MSB lamps comprised by CFLs increased by 10 percentage points between 2009 and 2012 (from 29% to 39%) while the incandescent lamp share dropped by 9 percentage points (from 65% to 56%). Among pin-based lamps, the share comprised by fluorescent lamps shrunk from 65 percent in 2009 to 57 percent in 2012, offset by an increase of 4 percentage points for halogen lamps and 2 percentage points for CFLs. Among SSB lamps, nearly all installed lamps were incandescent in both years (96% in 2009 and 94% in 2012), with an increase in the share of SSB lamps comprised by CFLs of one percentage point between years (from 3% to 4%).

Figure 56: Percentage of Total Lamps Installed by Lamp Technology and Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)



See Table 138 in Appendix D for number of lamps installed by technology, base type, and study period.
Note: Results may not total 100 percent because of rounding.

6.2.6.2 Key Technologies and Lamp Shapes, 2012

This section provides details on lamp installations by control type for A-lamp replacements as well as incandescent, CFL, and LED reflector and globe lamps.

6.2.6.2.1 A-Lamp Replacements

Table 38 shows that approximately 97 percent of all A-lamp replacement lamps installed in 2012 were MSB lamps, representing over 212 million lamps and an average of roughly 21 lamps per household. CFL A-lamps had the smallest share of MSB lamps across all base types and A-lamp replacement types at 96% of CFL A-lamps, with 7 percent comprised by SSB lamps (the largest share for SSB lamps across all A-lamp replacement lamp types). Note that Table 139 in Appendix D provides these results for 2009.

Table 38: Total A-Lamp Replacements and Average Number of A-Lamp Replacements per Household by Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	Total Lamps Installed (Millions)					% of Total Lamps Installed					Avg # Lamps Installed per Household				
Base Type	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all	Inc A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Over-all
MSB	105.4	4.3	101.3	1.22	212.2	98%	92%	96%	99%	97%	10.6	0.4	10.1	0.12	21.2
Pin-base	0.0	0.0	2.9	0.01	3.0	0%	0%	3%	1%	1%	0.0	0.0	0.3	0.00	0.3
SSB	1.9	0.3	0.5	0.01	2.7	2%	7%	0%	0%	1%	0.2	0.0	0.0	0.00	0.3
Other	0.7	0.0	0.4	-	1.1	1%	1%	0%	-	1%	0.1	0.0	0.0	-	0.1
Total	**108.0**	**4.7**	**105.1**	**1.23**	**219.1**	**100%**	**100%**	**100%**	**100%**	**100%**	**10.8**	**0.5**	**10.5**	**0.12**	**21.9**

Note: Column values may not sum to "Total" because of rounding.

6.2.6.2.2 Reflector Lamps

Of the 50 million reflector lamps installed in the study area in 2012, nearly 48 million were MSB lamps (95% of all installed reflector lamps or nearly 5 per household; Table 39). Among incandescent and CFL reflectors installed in 2012, 98 to 99 percent were MSB lamps. For LED lamps, however, only a third were MSB and 50 percent were pin-base lamps (nearly 1.2 million lamps). Among incandescent lamps and CFLs, in contrast, pin-based reflector lamps represented 100,000 or fewer lamps installed in 2012. Note that Table 140 in Appendix D provides these results for 2009.

Table 39: Total Reflector Lamps and Average Number of Reflector Lamps per Household by Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

Base Type	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall
MSB	34.9	11.8	0.77	47.5	98%	99%	33%	95%	3.5	1.2	0.08	4.8
Pin-base	0.1	0.0	1.15	1.2	0%	0%	50%	2%	0.0	0.0	0.12	0.1
SSB	0.5	0.1	0.00	0.5	1%	1%	0%	1%	0.0	0.0	0.00	0.1
Other	0.2	0.0	0.39	0.6	1%	0%	17%	1%	0.0	0.0	0.04	0.1
Total	**35.7**	**11.9**	**2.31**	**49.9**	**100%**	**100%**	**100%**	**100%**	**3.6**	**1.2**	**0.23**	**5.0**

Note: Column values may not sum to "Total" because of rounding.

6.2.6.2.3 Globe Lamps

MSB lamps represented more than 4 out of 5 globe lamps installed in the study area in 2012, or approximately 29 million lamps (Table 40). Globe lamps had the largest share of SSB lamps installed across the other key technologies and lamp shapes of interest (A-lamp replacements and reflectors) at 17 percent of all installed lamps. These roughly 6 million lamps were predominantly incandescent. Note that Table 141 in Appendix D provides these results for 2009.

Table 40: Total Globe Lamps and Average Number of Globe Lamps per Household by Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

Base Type	Total Lamps Installed (Millions)				% of Total Lamps Installed				Avg # Lamps Installed per Household			
	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall
MSB	25.0	3.4	0.15	28.6	81%	95%	95%	83%	2.5	0.3	0.02	2.9
Pin-base	-	-	0.01	0.0	-	-	5%	0%	-	-	0.00	0.0
SSB	5.7	0.2	-	5.9	19%	5%	-	17%	0.6	0.0	-	0.6
Other	0.1	-	-	0.1	0%	-	-	0%	0.0	-	-	0.0
Total	**30.8**	**3.6**	**0.16**	**34.6**	**100%**	**100%**	**100%**	**100%**	**3.1**	**0.4**	**0.02**	**3.5**

Note: Column values may not sum to "Total" because of rounding.

6.3 Lamp Storage

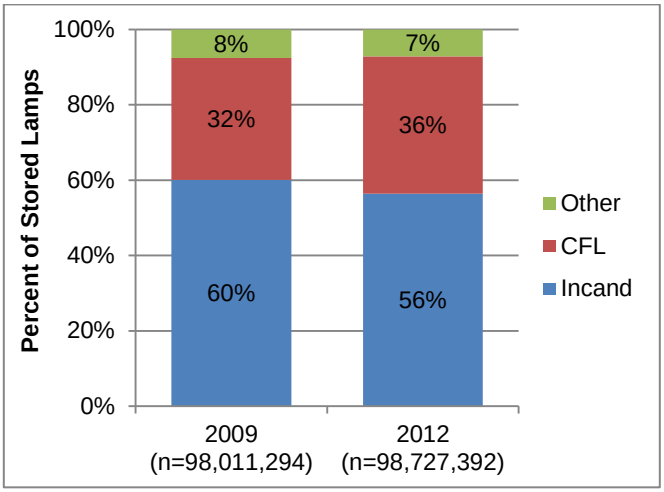
Both the 2009 and 2012 household lighting inventories gathered details regarding lamps in storage among PG&E, SCE and SDG&E residential electric customers. While the 2012 inventory identified all lamp technologies as well as additional details including lamp shape and base type for stored lamps, the 2009 study classified stored lamps as incandescent lamps or CFLs and included all other stored lamps in an "other" category. Below we provide a high-level comparison of stored lamps in 2009 and 2012 for incandescent lamps, CFLs, and all other technologies as well as additional details regarding lamps in storage in 2012. Key findings include:

- There were roughly 98 million lamps in storage in the study area in both 2009 and 2012, averaging roughly 10 lamps in storage per household. The share of stored lamps comprised by incandescent lamps dropped by 4 percentage points between years while the share comprised by CFLs increased by the same amount.
- Eighty-five percent of stored lamps in 2012 were MSB lamps, and another 10 percent were SSB. One-third of all stored lamps were incandescent A-lamps and nearly another 30 percent were spiral CFLs. Aside from incandescent lamps and CFLs (which comprised 93% of stored lamps in 2012), halogen lamps comprised the next-largest share of stored lamps (4%).

6.3.1 By Technology, 2009 and 2012

There were over 98 million lamps in storage among PG&E, SCE, and SDG&E residential electric customers in both 2009 and 2012. Between years, the number of stored lamps increased by only one-tenth of one percent. As shown in Figure 57, more than half of stored lamps in each year were incandescent lamps and roughly one-third or more were CFLs. The composition of stored lamps by technology changed little between years, with a drop in the share of stored lamps comprised by incandescent lamps of 4 percentage points and concurrent increase of the same margin in the share comprised by CFLs.

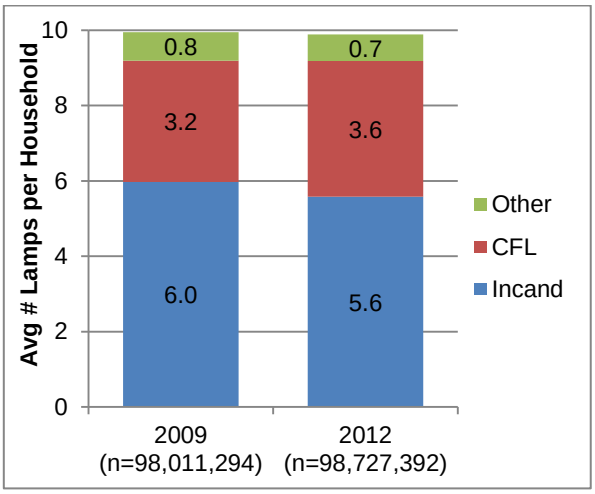
Figure 57: Percent of Lamps in Storage by Lamp Technology Among PG&E, SCE, and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)



Note: Results may not total 100 percent because of rounding.

Figure 58 shows that households in the study area had an average of roughly 10 lamps in storage in both study periods. The average number of CFLs in storage per household increased slightly (from 3.2 to 3.6 lamps) while the average number of incandescent lamps decreased slightly from 6.0 in 2009 to 5.6 in 2012. These results underscore the shift away from incandescent lamps and toward CFLs among installed lamps as discussed above in section 6.2 (see, e.g., Table 25).

Figure 58: Average Number of Lamps in Storage per Household by Lamp Technology Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)



Note: Results may not total 100 percent because of rounding.

6.3.2 Additional Details Regarding Lamps in Storage in 2012

Table 41 provides additional detail regarding the lamp technologies in storage among residential electric customers in PG&E, SCE, and SDG&E's service territories in 2012. As shown, other than incandescent lamps and CFLs, halogen lamps comprised the greatest share of lamps in storage (more than 4 million lamps) but represented far less than one lamp in storage per household, on average (0.4 lamps). There were just under 2 million fluorescent lamps in storage and roughly 700,000 LED lamps in storage among study-area households in 2012.

Table 41. Total Lamps and Average Number of Lamps in Storage per Household by Technology Among PG&E, SCE and SDG&E Residential Electric Customers, 2012 (In-Home Lighting Inventories)

	2012		
Technology	Total Stored Lamps (Millions)	% of Total Stored Lamps	Avg # Stored Lamps per Household
Incandescent	55.7	56%	5.6
CFL	36.0	36%	3.6
Fluorescent	1.9	2%	0.2
Halogen	4.3	4%	0.4
LED	0.7	1%	0.1
Other	0.1	0%	0.0
Total	**98.7**	**100%**	**9.9**

Number of households in 2012 sample: 1,987.
Note: Column values may not sum to "Total" because of rounding.

Eighty-five percent of stored lamps in 2012 were MSB lamps and another 10 percent primarily incandescent lamps—were SSB. When stored lamps are further examined by lamp shape, six lamp technology/lamp shape combinations comprised nearly 90 percent of all lamps stored among PG&E, SCE, and SDG&E residential customers in 2012:

- One-third of lamps in storage were incandescent A-lamps (33%);
- Nearly another third were spiral CFLs (29%);
- Twelve percent were candelabra-shaped (including flame-tip) incandescent lamps;
- 5 percent were incandescent reflectors;
- 5 percent were incandescent globes; and
- 3 percent were reflector CFLs.

All other combinations of lamp technology and shape accounted for 2 percent or less of all lamps in storage in 2012.

7. REMAINING INSTALLATION POTENTIAL FOR ENERGY-EFFICIENT LAMPS

This chapter of the report provides a foundation for estimating remaining residential lighting savings potential in terms of the number of sockets remaining for conversion from inefficient to efficient lamps among households in PG&E, SCE, and SDG&E electric service territories. The in-home lighting inventories conducted in 2009 and 2012 provided the basis for this assessment. Note that the installation potential characterized herein is best described as "theoretical," as analyses regarding the availability or suitability of energy-efficient replacement lamps for each remaining application were outside the scope of this effort.

As described above, the 2012 California Lighting and Appliance Saturation Survey (CLASS) included a detailed inventory of all installed lamps in households that receive electric service from PG&E, SCE and SDG&E.[107] The 2009 household lighting inventory conducted as part of the 2006-2008 ULP evaluation provides similar data. DNV GL staff analyzed these data to assess the remaining installation potential for energy-efficient lamps. The sections below present the results from these analyses. Appendix E reproduces these analyses by IOU service territory.

Key findings from the analyses of remaining installation potential include:

- Sixty-nine percent of lamps installed in 2012 were inefficient (i.e., were not CFLs or LED lamps), down from 89 percent in 2009. This represents a noteworthy increase in energy-efficient lamp installations between years, with remaining potential for energy-efficient lamp installations in 2012 around 314 million lamps.
- Remaining potential (in terms of quantity of lamps) was highest in 2012 in the rooms in which the largest numbers of lamps were installed—bathrooms, bedrooms, kitchens, and living rooms—but proportionally, nearly 40 percent of lamps installed in bedrooms were energy-efficient in 2012, higher than in any other household location. Three-fifths of the remaining potential is among MSB lamps.
- Of the 418 million lamps controlled by on/off switches in 2012, approximately 283 million were inefficient lamps. The lamps installed in five household locations—bathrooms, kitchens, bedrooms, living rooms, and exterior—comprised roughly two-thirds of all remaining potential for energy-efficient lamp installations in 2012. Three out of five of these lamps were MSB.
- Dimmer switches controlled approximately 15 million lamps in 2012, 14 million of which were inefficient. Two installation locations—living rooms and dining rooms—comprised more than half of the remaining potential for lamps controlled by dimmer switches in 2012. These results are not surprising, as these two locations had the greatest numbers of lamps controlled by dimmer switches in 2012. Three out of five of these lamps were MSB.
- Three-way switches controlled just under 12 million lamps in the study area in 2012, and more than 8 million of these were inefficient. Four out of five of these inefficient lamps were MSB, and two-thirds of these were installed in bedrooms and living rooms (again, the locations with the highest concentrations of lamps with this control type).

[107] Note that these analyses exclude empty sockets (i.e., sockets in which no lamps were installed at the time the in-home inventories were conducted in 2009 and 2012). This includes 15.2 million empty sockets in 2009 and 10.5 million empty sockets in 2012.

7.1 Change in Remaining Potential Between 2009 and 2012

Table 42 shows the distribution of installed lamps by technology among households that received electric service from PG&E, SCE, and SD&GE in 2012. As shown, across all lamps installed, 30 percent were CFLs and 1 percent were LED lamps in 2012. The remaining 69 percent of lamps were inefficient relative to CFLs and LED lamps. Broadly, these inefficient lamps (incandescent, fluorescent,[108] halogen,[109] and other technologies) represent the remaining potential for energy-efficient lamp installations in the IOUs' electric service territories as of 2012—roughly 314 million lamps. In 2009, approximately 78 percent of installed lamps were inefficient, suggesting a decline between 2009 and 2012 in remaining potential for energy-efficient lamp installations of more than 39 million lamps. This decline represents a noteworthy increase in energy-efficient lamp installations, particularly given that the overall number of installed lamps remained fairly constant between 2009 and 2012.

Table 42: Distribution of Installed Lamps Among PG&E, SCE, and SD&GE Residential Electric Customers by Technology, 2009 and 2012 (In-Home Lighting Inventories)

	2009		2012	
Lamp Technology	**Number of Installed Lamps (Millions)**	**Percent of Installed Lamps**	**Number of Installed Lamps (Millions)**	**Percent of Installed Lamps**
Incandescent	254.2	55.9%	223.1	49.0%
CFL	101.6	22.3%	136.0	29.9%
Fluorescent	55.9	12.3%	50.7	11.1%
Halogen	37.4	8.2%	39.5	8.7%
LED	0.4	0.1%	5.5	1.2%
Other Technologies	5.6	1.2%	0.5	0.1%
Total Efficient (CFL + LED)	101.9	22.4%	141.5	31.1%
Total Inefficient	353.1	77.6%	313.9	68.9%
Grand Total	**455.0**	**100.0%**	**455.4**	**100.0%**

Note: Column values may not sum to "Total" or "Grand Total" because of rounding.

7.2 Remaining Potential by Installation Location (2012)

When the 2012 data are further examined by the locations in which lamps are installed, remaining installation potential ranges from 60 to 86 percent of all installed lamps in each household location (indoors and outdoors; Figure 59). Thus, remaining potential in terms of the total quantity of inefficient lamps installed is greatest in the household locations that have the highest overall number of lamps installed. Of these, remaining potential was greatest in bathrooms (in which roughly 56 million inefficient lamps were installed in 2012) as well as kitchens (roughly 46 million inefficient lamps) and bedrooms (roughly 45 million inefficient lamps). Remaining potential in living rooms was also high (nearly 38 million inefficient lamps). There were nearly 185 million inefficient lamps installed in 2012 in high-use locations such as such as kitchens, living rooms, dining rooms, bedrooms, and exterior applications.

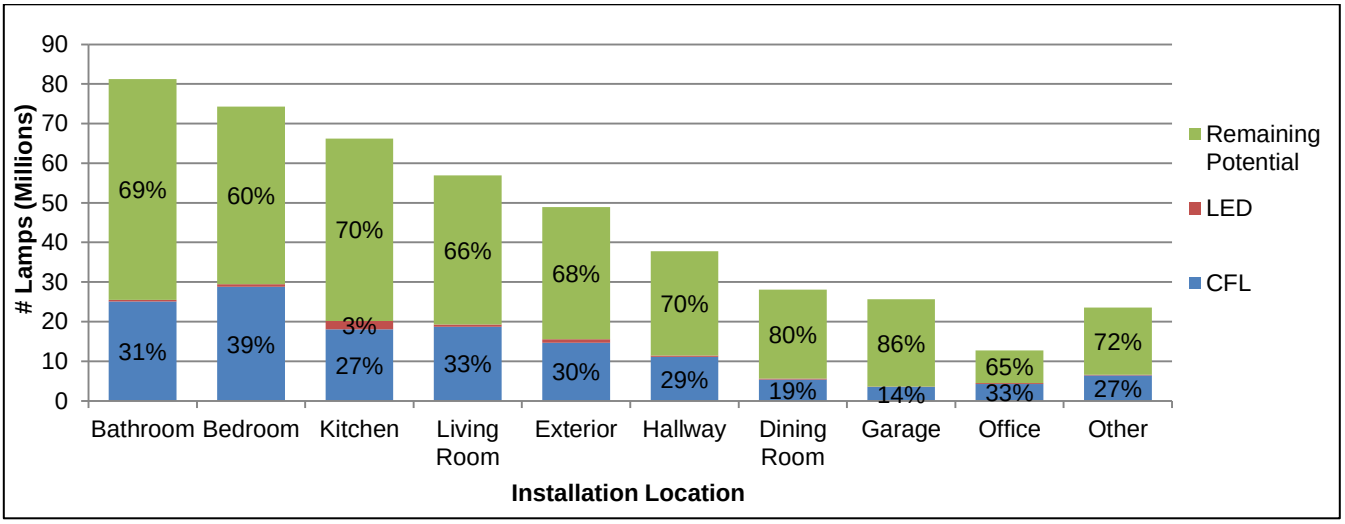
In terms of the proportion of inefficient versus efficient lamps installed within each location, the remaining energy-efficient lamp installation potential in 2012 was greatest in garages (86% of lamps installed in 2012 were inefficient) and dining rooms (80% inefficient). Both of these locations have relatively small

[108] Note that we include all fluorescent lamps in the "inefficient" category, as we are unable to characterize these lamps as either efficient or inefficient based on data collected during the 2012 CLASS.

[109] Note that we include all halogen lamps in the "inefficient" category whether or not these lamps meet the efficacy standards as defined in EISA, as even lamps that meet the criteria are still inefficient compared to CFLs and LED lamps.

numbers of lamps installed compared to other household locations. Dining rooms in particular tend to have higher numbers of decorative and dimmable fixtures than other locations, and customers may have difficulty finding energy-efficient lamps to fit these applications. In garages, hours of use are relatively low, and fluorescent lamps comprise roughly 75 percent of all installed lamps (see Table 126 in Appendix D).

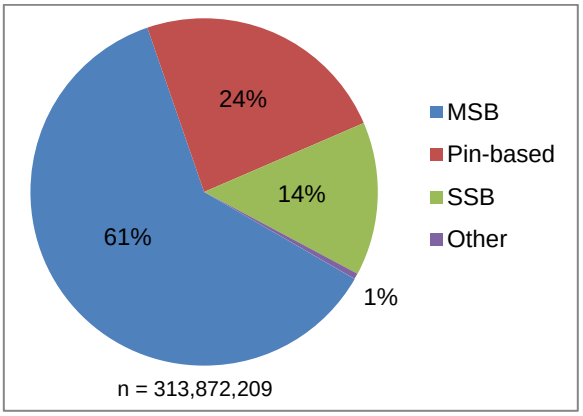
Figure 59: Remaining Energy-Efficient Lamp Installation Potential Across All Lamp Technologies by Installation Location Among PG&E, SCE, and SD&GE Residential Electric Customers by Technology, 2012 (In-Home Lighting Inventories)



See Table 126 in Appendix D for number of lamps installed by technology and location.
Note: Results may not total 100 percent because of rounding.

Figure 60 shows that of the roughly 314 million inefficient lamps that represented the remaining installation potential for energy-efficient technologies in 2012, approximately 61 percent were MSB lamps (nearly 193 million lamps). Twenty-four percent of the remaining installation potential was for pin-based lamps (nearly 75 million lamps), and 14 percent for SSB lamps (nearly 45 million lamps). Less than one percent of remaining installation potential for energy-efficient lamps among PG&E, SCE, and SDG&E residential electric customers in 2012 was for lamps with other base types (approximately 1.7 million lamps).

Figure 60: Remaining Potential (Installed Inefficient Lamps) Among PG&E, SCE, and SDG&E Residential Electric Customers by Base Type, 2012 (In-Home Lighting Inventories)



Note: Results may not total 100 percent because of rounding.

7.3 Remaining Potential by Control Type (2012)

More than 9 out of 10 of the 455 million lamps installed in PG&E, SCE, and SDG&E electric service households in 2012 were controlled with on/off switches (92%). Dimmer switches controlled 3 percent of lamps; three-way switches, another 3 percent; and other types (or unknown types) of switches controlled the remaining 2 percent of lamps installed among households in PG&E, SCE, and SDG&E electric service in 2012 (see Figure 55 in Section 6.2.5 for further detail). The sections below provide an overview of remaining potential for each of these control types based on 2012 household lighting inventory results.

7.3.1 On/Off Switch

Among the 418 million lamps controlled with on/off switches in 2012 within PG&E, SCE, and SDG&E electric service households, approximately 129 million were CFLs and nearly another 5.2 million were LED lamps (Table 43). CFLs and LED lamps together represented 32 percent of installed lamps controlled by on/off switches in 2012. The remaining potential for energy-efficient lamp installations among lamps controlled by on/off switches exceeded 283 million lamps in 2012.

Of the lamps controlled with on/off switches in 2012, the lamps installed in 5 household locations comprised roughly two-thirds of all remaining potential (69%). These include the inefficient lamps installed in bathrooms (nearly 54 million), bedrooms (more than 43 million), kitchens (more than 39 million), living rooms (nearly 31 million) and exterior household locations (more than 28 million lamps). These results are similar to those presented above across all installation locations because lamps controlled with on/off switches represent the vast majority of lamps installed in households that received electric service from PG&E, SCE, and SDG&E in 2012.

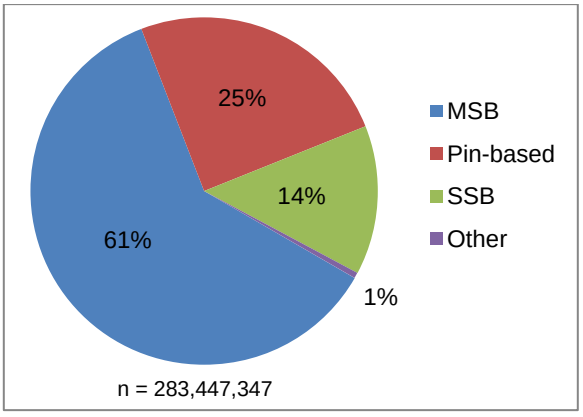
Table 43: Distribution of Installed Lamps with On/Off Controls Among PG&E, SCE, and SD&GE Residential Electric Customers by Technology and Installation Location, 2012 (In-Home Lighting Inventories)

Installation Location	Number of Installed Lamps (Millions)						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	24.9	0.4	45.6	4.8	3.3	0.0	79.1
Bedroom	27.1	0.6	34.2	1.4	3.7	0.0	67.0
Kitchen	17.8	2.0	18.3	16.9	7.9	0.0	63.0
Living Room	16.5	0.5	25.0	1.3	4.6	0.0	47.9
Exterior	13.5	0.8	19.8	1.5	6.8	0.3	42.7
Hallway	10.6	0.3	21.0	0.7	2.4	0.0	35.0
Garage	5.1	0.2	16.8	0.2	1.5	0.0	23.8
Dining Room	3.5	0.0	3.6	17.6	0.3	0.0	25.0
Office	4.0	0.2	5.1	0.9	1.5	0.0	11.6
Other	6.3	0.1	10.8	4.4	1.1	0.0	22.8
Total	**129.3**	**5.2**	**200.3**	**49.7**	**33.0**	**0.4**	**418.0**

Note: Column values may not sum to "Total" because of rounding.

Figure 61 shows that of the 283 million inefficient lamps with on/off controls in 2012, approximately 61 percent were MSB lamps (more than 172 million lamps). Twenty-five percent of the remaining installation potential for lamps with on/off controls was for pin-based lamps (more than 70 million lamps), and 14 percent for small screw-base lamps (more than 39 million lamps). Less than one percent of remaining installation potential for energy-efficient lamps with on/off controls among PG&E, SCE, and SDG&E residential electric customers in 2012 was for lamps with other base types (approximately 1.5 million lamps). Because lamps with on/off controls represent such a high proportion of overall lamp installations among PG&E, SCE, and SD&GE residential electric customers, these results closely mimic those shown for overall remaining potential (across control types) in Figure 60 above.

Figure 61: Remaining Potential (Installed Inefficient Lamps) with On/Off Controls Among PG&E, SCE, and SDG&E Residential Electric Customers by Base Type, 2012 (In-Home Lighting Inventories)



Note: Results may not total 100 percent because of rounding.

7.3.2 Dimmer Switch

Nearly 15 million of the lamps installed among households in PG&E, SCE, and SDG&E service territories in 2012 were controlled by dimmer switches (approximately 3 percent of all installed lamps). Among lamps controlled with dimmer switches in 2012, roughly 860,000 were CFLs and just over 80,000 were LED lamps (Table 44). This represents a somewhat higher ratio of LED lamps to CFLs compared to lamps controlled by other control types in 2012, and may reflect the lower availability and higher cost of dimmable CFLs versus non-dimmable CFLs. Together, CFLs and LED lamps represented only 6 percent of installed lamps controlled by dimmer switches in 2012, and the remaining 94 percent of installed lamps were inefficient. Thus, the maximum remaining potential for efficient lamp installations with dimmer controls in 2012 was nearly 14 million lamps.

Not surprisingly, the majority of the remaining potential for energy-efficient lamp installations with dimmer controls in 2012 was in the household locations in which dimmer switchers were concentrated. Of the lamps controlled with dimmer switches in 2012, two installation locations comprised more than half of all installed lamps with dimmer controls (51%) and the same proportion of the remaining potential for energy-efficient lamp installations. These locations included dining rooms and living rooms (with approximately 3.4 and 3.7 million inefficient lamps in 2012, respectively). Another 16 percent of the remaining potential was in bedrooms (2.2 million inefficient lamps) and 12 percent in kitchens (1.6 million lamps).

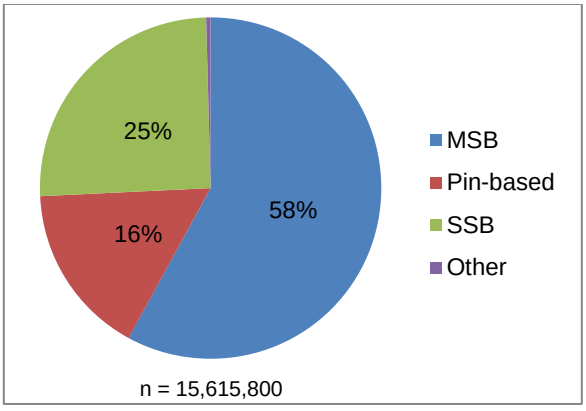
Table 44: Distribution of Installed Lamps with Dimmer Controls Among PG&E, SCE, and SD&GE Residential Electric Customers by Technology and Installation Location, 2012 (In-Home Lighting Inventories)

Installation Location	Number of Installed Lamps (Millions)						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	0.07	0.01	0.75	0.00	0.17	-	1.00
Bedroom	0.14	0.02	1.65	0.04	0.48	0.00	2.33
Kitchen	0.12	0.03	1.24	0.01	0.39	-	1.78
Living Room	0.31	0.00	2.41	0.00	1.03	-	3.76
Exterior	0.01	-	0.20	-	0.06	-	0.27
Hallway	0.04	-	0.86	-	0.17	-	1.07
Garage	0.11	0.01	3.50	-	0.19	-	3.81
Dining Room	-	-	0.02	0.00	0.00	-	0.03
Office	0.06	0.01	0.29	-	0.19	-	0.56
Other	0.01	-	0.19	-	0.12	-	0.32
Total	**0.86**	**0.08**	**11.10**	**0.06**	**2.82**	**0.00**	**14.92**

Note: Column values may not sum to “Total” because of rounding.

Figure 62 shows that of the 15.6 million inefficient lamps with dimmer controls installed in 2012, approximately 58 percent were MSB lamps (more than 8.3 million lamps). One-quarter of the remaining installation potential among lamps with dimmer controls was for SSB lamps (25%; more than 2 million lamps), and 16 percent was for pin-based lamps (roughly 2 million lamps). Less than one percent of remaining installation potential for energy-efficient lamps with dimmer controls among PG&E, SCE, and SDG&E residential electric customers in 2012 was for lamps with other base types (roughly 39,000 lamps).

Figure 62: Remaining Potential (Installed Inefficient Lamps) with Dimmer Controls Among PG&E, SCE, and SDG&E Residential Electric Customers by Base Type, 2012 (In-Home Lighting Inventories)



Note: Results may not total 100 percent because of rounding.

7.3.3 3-Way Switch

As described above, 3-way switches controlled approximately 3 percent of lamps installed in PG&E, SCE, and SDG&E electric service households in 2012 (more than 11.6 million lamps). Three-way switches typically require special 3-way lamps with three distinct wattage settings.[110] Among lamps controlled with 3-way switches, approximately 3.4 million were CFLs and just under 50,000 were LED lamps in 2012, representing just under one-third of all installed lamps controlled by 3-way switches (30%; Table 45). The remaining 8.1 million lamps were inefficient and thus represented the maximum remaining potential for energy-efficient lamp installations in sockets with 3-way controls in 2012.

The majority of lamps controlled with three-way switches in 2012 were found in bedrooms and living rooms. Not surprisingly, roughly two-thirds of the remaining installation potential for energy-efficient lamps was also in these two locations (66%; more than 2.7 million lamps each in bedrooms and living rooms). Another 13 percent of the remaining potential in 2012 was in kitchens (nearly 1.1 million lamps).

110 Traditional incandescent 3-way lamps typically have two filaments that are switched on together or independently, giving three different levels of brightness. For example, a traditional incandescent 3-way lamp may have wattages of 50, 100 and 150.

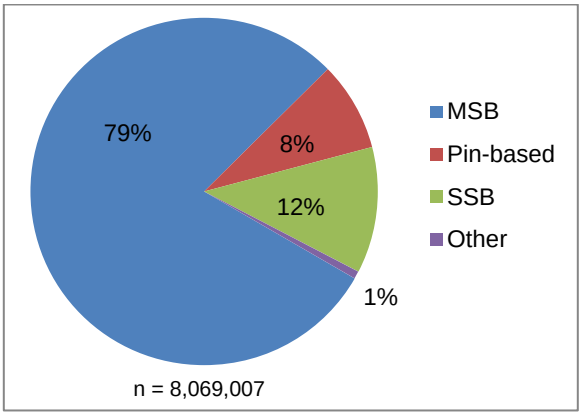
Table 45: Distribution of Installed Lamps with 3-Way Controls Among PG&E, SCE, and SD&GE Residential Electric Customers by Technology and Installation Location, 2012 (In-Home Lighting Inventories)

Installation Location	Number of Installed Lamps (Millions)						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	0.01	-	0.07	-	-	0.00	0.08
Bedroom	1.15	0.01	2.65	0.03	0.05	0.00	3.89
Kitchen	0.13	0.03	0.48	0.25	0.33	0.00	1.21
Living Room	1.52	-	2.47	0.02	0.08	0.00	4.08
Exterior	0.01	-	0.04	-	0.00	0.00	0.04
Hallway	0.36	0.00	0.78	0.05	0.04	0.00	1.24
Garage	0.13	-	0.13	-	0.01	0.00	0.27
Dining Room	0.00	-	0.03	0.06	0.01	0.00	0.11
Office	0.08	0.00	0.30	-	0.00	0.00	0.39
Other	0.05	-	0.16	0.02	0.00	0.00	0.23
Total	**3.44**	**0.05**	**7.12**	**0.42**	**0.52**	**0.00**	**11.56**

Note: Column values may not sum to "Total" because of rounding.

Figure 63 shows that of the nearly 8.1 million inefficient lamps controlled by 3-way switches in 2012, nearly 4 out of five were MSB lamps (79%; roughly 6.4 million lamps). Twelve percent of the remaining installation potential for lamps controlled by dimmer switches was for small screw-base lamps (nearly 950,000 lamps), and 8 percent was for pin-based lamps (approximately 670,000 lamps). Less than one percent of remaining installation potential for energy-efficient lamps with dimmer switches among PG&E, SCE, and SDG&E residential electric customers in 2012 was for lamps with other base types (under 57,000 lamps).

Figure 63: Remaining Potential (Installed Inefficient Lamps) with 3-Way Controls Among PG&E, SCE, and SDG&E Residential Electric Customers by Base Type, 2012 (In-Home Lighting Inventories)



Note: Results may not total 100 percent because of rounding.

8. PROJECTED LAMP TECHNOLOGY CHOICES UNDER CHANGED REGULATORY AND MARKET CONDITIONS

This chapter of the report explores how consumers' lamp purchasing decisions may change as a result of three major anticipated changes in the residential market for A-lamp replacements: the pending phase-out of traditional incandescent lamps under EISA and AB 1109, changing IOU program support for basic CFLs; and declining LED lamp prices. The objective of these analyses is to understand how consumers are likely to respond to planned or potential changes in standards, programs, and other key market conditions. To address this objective, the DNV GL team produced market share estimates for the various types of A-lamp replacements (i.e., traditional incandescent, EISA-compliant incandescent, and LED A-lamps along with CFL A-lamps and spiral lamps) under different scenarios. This section relies upon the Lamp Choice Model developed as part of CPUC EM&V WO28 to estimate the market shares of various lamp technologies of total A-lamp replacement sales.[111] The market share estimates represent how consumers would have responded to different lamp prices in 2013 and suggests the future market potential for CFLs and LED lamps.

8.1 Lamp Choice Model

The Lamp Choice Model determines technology market shares as a function of available technologies and their prices and availability along with customer demographics. The model was estimated from data collected during 2012 and 2013 during shelf survey visits and in-store shopper intercept surveys. The shelf survey data provides the market context—that is, what lamp technologies are available, where they are available, and how much they cost. The intercept survey data reflects shopper characteristics (such as personal income and household characteristics), as well as what customers chose under various store conditions including lamp availability and pricing. The Lamp Choice Model brings together the store context with the customer characteristics and choices.

The Lamp Choice Model estimates how consumer choices would have differed in the 2012-2013 period if market conditions (e.g., lamp prices) were different. The model reflects a snapshot of time in a market that is rapidly changing. As market conditions change, the model's ability to represent consumer choices is diminished. The principal limitations of the model (as it applies to the scenario analysis below) are as follows:

- **Limited LED lamp availability.** The Lamp Choice Model constructs choices from shelf survey records. LED market shares in stores that did not stock LED lamps at the time of the shelf survey will be zero. Because the purpose of the model is to assess how consumer choices would have differed if market conditions were different during the 2012-2013 timeframe, this is not a limitation per se, but it does affect our ability to predict how consumer choices might change in the future as LED lamp availability increases beyond the 33 percent of California retail stores in which they were available in 2013 (see section 4.2.1.1 above for details).
- **No brightness substitution.** The model uses shopper intercept survey results to simulate consumer purchases. If the intercept survey recorded that a consumer had a high-brightness (1490 to 2600 lumen) lamp in his or her basket, the Lamp Choice Model only offered lamps in the same lumen bin as alternate choices. As noted in section 4.2.2.5 above, LED lamp selection in particular was fairly limited

[111] Please refer to the final impact evaluation report for CPUC EM&V WO28 for more details (DNV GL, 2014).

to the two lowest brightness categories (<349 lumens and 350-759 lumens) during the 2012-2013 timeframe. As manufactures begin to offer higher-brightness LED lamps, consumers will have options that the Lamp Choice Model did not represent in the scenarios described herein.

- **Stable consumer perception.** As LED lamps become more common, consumer perceptions and preferences for LED lamps may change. The model does not attempt to capture how consumer preferences for LED lamps may change over time.
- **Opportunistic sampling approach.** The model reflects how consumers in an opportunistic sample ranked their choices regarding which lamp technologies they would have purchased under different market conditions. While the model matches what intercept survey respondents reported, there is no guarantee that choices made by intercept survey respondents are consistent with choices in the overall market. If we had complete sales data (or share of total sales) for all technologies, we could ensure that the aggregate model results are consistent with the California market. However, because the scenario analyses below are cumulative (that is, the second builds on the first, the third on the second, and so on), the primary interest is not whether the point estimates of market shares are correct but instead the directionality of changes in market share from scenario to scenario.[112]

The scenarios described below change the market context. The model then estimates how consumers respond to those market variations in terms of the replacement lamps they are expected to choose as a result. Appendix F provides the coefficients for the Lamp Choice Model. For more background regarding the model, please refer to the WO28 report.[113]

8.2 Scenario Analyses

DNV GL staff utilized the Lamp Choice Model to examine four sets of scenarios related to regulatory and market contexts and their implications for each technology's market share. The team developed these scenarios based on recent and expected market developments—for example, reduction of IOU support for basic CFLs. This approach required developing a baseline scenario against which to compare these alternative scenarios. The team developed the baseline scenario based on current market conditions as evidenced by analyses of shelf survey and in-store customer intercept survey data.

As mentioned above, the scenarios are cumulative – the second builds upon the assumptions included in the first, the third builds upon the assumptions included in the first and second, and so forth, because the expectation is that these market changes will occur in the order in which we have modeled them. We have structured the scenario analysis to follow our expectation of how the market will change as noted below. The four scenario sets are:

1. **Baseline (observed)**: This scenario represents market conditions observed in 2012 and 2013. The inputs to this scenario are lamp prices and availability as recorded during the 2012 and 2013 shelf surveys.
2. **Phase out traditional general purpose incandescent lamps**: In line with state regulations (i.e., implementation of AB 1109), traditional incandescent lamps will no longer be available in retail stores

[112] For example, the model results generally point to large market shares for CFL spirals and A-lamps. This result is consistent with shelf survey results from 2012 (in which MSB CFL A-lamps had the largest share of MSB A-lamp replacement stock) and in 2013 (when these products still maintained a high share of total lamp stock; see Figure 24 in section 4.2.2.3.1 above). However, the point estimates of baseline scenario market share for each technology differ from those in the shelf survey results.

[113] DNV GL, 2014a.

at some point in the future. This scenario models how consumer choices might have differed during 2012 and 2013 if traditional general purpose incandescent A-lamps were not available.

3. **No IOU incentives for A-lamp replacement CFLs**: The CPUC has directed the IOUs to reduce incentive funding for basic CFL programs and redirect that funding toward "advanced lighting programs and other lighting market transformation activities."[114] This direction may suggest a future in which the IOUs no longer offer incentives for basic spiral CFLs and possibly for other general purpose CFLs as well (i.e., CFL A-lamps). This scenario builds on the previous scenario (regarding the phase-out of traditional incandescent lamps) and assumes that the discontinuation of IOU incentives for CFL spirals and A-lamps will occur in addition to the phase-out. We structured the scenario analyses to reflect lamp suppliers' perspectives that retailers will have sold through their remaining stock of traditional incandescent lamps by the end of 2014 (see section 4.1.3 above) and that IOU incentives for CFLs are likely to remain in effect after that. This scenario models the change in market share among A-lamp replacements as a result for CFL price changes that might occur in response to the CPUC's direction. The key differences between this scenario and the previous scenario include changes in CFL price and CFL availability (e.g., discount stores may stop stocking CFLs if incentives for CFL spirals and A-lamps are not available).

4. **Declining LED lamp prices**: The final factor that we added into our stream of scenarios (building upon the previous scenarios) was to decrease LED lamp prices. The key difference between these two scenarios and the two preceding ones is the price of LED lamps.

   This scenario includes only the stores that stocked LED lamps during 2012 and 2013. The Lamp Choice Model reflects the availability of specific lamp technologies by retail chain based on shelf survey results from 2012 and 2013 in California. As such, the model does not reflect the anticipated expansion of LED stocking beyond the stores in which they were stocked in 2012 and 2013. As such, while the second and third scenarios model changing CFL prices and availability (in terms of the stores in which CFLs are stocked), the final scenario models only the changes in LED lamp pricing within the stores in which LED lamps were available during 2012 and 2013.

   We model changing LED lamp prices in two separate scenarios in the analyses:

   a. Scenario 4: LED lamp prices are reduced by $5.00 per lamp; and

   b. Scenario 5: LED lamp prices are reduced by $10.00 per lamp.

   These price reductions reflect a simple subtraction from the LED lamp prices observed during the 2012 and 2013 shelf survey visits.

The model design reflects the difference in choice sets by retail channel based on analyses of lamp technologies and four brightness categories (lumen bins) for lamps available in each store according to shelf survey results from 2012 and 2013. The in-store shopper intercept survey presented only the lamp choices a consumer was likely to see at the time of the intercept survey in the specific retail channel in which survey took place. Field researchers intercepted each shopper after he or she selected a lamp for purchase. For each intercept survey, the lumen bin for the selected lamp constrained the lamp choices offered to the consumer in the modelling effort. Thus, a specific A-lamp replacement technology would only be offered as an alternate choice to the consumer if that lamp technology was available (per 2012

[114] CPUC, 2009.

and 2013 shelf survey results) in the relevant retail channel in the same lumen bin as the consumer's selected lamp.

8.3 Key Findings

Table 46 presents A-lamp replacement market share by lamp type for each scenario by retail channel.[115] Key findings include:

- **CFL Spirals and A-Lamps.** The model suggests that CFL spirals and A-lamps would have constituted a majority share of the A-lamp replacement market if traditional incandescent A-lamps disappeared from retail stores in 2012 and 2013—but only if incentive support for CFLs continued. The model predicts that spiral CFLs will gain the majority market share from consumers who previously would have chosen traditional incandescent lamps (which constituted more than 90 percent of the A-lamp replacement lamps available in some retail channels), with the remaining share divided between EISA-compliant and CFL A-lamps.
    - In the absence of IOU-discounted CFLs, consumers likely would have chosen EISA-compliant incandescent lamps under 2012 and 2013 market conditions.
    - CFL A-lamps had a large market share in the independent grocery store channel in all scenarios. This is likely a result of program activity that targeted this channel. As a result, the Lamp Choice Model predicts that CFL A-lamps will have over 10 percent market share in this channel, compared to 6 percent or less in other channels in all scenarios. These results rely on independent grocery stores continuing to stock CFL A-lamps after the IOU programs are discontinued—many of these stores carry CFL A-lamps only when these lamps are available with program discounts. In other channels, when program discounts are discontinued, the effect is that the price of these lamps would increase, but the stores may continue to stock them. Supplier perspectives support these results (see, e.g., Figure 3 in section 4.1.2.3.1 above).
- **EISA-compliant incandescent A-lamps.** The availability of EISA-compliant incandescent A-lamps varied substantially across retail channels. During 2012 and 2013, EISA-compliant incandescent A-lamps were not widely available in the discount and drug channels, which has implications on the modelled impact of eliminating incentives for spiral CFLs and CFL A-lamps. The results of the Lamp Choice Model suggest that most consumers will shift from CFLs to EISA-compliant incandescent A-lamps if these types of CFL incentives are eliminated.
- **LED A-Lamps.** For LED A-lamps to achieve wide-spread adoption, they will need to be as ubiquitous (or nearly as ubiquitous) as spiral CFLs and CFL A-lamps. Part of the reason that market shares are not higher for LED A-lamps is that they were not offered in many retail stores in 2012 and 2013. However, part of the reason that many stores did not offer these lamps was because of the price. When LED lamp prices drop, it is reasonable to expect that more stores will begin stocking them. As consumers become increasingly familiar with the LED lamps (beyond general awareness of the technology)—and understand their benefits, including lamp life—consumer choices may ultimately generate market outcomes that this model cannot predict given the low levels of LED lamp

[115] The table does not report confidence intervals around each of the market share point estimates. The uncertainty analysis included in the WO28 report suggests that the LCM 90% confidence intervals of ±3% or better. The full uncertainty around the market shares depends both on the precision of the estimation and the assumptions of what lamps stores will stock in each of the scenarios.

penetration in 2012 and 2013. However, the model results are useful in that they identify what changes need to take place before widespread LED adoption can occur; should a large percentage of retailers not stock a wide range of products in substantial volumes, LED lamp market share of the A-lamp replacement market will remain low even with much lower prices.

- Even with a $10 discount from 2012 and 2013 price levels, the average LED lamp price is still significantly higher than the average spiral CFL price across all channels in which LEDs were available during 2012 and 2013. The low LED market shares in the reduced LED lamp price scenarios are mostly the result of lack of availability. However, the higher prices will limit the LED A-lamp share of the A-lamp replacement market.
- The small hardware, large home improvement, and mass merchandise channels evinced broader penetration of LED lamps than other retail channels during the 2012 and 2013 shelf survey visits. However, the model suggests that even a $10 reduction from 2012-2013 prices is not enough to cause a large increase in LED lamp market shares.[116]

[116] This result may reflect the lack of availability of LED lamps in the higher lumen bins during the 2012-2013 period as shown in section 4.2.2.5 above). The lamp choice exercise only offered LED lamps as an alternate choice to a consumer's selected lamp if the retail channel in which field staff intercepted the shopper had LED lamps available at that brightness level at that time. Because market penetration of high-brightness and medium-high brightness LED lamps was low in 2012 and 2013, LED lamps (regardless of price) may not have been offered as alternate choices to many consumers who participated in the choice exercise.

Table 46: Modelled Market Share for A-lamp Replacements by Retail Channel, A-Lamp Replacement Type, and Scenario (Lamp Choice Model)

	A-Lamp Replacement Type					
Channel/Scenario†	Traditional Incand A-Lamp	EISA-Compliant Incand A-Lamp	Spiral CFL	CFL A-Lamp	LED A-Lamp	Total*
Discount						
Baseline Scenario	28%	1%	66%	5%	0%	100%
Phase Out Incandescent Lamps	0%	1%	93%	6%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	3%	92%	5%	0%	100%
LED Lamp Price Reduction - $5	0%	3%	92%	5%	0%	100%
LED Lamp Price Reduction - $10	0%	3%	92%	5%	0%	100%
Drug						
Baseline Scenario	3%	1%	93%	3%	0%	100%
Phase Out Incandescent Lamps	0%	1%	96%	3%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	41%	56%	3%	0%	100%
LED Lamp Price Reduction - $5	0%	41%	56%	3%	0%	100%
LED Lamp Price Reduction - $10	0%	41%	56%	3%	0%	100%
Grocery Chain						
Baseline Scenario	17%	0%	83%	0%	0%	100%
Phase Out Incandescent Lamps	0%	0%	100%	0%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	13%	87%	0%	0%	100%
LED Lamp Price Reduction - $5	0%	13%	87%	0%	0%	100%
LED Lamp Price Reduction - $10	0%	13%	87%	0%	0%	100%
Grocery Independent						
Baseline Scenario	3%	0%	84%	14%	0%	100%
Phase Out Incandescent Lamps	0%	0%	86%	14%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	0%	89%	11%	0%	100%
LED Lamp Price Reduction - $5	0%	0%	89%	11%	0%	100%
LED Lamp Price Reduction - $10	0%	0%	89%	11%	0%	100%
Hardware						
Baseline Scenario	14%	3%	79%	5%	0%	100%
Phase Out Incandescent Lamps	0%	3%	92%	5%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	29%	65%	6%	0%	100%
LED Lamp Price Reduction - $5	0%	29%	64%	6%	1%	100%
LED Lamp Price Reduction - $10	0%	29%	64%	6%	2%	100%
Home Improvement						
Baseline Scenario	14%	16%	66%	4%	0%	100%
Phase Out Incandescent Lamps	0%	19%	76%	4%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	43%	53%	5%	0%	100%
LED Lamp Price Reduction - $5	0%	42%	52%	5%	1%	100%
LED Lamp Price Reduction - $10	0%	42%	51%	5%	2%	100%
Mass Merchandise						
Baseline Scenario	27%	13%	58%	2%	0%	100%
Phase Out Incandescent Lamps	0%	16%	81%	2%	0%	100%
No IOU Incentives for CFL Spiral/A-lamp	0%	39%	54%	7%	0%	100%
LED Lamp Price Reduction - $5	0%	39%	54%	7%	1%	100%
LED Lamp Price Reduction - $10	0%	39%	53%	7%	1%	100%

* Note: Results may not total 100 percent because of rounding.
† As noted above, wholesale clubs and lighting showrooms are excluded from these analyses. Wholesale clubs are excluded because of the limited lamp selection available in these stores. The Lamp Choice Model introduces variation into the technologies and prices of the lamps available in these stores—with a limited selection, the options for variation are also limited. Lighting showrooms are excluded due to the lack of shelf survey and intercept survey data for this channel.

8.4 Detailed Results

The sections below present the market share results for the various types of A-lamp replacements by retail channel. Each figure presents the baseline scenario along with the other modelled scenarios by retail channel for discount, drug, independent grocery, chain grocery, small hardware, large home improvement, and mass merchandise stores.[117] The section closes with a summary table showing market shares by technology and retail channel for all five scenarios.

8.4.1 Discount Stores

Discount channel stores cater to budget-minded consumers.[118] Stores in this channel tend to have a limited selection of lamps available and many have prices in the $1.00 range for each product they stock. During the 2012 and 2013 shelf survey visits in California, field researchers did not find any discount stores stocking LED lamps. Additionally, only one-third of the total 58 discount stores visited in 2012 and 2013 stocked CFL A-lamps (20 stores).

Figure 64 shows the market shares resulting from the scenario analyses in discount stores. Spiral-style CFLs dominate the market share in this channel. The key findings from these analyses are:

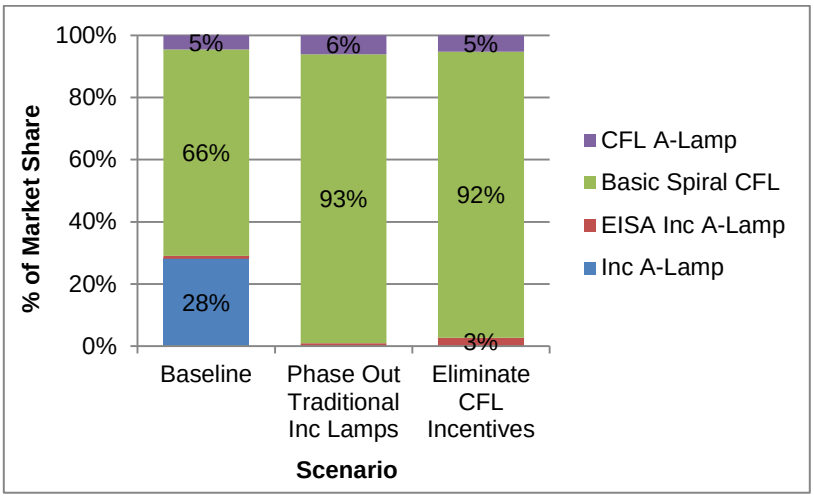
1. **Large impact from the traditional incandescent lamp phase-out**. The disappearance of traditional incandescent lamps from California's market will have a large impact in this channel. The baseline scenario suggests that two-thirds of discount store market share is comprised of spiral CFLs (66%) and nearly one-third by traditional incandescent lamps (28%). After the phase-out, the analyses suggest that spiral CFL market share will increase to over 93 percent. Note that the lack of EISA-compliant A-lamps in this scenario reflects the minimal presence of these lamps in discount stores in the baseline scenario.
2. **Little impact from eliminating IOU incentives for spiral CFLs and CFL A-lamps**. The stores in this channel do not have a large selection of lamps. After the phase-out of traditional incandescent lamps, there are very few opportunities for consumers to shift from purchasing CFLs to purchasing other A-lamp replacement technologies because spiral-style CFLs already dominate the market share for lamps in this channel (at over 90%). Eliminating discounts has the potential to cause consumers to shift to other stores or other retail channels to find the products they desire.

Note that because there were no LED lamps stocked in the discount channel during 2012 and 2013, we are unable to comment on how LED market share might change in discount stores when prices decline.

[117] Wholesale clubs and lighting showrooms are excluded from the analyses. Wholesale clubs are excluded because of the limited lamp selection available in these stores. The Lamp Choice Model introduces variation into the technologies and prices of the lamps available in these stores—with a limited selection, the options for variation are also limited. Lighting showrooms are excluded due to the lack of shelf survey and intercept survey data for this channel.

[118] Please see the Retail Channel Overview provided in section 4.1.2.1 above for more details regarding characteristics of each channel.

Figure 64: Modelled Market Share for A-lamp Replacements in Discount Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

8.4.2 Drug Stores

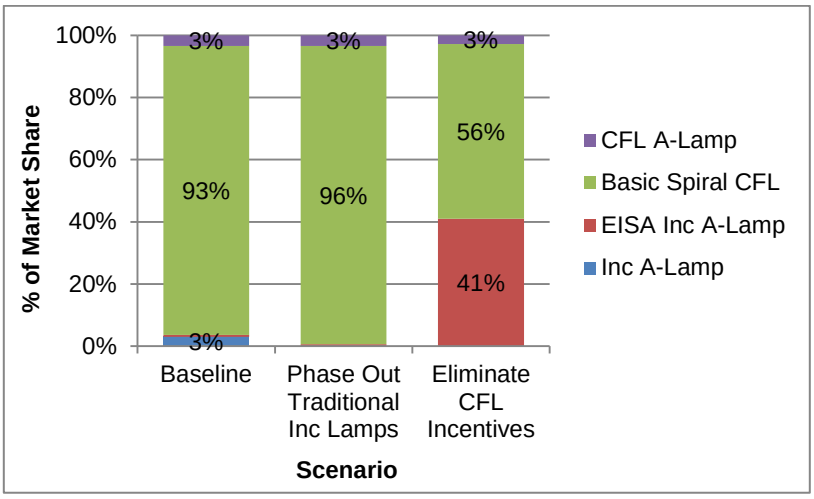
For lighting, drug stores cater to convenience shoppers. Stores in this channel tend to have a limited selection of lamps and prices are typically higher than among many other channels (particularly higher than big box stores). Field research did not identify any LED lamps in any drug stores during the 2012 and 2013 shelf survey visits. Nearly 90 percent of drug stores stocked CFL A-lamps at that time.

Figure 65 shows the market shares from the scenario analyses for drug stores. As in discount stores, spiral-style CFLs dominate among A-lamp replacements offered in this channel. The key findings from the scenario modelling in drug stores are:

1. **Little impact from the traditional incandescent lamp phase-out**. Removing traditional incandescent lamps will have little impact in this channel. Spiral CFLs dominate in the baseline scenario (with 93% market share). The phase-out of traditional incandescent lamps only slightly increases market share for CFL A-lamps, spiral CFLs, and EISA-compliant incandescent lamps.
2. **Large impact from eliminating IOU incentives for spiral CFLs and CFL A-lamps**. The stores in this channel stock EISA-compliant incandescent lamps. Without discounts for spiral CFLs and CFL A-lamps, the EISA-compliant incandescent lamps are cost-competitive with basic spiral CFLs. The model results show a 41 percent market share for EISA-compliant incandescent lamps in comparison to a 56 percent market share for spiral CFLs—a dramatic increase for EISA-compliant A-lamps and a dramatic decrease for spiral CFLs as compared with the previous scenario.

Note that because there were no LED lamps stocked in the drug channel during 2012 and 2013, we are unable to comment on how LED market share might change in drug stores when prices decline.

Figure 65: Modelled Market Share for A-lamp Replacements in Drug Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

8.4.3 Grocery Stores

Both independent and chain grocery stores cater to convenience shoppers when it comes to replacement lamps. These stores also tend to have a limited selection of lamps and prices tend to be higher in this channel than in big box stores in particular. Recent IOU program efforts have focused on offering incentives for spiral-style CFLs and CFL A-lamps through independent grocery stores to ensure access for hard-to-reach customers. None of the 56 grocery stores visited in 2012 and 2013 stocked LED lamps, and none of the chain grocery stores stocked CFL A-lamps.

Figure 66 and Figure 67 show the market shares from the scenario analyses for independent and chain grocery stores, respectively. Spiral-style CFLs have the dominant market share in this channel with over 80 percent market share in each scenario. The key findings from these analyses are:

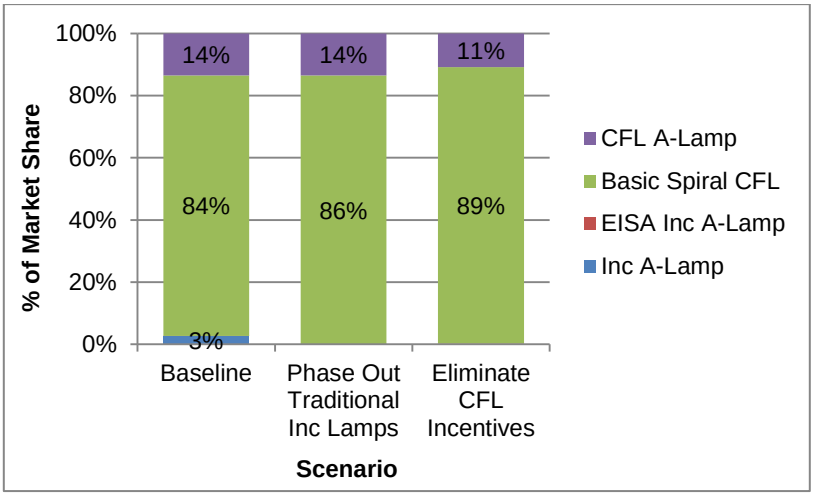
1. **Mixed impact from the traditional incandescent lamp phase-out**. Removing traditional incandescent lamps will have little impact on A-lamp replacement stock independent grocery stores. Very few independent grocery stores stocked traditional incandescent lamps in 2012 and 2013. In the incandescent lamp phase-out scenario, spiral CFLs continue to dominate the landscape, absorbing the entire incandescent A-lamp baseline market share.

2. **Mixed impact from eliminating incentives for spiral CFLs and CFL A-lamps**. Independent grocery stores did not stock many EISA-compliant incandescent A-lamps in 2012 and 2013. As a result, eliminating incentives for spiral and A-lamp CFLs does not shift any of the CFL market share toward these lamp types in independent grocery stores. In contrast, there was a larger penetration of EISA incandescent lamps in chain grocery stores. As a result, in this scenario, the EISA-compliant incandescent A-lamps compete with spiral CFLs and capture about 13 percent of the market share in chain grocery stores under this scenario.

Note that because there were no LED lamps stocked in the independent or chain grocery stores during 2012 and 2013, we are unable to comment on how LED market share might change in drug stores when

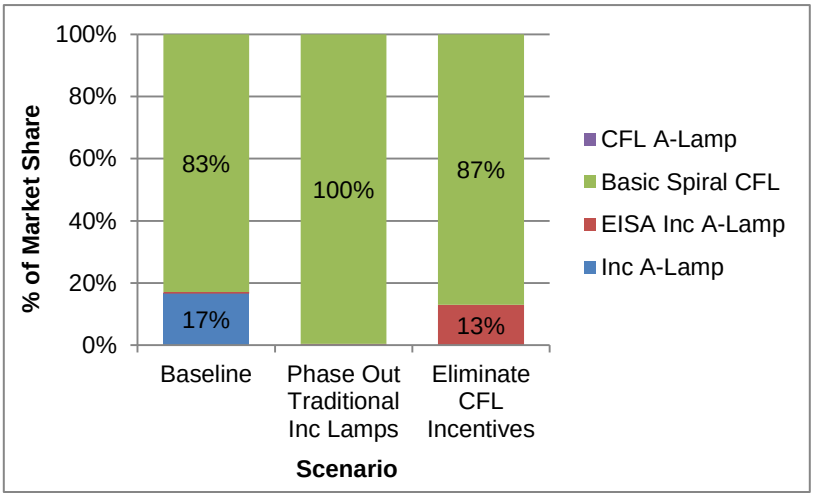
LED lamp prices decline.

Figure 66: Modelled Market Share for A-lamp Replacements in Independent Grocery Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

Figure 67: Modelled Market Share for A-lamp Replacements in Chain Grocery Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

8.4.4 Small Hardware Stores

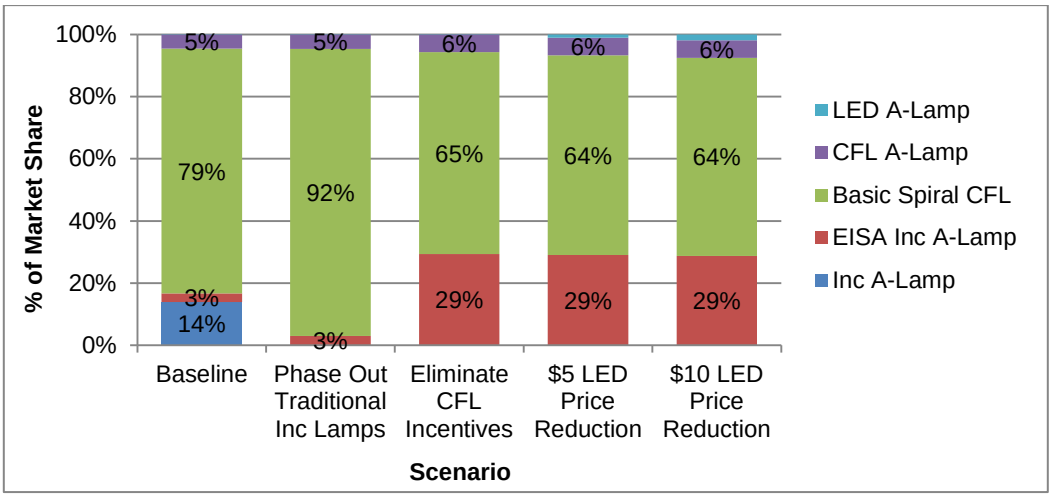
Small hardware channel stores generally have a wider selection of lamps than other channels with the exception of large home improvement stores. For example, of the 58 small hardware stores visited by shelf survey researchers in 2012 and 2013, 60 percent stocked LED lamps. Figure 68 shows the market shares from the scenario analyses for small hardware stores. Spiral CFLs dominate the market share of A-lamp replacements in this channel. The key findings from these analyses are:

1. **Modest impact from the traditional incandescent lamp phase-out**. Model results suggest that removing traditional incandescent lamps from the market will have modest impact on small hardware stores. Spiral CFLs dominate the market in the baseline scenario with 79 percent market share. Phasing out traditional incandescent lamps increases market share of Spiral CFLs to 92 percent, overtaking the market share comprised by incandescent A-lamps in the baseline scenario.

2. **Large impact from eliminating incentives for spiral CFLs and CFL A-lamps**. The stores in this channel stock EISA-compliant incandescent A-lamps. Without discounts for spiral and A-lamp CFLs, EISA-compliant incandescent A-lamps compete for market share with spiral CFLs. The model results suggest a 29 percent market share for EISA-compliant incandescent A-lamps in comparison to a 65 percent share for spiral CFLs. This represents a shift of approximately one-third of the market share comprised by spiral CFLs in the incandescent lamp phase-out scenario shifting toward EISA-compliant A-lamps when incentives for spiral and A-lamp CFLs are eliminated based on modelled consumer choices.

3. **Negligible LED price impacts**. Even with a $10 discount, LED prices remain higher than prices for other A-lamp replacements. Furthermore, only 60 percent of hardware stores stocked LED lamps at the time of the retail store shelf survey visits. As a result, the model shows a market share of less than 2 percent for LED lamps even when 2012-2013 prices for LED lamps in this channel are reduced by $10.

Figure 68: Modelled Market Share for A-lamp Replacements in Small Hardware Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

8.4.5 Large Home Improvement Stores

Stores in the large home improvement channel typically have a wider selection of lamps than other channels. For example, of the 57 large home improvement stores visited during the 2012 and 2013 shelf surveys, 100 percent stocked LED lamps—a higher proportion of stores than in any other channel.

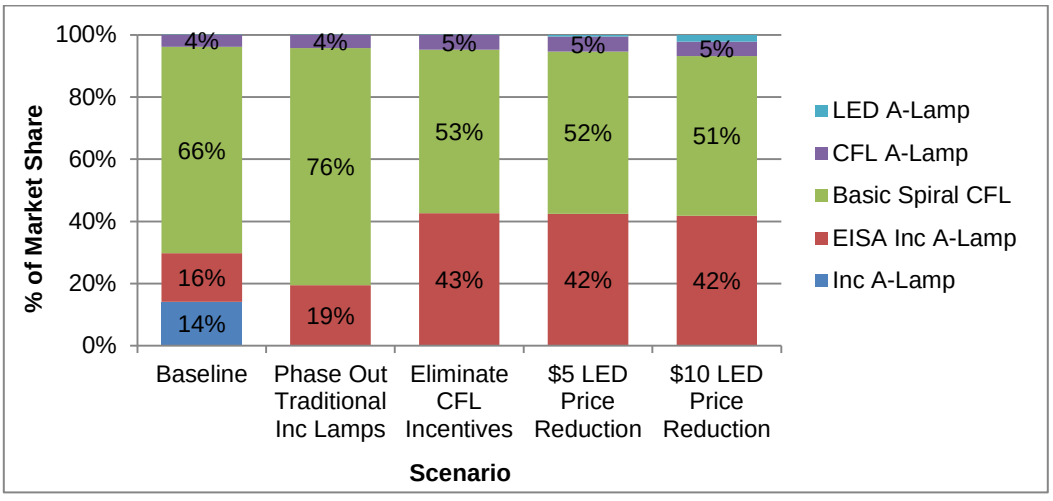
Figure 69 shows the market shares that result from the scenario analyses. As in other channels, spiral CFLs dominate the market share of incandescent A-lamp replacements in this channel regardless of scenario. Key findings from these analyses include:

1. **Moderate impact from the traditional incandescent lamp phase-out**. Modelled results suggest that eliminating traditional incandescent lamps from large home improvement stores will have a moderate impact on A-lamp replacement market shares in in this channel. Spiral CFLs dominate the market in the baseline scenario with 66 percent market share. The phase-out of traditional incandescent lamps increases market share of spiral CFLs to 76 percent, absorbing most of the market share comprised by traditional incandescent A-lamps in the baseline scenario.

2. **Large impact from eliminating incentives for spiral CFLs and CFL A-lamps**. The stores in this channel typically stocked EISA-compliant incandescent A-lamps during the 2012 and 2013 shelf survey visits. When discounts for spiral and A-lamp CFLs are eliminated from home improvement stores, model results suggest that EISA-compliant incandescent A-lamps will compete for market share with spiral CFLs. The model results show a 43 percent market share for EISA-compliant incandescent A-lamps in comparison to a 53 percent share for spiral CFLs. When compared to the incandescent lamp phase-out scenario, this suggest that when prices for spiral CFLs increase, approximately one-third of their market share will shift toward EISA-compliant incandescent A-lamps based on modelled consumer choices.

3. **Negligible LED price impacts**. Even with a $10 discount, LED prices remain higher than other A-lamp replacements. LED lamps were available in this channel during the 2012 and 2013 shelf survey visits. However, LED lamps represented only 3 to 5 percent of all retail lamp stock in 2012 and 2013 (see Figure 23 in section 4.2.2.1 above). The model, correspondingly, suggests very low market share for LED lamps even with a $10 reduction in price from 2012-2013 levels.

Figure 69: Modelled Market Share for A-lamp Replacements in Large Home Improvement Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

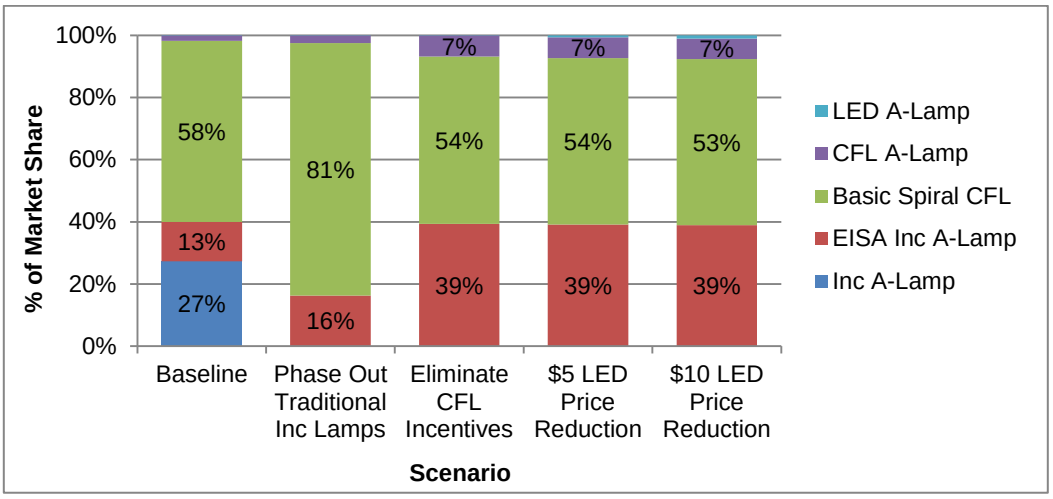
8.4.6 Mass Merchandise Stores

The stores in the mass merchandise channel typically sell high volumes of lamps and offer a moderate to large selection. During the 2012 and 2013 retail store shelf survey visits, field researchers found that 52 of the total 58 mass merchandise stores stocked LED lamps (90%) and the same proportion stocked EISA-compliant incandescent A-lamps.

Figure 70 shows the market shares from the scenario analyses. As in all other channels, spiral CFLs dominate the market share of incandescent A-lamp replacements, but to a lesser extent than in other channels. Key findings from these analyses include:

1. **Large impact from the traditional incandescent lamp phase-out**. Removing traditional incandescent lamps will have a large impact in this channel. Spiral CFLs, traditional incandescent A-lamps, and EISA-compliant incandescent A-lamps capture nearly all of the market in the baseline scenario (98%). When traditional incandescent lamps are no longer available, modelled results suggest an increase in spiral CFL market share from 58 percent to 81 percent, absorbing the majority of market share comprised by traditional incandescent A-lamps in the baseline scenario. Market share for EISA-compliant incandescent A-lamps increase from 13 percent to 16 percent.
2. **Large impact from eliminating incentives for spiral CFLs and CFL A-lamps**. The stores in this channel stock EISA-compliant incandescent A-lamps. Without discounts for spiral and A-lamp CFLs, EISA-compliant incandescent A-lamps compete with spiral CFLs for market share of A-lamp replacements. The model results show a market share of 39 percent for EISA-compliant incandescent A-lamps in this scenario (more than doubling the market share from the previous scenario) and spiral CFLs market share shrinking to just over half of the market for A-lamp replacements (54%).
3. **Negligible LED price impacts**. Even with a $10 discount, LED prices remaining higher than other A-lamp replacements available in mass merchandise stores. Despite the broad availability of LED lamps during the 2012 and 2013 shelf survey visits in this channel, the model shows LED lamp market share increasing to less than 2 percent even with $10 reductions from 2012-2013 prices.

Figure 70: Modelled Market Share for A-lamp Replacements in Mass Merchandise Stores by Lamp Type and Scenario (Lamp Choice Model)



Note: Results may not total 100 percent because of rounding.

9. CONCLUSIONS

The study results described in chapters 3 through 8 yield the following conclusions:

1. **CFL installations increased among consumers between 2009 and 2012, but retail stocking declined—particularly in big box stores—possibly as a result of decreased ULP support for CFLs between 2006-2008 and 2010-2012.**

Based on in-home lighting inventory results, PG&E, SCE, and SDG&E residential electric customers increased their CFL installations by an average of three lamps per household between 2009 and 2012. CFLs were widely available in retail stores: in both 2012 and 2013, roughly 90 percent of California retail stores that stocked replacement lamps had CFLs in stock. However, within these stores, CFL stocking declined substantially. The share of total lamp stock comprised by CFLs in retail stores dropped significantly between 2012 and 2013, and halogen lamps filled most of the gap. In terms of absolute quantities of lamp stock, results from a limited set of stores suggest that the quantity of CFLs in stock declined by roughly one-fourth between 2012 and 2013. These results are largely driven by dramatic declines in big box stores—and in wholesale clubs in particular—between years. Many supplier representatives attribute these declines to declining support over time for these CFLs through the ULP, especially for basic spiral CFLs. Most lamp manufacturers suggested that the ULP exerted considerable influence on their market activities.

In the 2006-2008 program period, the IOUs provided incentives for roughly 93 million CFLs through the ULP. In the 2010-2012 period, the program included roughly 72 million CFLs, with incentives for 35 million fewer basic CFLs and 13 million more specialty CFLs than during the 2006-2008 program. The IOUs largely allocated these incentives to non- big box channels (roughly 69% of 2010-2012 CFLs and 66% in 2006-2008). The overall decline of 22 million CFLs between program periods was skewed toward reduced CFL allocations in big box stores: manufacturers shipped roughly 49 million ULP-discounted CFLs to non- big box retailers during the 2010-2012 program (roughly 12 million fewer than in 2006-2008, a 20% drop) and 20 million CFLs to big box stores in 2010-2012 (nearly 10 million fewer than in 2006-2008, a 30% drop). Shelf survey results demonstrate that the percentage of big box stores that stocked IOU-discounted CFLs dropped by half between 2012 and 2013, while the percentage of non- big box stores that stocked IOU-discounted lamps increased by 25 percent in the same timeframe.

2. **Largely driven by changes in big box stores, the overall quantities of replacement lamp stock declined in retail stores between 2012 and 2013, but the diversity of products increased.**

Supplier interviews and shelf survey results suggest that retailers stocked fewer replacement lamps in general (i.e., smaller quantities) in 2013 than in 2012. However, retailers stocked a wider variety of technologies within that more limited stock, and a wider array of models within each technology available. In other words, within the reduced lamp stocking quantities available in 2013, consumers typically had access to a wider array of lamps (technologies and models) than when quantities were greater in 2012, particularly in big box stores. As described above, many supplier representatives attribute declining CFL stock to declining ULP support for CFLs over time, but a handful of suppliers mentioned other possible drivers: for example, some representatives of the big box channels suggested that many chains focused

their stock on a limited number of SKUs in 2012 and 2013, and some mentioned constraining their lamp offerings to the same set of SKUs year-round and/or to a consistent packaging size or configuration across all lamps. Since these channels dominate the market in terms of total quantity of lamps stocked, these changes within big box stores had noticeable effects on lamp availability and diversity at the overall market level.

3. **CFL awareness and purchase rates declined between 2012 and 2013, but awareness and purchase rates for other lamp technologies—including EISA-compliant halogen lamps and LED lamps—held steady or increased. Several factors may be driving these trends.**

General awareness of CFLs increased substantially between 2001 and 2006, and held steady at roughly 96 percent of PG&E, SCE, and SDG&E residential electric customers through 2012. In 2013, CFL awareness declined by a significant margin to 87 percent of consumers. Between 2012 and 2013, awareness of LED lamps remained over 80 percent of the population and awareness of EISA-compliant incandescent lamps at roughly 60 percent of the population. Self-reported CFL purchase rates among consumers dropped by a small but significant margin between 2012 and 2013 (from 57% to 51%) while LED purchase rates increased slightly and EISA-compliant incandescent lamp purchase rates held steady. These phenomena are not limited to California—the same trends are apparent in Massachusetts and the Pacific Northwest, and may be a result of the expanding range of lamp technologies, a general decline in market attention to CFLs over the past several years, declining ULP support for basic CFLs, and/or other factors.

4. **California's LED replacement lamp market was still in its infancy in 2013. Key market barriers included lamp price, lack of availability, and lack of consumer familiarity with LED lamps.**

Less than a third of California retail stores that sold replacement lamps in 2012 or 2013 had LED lamps in stock at the time of our shelf survey visits. LED replacement lamps were not present in large quantities in retail settings during this timeframe—representing only 2 percent of all lamps stocked in 2012 and 2013—nor were they present in large quantities in the 2010-2012 ULP—representing less than one-tenth of one percent of all ULP discounted units (roughly 110,00 lamps—all reflectors). Additionally, the 2012 household lighting inventory showed that LED lamps were installed in only about 1 percent of sockets among PG&E, SCE, and SDG&E residential electric customers. Shelf survey results suggest that LED lamp prices averaged just under $15 per lamp in 2012 and 2013, more than three times as expensive as other replacement lamp technologies. Supplier interviews and lamp choice modeling efforts suggest that without increased availability and much lower prices, LED lamps may not achieve widespread adoption among consumers. Along with results from the consumer surveys, supplier interview results also suggest that lamp price and lack of familiarity with the technology—that is, understanding of LED lamps beyond basic awareness of the technology—were among the major market barriers for LED lamps in 2012 and 2013.

5. **Overall average LED lamp prices remained stable between 2012 and 2013 in California retail stores, largely because of a shift away from lamps with the lowest light output and toward lamps in the middle and higher-brightness ranges between years. Within each lumen bin except the lowest (<310 lumens), average LED lamp prices declined.**

LED lamps had the highest average price across all lamp technologies at nearly $15 per lamp in 2012 and 2013. Although the average price per LED lamp remained almost the same between years, there was a decline in average price per lamp within each lumen bin other than the lowest (<310 lumens). Although low- and medium-low brightness LED lamps still dominated retail store shelves in 2012 and 2013, lamp stocking shifted away from lamps in the lowest lumen bin and toward moderate and higher-lumen LED lamps. LED lamps in the lowest lumen bin were least expensive, and these comprised 51 percent of all LED lamp stock across retail channels in 2012 but only 15 percent in 2013. The shift toward stocking brighter lamps drove the overall price for LED lamps in 2013.

6. **The effects of EISA and AB 1109 on lamp sales and stocking are unclear, but the regulations may have contributed to decreased stocking and sales of CFLs.**

Of the 26 manufacturers' representatives we interviewed, ten suggested that the legislation had already decreased CFL sales or would do so in the future, primarily because they believed that EISA-compliant incandescent and LED lamps were displacing CFL sales and because IOU incentives for CFLs have decreased (prompting customers to select other lamp types, such as EISA-compliant incandescent lamps or LED lamps). Nine suggested the legislation may increase CFL sales (and the remainder were split between being unsure and suggesting that the legislation would have no effect on CFL sales). With regard to LED lamps, half of the manufacturers' representatives reported that the legislation had resulted (or would result) in increased LED lamp sales while the other half reported that EISA had not affected LED lamp sales and was unlikely to do so going forward. Most suppliers suggested that consumers would select EISA-compliant A-lamps when traditional incandescent A-lamps were no longer available. Results from the lamp choice model also suggested that CFLs will constitute a majority share of the A-lamp replacement market when traditional incandescent A-lamps disappear from retail stores—but only if IOU incentives for these types of CFLs continue. If not, consumers may select EISA-compliant incandescent lamps instead of more energy-efficient alternatives.

7. **EISA and AB 1109 drove increases in halogen lamps' market presence between 2012 and 2013, but halogen lamp installations were still low in 2012.**

The percentage of stores stocking halogen lamps went up by 40 percent between 2012 and 2013, with roughly two-thirds of stores stocking these products during the 2013 shelf survey visits. Halogen lamps also doubled their share of total retail lamp stock in California between 2012 and 2013 (from 7% to 14% of stock) and, based on results from a limited set of stores, exhibited dramatic increases in the total quantity of lamps stocked (particularly in big box stores). Lamp suppliers suggest that this influx of halogen lamps is likely a result of EISA and AB 1109 and the associated phase-out of traditional incandescent lamps beginning in January, 2011 in California.

During the 2012 in-home lamp inventories, however, halogen lamp installations were still low (roughly 8 to 9% of all installed lamps in 2009 and 2012 were halogens). Shelf survey results suggest that while EISA-compliant halogen lamps increased their retail presence between 2012 and 2013, traditional incandescent lamps were still widely available—which is not surprising, given that AB 1109 only went into effect for lamps in the 750-1049 and 310-749 lumen categories in January of 2013). In 2013, many lamp suppliers expected that consumers would switch to EISA-compliant halogen lamps in absence of traditional incandescent lamps, but given that we conducted the in-home inventories in 2012, the low

household saturation of halogen lamps at that time is not surprising.

8. **As of 2012, there remained substantial potential for additional energy-efficient lamp installations among PG&E, SCE, and SDG&E residential electric customers.**

In-home lighting inventories suggest that the share of all installed lamps comprised by energy-efficient lamps (i.e., CFLs or LED lamps) increased from 22 percent in 2009 to more than 31 percent in 2012, an increase of roughly 40 million energy-efficient lamps. As of 2012, there were nearly 315 million sockets in which inefficient lamps were still installed, nearly 185 million of which were in high-use locations (such as such as kitchens, living rooms, dining rooms, bedrooms, and exterior fixtures). Even if only half of these could be appropriately replaced with energy-efficient lamps (because of issues related to dimmability or other applicability concerns), that leaves the potential for more than 90 million additional energy-efficient lamp installations in high-use locations in PG&E, SCE, and SDG&E electric service territories as of 2012.

9. **Of the CFLs and LED lamps purchased in 2012 and 2013, the majority were acquired to replace inefficient lamp technologies (such as incandescent or halogen lamps) or to fill empty sockets.**

According to results of consumer telephone surveys and shopper intercept survey results, roughly 60 to 70 percent of the CFLs and LED lamps purchased during 2012 and 2013 were intended to replace lamp technologies other than CFLs or LED lamps (or were purchased to install in empty sockets). These results suggest that in the future, there may be further expansion of energy-efficient lamp installations beyond the 31 percent of household sockets in which these technologies were installed in 2012 and into sockets not yet filled with efficient lamps.

10. **The quantity of lamps in storage among PG&E, SCE and SDG&E residential electric customers averaged roughly 10 lamps per household in 2009 and 2012, and the share of stored lamps comprised by CFLs versus incandescent lamps changed little between years.**

In-home inventory results suggest that there were roughly 98 million lamps in storage in the study area in both 2009 and 2012, averaging roughly 10 lamps in storage per household. The share of stored lamps comprised by incandescent lamps and CFLs changed negligibly between years, and averaged roughly 3.5 incandescent lamps and 6 CFLs in storage per household. In the same timeframe, as described above, CFL saturation increased and incandescent lamp saturation decreased. Coupled with shopper intercept survey findings from 2012 and 2013 suggesting that the majority of the CFLs and LED lamps purchased in 2012 and 2013 were acquired to replace inefficient lamp technologies, the stable composition of stored lamps and increasing CFL saturation suggest that CFLs may be cycling through storage more quickly than incandescent lamps. In other words, consumers may be moving CFLs into and out of storage at a more rapid rate than incandescent lamps while acquiring new CFLs to maintain a constant storage volume. Alternatively, it is possible that the CFLs in storage are older or less desirable models that will remain in storage as consumers purchase newer, improved models to replace other lamps installed throughout their homes.

A. APPENDIX A - REFERENCES

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B. APPENDIX B – SHELF SURVEY WEIGHTS

memo

To:	Carmen Best and Jeorge Tagnipes California Public Utilities Commission, Energy Division	Date:	November 1, 2013
	Nikhil Gandhi and Ralph Prahl CPUC ED Consultants		
From:	Jenna Canseco, Mike Witt, Andrew Stryker, Kathleen Gaffney, and Miriam Goldberg DNV KEMA Energy & Sustainability		
Subject:	CPUC EM&V WO13 – Lighting Process Evaluation and Market Characterization **California Retail Lighting Storefront Weights: Overview of Methods and Results** **UPDATED MEMO**		

1 Introduction

1.1 Background

Several of the California Public Utilities Commission's (CPUC) Evaluation, Measurement and Verification (EM&V) work orders (WO) are related to residential lighting products (including WO13 – Lighting Process Evaluation and Market Characterization, WO28 – Residential/Advanced/Upstream Lighting Impact Evaluation, and WO54 – Market Assessment and Market Effects). Each of these involves research in California retail stores that sell light bulbs. Researchers have typically drawn the sample for these research efforts from lists of past and current participants in the California investor-owned electric utilities' Upstream Lighting Program (ULP) as well as supplemental research to identify additional stores that sell light bulbs but have not participated in the ULP. The challenge posed by this sampling approach is that it is unclear whether the frame accurately represents the population of retail stores in California that sell light bulbs. Evaluators are thus unable to develop sample expansion weights based on this frame. As such, research results are less meaningful across retail channels (the "overall" market-level results) than between individual channels.

To remedy this, the WO13 team developed an approach for estimating the approximate number of storefronts in each retail channel in California that sell light bulbs.[1] Note that the team could not simply acquire a list of retail stores in the state and develop storefront weights based on such a list for

[1] The term "storefront" is defined as an individual store location or premise (regardless of whether the store is a chain store or an independent store). "Storefront weights" refers to retail channel weights based on the relative number of California lighting retail storefronts per channel.

two reasons: one, because the percentage of stores that sells light bulbs likely differs from channel to channel; and two, this percentage is unknown for each channel. For these reasons, the WO13 team developed a survey-based method that used such a list as the starting point in determining the percentage of storefronts in California in each channel that sell light bulbs. The DNV KEMA team will apply the storefront weights from this effort to the results of ongoing research in WO13, WO28 and WO54 involving California retailers.

The purpose of this memorandum is to describe the methods used to develop storefront weights as well as the results. The immediate need for storefront weights relates to retail lighting shelf surveys conducted throughout California as part of WO28 during 2012 and 2013. As such, the memo describes the process by which the DNV KEMA team developed these weights, restricting the results only to channels in which we conducted shelf surveys. The same methods can be used for other data collection efforts (such as retail store manager telephone surveys) that may address other subpopulations defined by investor-owned utility (IOU) service territory, current or past participation in the ULP (or nonparticipation), and other elements described in subsequent sections of the memo.

1.2 Overview of Storefont Weights Task

As described above, the primary purpose of this memo is to explain the process by which the DNV KEMA team developed storefront weights for California retail stores that sell light bulbs and to share the resultant weights. This section of the memo provides a brief overview of the steps involved in developing the weights.

The first step in developing the storefront weights was to conduct what we'll refer to as the Survey of California Storefronts (SCS). This data collection effort entailed contacting a sample of storefronts in California using a computer-aided telephone interviewing (CATI) approach. Telephone interviewers conducted brief surveys with a representative of each storefront. The survey included the following questions:

- Q1. Does your store sell light bulbs? (Yes/No)
- Q2. Do you sell compact fluorescent light bulbs (CFLs)? (Yes/No)
- Q3. Do you sell LED light bulbs? (Yes/No)

The most important information obtained from the SCS was the yes/no response to Q1. The survey also asked respondents to confirm the name and address of the business (per the business name listed in the sample). The DNV KEMA team included questions 2 and 3 (regarding CFLs and LED lamps) for market characterization purposes only; they do not support development of storefront weights.

This memorandum provides a summary of the results from the SCS and describes the methodology used to develop the final storefront weights. Section 2 of this memo provides a summary of the SCS sample design. Section 3 describes the data collection process including a summary of the final eligibility and response rates achieved. Section 4 summarizes the survey results, including a discussion of the final estimates and associated sampling errors. Section 5 provides a summary of the development of the final storefront weights. Appendix A includes complete citations for sources referenced in this memo and Appendix B includes the additional detailed data tables referenced in Sections 2 and 3 of the memo.

2 Sample Design

The sample selection process for the Survey of California Storefronts (SCS) began by constructing a sample frame of storefronts in the desired retail channels. The DNV KEMA team obtained this master list of storefronts from InfoUSA, Inc.,[2] a vendor that maintains and sells lists of establishments that they construct from numerous sources. Their master list of establishments covers the entire United States and includes location and contact information for each establishment as well as Standard Industrial Classification (SIC) codes that are used to classify each establishment into an appropriate industry. For the SCS, DNV KEMA analysts pulled a list of establishments from the InfoUSA master file and classified them into the appropriate retail channel based on the storefront name and location (if in the IOU ULP tracking data) or by primary SIC code (if not in the tracking data). The scope of the SCS included only storefronts in California and only those classified in certain industries (noted below). The resulting file, which was used as the sample frame for the SCS, had 32,515 establishments.

The DNV KEMEA team designed the SCS to achieve a certain number of respondents in strata defined by investor-owned utility (IOU) service territory IOU ULP participation status, and retail channel.

1. **IOU Service Territory** refers to California IOU service territories. Because the research effort focuses on residential replacement lamps (an electric measure), the SCS was constrained to storefronts in the electric and dual-fuel IOU service territories of Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E). DNV KEMA analysts classified each storefront into an appropriate IOU service territory based on its zip code.
2. **ULP Status** refers to whether the specific storefront participated in California's ULP during the 2006-2008 and/or 2010-2012 program periods. For analytic purposes, it was important to develop storefront weights for this subgroup (see Section 5 for further discussion). Analysts classified each storefront in the sample frame into a ULP status category (either Participant or

[2] Additional information on InfoUSA can be found on their website at www.infousa.com.

Nonparticipant) after attempting to link the storefronts to a master list of ULP participants using the store name, location and contact information for each storefront.

3. **Retail Channel** refers to type of retail store and included:
    - Discount;
    - Drug;
    - Chain Grocery;
    - Independent Grocery;
    - Hardware;
    - Home Improvement;
    - Lighting & Electronics;
    - Mass Merchandise; and
    - Membership (Wholesale) Clubs.

    DNV KEMA analysts classified each storefront into one of these 9 retail channels using separate approaches based on the storefront's classification as a ULP Participant or ULP Nonparticipant:

    a. **ULP Participants**: For storefronts that participated in the ULP during the 2006-2008 and/or 2010-2012 program periods, DNV KEMA analysts used the channel assignments applied to the ULP tracking data in previous evaluation work. For cases in which a subset of the total stores in a specific chain participated in the ULP, analysts assigned the same storefront classification to all storefronts in the list. (For example, if there were 100 storefronts in the InfoUSA list from the same chain but only 80 of these in the ULP tracking data, analysts assigned all 100 storefronts to retail channels based on the tracking data assignments.)

    b. **ULP Nonparticipants**: For storefronts that did not participate in the ULP between 2006 and 2012, analysts assigned channels based on the primary SIC code. Appendix B (Table 7) includes a detailed mapping of SIC codes to retail channel.

    This is an imperfect process, as in a small number of cases, the channel assignments in the ULP tracking data differ from the channel assignments that would have been applied based on the SIC code classification from InfoUSA. In these cases, the DNV KEMA team used the ULP tracking data assignments in the analyses.

These three stratification variables – IOU service territory, retail channel and ULP Status – yielded a total of 54 strata defined by 3 regions, 9 retail channels and 2 ULP status categories. DNV KEMA analysts allocated a desired respondent sample of 800 storefronts to the 54 strata using frame information and an initial educated guesses (from DNV KEMA analysts familiar with the California retail market for residential replacement lamps) regarding the likely percent of stores in each stratum

that sell light bulbs. Analysts allocated the sample to strata such that the final estimate of the percent of stores that sell light bulbs was as precise as possible. The team determined this allocation using the Neyman Allocation approach (see for example, Cochran, 1977) and used stratum-level frame counts as well as the initial guesses at the outcome measure to determine optimal allocation.

Table 1 (in Section 3 below) provides a high-level summary of the sample frame, the selected number of storefronts and the responding number of storefronts by IOU territory, retail channel, and ULP status as discussed in the next section of this memo. Appendix B provides additional detail regarding the number of storefronts in each stratum for each combination of IOU territory, retail channel, and ULP status. Analysts selected the sample within each stratum using a simple random sampling process.

3 Data Collection Methodology and Response Rates

DNV KEMA analysts randomly selected a large sample of storefronts from the sample frame within each of the 54 sampling stratum discussed in Section 2. An independent third-party survey research firm conducted the surveys using a fairly simple data collection instrument. Interviewers asked the three questions presented in Section 1 as well as a few questions to verify name and address of the storefront. The DNV KEMA team designed the questionnaire such that any store employee could answer the questions (i.e., the survey did not require interviewers to request a specific respondent, such as the store manager, to complete the survey).

During the data collection process for the Survey of California Storefronts (SCS), telephone interviewers made at least 5 attempts at obtaining a response for each selected storefront. The CATI firm randomly sub-selected storefronts from the sample file provided by the DNV KEMA team, and interviewers worked through the sample until they achieved the desired number of respondents within each stratum. Data collection occurred in July, 2013.

Table 1 depicts the results of this data collection effort. During the data collection process, some stores were declared ineligible for the SCS. Ineligible stores are those that have the same address and phone number as that listed in the InfoUSA record, but where the business name did not match the InfoUSA record. We declared these ineligible based on the assumption that another record likely existed in the sample frame with the correct business name, so the record that was selected for the SCS actually represents a type of frame error.

Data collection concluded with an overall eligible rate of 97.6 percent and a respectable response rate of 34.6 percent. Response was lower in SCE’s territory (28.9%), hardware stores (28.2%) and membership clubs (25.4 %). Response rates were higher in PG&E’s territory (44.1%) and for lighting and electronics stores (50.5%). Response rates were fairly consistent between the ULP Participant and Nonparticipant groups (33.2% and 36.0%, respectively).

Table 1
Summary of Sample Frame, Eligibility and Response by IOU Territory, Retail Channel, and ULP Status

Domain		Number of Storefronts in Frame	Number of Storefronts Selected For CATI Data Collection	Eligible Storefronts	Desired Number of Respondents	Final Number of Respondents	Eligibility Rate	Response Rate
IOU Territory	PG&E	14,359	752	732	320	323	97.3%	44.1%
	SCE	15,150	1,137	1,111	320	321	97.7%	28.9%
	SDG&E	3,006	497	486	160	161	97.8%	33.1%
Retail Channel	Discount	3,162	255	245	86	88	96.1%	35.9%
	Drug	4,148	226	215	102	103	95.1%	47.9%
	Grocery Chain	3,163	232	223	76	77	96.1%	34.5%
	Grocery Independent	9,730	840	831	259	259	98.9%	31.2%
	Hardware	2,299	136	131	37	37	96.3%	28.2%
	Home Imprv	549	64	61	18	19	95.3%	31.1%
	Ltg & Electronics	3,035	107	105	53	53	98.1%	50.5%
	Mass Merch	6,250	458	451	151	152	98.5%	33.7%
	Membership Club	179	68	67	18	17	98.5%	25.4%
ULP Status	Participant	17,557	1,163	1,121	400	404	96.4%	36.0%
	Nonparticipant	14,958	1,223	1,208	400	401	98.8%	33.2%
Overall		**32,515**	**2,386**	**2,329**	**800**	**805**	**97.6%**	**34.6%**

4 Survey Estimates from the SCS and Their Precision

After data collection from the Survey of California Storefronts (SCS) was complete, DNV KEMA analysts computed direct survey estimates from questions Q1, Q2 and Q3 (noted in Section 1 above) for various domains of interest. Analysts computed these estimates using a sample expansion factor, or sample weight, for each responding storefront that was defined as the product of two factors:

1. **Sample Selection Weight**. This component of the weight accounts for the stratified simple random sampling process that was used to select the sample from the InfoUSA sample frame.
2. **Nonresponse Adjustment.** This adjustment to the sample selection weight accounts for those eligible storefronts that did not respond to the survey. This adjustment was computed for each of the original 54 strata.

Analysts computed percent estimates for each domain of interest. They also computed the precision, or sampling error, of each estimate using a Taylor Series Linearization approach. This approach is appropriate to use since it accounts for the complex design features of this study, including both stratification and weighting.

Tables 2 and 3 present final estimates as well as estimates of their precision. In these tables, we defined retail channel using each storefront's primary SIC code only (not based on pre-existing classifications for stores that participated in the ULP) to make the definition of channel consistent with discussions in Section 5. As noted in Section 2, retail channel was defined slightly differently during the sample selection process (used both primary SIC code and some re-assignments based on company name). Because of this difference in the definition of channel, the sample sizes in this table will differ slightly from those reported in earlier sections. (Note that this difference affects only 17 storefronts and thus has minimal effect on the results.)

The weighted survey results presented in Table 2 suggest that approximately 53 percent of storefronts in PG&E, SCE, and SDG&E service territories sell light bulbs. Approximately 28 percent of these storefronts sell CFLs and 15 percent sell LED lamps. The percentage of storefronts that sell light bulbs is lowest in the Lighting & Electronics channel (35%) and the Mass Merchandise channel (22%).[3] Results also suggest that a smaller percentage of ULP Nonparticipants reported selling light bulbs than ULP Participants (36% versus 68%, respectively). Table 3 presents estimates of the corresponding population totals. (Note that because each SCS respondent is classified by ULP territory, retail channel, and ULP status, we could estimate the population for any combination of these three variables

[3] The sample included a large number of small, independent variety stores and general merchandisers in the Mass Merchandise channel.

and use the resultant weights to expand shelf surveys that are similarly classified – however, given the small sample sizes for the 3-way totals, we instead rely upon a raking procedure to develop the weights as described in the next section.)

Table 2
Percent Estimates and Their Precision from the Survey of California Storefronts (SCS)

Domain		Q1: Percent that Sell Light Bulbs				Q2: Percent That Sell CFLs				Q3: Percent That Sell LED Bulbs			
		Percent	Sampling Errror	90% Confidence Interval	Sample	Percent	Sampling Errror	90% Confidence Interval	Sample	Percent	Sampling Errror	90% Confidence Interval	Sample
IOU Territory	PG&E	57.3	2.5	(53.2, 61.4)	323	28.5	2.5	(24.4, 32.6)	301	12.7	2	(9.3, 16.0)	297
	SCE	49.8	2.5	(45.7, 53.9)	321	27	2.3	(23.1, 30.8)	301	16.7	2	(13.4, 20.0)	301
	SDG&E	51.9	3.5	(46.2, 57.6)	161	27.6	3.2	(22.3, 32.9)	156	19.7	3	(14.8, 24.6)	153
Retail Channel[†]	Discount	68.6	5	(60.4, 76.9)	83	33.9	5.8	(24.4, 43.4)	73	13.2	4.2	(6.4, 20.0)	71
	Drug	58.5	3.5	(52.8, 64.3)	104	38.6	4.6	(31.1, 46.2)	98	15.4	3.6	(9.5, 21.3)	95
	Grocery	64.1	2.7	(59.7, 68.5)	336	24.3	2.5	(20.2, 28.4)	309	10.3	1.8	(7.3, 13.3)	307
	Hardware	68.1	6.8	(56.9, 79.3)	39	59.2	7.4	(46.9, 71.4)	39	38.7	8.8	(24.2, 53.1)	39
	Home Imprv	69.6	9.6	(53.7, 85.4)	18	66.7	9.8	(50.6, 82.8)	18	66.7	9.8	(50.6, 82.8)	18
	Ltg & Electronics	35.1	6.4	(24.4, 45.7)	53	20.5	5.8	(10.9, 30.0)	53	24.1	5.6	(14.9, 33.4)	53
	Mass Merch	21.9	3.5	(16.0, 27.7)	154	11.6	2.8	(7.0, 16.1)	151	7.1	2.2	(3.4, 10.7)	152
	Membership Club	90.1	0.3	(89.5, 90.7)	16	86.7	3.2	(81.4, 92.0)	16	68.6	13.3	(46.7, 90.5)	15
	Other, Unknown	*	*	*	2	*	*	*	1	*	*	*	1
ULP Status	Participant	68.3	2.2	(64.6, 71.9)	404	39.6	2.4	(35.6, 43.6)	376	22.3	2.2	(18.7, 25.8)	368
	Nonparticipant	36.2	2.4	(32.3, 40.1)	401	14.4	1.9	(11.2, 17.6)	382	7.6	1.5	(5.1, 10.0)	383
Overall		**53.3**	**1.6**	**(50.6, 56.0)**	**805**	**27.7**	**1.6**	**(25.1, 30.3)**	**758**	**15.2**	**1.3**	**(13.0, 17.4)**	**751**

* Estimates suppressed because standard error estimate was zero, sample size was fewer than 10, or the relative standard error of the estimate was greater than 50%.

[†] In this table, we defined retail channel using each storefront's primary SIC code only in order to make the definition of channel consistent with discussions in Section 5. As noted in Section 2, we defined retail channel slightly differently during the sample selection process (used both primary SIC code and some re-assignments based on company name). Because of this difference in the definition of channel, the sample sizes in this table differ slightly from those in Table 1 above.

Note: Item non-respondents are excluded from the estimates (so the sample size is not consistent in each row between the Q1, Q2 and Q3 estimates).

Table 3
Estimates of Totals and Their Precision from the Survey of California Storefronts (SCS)

Domain		Q1: Total Storefronts that Sell Light Bulbs				Q2: Total Storefronts That Sell CFLs				Q3: Total Storefronts That Sell LED Bulbs			
		Total Store-fronts	Sampling Error	90% Confidence Interval	Sample	Total Store-fronts	Sampling Error	90% Confidence Interval	Sample	Total Store-fronts	Sampling Error	90% Confidence Interval	Sample
IOU Territory	PG&E	7,986	345	(7,418, 8,554)	323	3,718	333	(3,169, 4,266)	301	1,634	264	(1,200, 2,068)	297
	SCE	7,313	365	(6,712, 7,914)	321	3,740	325	(3,205, 4,275)	301	2,319	282	(1,855, 2,784)	301
	SDG&E	1,534	102	(1,365, 1,702)	161	789	93	(636, 941)	156	553	84	(414, 692)	153
Retail Channel[†]	Discount	1,949	156	(1,692, 2,205)	83	857	152	(606, 1,107)	73	324	103	(154, 494)	71
	Drug	2,323	144	(2,086, 2,560)	104	1,441	178	(1,149, 1,734)	98	562	132	(344, 779)	95
	Grocery	8,072	356	(7,485, 8,659)	336	2,794	299	(2,302, 3,286)	309	1,174	212	(824, 1,524)	307
	Hardware	1,511	175	(1,224, 1,799)	39	1,313	182	(1,013, 1,612)	39	858	196	(535, 1,180)	39
	Home Imprv	351	52	(266, 436)	18	337	50	(255, 418)	18	337	50	(255, 418)	18
	Ltg & Electronics	1,039	191	(724, 1,353)	53	606	171	(324, 888)	53	715	166	(442, 989)	53
	Mass Merch	1,368	225	(997, 1,738)	154	708	169	(430, 987)	151	435	138	(209, 662)	152
	Membership Club	155	6	(145, 164)	16	149	6	(139, 159)	16	101	30	(52, 150)	15
	Other, Unknown	*	*	*	2	*	*	*	1	*	*	*	1
ULP Status	Participant	11,496	374	(10,879, 12,113)	404	6,216	388	(5,577, 6,855)	376	3,433	334	(2,883, 3,983)	368
	Nonparticipant	5,337	350	(4,760, 5,914)	401	2,030	273	(1,580, 2,480)	382	1,073	211	(725, 1,421)	383
Overall		16,833	513	(15,988, 17,677)	805	8,246	474	(7,465, 9,027)	758	4,506	395	(3,855, 5,156)	751

* Estimates suppressed because standard error estimate was zero, sample size was fewer than 10, or the relative standard error of the estimate was greater than 50%.

[†] In this table, we defined retail channel using each storefront's primary SIC code only in order to make the definition of channel consistent with discussions in Section 5. As noted in Section 2, we defined retail channel slightly differently during the sample selection process (used both primary SIC code and some re-assignments based on company name). Because of this difference in the definition of channel, the sample sizes in this table differ slightly from those in Table 1 above.

Note: Item non-respondents are excluded from the estimates (so the sample size is not consistent in each row between the Q1, Q2 and Q3 estimates).

5 Storefront Weights

As noted in Section 1, the primary purpose of the Survey of California Storefronts (SCS) was to develop estimates of population totals that could be used to develop weights for other the results of other data collection efforts involving California retail stores. In this section we illustrate how the estimates of population totals from the SCS can be used to develop storefront weights for storefronts included in two data collection efforts: the Winter 2012-2013 lighting retailer shelf surveys and the Summer 2013 shelf surveys.[4]

In addition to list of retail storefronts in which the DNV KEMA team conducted shelf surveys, data are also available regarding the IOU territory, retail channel and ULP status for each storefront visited during the shelf surveys. As noted in previous sections, these data are also available for SCS respondents (as they were used in the design of the SCS). Since these data are available from both studies, they can be used in developing storefront weights for the shelf surveys.

All shelf survey storefronts were eligible for inclusion in the SCS, however, some storefronts in the SCS were not eligible for shelf surveys because DNV KEMA staff conducted shelf surveys only in storefronts that stock light bulbs. So the first step in developing storefront weights was to subset the SCS file to only those storefronts that were also eligible for the shelf surveys. Only storefronts that sell light bulbs were eligible for shelf surveys, and only storefronts in the following retail channels were eligible:

- Discount
- Drug
- Grocery
- Hardware
- Home Improvement
- Mass Merchandise
- Membership Club

As such, this information was used to subset the SCS.

After DNV KEMA analysts reduced the SCS down to those storefronts that were eligible for inclusion in the Winter 2012-2013 and Summer 2013 shelf surveys, the SCS respondent sample weights can be summed by any combination of variables to obtain an estimate of the population eligible for shelf surveys in different groups. For example, to obtain an estimate of the eligible shelf survey population by IOU territory, the SCS respondent weights on the reduced file can be

[4] For an overview of general shelf survey methods and approaches, see DNV KEMA, 2012. The forthcoming WO13 California Residential Replacement Lamp Market Characterization Study will provide additional details on shelf survey findings.

summed by IOU territory - and these sums represent an estimate of the population of storefronts eligible for inclusion in shelf surveys by IOU territory.

To obtain the desired storefront weight for each storefront included in the shelf surveys, the reduced SCS analytic file was used to estimate population totals for several groups and a sample weight raking procedure was used to create weights for storefronts included in the shelf surveys. For this example, the raking-type procedure that was implemented was a model-based, calibration technique that is often used to derive nonresponse and post-stratification weight adjustments for survey respondents. This calibration technique involves fitting a Generalized Exponential Model where the independent variables of the model are the set of variables one wishes to control for during the raking process, and the model parameters are estimated using a series of calibration equations that ultimately force the resulting shelf survey storefront weights to equal the SCS estimates of population totals for each variable used in the modeling process.[5]

DNV KEMA analysts considered each phase of the shelf surveys individually, and developed a storefront weight for each storefront included in the shelf survey sample for each phase using the Generalized Exponential Model. The weights that resulted from this process were constructed so that that they would equal eligible population totals (obtained from the reduced SCS file) across the three main effect variables: IOU Territory, Retail Channel and ULP Status. Overall shelf survey sample sizes in each phase were too small to allow us to control for any interaction of these main effect variables in the raking process.

Table 4 presents the control totals derived from the SCS respondent data that were used in the raking process. The DNV KEMA team derived these totals by summing the SCS sample weights across SCS respondent storefronts that indicated they sell light bulbs. These population totals differ from those presented in Table 1 above because Table 4 represents estimates of the total population of storefronts that sell light bulbs while the totals in Table 1 also include storefronts that do not sell light bulbs.

[5] A discussion of this calibration technique can be found in Folsom and Singh, 2000.

Table 4
Control Totals Used in the Raking Process

Domain		Control Total Used in the Raking Process
IOU Territory	PG&E	7,544
	SCE	6,768
	SDG&E	1,417
Retail Channel	Discount	1,949
	Drug	2,323
	Grocery	8,072
	Hardware	1,511
	Home Imprv	351
	Mass Merch	1,368
	Membership Club	155
ULP Status	Participant	10,897
	Nonparticipant	4,832

Table 5 (below) presents a summary of the SCS sample design weights and the shelf survey storefront weights that resulted from the raking process. The final shelf survey storefront weights ranged in magnitude from 1.4 to roughly 335.

Table 5
Summary of SCS Storefront Weights from the SCS Sample Design and Shelf Survey Storefront Weights from the Raking Process

Domain		Survey of California Storefronts (SCS)				Winter 2012-2013 Shelf Surveys				Summer 2013 Shelf Surveys			
		Total Store-fronts	Sample	Minimum Sample Weight	Maximum Sample Weight	Total Store-fronts	Sample	Minimum Sample Weight	Maximum Sample Weight	Total Store-fronts	Sample	Minimum Sample Weight	Maximum Sample Weight
IOU Territory	PG&E	7,544	177	17.7	83.6	7,544	75	7.9	335.5	7,544	76	7.9	334.2
	SCE	6,768	151	5.9	86.4	6,768	75	5.8	327.9	6,768	75	5.8	326.1
	SDG&E	1,417	81	6	25.7	1,417	50	1.4	178.5	1,417	50	1.4	172.8
Retail Channel	Discount	1,949	57	5.9	41.1	1,949	29	6.8	102.3	1,949	29	7.5	99.1
	Drug	2,323	58	16.6	46.5	2,323	29	8.3	120.7	2,323	29	9.3	118.1
	Grocery	8,072	218	14	83.6	8,072	28	151.8	335.5	8,072	28	160.1	334.2
	Hardware	1,511	25	6.3	86.4	1,511	29	5.4	84.4	1,511	29	5.9	79.9
	Home Imprv	351	9	12.3	56	351	28	1.8	19.6	351	29	1.9	18.1
	Mass Merch	1,368	31	18.2	53.6	1,368	29	5	77.4	1,368	29	5.5	75
	Membership Club	155	11	5.9	24	155	28	1.4	7.9	155	28	1.4	7.9
ULP Status	Participant	10,897	271	6	86.4	10,897	149	1.4	335.5	10,897	152	1.4	334.2
	Nonparticipant	4,832	138	5.9	67.4	4,832	51	1.8	329.3	4,832	49	1.9	331.3
Overall		**15,729**	**409**	**5.9**	**86.4**	**15,729**	**200**	**1.4**	**335.5**	**15,729**	**201**	**1.4**	**334.2**

Note: In the above table, "Total Storefronts" is the estimated number of storefronts in the CSSS-eligible population. DNV analysts computed these estimates by summing the weights from the SCS and each of the shelf survey phases (Winter 2012-2103 and Summer 2013).

Notice that the estimates in Table 5 match estimates of the total stores that sell light bulbs in Table 4 for all retail channels included in Table 5. Table 5 excludes Lighting and Electronics stores and Other stores because these two channels are part of the original SCS eligible population but are not part of the population of stores eligible for inclusion in the shelf surveys. As such, DNV KEMA analysts removed these storefronts from the SCS file before implementing the raking procedure. The elimination of SCS storefronts in the Lighting and Electronics and Other categories also explains why there is a difference in the population totals between Table 4 and Table 5 for the IOU territory and ULP status variables. Storefronts in the two channels (Lighting and Electronics and Other) are included in the IOU territory and ULP status totals in Table 4 but not Table 5.

This section illustrates storefront weight development for the Winter 2012/2013 and Summer 2013 shelf surveys using the SCS data to derive control totals and using the Generalized Exponential model to derive the raked weights. There are several other methodologies that can be used to compute raking weights (such as iterative proportional fitting methods or the weighting class approach), but the basic steps for computing raked weights are the same for all methodologies.[6] In summary, the approach is as follows:

1. Identify which subset of the SCS data belongs to the target population of interest. In this example, we were interested in a subset of the channels and we were only interested in stores that sell light bulbs.
2. Derive appropriate population totals using the reduced SCS data file. These population totals are computed by summing the SCS respondent weights over the desired groups of interest.
    a. Note that the totals from step #2 are the desired control totals that one wishes their weights to sum to. These control totals are inputs into any raking methodology that is used.
3. Apply the raking methodology.
4. Check results from the raking algorithm by summing the final sample weights across the variables of interest. The weight sums should match the control totals.

6 Conclusions and Next Steps

On November 1, 2013, DNV KEMA's project manager for WO13 (Jenna Canseco) convened a discussion of the storefront weights. Other participants included Carmen Best and Jeorge Tagnipes from the CPUC; Nikhil Gandhi and Ralph Prahl (ED Consultants), and four other

[6] A discussion of other methods that can be used to develop raked weights can be found in Witt, 2009.

members of the DNV KEMA team (Mimi Goldberg, Andrew Stryker, Tyler Mahone, and Mike Witt). Below we describe the conclusions (decisions) and next steps resulting from the call.

6.1 Conclusions

During this call, the group reached the following decisions:

1. Regarding WO13 – Lighting Process Evaluation and Market Research:
    - The DNV KEMA team should apply storefront weights to the shelf survey data
    - The team should apply storefront weights to the retail store manager survey data
    - The team should apply these weights in the analyses for both the California Residential Replacement Lamp Market Characterization Report and the online shelf survey data analysis tool (online at www.bulbstockdata.com)

    The rationale for these decisions is that the purpose of the WO13 reporting efforts is to represent the California market – that is, to accurately reflect the distribution of retail stores that sell light bulbs across the different retail channels.

2. Regarding WO54 – Market Assessment and Market Effects – LED Market Effects Study:
    - The DNV KEMA team should apply storefront weights to the California shelf survey data (and not the shelf survey data collected in comparison areas)
    - The team should apply storefront weights to the California retail store manager survey data (and not the retail store manager survey data collected in comparison areas)

    The rationale for these decisions that the purpose of the WO54 reporting efforts is to represent the California market – that is, to accurately reflect the distribution of retail stores that sell light bulbs across the different retail channels.

3. Regarding WO28 – Residential/Advanced/Upstream Lighting Programs Impact Evaluation:
    - The DNV KEMA team should apply storefront weights to the shelf survey data
    - The team should apply storefront weights to the retail store manager survey data

    The rationale for these decisions is that the purpose of the WO28 reporting efforts is to represent the California market – that is, to accurately reflect the distribution of retail stores that sell light bulbs across the different retail channels.
    - The DNV KEMA team should apply storefront weights to the in-store shopper intercept surveys but should also apply sales weights of some kind

    The rationale for this decision is that while the shelf and store manager survey results are at the store level, the intercept survey results are at the lamp level -- and thus, weighting

only to storefronts may not adequately represent channel-level differences in shopping habits and sales volume.

6.2 Next Steps

Below we describe the next steps for each of the three work orders mentioned above:

1. For WO13:
    - The DNV KEMA will apply storefront weights to the shelf survey data and the retail store manager survey data.
    - The team will apply these weights in analyses for both the California Residential Replacement Lamp Market Characterization Report and the online shelf survey data analysis tool.

2. For WO54:
    - The team will apply storefront weights to the California shelf survey data and the California retail store manager survey data.
    - The team will apply these weights in analyses for the LED Market Effects Study.

3. For WO28:
    - The DNV KEMA will apply storefront weights to the shelf survey data and the retail store manager survey data.
    - The team will apply these weights in analyses for the final Residential/Advanced/Upstream Lighting Impact Evaluation Report.
    - The DNV KEMA WO28 team will hold a follow-up discussion with CPUC staff and consultants to determine which weights are most appropriate to apply to the in-store shopper intercept survey results.

A. References

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B. Detailed Tables

Table 6
Mapping of InfoUSA Store Listings to CPUC ED Lighting Retail Channel Categories

Retail Channel	SIC Code	SIC Description	Total Storefronts in Sample Frame
1: Discount	1742-02	Acoustical Contractors	1
	1781-02	Drilling & Boring Contractors	1
	2431-03	Building Materials-Manufacturers	1
	3469-09	Machinery Parts & Supplies (Mfrs)	1
	5031-14	Building Materials-Wholesale	2
	5063-30	Electric Equipment & Supplies-Wholesale	1
	5099-98	Distribution Centers (Whls)	2
	5211-26	Building Materials	9
	5211-38	Home Centers	3
	5251-04	Hardware-Retail	8
	5251-15	Tools-New & Used	3
	5311-02	Department Stores	159
	5311-04	Retail Shops	1,100
	5331-01	Variety Stores	1,378
	5399-01	General Merchandise-Retail	2
	5411-01	Food Markets	48
	5411-03	Convenience Stores	141
	5411-05	Grocers-Retail	178
	5541-01	Service Stations-Gasoline & Oil	1
	5712-16	Furniture-Dealers-Retail	52
	5719-26	Lighting Fixtures-Retail	1
	5719-29	Housewares-Retail	5
	5722-02	Appliances-Household-Major-Dealers	1
	5731-17	Electronic Equipment & Supplies-Retail	34
	5912-05	Pharmacies	20
	5921-02	Liquors-Retail	1
	5932-22	Thrift Shops	2
	5943-01	Office Supplies	3
	5947-16	Party Supplies	1
	5993-01	Cigar Cigarette & Tobacco Dealers-Retail	1
	5999-02	Cellular Telephones-Equipment & Supls	2
Subtotal - Discount			**3,162**
2: Drug	5031-14	Building Materials-Wholesale	1
	5311-02	Department Stores	4
	5311-04	Retail Shops	2
	5331-01	Variety Stores	4
	5411-01	Food Markets	3
	5411-03	Convenience Stores	10
	5411-05	Grocers-Retail	25
	5712-16	Furniture-Dealers-Retail	5
	5719-29	Housewares-Retail	1
	5731-17	Electronic Equipment & Supplies-Retail	3
	5912-05	Pharmacies	4,089
	7319-08	Distribution Services	1
Subtotal – Drug			**4,148**

3: Chain Grocery	5211-08	Windows-Wood	1
	5211-26	Building Materials	2
	5211-38	Home Centers	2
	5251-04	Hardware-Retail	5
	5311-02	Department Stores	36
	5311-04	Retail Shops	17
	5331-01	Variety Stores	7
	5411-01	Food Markets	44
	5411-03	Convenience Stores	243
	5411-05	Grocers-Retail	2,728
	5451-01	Dairy Products-Retail	2
	5712-16	Furniture-Dealers-Retail	11
	5719-26	Lighting Fixtures-Retail	1
	5719-29	Housewares-Retail	2
	5731-17	Electronic Equipment & Supplies-Retail	18
	5812-08	Restaurants	1
	5912-05	Pharmacies	39
	5932-02	Antiques-Dealers	1
	5943-01	Office Supplies	2
	7542-01	Car Washing & Polishing	1
Subtotal – Chain Grocery			**3,163**
4: Independent	1781-02	Drilling & Boring Contractors	1
Grocery	3429-02	Hardware-Manufacturers	1
	4812-07	Cellular Telephones (Services)	1
	5063-19	Lighting Fixtures-Wholesale	1
	5211-26	Building Materials	3
	5211-38	Home Centers	2
	5251-04	Hardware-Retail	19
	5311-02	Department Stores	48
	5311-04	Retail Shops	102
	5311-10	Wholesale Clubs	5
	5331-01	Variety Stores	23
	5411-01	Food Markets	1,372
	5411-03	Convenience Stores	1,837
	5411-05	Grocers-Retail	6,173
	5421-07	Meat-Retail	3
	5499-18	Oriental Goods	1
	5541-01	Service Stations-Gasoline & Oil	39
	5712-16	Furniture-Dealers-Retail	50
	5719-26	Lighting Fixtures-Retail	4
	5731-17	Electronic Equipment & Supplies-Retail	17
	5812-08	Restaurants	3
	5912-05	Pharmacies	18
	5921-02	Liquors-Retail	3
	5943-01	Office Supplies	2
	5947-12	Gift Shops	1
	8742-01	Business Management Consultants	1
Subtotal – Independent Grocery			**9,730**
5: Hardware	1542-13	Building Contractors	2
	1542-27	Maintenance Contractors	4
	1794-03	Excavating Contractors	1
	5039-03	Fence (Whls)	1
	5063-18	Light Bulbs & Tubes (Whls)	2

	5063-19	Lighting Fixtures-Wholesale	3
	5211-26	Building Materials	126
	5211-38	Home Centers	6
	5211-42	Lumber-Retail	422
	5251-04	Hardware-Retail	1,376
	5251-15	Tools-New & Used	276
	5311-02	Department Stores	4
	5311-04	Retail Shops	4
	5331-01	Variety Stores	2
	5411-01	Food Markets	4
	5411-03	Convenience Stores	15
	5411-05	Grocers-Retail	21
	5712-16	Furniture-Dealers-Retail	15
	5719-26	Lighting Fixtures-Retail	5
	5731-17	Electronic Equipment & Supplies-Retail	7
	5912-05	Pharmacies	1
	5943-01	Office Supplies	1
	7699-62	Locks & Locksmiths	1
Subtotal - Hardware			**2,299**
6: Home Improvement	1731-23	Installation Service	1
	2421-01	Lumber-Manufacturers	1
	5099-98	Distribution Centers (Whls)	1
	5211-26	Building Materials	11
	5211-38	Home Centers	398
	5211-42	Lumber-Retail	11
	5251-04	Hardware-Retail	98
	5311-02	Department Stores	4
	5411-01	Food Markets	1
	5411-03	Convenience Stores	6
	5411-05	Grocers-Retail	8
	5712-16	Furniture-Dealers-Retail	3
	5719-29	Housewares-Retail	1
	5731-17	Electronic Equipment & Supplies-Retail	1
	5912-05	Pharmacies	2
	5943-01	Office Supplies	1
	8741-30	Management Services	1
Subtotal - Home Improvement			**549**
7: Lighting &	0781-03	Landscape Designers	1
Electronics	5063-18	Light Bulbs & Tubes (Whls)	109
	5063-19	Lighting Fixtures-Wholesale	259
	5063-30	Electric Equipment & Supplies-Wholesale	1
	5311-02	Department Stores	4
	5311-04	Retail Shops	1
	5331-01	Variety Stores	2
	5411-03	Convenience Stores	9
	5411-05	Grocers-Retail	3
	5712-16	Furniture-Dealers-Retail	8
	5719-26	Lighting Fixtures-Retail	443
	5731-17	Electronic Equipment & Supplies-Retail	2,195
Subtotal – Lighting & Electronics			**3,035**
8: Mass Merchandise	5211-38	Home Centers	1
	5311-02	Department Stores	1,366
	5311-04	Retail Shops	3

	5311-10	Wholesale Clubs	1
	5331-01	Variety Stores	3
	5411-03	Convenience Stores	2
	5411-05	Grocers-Retail	19
	5712-16	Furniture-Dealers-Retail	3,575
	5719-26	Lighting Fixtures-Retail	1
	5719-29	Housewares-Retail	324
	5731-17	Electronic Equipment & Supplies-Retail	1
	5943-01	Office Supplies	947
	5995-02	Optical Goods-Retail	2
	5999-02	Cellular Telephones-Equipment & Supls	3
	7384-01	Photo Finishing-Retail	2
Subtotal – Mass Merchandise			**6,250**
9: Membership Club	5311-02	Department Stores	4
	5311-04	Retail Shops	3
	5311-10	Wholesale Clubs	169
	5411-05	Grocers-Retail	2
	5712-16	Furniture-Dealers-Retail	1
Subtotal – Membership Club			**179**
Grand Total			**32,515**

Table 7
Summary of Sample Frame, Eligibility and Response by Stratum

IOU Territory	Retail Channel	ULP Status	Number of Storefronts in Frame	Number of Storefronts Selected For CATI Data Collection	Eligible Storefronts	Desired Number of Respondents	Final Number of Respondents	Eligibility Rate	Response Rate
1: PG&E	1: Discount	1: Participant	814	47	45	20	21	95.7%	46.7%
		2: Nonparticipant	337	23	22	9	9	95.7%	40.9%
	2: Drug	1: Participant	1,130	47	41	23	23	87.2%	56.1%
		2: Nonparticipant	618	31	31	16	16	100.0%	51.6%
	3: Chain Grocery	1: Participant	1,211	66	62	26	26	93.9%	41.9%
		2: Nonparticipant	200	25	25	5	5	100.0%	20.0%
	4: Independ. Grocery	1: Participant	2,293	107	102	52	52	95.3%	51.0%
		2: Nonparticipant	2,707	168	168	71	71	100.0%	42.3%
	5: Hardware	1: Participant	585	14	14	7	7	100.0%	50.0%
		2: Nonparticipant	575	26	26	9	9	100.0%	34.6%
	6: Home Improvement	1: Participant	192	15	15	3	4	100.0%	26.7%
		2: Nonparticipant	49	14	14	3	3	100.0%	21.4%
	7: Ltg & Electronics	1: Participant	353	14	14	5	5	100.0%	35.7%
		2: Nonparticipant	712	19	19	11	11	100.0%	57.9%
	8: Mass Merchandise	1: Participant	1,063	52	51	20	20	98.1%	39.2%
		2: Nonparticipant	1,456	64	63	34	35	98.4%	55.6%
	9: Membership Club	1: Participant	53	13	13	3	3	100.0%	23.1%
		2: Nonparticipant	11	7	7	3	3	100.0%	42.9%
2: SCE	1: Discount	1: Participant	1,370	76	73	32	32	96.1%	43.8%
		2: Nonparticipant	389	49	48	10	10	98.0%	20.8%
	2: Drug	1: Participant	1,199	65	63	24	25	96.9%	39.7%
		2: Nonparticipant	838	47	45	20	20	95.7%	44.4%
	3: Chain Grocery	1: Participant	1,311	57	53	27	27	93.0%	50.9%
		2: Nonparticipant	162	17	17	4	4	100.0%	23.5%
	4: Independ. Grocery	1: Participant	2,284	247	244	50	50	98.8%	20.5%
		2: Nonparticipant	1,628	202	202	41	41	100.0%	20.3%
	5: Hardware	1: Participant	372	14	13	4	4	92.9%	30.8%
		2: Nonparticipant	553	39	38	8	8	97.4%	21.1%
	6: Home Improvement	1: Participant	196	7	6	3	3	85.7%	50.0%
		2: Nonparticipant	51	7	6	3	3	85.7%	50.0%

IOU Territory	Retail Channel	ULP Status	Number of Storefronts in Frame	Number of Storefronts Selected For CATI Data Collection	Eligible Storefronts	Desired Number of Respondents	Final Number of Respondents	Eligibility Rate	Response Rate
	7: Ltg & Electronics	1: Participant	429	13	13	6	6	100.0%	46.2%
		2: Nonparticipant	1,195	33	31	18	18	93.9%	58.1%
	8: Mass Merchandise	1: Participant	1,317	42	41	24	24	97.6%	58.5%
		2: Nonparticipant	1,765	195	192	40	40	98.5%	20.8%
	9: Membership Club	1: Participant	72	13	13	3	3	100.0%	23.1%
		2: Nonparticipant	19	14	13	3	3	92.9%	23.1%
3: SDG&E	1: Discount	1: Participant	154	44	41	9	10	93.2%	24.4%
		2: Nonparticipant	98	16	16	6	6	100.0%	37.5%
	2: Drug	1: Participant	156	11	11	7	7	100.0%	63.6%
		2: Nonparticipant	207	25	24	12	12	96.0%	50.0%
	3: Chain Grocery	1: Participant	205	49	49	10	10	100.0%	20.4%
		2: Nonparticipant	74	18	17	4	5	94.4%	29.4%
	4: Independ. Grocery	1: Participant	413	66	65	21	21	98.5%	32.3%
		2: Nonparticipant	405	50	50	24	24	100.0%	48.0%
	5: Hardware	1: Participant	60	14	11	3	3	78.6%	27.3%
		2: Nonparticipant	154	29	29	6	6	100.0%	20.7%
	6: Home Improvement	1: Participant	42	8	7	3	3	87.5%	42.9%
		2: Nonparticipant	19	13	13	3	3	100.0%	23.1%
	7: Ltg & Electronics	1: Participant	53	4	4	3	3	100.0%	75.0%
		2: Nonparticipant	293	24	24	10	10	100.0%	41.7%
	8: Mass Merchandise	1: Participant	212	43	42	9	9	97.7%	21.4%
		2: Nonparticipant	437	62	62	24	24	100.0%	38.7%
	9: Membership Club	1: Participant	18	15	15	3	3	100.0%	20.0%
		2: Nonparticipant	6	6	6	3	2	100.0%	33.3%
Overall			**32,515**	**2,386**	**2,329**	**800**	**805**	**97.6%**	**34.6%**

C. APPENDIX C – ADDITIONAL DATA TABLES: SHELF SURVEY RESULTS

Table 47: Percent of Stores Carrying EISA Compliant and EISA Non-Compliant Lamps by Store Category, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	81%	48%	81%	48%
Non- Big Box	27%	14%	27%	14%

Table 48: Percent of Stores Carrying EISA Compliant and EISA Non-Compliant Lamps by Store Category, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	64%	17%	92%	54%
Non- Big Box	20%	33%	69%	28%

Table 49: Percent of Stores Carrying EISA Compliant and EISA Non-Compliant Lamps by Store Category, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	80%	94%	94%	69%
Non- Big Box	19%	72%	45%	73%

Table 50: Percent of Stores Carrying EISA Compliant and EISA Non-Compliant Lamps by Store Category, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	78%	89%	93%	99%
Non- Big Box	15%	86%	45%	91%

Table 51: Percent of Stores Carrying MSB CFLs by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	90%	-	-	-	99%	-	-	-
Non- Big Box	72%	-	-	-	58%	-	-	-

Table 52: Percent of Stores Carrying MSB CFLs by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	94%	44%	85%	5%	94%	65%	86%	-
Non- Big Box	69%	32%	40%	4%	54%	24%	43%	5%

Table 53: Percent of Stores Carrying MSB CFLs by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	96%	80%	80%	58%	100%	96%	86%	72%
Non- Big Box	49%	47%	31%	13%	53%	52%	28%	14%

Table 54: Percent of Stores Carrying MSB CFLs by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	80%	72%	79%	79%	87%	78%	79%	85%
Non- Big Box	24%	20%	35%	19%	20%	26%	34%	19%

Table 55: Percent of Stores Carrying MSB LED Lamps by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	4%	-	-	-	-	-
Non- Big Box	-	-	-	-	-	-

Table 56: Percent of Stores Carrying MSB LED Lamps by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	8%	24%	-	15%	41%	-
Non- Big Box	-	-	-	1%	1%	-

Table 57: Percent of Stores Carrying MSB LED Lamps by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	26%	35%	-	64%	50%	-
Non- Big Box	-	1%	-	5%	3%	-

Table 58: Percent of Stores Carrying MSB LED Lamps by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	37%	38%	23%	54%	62%	8%
Non- Big Box	3%	3%	-	5%	3%	-

Table 59: Details Regarding the 33 Shelf Survey Stores Visited in Both 2012 and 2013 by Category and Retail Channel (Retail Store Shelf Surveys)

Store Category	Retail Channel	Number of Common Stores
Non- Big Box	Discount	4
	Drug	4
	Grocery	2
	Hardware	3
Big Box	Home Improvement	6
	Mass Merchandise	5
	Wholesale Club	9
Total		**33**

Table 60: Number of Lamps by Technology, 2012 and 2013 (Retail Store Shelf Surveys)

Lamp Technology	2012	2013
All CFL	270,114	183,104
Advanced CFL	80,244	60,106
Basic CFL (≤30 Watts)	189,870	122,998
Incandescent	226,415	201,325
Halogen	48,529	84,132
LED	32,719	36,336
Overall	**847,891**	**688,001**

Table 61: Percent of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012		2013	
	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	92%	8%	99%	1%
Non- Big Box	71%	29%	94%	6%

Table 62: Number of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	3,052	240	12,680	161
Non- Big Box	567	276	1,322	83

Table 63: Percent of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, Medium High Brightness Lamps (1050-1490 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	88%	12%	79%	21%
Non- Big Box	28%	72%	62%	38%

Table 64: Number of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, Medium High Brightness Lamps (1050-1490 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	1,667	369	8,934	1,771
Non- Big Box	599	1,503	1,306	476

Table 65: Percent of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	14%	86%	68%	32%
Non- Big Box	7%	93%	25%	75%

Table 66: Number of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	3,378	14,628	7,850	4,949
Non- Big Box	591	7,622	1,616	3,908

Table 67: Percent of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	9%	91%	13%	87%
Non- Big Box	6%	94%	56%	44%

Table 68: Number of EISA Compliant and EISA Non-Compliant Lamps Stocked by Store Category, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	2,442	38,958	10,410	14,692
Non- Big Box	809	9,541	1,491	7,497

Table 69: Percent of MSB CFLs Stocked by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store	2012				2013			
Category	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	28%	-	-	-	37%	-	-	-
Non- Big Box	72%	-	-	-	63%	-	-	-

Table 70: Number of MSB CFLs Stocked by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store	2012				2013			
Category	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	36,723	-	-	-	27,017	-	-	-
Non- Big Box	11,132	-	-	-	6,261	-	-	-

Table 71: Percent of MSB CFLs Stocked by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store	2012				2013			
Category	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	38%	5%	29%	41%	39%	5%	23%	0%
Non- Big Box	62%	95%	71%	59%	61%	95%	77%	100%

Table 72: Number of MSB CFLs Stocked by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	52,347	772	8,873	365	16,400	489	1,818	0
Non- Big Box	6,563	2,291	1,308	241	3,241	1,714	1,098	358

Table 73: Percent of MSB CFLs Stocked by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	44%	15%	13%	81%	45%	30%	24%	76%
Non- Big Box	56%	85%	87%	19%	55%	70%	76%	24%

Table 74: Number of MSB CFLs Stocked by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	62,107	3,264	13,422	1,279	57,779	4,387	10,224	1,477
Non- Big Box	11,847	2,117	3,528	120	6,199	1,706	1,572	158

Table 75: Percent of MSB CFLs Stocked by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	91%	79%	69%	64%	69%	71%	59%	80%
Non- Big Box	9%	21%	31%	36%	31%	29%	41%	20%

Table 76: Number of MSB CFLs Stocked by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	8,838	2,120	7,604	3,624	5,331	2,953	5,509	2,383
Non- Big Box	592	261	611	364	1,074	428	579	282

Table 77: Percent of MSB LED Lamps Stocked by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	-	-	-	100%	-	-
Non- Big Box	-	-	-	-	-	-

Table 78: Number of MSB LED Lamps Stocked by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	-	-	-	50	-	-
Non- Big Box	-	-	-	-	-	-

Table 79: Percent of MSB LED Lamps Stocked by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	100%	100%	-	88%	98%	-
Non- Big Box	-	-	-	12%	2%	-

Table 80: Number of MSB LED Lamps Stocked by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	71	2,087	-	311	2,543	-
Non- Big Box	-	-	-	8	6	-

Table 81: Percent of MSB LED Lamps Stocked by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	99%	100%	-	95%	95%	-
Non- Big Box	1%	0%*	-	5%	5%	-

Table 82: Number of MSB LED Lamps Stocked by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	2,628	5,174	-	6,191	6,672	-
Non- Big Box	5	4	-	37	87	-

Table 83: Percent of MSB LED Lamps Stocked by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	96%	93%	100%	92%	89%	100%
Non- Big Box	4%	7%	-	8%	11%	-

Table 84: Number of MSB LED Lamps Stocked by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	1,618	3,190	181	7,734	5,103	81
Non- Big Box	22	47	-	67	132	-

Table 85: Average Number of EISA Compliant and EISA Non-Compliant Lamp Models per Store by Store Category, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	EISA-Compliant	Non-Compliant	Total Model Numbers	EISA-Compliant	Non-Compliant	Total Model Numbers
Big Box	0.4	0.2	18	0.6	0.1	15
Non- Big Box	0.7	0.4	21	1.1	0.2	21

Table 86: Number of Lamp Models by Technology, 2012 and 2013 (Retail Store Shelf Surveys)

Lamp Technology	2012	2013
All CFL	1,208	1,096
Advanced CFL	697	671
Basic CFL (≤30 Watts)	511	425
Incandescent	524	600
Halogen	1,707	1,373
LED	304	359

Table 87: Number of Lamp Models by Technology and Store Category, 2012 and 2013 (Retail Store Shelf Surveys)

Lamp Technology	Big Box		Non-Big Box	
	2012	2013	2012	2013
All CFLs	794	698	592	601
Advanced CFLs	481	456	327	356
Basic CFLs (≤30 Watts)	313	242	265	245
LEDs	276	299	77	110
Halogen	377	377	274	347
Incandescent	887	789	1149	947

Table 88: Number of MSB A-Lamp Replacement Lamp Models by Technology, Store Category, and Year (Retail Store Shelf Surveys)

Lamp Technology	Big Box		Non-Big Box	
	2012	2013	2012	2013
CFL Spiral	366	300	307	292
CFL A-lamp	65	61	45	44
LED	54	72	12	23
Incandescent	232	179	332	247
Halogen	72	73	46	78

Table 89: Number of MSB Reflector Lamp Models by Technology, Store Category, and Year (Retail Store Shelf Surveys)

	Big Box		Non-Big Box	
Lamp Technology	2012	2013	2012	2013
CFL Reflector	129	114	75	79
LED Reflector	105	129	19	41
Incandescent Reflector	186	164	203	155
Halogen Reflector	161	161	132	149

Table 90: Number of MSB Globe Lamp Models by Technology, Store Category, and Year (Retail Store Shelf Surveys)

	Big Box		Non-Big Box	
Lamp Technology	2012	2013	2012	2013
CFL Globe	41	32	18	21
LED Globe	21	17	11	8
Incandescent Globe	103	99	153	100
Halogen Globe	8	15	4	7

Table 91: Number of IOU-Discounted and Non- IOU-Discounted MSB CFL Models by Store Category and Lamp Shape, 2012 and 2013

	2012				2013			
	IOU Discounted		Non- IOU Discounted		IOU Discounted		Non- IOU Discounted	
Lamp Technology	Big Box	Non-Big Box	Big Box	Non-Big Box	Big Box	Non-Big Box	Big Box	Non-Big Box
Spiral	78	47	344	276	43	30	291	266
A-lamp	13	13	63	37	9	12	60	36
Reflector	33	13	122	68	18	13	112	72
Globe	9	5	40	16	10	6	32	16

Table 92: Average Number of EISA Compliant and EISA Non-Compliant Lamp Models per Store by Store Category, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012			2013		
Store Category	EISA-Compliant	Non-Compliant	Total Model Numbers	EISA-Compliant	Non-Compliant	Total Model Numbers
Big Box	0.5	0.1	12	0.6	0.2	14
Non- Big Box	0.6	1.0	26	1.1	0.3	24

Table 93: Average Number of EISA Compliant and EISA Non-Compliant Lamp Models per Store by Store Category, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012			2013		
Store Category	EISA-Compliant	Non-Compliant	Total Model Numbers	EISA-Compliant	Non-Compliant	Total Model Numbers
Big Box	0.2	0.7	51	0.5	0.2	27
Non- Big Box	0.3	2.0	61	0.9	1.2	51

Table 94: Average Number of EISA Compliant and EISA Non-Compliant Lamp Models per Store by Store Category, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012			2013		
Store Category	EISA-Compliant	Non-Compliant	Total Model Numbers	EISA-Compliant	Non-Compliant	Total Model Numbers
Big Box	0.3	1.8	80	0.8	0.9	68
Non- Big Box	0.2	2.9	74	0.8	2.7	71

Table 95: Average Number of MSB CFL Models per Store by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012					2013				
Store Category	Spiral	A-lamp	Reflector	Globe	Total Model Numbers	Spiral	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	1.0	-	-	-	90	0.9	-	-	-	72
Non- Big Box	2.1	-	-	-	78	3.2	-	-	-	70

Table 96: Average Number of MSB CFL Models per Store by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012					2013				
Store Category	Spiral	A-lamp	Reflector	Globe	Total Model Numbers	Spiral	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	0.7	0.1	0.4	0.0*	115	0.6	0.1	0.4	-	82
Non- Big Box	1.5	0.4	0.6	0.0*	102	1.9	0.4	0.7	0.1	101

Table 97: Average Number of MSB CFL Models per Store by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012					2013				
Store Category	Spiral	A-lamp	Reflector	Globe	Total Model Numbers	Spiral	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	1.2	0.4	0.2	0.2	182	1.2	0.8	0.2	0.3	156
Non- Big Box	2.4	0.7	0.5	0.2	127	3.1	0.9	0.5	0.2	121

Table 98: Average Number of MSB CFL Models per Store by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012					2013				
Store Category	Spiral	A-lamp	Reflector	Globe	Total Model Numbers	Spiral	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	0.7	0.6	1.0	0.7	151	0.7	1.0	1.2	1.0	127
Non- Big Box	0.7	0.5	1.3	0.4	79	0.9	0.9	1.5	0.5	84

Table 99: Average Number of MSB LED Lamp Models per Store by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012				2013			
Store Category	A-lamp	Reflector	Globe	Total Model Numbers	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	-	-	-	0	1.0	-	-	2
Non- Big Box	-	-	-	0	-	-	-	0

Table 100: Average Number of MSB LED Lamp Models per Store by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012				2013			
Store Category	A-lamp	Reflector	Globe	Total Model Numbers	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	0.3	2.2	-	11	0.5	1.4	-	24
Non- Big Box	-	-	-	0	0.1	0.1	-	3

Table 101: Average Number of MSB LED Lamp Models per Store by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012				2013			
Store Category	A-lamp	Reflector	Globe	Total Model Numbers	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	1.2	2.7	-	47	1.3	1.5	-	70
Non- Big Box	0.0	0.1	-	3	0.4	0.3	-	17

Table 102: Average Number of MSB LED Lamp Models per Store by Store Category and Lamp Shape, Medium Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012				2013			
Store Category	A-lamp	Reflector	Globe	Total Model Numbers	A-lamp	Reflector	Globe	Total Model Numbers
Big Box	1.0	2.4	0.3	83	1.0	1.7	0.1	94
Non- Big Box	0.3	0.4	-	16	0.4	0.6	-	28

Table 103: Number of EISA-Compliant and EISA Non-Compliant Lamp Models by Store Category, 2012 and 2013

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	40	123	54	72
Non- Big Box	28	155	62	106

Table 104: Number of Lamps by Technology, Store Category, and Year (Retail Store Shelf Surveys)

	Big Box		Non-Big Box	
Lamp Technology	**2012**	**2013**	**2012**	**2013**
All CFL	226,275	155,588	43,839	27,516
Advanced CFL	66,078	48,704	14,166	11,402
Basic CFL (≤30 Watts)	160,197	106,884	29,673	16,114
Incandescent	41,853	73,847	6,676	10,285
Halogen	168,438	137,984	57,977	63,341
LED	32,167	35,055	552	1,281

Table 105: Number of MSB A-Lamp Replacement Lamps by Technology, Store Category, and Year (Retail Store Shelf Surveys)

	Big Box		Non-Big Box	
MSB Lamp Technology	**2012**	**2013**	**2012**	**2013**
CFL Spiral	163,214	110,901	31,344	17,591
CFL A-lamp	6,253	7,964	4,895	3,944
Incandescent A-lamp	67,587	29,327	26,823	18,032
Halogen A-lamp	14,585	46,563	2,903	6,101
LED A-lamp	4,865	14,596	83	213

Table 106: Number of MSB Reflector Lamps by Technology, Store Category, and Year (Retail Store Shelf Surveys)

	Big Box		Non-Big Box	
MSB Lamp Technology	**2012**	**2013**	**2012**	**2013**
CFL Reflector	30,083	17,662	5,451	3,256
Incandescent Reflector	25,865	30,330	4,451	4,148
Halogen Reflector	15,250	15,183	2,404	2,333
LED Reflector	10,638	14,374	74	294

Table 107: Number of MSB Globe Lamps by Technology, Store Category, and Year (Retail Store Shelf Surveys)

	Big Box		Non-Big Box	
MSB Lamp Technology	**2012**	**2013**	**2012**	**2013**
CFL Globe	5,087	3,779	847	798
Incandescent Globe	18,893	15,291	3,687	3,790
Halogen Globe	658	1,324	139	181
LED Globe	7,327	493	54	57

Table 108: Number of IOU-Discounted and Non- IOU-Discounted MSB CFLs by Store Category and Lamp Shape, 2012 and 2013

	2012				2013			
	IOU Discounted		Non- IOU Discounted		IOU Discounted		Non- IOU Discounted	
Lamp Technology	Big Box	Non-Big Box	Big Box	Non-Big Box	Big Box	Non-Big Box	Big Box	Non-Big Box
Spiral	62,100	20,323	101,114	11,021	11,779	5,463	99,122	12,128
A-lamp	1,203	3,974	5,050	921	184	2,770	7,780	1,174
Reflector	8,623	4,172	21,460	1,279	4,232	1,739	13,430	1,517
Globe	186	334	4,901	513	150	358	3,629	440

Table 109: Average Price per EISA Compliant and EISA Non-Compliant Lamp by Store Category, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	$1.27	$4.75	$1.21	$4.64
Non- Big Box	$3.13	$3.32	$2.44	$4.78

Table 110: Average Price per EISA Compliant and EISA Non-Compliant Lamp by Store Category, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	$2.23	$1.86	$1.58	$1.61
Non- Big Box	$3.46	$1.10	$2.94	$1.37

Table 111: Average Price per EISA Compliant and EISA Non-Compliant Lamp by Store Category, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	$2.06	$0.67	$1.58	$1.30
Non- Big Box	$3.28	$1.00	$2.59	$1.19

Table 112: Average Price per EISA Compliant and EISA Non-Compliant Lamp by Store Category, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

	2012		2013	
Store Category	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	$2.11	$0.92	$1.80	$1.56
Non- Big Box	$2.67	$1.16	$2.80	$1.51

Table 113: Average Price per MSB CFL by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	$2.85	-	-	-	$3.14	-	-	-
Non- Big Box	$1.37	-	-	-	$2.99	-	-	-

Table 114: Average Price per MSB CFL by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	$2.28	$4.41	$5.99	$5.99	$3.08	$5.88	$7.84	$1.02
Non- Big Box	$0.94	$1.22	$1.88	$0.77	$2.95	$0.84	$3.07	-

Table 115: Average Price per MSB CFL by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	$2.20	$4.59	$3.31	$4.70	$2.16	$4.67	$3.59	$4.00
Non- Big Box	$1.38	$0.86	$0.59	$8.60	$2.32	$1.48	$1.37	$4.94

Table 116: Average Price per MSB CFL by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012				2013			
	Spiral	A-lamp	Reflector	Globe	Spiral	A-lamp	Reflector	Globe
Big Box	$3.29	$5.22	$6.21	$4.25	$2.66	$4.87	$6.67	$4.81
Non- Big Box	$4.20	$9.33	$8.81	$2.19	$4.54	$8.44	$8.54	$6.45

Table 117: Average Price per MSB LED Lamp by Store Category and Lamp Shape, High Brightness Lamps (1490-2600 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	-	-	-	$30.80	-	-
Non- Big Box	-	-	-	-	-	-

Table 118: Average Price per MSB LED Lamp by Store Category and Lamp Shape, Medium High Brightness Lamps (1050-1489 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	$38.97	$29.89	-	$33.83	$27.75	-
Non- Big Box	-	-	-	$29.44	$15.99	-

Table 119: Average Price per MSB LED Lamp by Store Category and Lamp Shape, Medium Low Brightness Lamps (750-1049 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	$18.47	$27.99	-	$15.11	$21.89	-
Non- Big Box	$49.99	$42.52	-	$26.08	$42.24	-

Table 120: Average Price per MSB LED Lamp by Store Category and Lamp Shape, Low Brightness Lamps (310-749 Lumens), 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	A-lamp	Reflector	Globe	A-lamp	Reflector	Globe
Big Box	$14.91	$29.95	$23.48	$9.66	$21.47	$22.74
Non- Big Box	$20.44	$36.02	-	$21.49	$31.42	-

Table 121: Average Price per LED Lamp by Store Category and Lumen Bin, 2012 and 2013 (Retail Store Shelf Surveys)

Lumen Bin	2012			2013		
	Big Box	Non-Big Box	Overall	Big Box	Non-Big Box	Overall
High Brightness (1490-2600 Lumens)	-	-	-	$30.80	-	$30.80
Medium High Brightness (1050-1489 Lumens)	$30.35	-	$30.35	$28.79	$23.02	$28.55
Medium Low Brightness (750-1049 Lumens)	$24.78	$45.41	$24.88	$18.33	$33.70	$19.13
Low Brightness (310-749 Lumens)	$21.49	$28.94	$21.85	$15.40	$26.81	$16.48
Very Low Brightness (<310 Lumens)	$9.43	$13.75	$9.85	$10.88	$12.08	$11.34

Table 122: Number of LED Lamps by Store Category and Lumen Bin, 2012 and 2013 (Retail Store Shelf Surveys)

Store Category	2012			2013		
	Big Box	Non-Big Box	Overall	Big Box	Non-Big Box	Overall
High Brightness (1490-2600 Lumens)	-	-	-	50	-	50
Medium High Brightness (1050-1489 Lumens)	2,158	-	2,158	2,854	14	2,868
Medium Low Brightness (750-1049 Lumens)	7,802	9	7,811	12,863	124	12,987
Low Brightness (310-749 Lumens)	5,336	69	5,405	13,500	215	13,715
Very Low Brightness (<310 Lumens)	15,968	276	16,244	4,815	527	5,342

Table 123: Number of EISA-Compliant and EISA Non-Compliant Lamps by Store Category, 2012 and 2013

Store Category	2012		2013	
	EISA-Compliant	Non-Compliant	EISA-Compliant	Non-Compliant
Big Box	10,539	54,495	39,874	22,015
Non- Big Box	2,566	19,970	5,735	12,080

D. APPENDIX D – ADDITIONAL DATA TABLES: MARKET PENETRATION RESULTS

Table 124. Total Sockets, Percent of Sockets, and Average Number of Sockets per Household by Dwelling Type and Lamp Technology Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)

	Total Sockets (Millions)						Percent of Total Sockets						Average # Sockets per Household					
	Single Family		Multifamily		Mobile Home		Single Family		Multifamily		Mobile Home		Single Family		Multifamily		Mobile Home	
Lamp Technology	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012
Incandescent	218.0	187.6	31.4	32.3	4.7	3.2	54%	48%	52%	46%	58%	43%	31.8	27.0	11.2	11.5	22.9	15.0
CFL	83.6	110.0	16.4	23.2	1.5	2.8	21%	28%	27%	33%	19%	38%	12.2	15.8	5.9	8.2	7.4	13.2
Fluorescent	48.3	43.3	6.9	6.8	0.7	0.7	12%	11%	11%	10%	9%	10%	7.1	6.2	2.5	2.4	3.4	3.3
Halogen	34.1	34.2	2.4	4.9	0.9	0.4	8%	9%	4%	7%	11%	5%	5.0	4.9	0.9	1.7	4.3	1.9
LED	0.3	5.3	0.0	0.1	0.0	0.1	0%	1%	0%	0%	0%	1%	0.1	0.8	0.0	0.1	0.0	0.3
Other	4.9	0.5	0.6	0.0	0.0	0.0	1%	0%	1%	0%	0%	0%	0.7	0.1	0.2	0.0	0.0	0.0
Socket Empty	12.6	8.7	2.9	2.4	0.3	0.2	3%	2%	5%	3%	3%	3%	1.8	1.3	1.0	0.9	1.3	0.9

Table 125. Total Sockets, Percent of Sockets, and Average Number of Sockets per Household by Dwelling Type and Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 and 2012 (In-Home Lighting Inventories)

	Total Sockets (Millions)						Percent of Total Sockets						Avg # Sockets per Household*					
	Single Family		Multifamily		Mobile Home		Single Family		Multifamily		Mobile Home		Single Family		Multifamily		Mobile Home	
Location	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012
Bathroom	67.6	67.1	13.9	15.3	1.3	1.4	17%	17%	23%	22%	15%	19%	9.9	9.7	5.0	5.4	6.2	6.7
Bedroom	63.4	63.1	11.3	12.5	1.3	1.3	16%	16%	19%	18%	16%	18%	9.3	9.1	4.2	4.6	6.4	6.3
Dining Room	25.3	23.6	4.4	4.5	0.5	0.7	6%	6%	7%	7%	6%	9%	5.3	5.5	3.6	3.5	4.3	5.1
Exterior	45.4	45.1	3.4	4.0	1.2	0.7	11%	12%	6%	6%	15%	10%	6.7	6.7	1.7	2.0	7.3	3.6
Garage	22.5	24.6	0.6	1.4	0.2	0.2	6%	6%	1%	2%	2%	2%	4.8	4.8	2.7	3.5	3.3	4.7
Hallway	32.9	32.8	5.4	5.7	0.3	0.2	8%	8%	9%	8%	4%	2%	5.2	5.1	2.4	2.5	2.3	1.3
Kitchen	49.1	53.5	10.3	12.8	1.0	1.0	12%	14%	17%	18%	12%	14%	7.2	7.7	3.7	4.6	5.0	4.7
Living Room	36.8	47.3	7.9	9.6	1.2	1.4	9%	12%	13%	14%	14%	19%	5.6	7.0	3.0	3.8	5.7	6.8
Office	14.8	11.7	1.2	1.3	0.0	0.1	4%	3%	2%	2%	1%	1%	4.4	4.1	2.7	3.2	1.8	2.8
Other	44.0	20.8	2.3	2.8	1.2	0.3	11%	5%	4%	4%	14%	4%	7.6	4.2	2.1	2.0	7.8	2.5

* Note that the total of the average number of sockets by installation location exceeds the total number of sockets per household because some households do not include some installation locations. For example, we exclude households without dining rooms from estimates of the average number of sockets per dining room. To estimate the average number of sockets per household, we averaged the total number of sockets across all installation locations (regardless of whether each household included each installation location).

Table 126. Number of Lamps Installed by Technology and Location Among PG&E, SCE, and SD&GE Residential Electric Customers, 2009 and 2012

	Number of Lamps Installed (Millions)													
	2009							2012						
Location	Incand	CFL	Fluor	Halogen	LED	Other	Total	Incand	CFL	Fluor	Halogen	LED	Other	Total
Bathroom	50.97	19.22	5.07	3.29	0.02	1.06	79.64	47.26	25.05	4.94	3.50	0.43	0.03	81.21
Bedroom	45.29	19.71	1.68	4.39	0.06	0.67	71.79	39.12	28.81	1.44	4.24	0.64	0.04	74.29
Kitchen	20.16	11.40	20.13	6.44	0.05	0.64	58.82	20.08	18.06	17.23	8.74	2.09	0.03	66.23
Living Room	26.64	12.09	1.00	4.17	0.01	0.35	44.27	30.61	18.73	1.33	5.69	0.55	0.03	56.94
Exterior	25.99	10.40	0.89	9.88	0.06	1.47	48.68	21.76	14.69	1.56	9.63	0.90	0.36	48.91
Hallway	25.32	8.50	0.83	2.29	0.12	0.64	37.70	22.95	11.07	0.71	2.71	0.33	0.00	37.77
Dining Room	22.87	4.52	0.27	1.60	0.00	0.11	29.37	20.61	5.41	0.20	1.66	0.18	0.01	28.07
Garage	3.53	2.13	16.79	0.34	0.04	0.10	22.91	3.70	3.55	18.02	0.37	0.02	0.01	25.67
Office	7.94	4.28	1.44	1.79	0.01	0.08	15.54	5.78	4.22	0.85	1.67	0.23	0.01	12.76
Other	25.46	9.32	7.85	3.23	0.01	0.42	46.28	11.25	6.43	4.46	1.25	0.14	0.00	23.53
Total	**254.16**	**101.57**	**55.94**	**37.40**	**0.36**	**5.55**	**454.99**	**223.13**	**136.03**	**50.74**	**39.48**	**5.49**	**0.52**	**455.39**

Table 127. Total A-Lamp Replacement Lamps and Average Number of A-Lamp Replacements per Household by Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	Total Lamps (Millions)					% of Total Lamps					Avg # Lamps per Household				
Location	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall
Bathroom	18.1	0.6	11.6	0.0	30.3	60%	23%	16%	-	15%	2.0	0.1	1.3	0.00	3.28
Bedroom	32.4	0.5	16.7	0.0	49.6	26%	20%	23%	-	24%	3.4	0.1	1.8	0.00	5.26
Kitchen	7.8	0.2	6.6	0.0	14.6	6%	7%	9%	-	7%	1.0	0.0	0.9	0.00	1.93
Living Room	13.9	0.3	10.3	0.0	24.5	11%	11%	14%	-	12%	1.6	0.0	1.2	0.00	2.77
Exterior	13.4	0.4	6.8	0.0	20.6	11%	15%	9%	-	10%	1.6	0.0	0.8	0.00	2.52
Hallway	9.6	0.1	5.5	0.0	15.3	8%	6%	8%	-	8%	1.2	0.0	0.7	0.00	1.94
Dining Room	7.0	0.2	3.5	0.0	10.7	6%	7%	5%	-	5%	1.6	0.0	0.8	0.00	2.41
Garage	2.8	0.0	1.7	0.0	4.6	2%	2%	2%	-	2%	1.0	0.0	0.6	0.00	1.58
Office	4.8	0.1	3.2	0.0	8.1	4%	4%	4%	-	4%	1.4	0.0	1.0	0.00	2.42
Other	17.2	0.1	7.5	0.0	24.8	14%	5%	10%	-	12%	2.6	0.0	1.1	0.00	3.77
Total	**127.1**	**2.5**	**73.5**	**0.0**	**203.1**	**100%**	**100%**	**100%**	**-**	**100%**	**17.4**	**0.3**	**10.1**	**0.00**	**27.87**

Table 128. Total Reflector Lamps and Average Number of Reflector Lamps per Household by Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Location	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Bathroom	4.2	0.7	0.0	4.9	11%	9%	29%	11%	0.5	0.1	0.00	0.5
Bedroom	3.3	0.3	0.0	3.6	8%	4%	55%	8%	0.3	0.0	0.00	0.4
Kitchen	8.4	2.5	0.0	10.9	22%	33%	0%	23%	1.1	0.3	0.00	1.4
Living Room	4.5	0.4	0.0	5.0	12%	6%	0%	11%	0.5	0.1	0.00	0.6
Exterior	4.5	1.0	0.0	5.5	11%	13%	0%	12%	0.5	0.1	0.00	0.7
Hallway	6.2	1.2	0.0	7.5	16%	16%	0%	16%	0.8	0.2	0.00	0.9
Dining Room	1.4	0.2	0.0	1.6	4%	3%	0%	4%	0.3	0.0	0.00	0.4
Garage	0.6	CFL	0.0	0.6	1%	2%	16%	1%	0.2	0.0	0.00	0.3
Office	1.7	0.4	0.0	2.2	4%	6%	0%	5%	0.5	0.1	0.00	0.6
Other	4.0	0.7	0.0	4.7	10%	9%	0%	10%	0.6	0.1	0.00	0.7
Total	**38.8**	**7.7**	**0.1**	**46.6**	**100%**	**100%**	**100%**	**100%**	**5.4**	**1.1**	**0.01**	**6.5**

Table 129. Total Globe Lamps and Average Number of Globe Lamps per Household by Installation Location Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Location	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Bathroom	25.8	2.5	0.0	28.3	74%	64%	-	73%	2.8	0.3	0.00	3.1
Bedroom	1.5	0.4	0.0	1.8	4%	10%	-	5%	0.2	0.0	0.00	0.2
Kitchen	0.8	0.3	0.0	1.1	2%	7%	-	3%	0.1	0.0	0.00	0.1
Living Room	1.1	0.2	0.0	1.4	3%	6%	-	3%	0.1	0.0	0.00	0.2
Exterior	0.6	0.1	0.0	0.7	2%	3%	-	2%	0.1	0.0	0.00	0.1
Hallway	2.6	0.1	0.0	2.8	8%	4%	-	7%	0.3	0.0	0.00	0.4
Dining Room	1.4	0.1	0.0	1.4	4%	2%	-	4%	0.3	0.0	0.00	0.3
Garage	0.1	0.0	0.0	0.1	0%	0%	-	0%	0.0	0.0	0.00	0.0
Office	0.2	0.0	0.0	0.3	1%	1%	-	1%	0.1	0.0	0.00	0.1
Other	0.8	0.1	0.0	0.9	2%	3%	-	2%	0.1	0.0	0.00	0.1
Total	**34.9**	**3.9**	**0.0**	**38.8**	**100%**	**100%**	**-**	**100%**	**4.1**	**0.5**	**0.00**	**4.6**

Table 130. Number of Lamps Installed by Technology and Fixture Type Among PG&E, SCE, and SD&GE Residential Electric Customers, 2009 and 2012

	Number of Lamps Installed (Millions)													
	2009							2012						
Fixture Type	Incand	CFL	Fluor	Halogen	LED	Other	Total	Incand	CFL	Fluor	Halogen	LED	Other	Total
Wall-mounted	67.84	25.28	2.84	9.56	0.06	1.12	106.70	60.54	32.61	2.34	9.75	0.97	0.30	106.50
Ceiling-Mounted	42.92	20.50	31.74	2.76	0.01	1.45	99.37	31.95	28.83	33.19	2.19	0.24	0.03	96.42
Recessed	33.59	13.93	6.96	10.88	0.00	1.09	66.45	32.59	22.89	4.91	11.61	1.90	0.01	73.92
Floor/Table Lamp	36.53	20.26	1.01	3.07	0.06	0.29	61.22	28.23	23.33	0.48	1.00	0.35	0.03	53.42
Suspended	36.58	5.28	6.37	0.87	0.14	0.49	49.72	33.60	6.45	3.62	1.22	0.31	0.01	45.21
Ceiling Fan	25.75	11.24	0.14	0.44	0.02	0.44	38.03	25.23	14.76	0.20	0.60	0.31	0.02	41.13
Total	**243.21**	**96.48**	**49.06**	**27.58**	**0.29**	**4.87**	**421.49**	**212.13**	**128.87**	**44.75**	**26.37**	**4.08**	**0.40**	**416.59**

Table 131. Total A-Lamp Replacement Lamps and Average Number of A-Lamp Replacements per Household by Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	Total Lamps (Millions)					% of Total Lamps					Avg # Lamps per Household				
Fixture Type	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall
Ceiling Fan	18.9	0.5	9.6	0.0	29.0	15%	22%	13%	-	14%	1.9	0.1	0.97	0.00	2.94
Ceiling-Mounted	32.8	0.3	15.9	0.0	49.0	26%	12%	22%	-	24%	3.3	0.0	1.61	0.00	4.97
Desk Lamp	0.4	0.0	0.4	0.0	0.8	0%	0%	1%	-	0%	0.0	0.0	0.04	0.00	0.09
Floor/Table Lamp	26.7	0.5	17.2	0.0	44.4	21%	18%	23%	-	22%	2.7	0.0	1.74	0.00	4.50
Garage door	0.0	0.0	0.0	0.0	0.0	0%	0%	0%	-	0%	0.0	0.0	0.00	0.00	0.00
Hard-wired	0.6	0.1	0.1	0.0	0.8	0%	2%	0%	-	0%	0.1	0.0	0.01	0.00	0.08
Plug-in	0.2	0.0	0.1	0.0	0.3	0%	0%	0%	-	0%	0.0	0.0	0.01	0.00	0.03
Recessed	4.9	0.2	5.4	0.0	10.4	4%	6%	7%	-	5%	0.5	0.0	0.55	0.00	1.06
Suspended	9.3	0.1	4.2	0.0	13.6	7%	5%	6%	-	7%	0.9	0.0	0.42	0.00	1.38
Torchiere	3.1	0.0	2.3	0.0	5.4	2%	1%	3%	-	3%	0.3	0.0	0.23	0.00	0.55
Track Lighting	0.8	0.0	0.7	0.0	1.6	1%	0%	1%	-	1%	0.1	0.0	0.07	0.00	0.16
Under Counter	0.7	0.0	0.2	0.0	0.9	1%	0%	0%	-	0%	0.1	0.0	0.02	0.00	0.09
Wall-mounted	28.4	0.8	17.4	0.0	46.6	22%	33%	24%	-	23%	2.9	0.1	1.77	0.00	4.73
Other	0.3	0.0	0.0	0.0	0.3	0%	0%	0%	-	0%	0.0	0.0	0.00	0.00	0.03
Total	**127.1**	**2.5**	**73.5**	**0.0**	**203.1**	**100%**	**100%**	**100%**	**-**	**100%**	**12.9**	**0.3**	**7.46**	**0.00**	**20.61**

Table 132. Total Reflector Lamps and Average Number of Reflector Lamps per Household by Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Fixture Type	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Ceiling Fan	0.5	0.1	0.0	0.6	1%	1%	0%	1%	0.1	0.0	0.00	0.1
Ceiling-Mounted	2.9	0.3	0.0	3.2	7%	4%	0%	7%	0.3	0.0	0.00	0.3
Desk Lamp	0.0	0.0	0.0	0.1	0%	1%	10%	0%	0.0	0.0	0.00	0.0
Floor/Table Lamp	0.5	0.1	0.0	0.7	1%	2%	40%	1%	0.1	0.0	0.00	0.1
Garage door	0.0	0.0	0.0	0.0	0%	0%	0%	0%	0.0	0.0	0.00	0.0
Hard-wired	0.1	0.1	0.0	0.1	0%	1%	0%	0%	0.0	0.0	0.00	0.0
Plug-in	0.1	0.0	0.0	0.1	0%	0%	0%	0%	0.0	0.0	0.00	0.0
Recessed	28.4	6.0	0.0	34.4	73%	78%	5%	74%	2.9	0.6	0.00	3.5
Suspended	0.5	0.0	0.0	0.5	1%	0%	29%	1%	0.0	0.0	0.00	0.1
Torchiere	0.0	0.0	0.0	0.0	0%	0%	0%	0%	0.0	0.0	0.00	0.0
Track Lighting	1.7	0.2	0.0	2.0	4%	3%	0%	4%	0.2	0.0	0.00	0.2
Under Counter	0.4	0.0	0.0	0.4	1%	0%	0%	1%	0.0	0.0	0.00	0.0
Wall-mounted	3.7	0.8	0.0	4.5	9%	10%	16%	10%	0.4	0.1	0.00	0.5
Other	0.0	0.0	0.0	0.0	0%	0%	0%	0%	0.0	0.0	0.00	0.0
Grand Total	**38.8**	**7.7**	**0.1**	**46.6**	**100%**	**100%**	**100%**	**100%**	**3.9**	**0.8**	**0.01**	**4.7**

Table 133. Total Globe Lamps and Average Number of Globe Lamps per Household by Fixture Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)Text

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Fixture Type	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
Ceiling Fan	0.7	0.3	0.0	1.0	2%	8%	-	3%	0.1	0.0	0.00	0.1
Ceiling-Mounted	3.5	0.3	0.0	3.8	10%	8%	-	10%	0.4	0.0	0.00	0.4
Desk Lamp	0.0	0.0	0.0	0.0	0%	0%	-	0%	0.0	0.0	0.00	0.0
Floor/Table Lamp	1.3	0.3	0.0	1.6	4%	6%	-	4%	0.1	0.0	0.00	0.2
Garage door	0.0	0.0	0.0	0.0	0%	0%	-	0%	0.0	0.0	0.00	0.0
Hard-wired	0.0	0.0	0.0	0.0	0%	0%	-	0%	0.0	0.0	0.00	0.0
Plug-in	0.1	0.0	0.0	0.1	0%	0%	-	0%	0.0	0.0	0.00	0.0
Recessed	0.1	0.2	0.0	0.3	0%	4%	-	1%	0.0	0.0	0.00	0.0
Suspended	2.7	0.2	0.0	2.9	8%	5%	-	7%	0.3	0.0	0.00	0.3
Torchiere	0.1	0.0	0.0	0.1	0%	0%	-	0%	0.0	0.0	0.00	0.0
Track Lighting	0.0	0.0	0.0	0.1	0%	1%	-	0%	0.0	0.0	0.00	0.0
Under Counter	0.1	0.0	0.0	0.1	0%	0%	-	0%	0.0	0.0	0.00	0.0
Wall-mounted	26.1	2.6	0.0	28.8	75%	67%	-	74%	2.7	0.3	0.00	2.9
Other	0.0	0.0	0.0	0.0	0%	0%	-	0%	0.0	0.0	0.00	0.0
Grand Total	**34.9**	**3.9**	**0.0**	**38.8**	**100%**	**100%**	**-**	**100%**	**3.5**	**0.4**	**0.00**	**3.9**

Table 134. Number of Lamps Installed by Technology and Control Type Among PG&E, SCE, and SD&GE Residential Electric Customers, 2009 and 2012

	Number of Lamps Installed (Millions)													
	2009							2012						
Control Type	**Incand**	**CFL**	**Fluor**	**Halogen**	**LED**	**Other**	**Total**	**Incand**	**CFL**	**Fluor**	**Halogen**	**LED**	**Other**	**Total**
On/Off	208.30	94.35	55.45	26.67	0.34	5.02	390.11	188.56	129.79	50.24	29.47	4.78	0.51	403.34
Dimmer	36.11	2.32	0.28	10.31	0.02	0.50	49.55	26.82	2.13	0.08	9.39	0.66	0.01	39.09
3-Way	9.75	4.90	0.21	0.43	0.00	0.03	15.33	7.74	4.12	0.43	0.62	0.05	0.00	12.96
Total	**254.16**	**101.57**	**55.94**	**37.40**	**0.36**	**5.55**	**454.99**	**223.13**	**136.03**	**50.74**	**39.48**	**5.49**	**0.52**	**455.39**

Table 135. Total A-Lamp Replacements and Average Number of A-Lamp Replacements per Household by Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	Total Lamps (Millions)					% of Total Lamps					Avg # Lamps per Household				
Control Type	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall
On/Off Switch	107.8	2.4	100.4	0.0	210.6	85%	95%	96%	-	90%	10.9	0.2	10.1	0.00	21.23
Dimmer	11.1	0.1	1.1	0.0	12.2	9%	3%	1%	-	5%	1.1	0.0	0.1	0.00	1.24
3-Way Switch	8.2	0.0	3.6	0.0	11.9	6%	2%	3%	-	5%	0.8	0.0	0.4	0.00	1.20
Total	**127.1**	**2.5**	**105.1**	**0.0**	**234.7**	**100%**	**100%**	**100%**	**-**	**100%**	**12.9**	**0.3**	**10.5**	**0.00**	**23.68**

Table 136. Total Reflector Lamps and Average Number of Reflector Lamps per Household by Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Control Type	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall
On/Off	28.2	7.2	0.0	35.5	73%	94%	66%	76%	2.9	0.7	0.00	3.6
Dimmer	10.4	0.4	0.0	10.9	27%	6%	34%	23%	1.1	0.0	0.00	1.1
3-Way	0.2	0.0	0.0	0.2	1%	0%	0%	1%	0.0	0.0	0.00	0.0
Total	**38.8**	**7.7**	**0.1**	**46.6**	**100%**	**100%**	**100%**	**100%**	**3.9**	**0.8**	**0.01**	**4.7**

Table 137. Total Globe Lamps and Average Number of Globe Lamps per Household by Control Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Control Type	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall
On/Off	31.8	3.9	0.0	35.7	91%	99%	-	92%	3.2	0.4	0.00	3.6
Dimmer	3.0	0.0	0.0	3.0	9%	0%	-	8%	0.3	0.0	0.00	0.3
3-Way	0.1	0.0	0.0	0.2	0%	1%	-	0%	0.0	0.0	0.00	0.0
Total	**34.9**	**3.9**	**0.0**	**38.8**	**100%**	**100%**	**-**	**100%**	**3.5**	**0.4**	**0.00**	**3.9**

Table 138. Number of Lamps Installed by Technology and Base Type Among PG&E, SCE, and SD&GE Residential Electric Customers, 2009 and 2012

	Number of Lamps Installed (Millions)													
	2009							2012						
Base Type	Incand	CFL	Fluor	Halogen	LED	Other	Total	Incand	CFL	Fluor	Halogen	LED	Other	Total
MSB	204.63	90.97	0.36	15.33	0.04	1.40	312.73	177.39	123.12	1.18	13.71	2.28	0.33	318.00
Pin-base	0.02	8.32	55.40	21.04	0.17	0.19	85.15	0.27	10.27	49.21	25.22	1.48	0.05	86.50
SSB	48.20	1.60	0.00	0.37	0.09	0.02	50.28	44.42	2.12	0.03	0.39	0.44	0.02	47.42
Other	1.32	0.68	0.17	0.66	0.07	3.94	6.84	1.05	0.52	0.33	0.16	1.29	0.13	3.48
Total	**254.16**	**101.57**	**55.94**	**37.40**	**0.36**	**5.55**	**454.99**	**223.13**	**136.03**	**50.74**	**39.48**	**5.49**	**0.52**	**455.39**

Table 139. Total A-Lamp Replacements and Average Number of A-Lamp Replacements per Household by Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	Total Lamps (Millions)					% of Total Lamps					Avg # Lamps per Household				
Base Type	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall	Incand A-Lamp	CFL A-Lamp	Spiral CFL	LED A-Lamp	Overall
MSB	124.3	2.4	72.7	0.00	199.3	98%	94%	99%	-	98%	12.6	0.2	7.4	0.00	20.2
Pin-based	0.0	0.0	0.5	0.00	0.5	0%	0%	1%	-	0%	0.0	0.0	0.0	0.00	0.0
SSB	2.5	0.1	0.1	0.00	2.8	2%	5%	0%	-	1%	0.3	0.0	0.0	0.00	0.3
Other	0.3	0.0	0.3	0.00	0.6	0%	1%	0%	-	0%	0.0	0.0	0.0	0.00	0.1
Total	**127.1**	**2.5**	**73.5**	**0.00**	**203.1**	**100%**	**100%**	**100%**	**-**	**100%**	**12.9**	**0.3**	**7.5**	**0.00**	**20.6**

Table 140. Total Reflector Lamps and Average Number of Reflector Lamps per Household by Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Base Type	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall	Incand	CFL	LED	Overall
MSB	38.5	7.6	0.03	46.2	99%	99%	44%	99%	3.9	0.8	0.00	4.7
Pin-based	0.0	0.0	0.02	0.0	0%	0%	28%	0%	0.0	0.0	0.00	0.0
SSB	0.3	0.1	0.01	0.3	1%	1%	12%	1%	0.0	0.0	0.00	0.0
Other	0.0	0.0	0.01	0.0	0%	0%	16%	0%	0.0	0.0	0.00	0.0
Total	**38.8**	**7.7**	**0.06**	**46.6**	**100%**	**100%**	**100%**	**100%**	**1.0**	**0.8**	**0.01**	**1.8**

Table 141. Total Globe Lamps and Average Number of Globe Lamps per Household by Base Type Among PG&E, SCE and SDG&E Residential Electric Customers, 2009 (In-Home Lighting Inventories)

	# Lamps Installed (in Millions)				% of Installed Lamps				Avg # Lamps Installed per Household			
Base Type	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**	**Incand**	**CFL**	**LED**	**Overall**
MSB	26.8	3.8	0.00	30.5	77%	95%	-	79%	2.7	0.4	0.00	3.1
Pin-based	0.0	0.0	0.00	0.0	0%	0%	-	0%	0.0	0.0	0.00	0.0
SSB	8.0	0.2	0.00	8.2	23%	4%	-	21%	0.8	0.0	0.00	0.8
Other	0.1	0.0	0.00	0.1	0%	1%	-	0%	0.0	0.0	0.00	0.0
Total	**34.9**	**3.9**	**0.00**	**38.8**	**100%**	**100%**	**-**	**100%**	**3.5**	**0.4**	**0.00**	**3.9**

E. APPENDIX E – ADDITIONAL DATA TABLES: REMAINING INSTALLATION POTENTIAL FOR ENERGY-EFFICIENT LAMPS BY IOU

Change in Remaining Potential between 2009 and 2012

Table 142: Distribution of Installed Lamps Among PG&E Residential Electric Customers by Technology, 2009 and 2012 (In-Home Lighting Inventories)

	2009		2012	
Lamp Technology	Number of Installed Lamps	Percent of Installed Lamps	Number of Installed Lamps	Percent of Installed Lamps
Incandescent	112,072,642	54%	100,244,822	49%
CFL	47,072,288	23%	59,864,250	29%
Fluorescent	27,009,864	13%	22,427,181	11%
Halogen	19,113,344	9%	19,148,196	9%
LED	195,757	0%	3,041,591	1%
Other Technology	2,147,203	1%	161,480	0%
Total Efficient	**47,268,045**	**23%**	**62,905,841**	**31%**
Total Inefficient	**160,343,053**	**77%**	**141,981,679**	**69%**
Grand Total	**207,611,098**	**100%**	**204,887,520**	**100%**

Table 143: Distribution of Installed Lamps Among SCE Residential Electric Customers by Technology, 2009 and 2012 (In-Home Lighting Inventories)

	2009		2012	
Lamp Technology	Number of Installed Lamps	Percent of Installed Lamps	Number of Installed Lamps	Percent of Installed Lamps
Incandescent	107,096,838	57%	95,154,287	49%
CFL	42,924,728	23%	59,089,231	30%
Fluorescent	21,769,715	12%	22,766,126	12%
Halogen	12,324,173	7%	15,128,185	8%
LED	88,296	0%	1,917,972	1%
Other Technology	2,394,718	1%	245,099	0%
Total Efficient	**43,013,024**	**23%**	**61,007,202**	**31%**
Total Inefficient	**143,585,444**	**77%**	**133,293,698**	**69%**
Grand Total	**186,598,468**	**100%**	**194,300,900**	**100%**

Table 144: Distribution of Installed Lamps Among SD&GE Residential Electric Customers by Technology, 2009 and 2012 (In-Home Lighting Inventories)

	2009		2012	
Lamp Technology	Number of Installed Lamps	Percent of Installed Lamps	Number of Installed Lamps	Percent of Installed Lamps
Incandescent	34,994,801	58%	27,726,770	49%
CFL	11,570,357	19%	17,080,753	30%
Fluorescent	7,159,698	12%	5,551,378	10%
Halogen	5,967,460	10%	5,201,071	9%
LED	78,223	0%	527,454	1%
Other Technology	1,010,633	2%	117,613	0%
Total Efficient	**11,648,580**	**19%**	**17,608,206**	**31%**
Total Inefficient	**49,132,592**	**81%**	**38,596,832**	**69%**
Grand Total	**60,781,171**	**100%**	**56,205,039**	**100%**

Remaining Potential by Installation Location (2012)

Figure 71: Remaining Lamp Installation Potential Across All Lamp Technologies by Installation Location Among PG&E Residential Electric Customers by Technology, 2012 (In-Home Lighting Inventories)

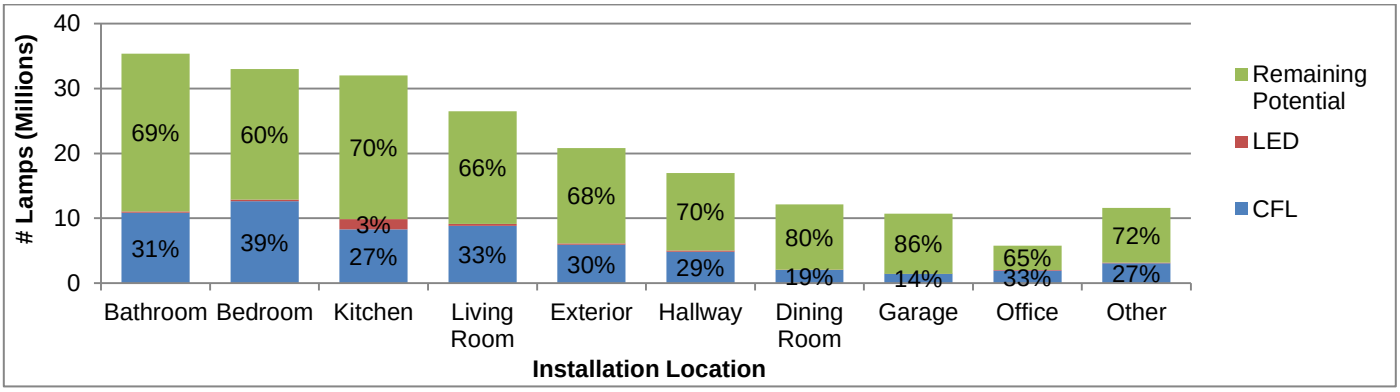


Figure 72: Remaining Lamp Installation Potential Across All Lamp Technologies by Installation Location Among SCE Residential Electric Customers by Technology, 2012 (In-Home Lighting Inventories)

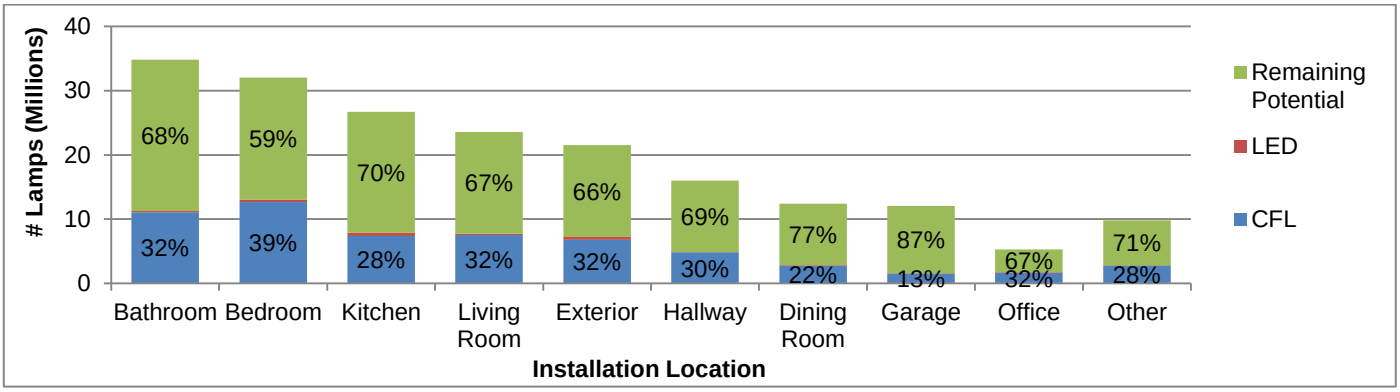
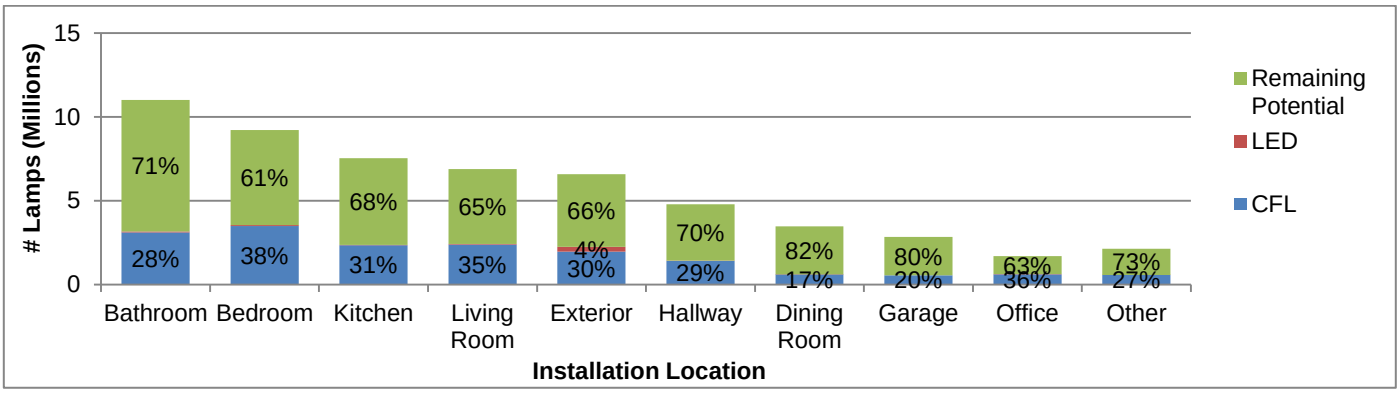


Figure 73: Remaining Lamp Installation Potential Across All Lamp Technologies by Installation Location Among SD&GE Residential Electric Customers by Technology, 2012 (In-Home Lighting Inventories)



Remaining Potential by Control Type (2012)

On/Off Switch

Table 145: Distribution of Installed Lamps with On/Off Controls Among PG&E Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	10,764,363	212,687	20,424,368	1,872,284	1,413,993	18,315	34,706,009
Bedroom	11,697,645	214,320	15,268,946	490,747	1,713,524	0	29,385,182
Kitchen	8,209,462	1,561,762	8,904,034	7,734,653	4,384,042	0	30,793,952
Living Room	7,457,022	296,581	11,186,296	628,091	2,397,149	0	21,965,138
Exterior	5,566,339	177,604	8,975,557	812,525	3,151,020	135,242	18,818,287
Hallway	4,793,643	220,859	9,874,934	308,209	1,361,911	0	16,559,556
Garage	1,880,387	70,154	7,897,972	98,358	818,636	0	10,765,507
Dining Room	1,388,350	12,978	1,552,856	7,381,812	221,336	0	10,557,331
Office	1,791,957	109,161	2,159,436	413,982	777,245	0	5,251,782
Other	3,046,904	98,521	5,017,301	2,596,538	550,519	0	11,309,783
Total	**56,596,072**	**2,974,627**	**91,261,700**	**22,337,197**	**16,789,374**	**153,557**	**190,112,527**

Table 146: Distribution of Installed Lamps with On/Off Controls Among SCE Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	11,047,717	155,528	18,865,812	2,473,554	1,420,065	8,677	33,971,353
Bedroom	12,184,370	343,062	14,728,718	677,974	1,453,810	12,420	29,400,354
Kitchen	7,276,975	426,569	7,330,007	7,343,523	2,683,533	12,938	25,073,545
Living Room	6,820,338	204,272	10,806,966	426,259	1,567,607	19,879	19,845,321
Exterior	6,103,949	397,160	8,212,601	656,936	2,834,814	97,466	18,302,926
Hallway	4,463,632	73,238	8,589,131	199,954	713,370	0	14,039,327
Garage	2,662,454	93,119	7,007,712	95,264	412,747	0	10,271,296
Dining Room	1,529,557	2,475	1,708,816	8,383,913	68,228	11,626	11,704,615
Office	1,593,765	85,354	2,313,261	282,025	499,308	8,253	4,781,966
Other	2,741,488	31,749	4,929,388	1,419,196	373,703	0	9,495,524
Total	**56,424,246**	**1,812,526**	**84,492,413**	**21,958,597**	**12,027,186**	**171,259**	**176,886,227**

Table 147: Distribution of Installed Lamps with On/Off Controls Among SD&GE Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	3,049,662	26,421	6,345,678	502,062	492,566	1,962	10,418,351
Bedroom	3,262,920	35,964	4,194,114	202,890	522,947	26,600	8,245,434
Kitchen	2,318,087	33,311	2,017,629	1,841,398	873,771	13,377	7,097,573
Living Room	2,201,626	37,803	3,035,719	238,742	586,398	9,153	6,109,441
Exterior	1,787,879	253,667	2,655,215	20,452	831,825	43,967	5,593,006
Hallway	1,379,780	28,897	2,537,318	156,317	297,724	1,637	4,401,673
Garage	577,778	4,537	1,929,080	6,119	229,430	10,620	2,757,565
Dining Room	563,187		312,356	1,868,977	22,297	0	2,766,817
Office	581,475	17,691	598,896	156,141	194,786	0	1,548,989
Other	559,012	5,434	894,976	429,302	153,622	0	2,042,346
Total	**16,281,407**	**443,724**	**24,520,981**	**5,422,401**	**4,205,366**	**107,316**	**50,981,195**

Dimmer Switch

Table 148: Installed Lamps with Dimmer Controls Among PG&E Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	22,291	0	232,610	1,925	45,633	0	302,460
Bedroom	43,357	0	535,781	8,596	119,843	0	707,577
Kitchen	53,902	0	266,395	0	55,762	0	376,059
Living Room	59,357	0	733,662	2,362	245,121	0	1,040,502
Exterior	4,337	0	0	0	3,427	0	7,764
Hallway	9,386	0	171,668	0	33,639	0	214,693
Garage	48,785	0	1,041,717	0	51,121	0	1,141,624
Dining Room	0	0	10,061	0	0	0	10,061
Office	0	0	25,344	0	47,390	0	72,733
Other	0	0	52,027	0	98,435	0	150,463
Total	**241,415**	**0**	**3,069,265**	**12,883**	**700,372**	**0**	**4,023,935**

Table 149: Distribution of Installed Lamps with Dimmer Controls Among SCE Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	10,801	0	341,472	0	62,243	0	414,515
Bedroom	42,113	0	827,870	0	192,239	0	1,062,221
Kitchen	51,465	27,946	677,872	6,126	245,760	0	1,009,168
Living Room	188,650	0	1,405,734	0	639,334	0	2,233,718
Exterior	0	0	148,789	0	26,804	0	175,593
Hallway	12,462	0	504,001	0	33,863	0	550,326
Garage	40,865	0	1,905,042	0	82,543	0	2,028,449
Dining Room	0	0	9,712	4,949	2,895	0	17,556
Office	39,625	11,557	207,511	0	109,234	0	367,928
Other	8,334	0	102,174	0	10,960	0	121,468
Total	**394,314**	**39,503**	**6,130,177**	**11,075**	**1,405,875**	**0**	**7,980,944**

Table 150: Distribution of Installed Lamps with Dimmer Controls Among SD&GE Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	35,061	5,537	173,593	0	65,575	0	279,766
Bedroom	49,758	22,356	286,289	29,095	169,601	2,980	560,078
Kitchen	14,555	0	291,052	0	85,426	0	391,033
Living Room	59,940	4,866	273,435	2,233	145,698	0	486,172
Exterior	745	0	54,107	0	27,965	0	82,816
Hallway	21,406	0	179,968	0	105,836	0	307,210
Garage	0	0	0	0	0	0	0
Dining Room	19,083	8,516	550,238	0	57,502	0	635,339
Office	24,389	0	53,320	0	38,035	0	115,744
Other	0	0	37,444	0	14,717	0	52,162
Total	**224,936**	**41,275**	**1,899,446**	**31,328**	**710,355**	**2,980**	**2,910,320**

3 Way Switch

Table 151: Distribution of Installed Lamps with 3-Way Controls Among PG&E Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	0	0	21,891	0	0	0	21,891
Bedroom	666,458	14,865	1,678,251	0	30,604	0	2,390,179
Kitchen	49,131	0	374,700	0	286,852	0	710,683
Living Room	1,032,844	0	1,618,914	2,515	43,922	0	2,698,195
Exterior	0	0	18,594	0	0	0	18,594
Hallway	9,454	0	46,021	0	9,454	0	64,928
Garage	60,860	0	109,975	0	6,344	0	177,179
Dining Room	4,727	0	31,536	0	6,344	0	42,607
Office	61,660	4,358	218,821	0	1,941	0	286,779
Other	23,899	0	69,882	0	0	0	93,781
Total	**1,909,033**	**19,224**	**4,188,585**	**2,515**	**385,460**	**0**	**6,504,817**

Table 152: Distribution of Installed Lamps with 3-Way Controls Among SCE Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	14,472	0	44,554	0	0	0	59,026
Bedroom	338,249	0	846,232	6,846	22,108	0	1,213,435
Kitchen	71,561	26,613	90,412	250,086	41,263	0	479,934
Living Room	368,386	0	712,943	13,203	31,861	0	1,126,392
Exterior	6,557	0	9,447	0	3,237	0	19,242
Hallway	338,662	3,852	693,443	49,701	33,215	0	1,118,873
Garage	59,997	0	3,105	0	4,856	0	67,958
Dining Room	0	0	0	63,741	0	0	63,741
Office	14,150	0	77,884	0	0	0	92,033
Other	24,234	0	80,905	19,738	1,619	0	126,496
Total	**1,236,267**	**30,465**	**2,558,925**	**403,315**	**138,158**	**0**	**4,367,130**

Table 153: Distribution of Installed Lamps with 3-Way Controls Among SD&GE Residential Electric Customers by Technology and Installation Location, 2009 and 2012 (In-Home Lighting Inventories)

Installation Location	Lamp Technology						
	CFL	LED	Incandescent	Fluorescent	Halogen	Other	Total
Bathroom	0	0	0	0	0	0	
Bedroom	140,783	0	128,284	18,686	0	0	287,753
Kitchen	5,452	0	18,220	0	0	0	23,672
Living Room	116,141	0	138,701	0	0	0	254,842
Exterior	0	0	6,968	0	0	0	6,968
Hallway	11,758	0	44,450	0	0	0	56,207
Garage	0	0	0	0	0	0	
Dining Room	8,522	0	19,374	0	0	0	27,895
Office	8,138	0	7,954	0	0	0	16,092
Other	1,107	0	9,413	0	0	0	10,521
Total	**291,900**	**0**	**373,364**	**18,686**	**0**	**0**	**683,950**

F. APPENDIX F – LAMP CHOICE MODEL COEFFICIENTS

Table 154 shows the coefficient values and statistical significance for each of the parameters in the A-Lamp/Twister model. The pseudo R^2, which measures the overall fit, is 0.32. For a detailed discussion of the estimation results, please see section 5.3.4.2 of the California Upstream and Residential Lighting Impact Evaluation (WO28).

Table 154. Estimated Parameter Values for the A-Lamp/Twister Model

Group	Parameter	Type	Value	T-Stat
Alternative Specific Constant	CFL Twister	Alternative	0	-
	CFL A-Lamp	Alternative	-1.14	-1.94
	Incandescent A-Lamp	Alternative	-1.44	-2.84
	EISA Incandescent A-Lamp	Alternative	-2.91	-4.65
	LED A-Lamp	Alternative	1.64	1.69
Price Sensitivity	Generic	Choice	-0.38	-9.22
	Income over $100k	Individual	0.08	3.69
	Unknown income	Individual	0.02	0.71
	Planned purchase	Individual	0.02	0.78
	CFL A-Lamp	Alternative	0.06	0.95
	Incandescent A-Lamp	Alternative	-0.20	-2.86
	EISA Incandescent A-Lamp	Alternative	0.01	0.14
	LED A-Lamp	Alternative	0.21	5.64
Discount Channel	Incandescent A-Lamp	Choice	0.86	1.50
	CFL Twister	Choice	0.31	0.64
Drug Store Channel	Incandescent A-Lamp	Choice	-1.10	-1.35
	EISA Incandescent A-Lamp	Choice	0.31	0.34
	CFL Twister	Choice	-1.02	-1.30
Grocery Channel	Incandescent A-Lamp	Choice	1.01	1.06
	EISA Incandescent A-Lamp	Choice	2.11	2.21
	CFL Twister	Choice	0.48	0.51
Hardware Channel	CFL A-Lamp	Choice	0.00	0.01
	Incandescent A-Lamp	Choice	0.55	1.68
	EISA Incandescent A-Lamp	Choice	1.08	3.25
	LED A-Lamp	Choice	-1.28	-1.78
Mass Merchandise Channel	CFL A-Lamp	Choice	0.52	1.63
	Incandescent A-Lamp	Choice	-0.10	-0.40
	EISA Incandescent A-Lamp	Choice	0.93	4.03
	LED A-Lamp	Choice	-1.58	-2.45
Replacement	Incandescent to incandescent	Choice	0.62	3.76
	CFL to CFL	Choice	0.38	1.42
Housing size 3 or more	CFL A-Lamp	Choice	-0.21	-0.64
	Incandescent A-Lamp	Choice	-0.83	-2.64
	EISA Incandescent A-Lamp	Choice	-0.73	-3.10
	LED A-Lamp	Choice	-0.20	-0.47
Housing size 4 or more	CFL A-Lamp	Choice	-0.66	-1.84
	Incandescent A-Lamp	Choice	0.25	0.82
	EISA Incandescent A-Lamp	Choice	-0.21	-0.85
	LED A-Lamp	Choice	-0.48	-1.10

Table 154 (Continued). Estimated Parameter Values for the A-Lamp/Twister Model

Group	Parameter	Type	Value	T-Stat
Bedrooms, 2 or more	CFL A-Lamp	Choice	0.09	0.17
	Incandescent A-Lamp	Choice	0.16	0.34
	EISA Incandescent A-Lamp	Choice	1.33	2.16
	LED A-Lamp	Choice	-0.88	-1.00
Bedrooms, 3 or more	CFL A-Lamp	Choice	0.72	1.89
	Incandescent A-Lamp	Choice	0.37	1.44
	EISA Incandescent A-Lamp	Choice	0.24	0.89
	LED A-Lamp	Choice	-0.08	-0.15
Renting	CFL A-Lamp	Choice	-0.42	-1.40
	Incandescent A-Lamp	Choice	0.17	0.72
	EISA Incandescent A-Lamp	Choice	-0.20	-0.80
	LED A-Lamp	Choice	-1.34	-2.15
Application room	Unknown room—CFL Twist	Choice	-0.15	-0.77
	Bedroom—CFL Twist	Choice	1.16	3.54
Nesting	Incandescent		0.84	5.21
	CFL-LED		0.84	6.85

G. APPENDIX G – REVIEWER COMMENTS AND AUTHOR RESPONSES

Table 155. Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-1	SCE	General	N/A	Question	Can you please provide a list of acronyms or, at a minimum, define acronyms the first time they are used in each chapter (e.g., MSB - supposedly "medium screw base" is not defined anywhere in the text.) Even though this may be standard industry parlance, it would greatly facilitate understanding.	We have reviewed the report to ensure that all acronyms are spelled out on their first use in the Executive Summary and again in the main body of the report.
SCE-2	SCE	General	N/A	Question	Please define what inefficient and efficient lamps are. Does the definition of efficient include efficient incandescent lamps and basic CFLs or just specialty CFLs, LED, etc.?	The report defines these terms (for the purposes of "Remaining installation potential for energy-efficient lamps") as CFLs and LED lamps.
SCE-3	SCE	Figure 1	Page 3	Comment	Please include the sample sizes for each of the surveys and in-depth interviews mentioned in Figure 1 as in (n= i) to give the reader a sense of the coverage of each of these data collection techniques.	We have added sample sizes to the figure.

Table 156. Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-4	SCE	Table 4 and text	Page 8	Question	Table 4 indicates that only seven retail lighting buyers were interviewed, covering only 13% of ULP lamp shipments. Can you provide more detail on the representativeness of the findings? In addition, can you discuss why it was not possible to obtain a larger sample of retail buyers, and whether the characteristics of the interviewed retail buyers were different from those of who declined to interview?	Retail lighting buyers interviewed cover four of eight retail channels including mass merchandise, small hardware, grocery and discount; and more than half represent a range of regional or national chain stores. Retail lighting buyers are typically more difficult to reach than manufacturer representatives. DNV GL attempted to arrange interviews with the retail lighting buyers covering more than 80% of ULP lamp shipments, but either interviewers could not reach the contacts (after 7x attempts), or received a refusal. Retail buyers who declined to be interviewed represented the other major retail channels including drug stores; large home improvement; wholesale club; and lighting and electronics. We leveraged the manufacturer interviews to inform our discussion of retailers and added select manufacturer interview quotes to highlight characteristics or important findings related to retail channels where retail buyers declined to be interviewed. However, as noted in the report (e.g., on page 8), the summaries presented in the report focus primarily on results from lamp manufacturers given that the manufacturer sample represented 98% of 2010-2012 ULP shipments.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-5	SCE	General	Page 8	Comment	While this may have been mentioned in Chapter 7 and 8, it definitely bears stating in this introductory chapter that an opportunistic intercept survey was conducted to gather data with the choice of lamp technologies. It would also be helpful to explain why this particular intercept approach is most relevant (as opposed to, say, a systematic random intercept approach, e.g. every 3rd or ith customer) given the objectives of the present endeavor.	Added comments on page 5 (Section 2.1.2 Lighting Retail Store Shelf Surveys and Shopper Intercept Surveys) to clarify opportunistic sampling approach. The report clearly states that it leverages research conducted for other studies to support the objectives of those other studies and as such, do not feel it is appropriate to comment in this report on the relevance of this data collection approach with regard to the needs of the study for which it was conducted.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-6	SCE	Stratification scheme	Page 7	Comment	It would be helpful to graphically present the stratification scheme for the 42 strata mentioned in the 2nd paragraph of section 2.1.3.1, page 7, to show how the final sample distributes across the various strata. Please specify whether a proportionate allocation was used for this stratified sampling.	The CLASS utilized a complicated and detailed sampling approach, and the tables detailing sample targets and completion span 4 pages in the CLASS report. As such, we have provided limited details regarding the sampling approach in this report and refer the reader to the CLASS report for more details. We have updated the CLASS report reference to include the page numbers for the relevant section for ease of reference.
SCE-7	SCE	Weights	Page 14	Question	Were there any significant differences in the census-adjusted weights estimated for the PG&E, SCE, and SDG&E residential electric customer households in 2012 and 2014? In effect, were there significant changes in the customer mix by IOU between the two periods? Refer to discussions in sections 2.1.3.1 and 2.1.3.2.	We are aware of no substantial differences in this regard. The CLASS report provides further detail regarding the weighting approach.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-8	SCE	LCM	Page 8	Comment	Since the Lamp Choice Model (LCM) described in the current market characterization report is essentially the very same model presented in W028, it will be very helpful to state the major methodological limitation articulated by the April 10, 2014 preliminary comments submitted by PG&E for the joint IOUs, i.e. that of the failure to account for the non-purchasers of lamps for the reference category in the nested logistic regression model.	The April 10 comment submitted by PG&E on the WO28 report mentioned that the LCM's exclusion of the choice not to purchase any lamp from among the lamps offered in the shopper intercept survey's choice set was a limitation of the model. The DNV GL team then explained that the LCM results are based exclusively on results of shopper intercept surveys completed with lamp purchasers for the most common lamp types (and for the A-lamp replacement types included in the WO13 analyses). As such, on July 25, SCE submitted comments on WO28 Residential/Upstream Lighting Impact Evaluation Report stating that "Earlier comments about not including a “none-of-the-above” option are no longer relevant for purchasers now that it is clear that the lamp chosen by the respondent is included in the choice set. This was not clear from the presentation in the spring." (Page 3, section 5-34). Based on this exchange, we believe comment SCE-8 is no also no longer relevant (since again, the WO13 analyses focus on LCM results only for A-lamp replacement lamps, and the LCM uses only purchaser data from the shopper intercept surveys for these analyses).

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-9	SCE	LCM	Page 9	Comment	Additionally, it would be very helpful to state the specific key findings attached to each of the key LCM features enumerated in page 9 (i.e. on market share predictions, heterogeneous price sensitivities, and retail channel differences). This will serve as a recap summary of the LCM results.	We do not believe it's appropriate to state findings in the methods chapter.
SCE-10	SCE	Phrasing	Page 34 and general comment	Comment	"...only a handful of the lamp manufacturers that serve the home improvement and small hardware channels said that they stopped selling CFLs in these channels when the ULP discounts are not available." The term "handful" seems misleading, as it describes 4 out of 10 responses. Throughout this chapter, with such small response numbers, it would be helpful to be circumspect with terms such as this one.	We have updated the text accordingly.
SCE-11	SCE	Program design implications	Page 36	Question	The declining trend of home improvement stores' participation in ULP is attributed to changes towards uniform nationwide stocking practices. Does this suggest that more coordination is needed nationwide in upstream programs to continue reaching these stores? What are the potential implications for the design and reach of the ULP program?	Specific recommendations (regarding program design, etc.) are outside the scope of this reporting effort.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-12	SCE	Continuity	Page 53/54	Question	The section on Continuity has some interesting information on periods when lamps were not available. Can you provide more detail on the underlying causes? What are the implications for the design of the ULP program?	Lighting suppliers presented a range of reasons for why there were periods when lamps were not available. Major reasons can be grouped into three categories: IOUs initiating programs in March or April; allocations running out before year-end; and incorrect allocations requested by the supplier (the latter mentioned by only 2 representatives). We have added these details on page 54 of the report. Discussions about implications of results regarding program design, however, are outside the scope of this reporting effort. Nonetheless, with this clarification, we believe the implications for ULP design are fairly clear.
SCE-13	SCE	Missing references	Page 65	Comment	"Error! Reference source not found" - Please check for such instances.	We have updated the text accordingly.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-14	SCE	Reasons for declining CFL stock	Page 69	Question	Some potential reasons for declining CFL stocks are listed here. Might another reason be that CFL lamps have longer lifetimes, so as the saturation with CFLs increases; there is less replacement demand than before? Yet another reason could be the funding decrease for ULP programs in the 2010-12 cycle, compared to the prior cycle?	Agreed; the latter (decreased ULP funding) is mentioned but we have updated the text to clarify this. We have also updated the text to reference the longer lifetimes associated with CFLs.
SCE-15	SCE	Reasons for declining CFL purchase rates	Page 100	Question	This section provides some reasons for the decline in CFL purchase rates. Might another reason be the funding decrease for ULP programs in the 2010-12 cycle, compared to the prior cycle?	We have updated the text accordingly.
SCE-16	SCE	Sample sizes	Page 110 and remainder of chapter 5	General question	In the store intercept surveys, the number of LED and halogen purchasers is quite small. It is doubtful that the sample size provides more than anecdotal evidence on these purchasers, especially given the opportunistic nature of the store intercepts and given that results are not weighted. Can some discussion be included on the limitations of these results?	We have updated the text accordingly.
SCE-17	SCE	Table 24	Page 119	Question	Table 24 provides summary statistics on sockets per dwelling type. Given the large increase in sockets in multi-family buildings, it would be very interesting to know if the distribution of lamp technologies and installation locations is the same or different than in single-family buildings. This is important information for program design. Would it be possible to add tables showing technology by dwelling type and installation location by dwelling type, possibly to Appendix D?	We have updated Appendix D with these tables (Table 124 and 125).

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-18	SCE	Use of results	Page 144	Question	Note that the installation potential characterized herein is best described as theoretical, "as analyses regarding the availability or suitability of energy-efficient replacement lamps for each remaining application were outside the scope of this effort." We acknowledge that a full potential study is outside the scope of this effort. However, could you please describe the suggested use(s) of this study in potential studies, as well as the conclusions that can be inferred?	The report states that the installation potential represents an estimate of "the number of sockets remaining for conversion from inefficient to efficient lamps among households in PG&E, SCE, and SDG&E electric service territories" and we present all related findings/conclusions solely from this perspective. The authors do not suggest whether or how these data might be used in support of an energy-efficiency potential study.
SCE-19	SCE	Logic error	Page 144	Comment	"Sixty-nine percent of lamps installed in 2012 were inefficient (i.e., were not incandescent lamps or CFLs), down from 89 percent in 2009." There seems to be a logic error in this sentence. Are you talking about inefficient or efficient lamps?	We have updated the text accordingly.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-20	SCE	Run times	Page 144	Question	"Remaining potential (in terms of quantity of lamps) was highest in 2012 in the rooms in which the largest numbers of lamps were installed-bathrooms, bedrooms, kitchens, and living rooms." The location of the lamps is significant as run times and claimed savings will be different. Even if there is high remaining potential in some area, the low run times could not make it a priority target. We acknowledge that run times were not logged in the in-home bulb surveys. Nevertheless, would it be possible to add the standard run-times currently used under DEER rules to gain a better sense of the areas with the highest remaining savings potential?	The DEER database does not include estimates of average daily hours of use per lamp (run time) beyond making the distinction between interior or exterior lamps. The DNV GL team is not aware of another recent published source for average daily hours of use at a more detailed level (i.e., by detailed installation location). As such, we are unable to provide those estimates here. However, we would be happy to provide some previously unpublished numbers to IOU staff outside of the published report, and IOU staff should feel free to reach out the DNV GL team to discuss this possibility. We do not feel that it's appropriate to publish those (un-vetted) numbers in this report.
SCE-21	SCE	Phrasing	Page 144	Comment	"The lamps installed in five household locations-bathrooms, kitchens, bedrooms, living rooms, and exterior-comprised nearly three-quarters of all remaining potential for energy-efficient lamp installations in 2012." This should more accurately be called "more than two thirds," rather than "three-quarters," as the base percentage is 68%.	We have updated the text accordingly.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-22	SCE	Run times	Page 145, Figure 59 "Remaining Energy-Efficient Lamp Installation Potential"	Comment	Would it be possible to denote the different annual run times for each location? Longer run time areas such a living rooms and offices will have different EE savings that say hallways, bathrooms, etc. Integrating this information would be extremely useful to guide program design.	Please refer to the response provided above to comment SCE-20.
SCE-23	SCE	Three-way switches	Page 146	Question	Can you provide a little more detail on three-way switches? Do you mean that this is a switch with three lighting levels or a switch that controls lighting/plugs from more than one location? Are the impacts similar to dimmers, or are there lamps that can work in three way switches, but not with dimmers? Please clarify.	We have updated the text accordingly.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-24	SCE	LCM	Page 151/152	Comment	SCE appreciates that the limitations of the lamp choice models are addressed in the opening paragraphs of this chapter. However, the only methodological limitation stated in this list refers to the opportunistic sampling. A much more serious limitation was already noted by the joint IOUs in their preliminary comments to WO28 ULP Impact Evaluation, and again by SCE in our public comments to the same study: The lamp choice model does not account for the non-purchasers of lamps in the baseline reference category of the nested logistic regression model. This severely limits the analyses to a subsample of customers who have taken action, i.e. indicated or actually purchased a particular lamp, and, as such, results may not be generalized to the general population that can conceivably include a sizeable segment of customers who opt not to make any purchase for one reason or another. This is particularly important since "[t]his section relies upon the Lamp Choice Model . . . to estimate the market shares of various lamp technologies" to inform the reader of the specific methodological context in which these market share estimates have been obtained for the current report. This limitation must be fully articulated in the current report.	Please refer to the response provided above to comment SCE-8.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-25	SCE	LCM	Page 151/152	Comment	For a more transparent methodological presentation, the fundamental equation of the Lamp Choice Model (LCM) can be presented in this section rather than referring the reader to the W028 report (or some other part of the current report for that matter).	We have added a new appendix (Appendix F) which provides the coefficient values and statistical significance for each of the parameters in the A-Lamp/Twister model (which is the model on which Chapter 8: "Projected Lamp Technology Choices Under Changed Regulatory and Market Conditions" relies). We've added a reference to this Appendix in Chapter 1 ("Introduction") as well as in the Chapter 2 ("Methods").
SCE-26	SCE	LCM	Page 151/152	Comment	Were there formal tests conducted to check if the LCM nested logistic regression model meets the basic assumptions of normality, homoscedasticity, etc.? It would be prudent and transparent to inform the technical readers how much confidence can be placed on the results of the LCM that uses this stringent parametric technique. Whether the current LCM meets these stringent assumptions or not, especially if there are any violations of these underlying assumptions, this must be sufficiently documented in an appendix to the report. This information can help improve upon this multivariate model in future studies of this genre.	This report is not focused on the LCM and its methods, as we did not perform the LCM effort as part of the work order that produced this report (WO13). The 2010-2012 Residential/Upstream Lighting Program Impact Evaluation (WO28) report addresses the model and its limitations, and provides detail regarding sensitivity analyses conducted to address issues regarding confidence in specific model results. We refer the reader to the WO28 report for details regarding the LCM approach.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-27	SCE	LCM	Page 159	Comment	While the report outright states that ". . .the primary interest [of the LCM] is not whether the point estimates of market shares are correct but instead the directionality of changes in market share from scenario to scenario" (2nd paragraph, page 159), it would be most prudent and transparent to include an appendix discussing the overall goodness of fit of the said multivariate model. Indeed, while the modeling exercise did not aim to generate precise and accurate coefficients to obtain robust estimates of the market shares, it still remains to be desired that the technical readers, at the very least, are assured beyond doubt that the "directionality of changes" are truly precise and accurate directions as evinced by the positive or negative signs of the very model coefficients.	Again, this report is not focused on the LCM and its methods, as we did not perform the LCM effort as part of the work order that produced this report (WO13). The WO28 report and the associated process of public comments/responses addressed the methodological limitations of the LCM.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
SCE-28	SCE	LCM	Page 154 onwards	Comment	With respect to the presentation of the key findings from the LCM in Section 8.3, while the immediate goal is to present these results in comprehensible lay language to the general audience, it is nonetheless equally important to state outright the statistical significance associated with these results. For instance, a generic statement that goes "The model suggests…" (Paragraph 1, page 161) does not give the technical audience of this report a solid foundation of knowledge as to the statistical significance attached to this particular finding. In effect, are we talking about only the statistically significant findings in this section or are we highlighting the significant results, including those that almost made it to the statistical benchmark of, say, p = .05 at the very least? Perhaps those that almost made it to that conventional benchmark may also be worth mentioning in this section, given that the pattern of results may differ if and when the level of statistical significance is changed accordingly. Just gauging from the text of the report in this section, the technical reader could not even ascertain the level of statistical significance used to establish the influence of a predictor variable. The same comment above is made for Section 8.4 on the Detailed Results, i.e. please state outright whether results reflect only the statistically significant findings or include some that almost cleared the statistical benchmark of p=.05.	We have updated the text with a footnote to give readers sense of the LCM precision. We have also pointed to the uncertainty analysis that we performed and documented as part of WO28. However, the text appropriately cautions readers to pay attention to the assumptions in the scenarios. We constructed the scenarios from stocking data that reflected product available in 2012 and 2013. The explicit assumption is that product availability will not change, expect where we eliminated traditional incandescent lamps. These assumptions have a greater impact on market shares than the precision of the LCM.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
PG&E-1	PG&E	Recommendations	N/A	Question	The report would greatly benefit from a Recommendations section to address needs for future research and/or changes to program design. Can a Recommendations section be included in the final report?	Specific recommendations (regarding program design, etc.) are outside the scope of this reporting effort.
PG&E-2	PG&E	Tables in Microsoft Excel	N/A	Question	Can the report tables be made available to the IOUs in electronic format (such as in Microsoft Excel)?	Our original scope of work did not provide budget for this task. As such, we are unable to provide the tables in electronic format as requested.
PG&E-3	PG&E	Typo	Page 16	Comment	There is a typo in this sentence: "PG&E focused on direct-mail coupon campaigns and retailer incentives between 1989 and 1991. Together, these programs achieved sales of resulted in sales of more than 340,000 CFLs."	We have updated the text accordingly.
PG&E-4	PG&E	Y Axis, Figure 13	Page 56	Question	There appears to be a typo in the Y axis of Figure 13 (all 0's are displayed in the Y axis). Can this be corrected in the final report?	We have updated the figure accordingly.
PG&E-5	PG&E	Typo	Page 65	Comment	There is a typo in the last paragraph: (see Error! Reference source not found.	We have updated the text accordingly.
PG&E-6	PG&E	Typo	Page 67	Comment	There is a typo toward the bottom of page 67 – an extra space between “K” and “e” in the word “K ey”.	We have updated the text accordingly.
PG&E-7	PG&E	Labeling in Table 13	Page 72	Question	In Table 13, it refers to “Lamp Stock” and “Lamp Volume”. For consistency, can the report only use one term in this table – lamp stock or lamp volume?	We have updated the table accordingly.
PG&E-8	PG&E	Typo	Page 77	Comment	There is a typo in the third paragraph: (see Error! Reference source not found.	We have updated the text accordingly.
PG&E-9	PG&E	Figure 30	Page 81	Question	To be consistent with other tables displayed in the report, please report whole percentages (do not report to 10th of the decimal point) in Figure 30.	We have updated the figure accordingly.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
PG&E-10	PG&E	Table 15 Header	Page 87	Question	For added clarity, can the Table 15 header be revised to read, "Table 15: Average Number of EISA-Compliant and Non-Compliant Incandescent and Halogen Lamp Models per Store by Store Category, 2012 and 2013 (Retail Store Shelf Surveys)?	We have updated the figure caption accordingly.
PG&E-11	PG&E	Figure 37	Page 90	Question	In Figure 37, the average price of Incandescent lamps ($1.94) is slightly higher than the average price of Advanced CFLs ($1.80) in Non-Big Box stores in 2012. One might expect the price of incandescent lamps to be lower in price than advanced CFLs. Can these numbers be checked?	We double-checked these numbers and they are correct. The low price of advanced CFLs compared to incandescent lamps in non-big box stores in 2012 was largely driven by the fact that grocery stores had a large share of overall advanced CFL stock in non- big box stores (66%) and the average advanced lamp price in this channel was low ($0.91), largely as a result of IOU discounts. In 2012, hardware stores comprised 36 percent of non- big box incandescent lamp stock and grocery stores, 32 percent. These two channels had relatively high average prices for incandescent lamps ($2.46 in hardware and $1.93 in grocery), which together drove the overall average price of incandescent lamps in non- big box stores.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
PG&E-12	PG&E	Typo	Page 92	Question	"Figure 39 shows the average MSB globe lamp price by lamp technology and store category in 2012 and 2013." Should this actually read, "Figure 40 shows the average MSB globe lamp price by lamp technology and store category in 2012 and 2013."?	Yes. We have updated the text accordingly.
PG&E-13	PG&E	Typo	Page 106	Comment	The word "than" is missing from this sentence, and the word "that" is redundant: "More a third of respondents mentioned that that CFLs contain harmful materials (i.e., that they contain mercury, are considered hazardous waste, or contain dangerous materials)."	We have updated the text accordingly.
PG&E-14	PG&E	N sizes	Page 126, 130, 134, 137	Question	Some of the Figures are missing n sizes (i.e., Figure 53, Figure 54, Figure 55, and Figure 56). Can the n sizes be added to these figures in the report?	We could not find a clear way to include all of the relevant n's into these figures. As such, each figure includes a footnote directing the reader to a table in Appendix D that includes the relevant n's. (E.g., for Figure 53, the table footnote says, "See Table 123 in Appendix D for number of lamps installed by technology, location and study period.")
PG&E-15	PG&E	6.2.5.2 Key Technologies and Lamp Shapes, 2012	Pages 135-136	Question	How do key technologies and lamp shapes in 2012 compare to the past? Can historical comparisons be included in this section of the report?	We have updated Appendix D to include these tables.

Table 155 (Continued). Reviewer Comments and Author Responses

Comment Number	*IOU*	*Subject*	*Location in Document*	*Question or Comment*	*Detailed Question or Comment*	*Author Response*
PG&E-16	PG&E	Figured 56 - 58	Page 137, 140, 141	Question	In Figures 56 – 58, are any of the differences from the prior study statistically significant? If so, please asterisk those scores and include a footnote: * Difference from Prior study period is statistically significant.	We did not report statistical tests on the results in Chapter 6. Sample sizes for these efforts are vast, thus any differences between years are typically statistically significant. Adding asterisks to all percentages shown in the tables and figures would be visually distracting.
PG&E-17	PG&E	Figure 59	Page 145	Question	Can Table 59 be expanded to include HOU data? For example, can the installation locations with the highest hours of use be “flagged” in the table?	Please refer to the response provided above to comment SCE-20.
PG&E-18	PG&E	Typo	Page 154	Comment	The second sub-bullet after the first primary bulled has a typo (is missing the word “to”): As a result, the Lamp Choice Model predicts that CFL A-lamps will have over 10 percent market share in this channel, compared 6or less in other channels in all scenarios.	We have updated the text accordingly.
PG&E-19	PG&E	Asterisk, Table 46 sub-header	Page 156	Question	What does the asterisk after the sub-heading, “A-Lamp Replacement Type*” indicate? Is this asterisk a typo, or should it be some other type of symbol?	This was a reference to the table footnote stating, "Note: Results may not total 100 percent because of rounding." We have moved the asterisk to a more appropriate location in the table.
PG&E-20	PG&E	Typo	Page 165	Comment	There is a typo at the end of the first paragraph of page 165: Most lamp manufacturers suggested that the ULP exerts considerable influence on their market activities.	We have updated the text accordingly.