Tim Cole

From: Glenn Reed [greed@energyfuturesgroup.com]
Sent: Friday, June 08, 2012 6:10 AM
To: Tim Cole
Subject: Comments on lighting evaluation
Attachments: DRAFT CT EISA Lighting Report 052112-GR comments.docx

Tim

Please see the attached

Also note the following

1. I think that Table B-20 and/or Figure 2-9 should be in the Executive Summary
2. The increase in socket saturation from 2009 through early 2012 is (much?) less than one might have expected given the large number of CFLs sold into the market through the Companies' programs. NMR should make some effort to explain this. Maybe out of program sales were negligible. And NMR does note that many CFLs are now being purchased to replace other CFLs. NMR should connect the dots
3. In Appendix section B.2.2. there is presentation of two sets of free ridership and net to gross values (noting that no attempt had been made to account for spillover). Does NMR propose that these values should be used for planning and reporting purposes? They are lower – and in the case of the values in Table B-19 much lower – than the current NTG values in the PSD

Glenn

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Connecticut EISA Lighting Exploration: Stage 2 Results

DRAFT

5/21/2012

Submitted to:

The Connecticut Energy Efficiency Fund

Connecticut Light and Power

The United Illuminating Company

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Contents

Tables

Figures

Executive Summary

The residential lighting market in Connecticut and beyond is facing a period of rapid change. The new lighting efficiency standards mandated by the Energy Independence and Security Act of 2007 (EISA) effectively phase out the traditional incandescent light bulbs over a three year period. Consumers are now faced with a greater number and diversity of bulb choices—compact fluorescent lamps (CFLs), incandescent halogen, and light emitting diodes (LEDs)—than in the past. Moreover, the State of Connecticut has a goal of filling 36% of the residential sockets in the state with CFLs, that is, achieving 36% CFL socket saturation.

Comment [GR1]: Note that there was a "deadline" for this goal of the end of last year. They appear to have missed it

Given this period of rapid change, the Connecticut Energy Efficiency Board, in cooperation with Connecticut Light and Power (CL&P) and the United Illuminating Company (UI) hired NMR Group, Inc. (NMR) and its subcontractor Tetra Tech (collectively referred to as the evaluation team) to explore the current conditions of residential lighting in Connecticut as well likely consumer reactions to EISA. The team performed focus groups in the fall of 2011, which served as the first stage of the study. This report summarizes the results of the second stage of the study that relied on telephone surveys and onsite visits to residents' homes. It also incorporates the current findings to those from the focus groups, which addressed similar topics in a more qualitative manner.

Research Objectives and Methodology

This second stage of the exploration of EISA on the residential lighting market in Connecticut had the following objectives, as outlined in the work plan:

- Establish consumers' awareness of various lighting options and of the upcoming changes in the light market stemming from EISA
- Understand consumers current and likely reactions to EISA, such as stockpiling of bulbs and the type of bulbs they except to buy after the incandescent phase-out
- Determine the current rates of use and storage for various lighting technologies and the reasons that underlie current lighting choices
- Identify ways in which the Companies could assist consumers in making more efficient lighting choices, including exploring issues related to incentives, education, and program design, among others

In order to meet these objectives, the evaluation team completed and analyzed a telephone survey of 551 residential customers of CL&P and UI and onsite visits to a subset of 100 survey respondents' homes. The telephone survey primarily provided information on customers' current awareness and knowledge of various lighting technologies and of the EISA legislation as well as their opinions about and reactions to those technologies and the incandescent phase-out. The onsite visits served to describe the use, saturation, and storage of various lighting technologies in

the home through a detailed lighting inventory; a follow-up survey delivered onsite also explored how respondents make decisions about lighting their home, their commitment to purchasing efficient lighting, and their willingness to pay for CFLs and LEDs at various price points. Table 1-1 in the main body of the report provides a more in-depth description of the research questions addressed through the surveys and onsite visits.

We also present relevant results from the Stage 1 lighting focus groups performed in the fall of 2011 throughout this report. However, because the focus groups were qualitative in nature, their findings provide insights that complement and inform the results from the more quantitative and statistically representative telephone survey and onsite visits.

Key Findings

Awareness of Lighting Options and Changes in Market

The first objective of the study was to establish customer awareness of lighting options and changes in the lighting market. Addressed primarily through the consumer survey, the key findings related to this objective include:

- Three-fourths of respondents were familiar with standard CFLs, but typically no more than one-half of respondents were familiar with specialty CFLs, A-line LEDs, and A-line halogen bulbs.
- Only thirty-nine percent of respondents reported that they had heard something about changes to lighting standards, and just 30% had specifically heard about the incandescent phase-out resulting from EISA.
- When asked what they had heard about the changes in lighting efficiency standards, 78% said that some light bulbs would not be available, and 17% thought they that they would be required to use CFLs or LEDs.

Current and Likely Consumer Reactions to EISA

A second objective of the study was to gauge consumers' current and likely reaction to the increased lighting efficiency standards—especially the incandescent bulb phase-out—resulting from EISA. The team addressed this objective through both the telephone survey and the onsite saturation components of the study. The exploration into reactions to EISA yields the following key conclusions:

- More than three-fourth of the respondents who were aware of some change to the lighting standards understood that some light bulbs would no longer be available.
- About 30% of all respondents had noticed changes in the availability of light bulbs in the past three months, but this increased to 50% among those respondents who had actually shopped for light bulb in the past three months. Those who had noticed changes typically cited a greater availability of CFLs and LEDs, a lower availability of incandescents, or an overall increase in the variety of bulbs on store shelves.

- When asked which type of bulb they would most likely purchase to replace a 100 Watt incandescent, 39% of respondents chose a lower wattage incandescent and 34% chose a CFL. These results are statistically different from each other. Common reasons for choosing an incandescent included preference for the light quality and familiarity with the product, while many respondents noted energy or bill savings for CFLs. Focus group results suggest that more exposure to A-line (covered) CFLs through light displays or demonstrations could sway incandescent purchasers to buy covered CFL instead.
- About one-third of telephone survey respondents reported purchasing light bulbs in the three months prior to the study. Most of these respondents bought CFLs (58% of purchasers who were also aware of CFLs) and incandescent bulbs (55% of purchasers; we assumed all were aware of incandescent bulbs).
- Households in the onsite saturation sample stored an average of 11 incandescent bulbs versus five CFLs. Although none of the households storing incandescents reported doing so in reaction to EISA, households that said they were "very likely" to stockpile incandescent bulbs also had more 100 Watt and all wattage incandescents in storage than those who indicated that they were less likely to stockpile.

Light Bulb Use, Saturation, Storage, and Purchase

A third objective of the Stage 2 EISA exploration was to establish the types and characteristics of lighting technologies in use and in storage in homes and understand socket saturation and bulb purchasing habits. The key findings related to this objective include the following:

- CFL saturation stood at 27% in spring 2012, 9% short than the goal set by the state. Another one percent of sockets are filled with LEDs, bringing the total percentage of energy efficient bulbs installed in Connecticut residences to 28% of sockets.
- Almost all homes (94%) in Connecticut used at least one CFL, but most households tended to use them in only occasional sockets, hence the saturation rate of only 27%.
- A total of 49.3 million sockets (61%) could be converted to CFLs or LEDs. Of these potential sockets, 21.4 million (49%) have an A-line profile meaning they could be filled with standard or covered CFLs or A-line LEDs. Ample opportunity exists for globe, spot, and candelabra CFLs and LEDs as well. Approximately seven million sockets could be filled with a dimmable or three-way LEDs or CFL.
- While the 60 Watt bulb or its equivalent remains the most common in homes, it accounts for only 36% of incandescents since there is a broader range of wattages available for incandescents than for CFLs. CFLs are more likely to be 13 or 14 Watt, which are sold as 60 Watt equivalents (60% of CFLs) than any other wattage.
- While the team did not directly measure change in bulb use due to EISA, over the past three years, households have shown a reduced tendency to use incandescent bulbs and have instead turned more to CFLs, LEDs, fluorescent tubes, and halogen bulbs to fill sockets. Importantly, the availability and diversity of CFLs, halogens, and LEDS has

Comment [GR2]: Might be useful to note % of sockets on dimming circuits given less than stellar CFL dimming performance and some growing concerns as to LED performance.

Comment [GR3]: While not part of the state goal, I assume that there were also some number of linear fluorescent lamps yielding a higher saturation of efficient lighting

And I don't think that the state goal included LEDs either

How does this compare to the last measurement of CFL saturation?

increased due to EISA, making it likely that the legislation is leading, directly or indirectly, to changes in residential light bulb use patterns.

- Bedrooms and bathrooms are the most popular places to install CFLs, with 22% of CFLs installed in bedrooms and 17% installed in bathrooms. However, more than 56% of bedroom sockets and 57% of bathroom sockets could still be filled with CFLs or LEDs. Most LEDs are installed in the kitchen (51%), but they remain the older style under-the-cabinet, pin-based lights and not the A-line screw-in type.
- When asked an open-ended question about how they decide to light a room, respondents most frequently mentioned price, brightness, energy efficiency, wattage, and a preference for a particular bulb type. Close-ended questions about the preferred characteristics for a room revealed that brightness was most important in all rooms, typically followed by price; the exceptions were bedrooms and dining rooms, where price was more important than brightness, and the living room, where energy efficiency nudged out price for the second most important factor.
- When asked why they did not have CFLs installed in some rooms, most respondents indicated that they were waiting for an installed bulb to burn out or had not gotten around to it. However, 13% of respondents indicated that CFLs did not fit properly.
- Dining rooms have the highest remaining potential for CFLs and LEDs (88%), and more than one-half of onsite households did not use any CFLs in their dining room. More than any other rooms in the home, respondents that did not use CFLs in the dining room noted that the bulbs did not work with dimmers, that they did not like the appearance of CFLs in the dining room, or that they could not find a bulb for the application.
- Satisfaction with CFLs and LEDs is high, with 77% of CFL users and 83% of LED users rating themselves as "somewhat or very satisfied" with the products. Consumers appreciate the energy savings of CFLs and the light quality of LEDs. Persistent concerns about CFLs include light quality and brightness, being slow to brighten, and mercury content, while LED users also cite price and the appearance of the bulb itself.
- Households in Connecticut collectively stored about 22.6 million bulbs, of which 65% are incandescents and 28% are CFLs.
- By and large, consumers are not *changing out* inefficient bulbs for CFLs. Instead, they fill whatever sockets need replacing at that moment and then they store the remaining CFLs until another bulb—which may or may not be an incandescent—burns out. In fact, 57% of stored CFLs will likely replace another CFL, 36% will replace whatever bulb type burns out first, and 6% will replace incandescent bulbs.

Comment [GR4]: Over 15 bulbs/HH – seems like a lot

Comment [GR5]: This might explain in part why we do not see socket saturations increasing as fast as sales

Assisting Consumers to make Efficient Lighting Choices

Along with understanding respondents' likely reactions to EISA and determining their current usage of efficient lighting technologies, a fourth objective of the current study was determining how to assist consumers in making more efficient lighting choices. Key findings related to this objective include the following:

- A willingness-to-pay analysis reveals that consumers are sensitive to price changes in standard and specialty CFLs, suggesting the continued need for incentives, suggested amounts for which are discussed in the conclusions and recommendations.
- Consumers will balance upfront costs with bill savings and operating costs if they believe the upfront cost is reasonable. At this time, most telephone survey respondents (77%) said they were likely to buy a six dollar bulb that lasts seven years and saves $10 a year, but fewer than half thought they were likely to purchase a $20 bulb that lasts for 20 years and saves $10 a year (46%).
- A majority of telephone survey respondents reported being familiar with the terms "lumens" (56%) and "warm white and cool white" (62%) in reference to lighting. Most respondents who reported that they are familiar with the term lumens correctly identified it as a measure of light output or brightness (62%), but 27% admitted that they really did not know what the term meant. A similar percentage of respondents who identified themselves as familiar with the terms "warm white and cool white" knew they referred to color appearance. However, 27% thought those terms referred to brightness or the amount of light, and 17% admitted they did not really know what the terms meant.

Conclusions and Recommendations

The EISA Lighting Exploration tasks—Stage 1 Focus Groups and Stage 2 Consumer Telephone Survey and Onsite Lighting Inventory—have yielded a number of important conclusions and recommendations regarding CEEF-funded programs that include residential lighting elements. We present recommendations focused on the two following themes:

1. What the CEEF-funded programs and Companies can do to help consumers make efficient lighting choices in the post-EISA period, and
2. What the CEEF funded programs and Companies can do to boost saturation of CFLs and LEDs in residential homes in Connecticut in order to achieve 36% socket saturation

Comment [GR6]: Not clear that this remains a goal

The research presented in the main body of the report and in the earlier focus groups makes clear that a multi-prong approach that involves education, incentives, and additional promotional efforts will be needed to help consumers make better lighting choices and to achieve 36% socket saturation. NMR believes that the research supports continuation of incentives on standard and specialty CFLs as well as LEDs. Additionally, the Companies should continue to promote activities that educate consumers about the lighting market and the bulb choices available to them. They should also *expose* consumers to the range of lighting available by providing consumers with low-cost or no cost opportunities to see the bulbs "in action". The recommendations presented below, then, highlight programmatic efforts that go beyond the retail setting to include programs such as Home Energy Solutions and Home Energy Solutions-Income Eligible as well as community and neighborhood outreach and educational efforts.

Conclusion 1: **C**onsumers will consider operating costs and energy savings if the initial bulb price seems reasonable to them. The Willingness to Pay (WTP) analysis and survey questions

about the likelihood of purchase bulbs at give prices and bill savings make clear that retail-based incentives on standard and specialty CFLs and LEDs should be continued in the immediate future.

> ***Recommendation 1a:*** The recommendations below provide guidance on incentive amounts, but small sample sizes and hypothetical situations render the results somewhat unreliable. Therefore, NMR recommends that the CEEF fund market-based research focused on determining *optimal* incentive levels for CFLs and LEDs, taking into account the *reasonable* amounts offered here but also testing for cost effectiveness.
>
> ***Recommendation 1b:*** A reasonable incentive amount for standard CFLs would reduce the shelf price of the bulbs to approximately $3.50. Reasonable incentive amounts for specialty CFL bulbs to approach $5.25 to $6.00, and NMR particularly recommends the lower amount for A-line covered CFLs, which are likely the most attractive to consumers who avoid standard CFLs for aesthetic or fit in fixture reasons. We were not able to obtain an estimate of a reasonable incentive for LEDs, but the consumer survey suggests that only about one-half of consumers would purchase LEDs at $20 per bulb. Therefore, it may be reasonable to reduce the price to approximately $12 to $15 per bulb, tracking sales to see if they increase at the lower price points.

Comment [GR7]: Aren't CFLs already at this price w/o incentives in multipacks at some/many retailers?

Conclusion 2: Consumers generally accept CFL-based technology in their homes, but they continue to voice reservations about the ability of CFLs to meet all of their lighting needs. Concerns remain about CFL brightness, light quality and color, slowness to brighten, mercury content, fit in fixtures, and dimmability. Consumers are less familiar with specialty CFLs and A-line, screw-in LEDs. In fact, the disconnect between self-reported use of products during the telephone survey and actual product use found onsite demonstrates that consumers remain confused about the types of lighting products *already in use* in their homes. Many of the newer CFL and LED products on the market could respond to some of the persistent concerns about CFLs.

> ***Recommendation 2a:*** Programs should continue their efforts to raise awareness of the diversity of energy efficient lighting products available to consumers through lighting displays in stores. Such displays could include bulb comparisons, end-cap promotions, and pamphlets and signs that demonstrate the range of products available and allow consumers to see the products "in action."
>
> ***Recommendation 2b*:** While the A-line covered CFL is correctly classified as a "specialty" bulb from a CFL history and manufacturing perspective, it is intended to fill the same applications as a standard A-line incandescent bulb. Therefore, NMR recommends treating the A-line covered CFL as a "standard" bulb offering in promotional materials and even from a future evaluation perspective.

Comment [GR8]: Including net to gross considerations? May unfairly penalize it

Conclusion 3: Many consumers are just learning about the new EISA efficiency standards, and a great deal of misinformation persists about the changes that will accompany the new lighting

standards. Coupled with a lack of familiarity of the diversity of efficient bulbs available, consumers may be wary to try products that look or feel "different" than the incandescent bulb. Yet, the relatively high levels of satisfaction among CFL and LED users suggests that once consumers are exposed to the technology in real world settings they tend to accept it as a viable option for at least some of their lighting needs.

> ***Recommendation 3:*** The Companies should continue giving away bulbs—particularly A-line, covered CFLs—through such programs as Home Energy Solutions and Home Energy Solutions – Income Eligible as well as during in-store promotions, fairs, and special events. Because of their higher price, it may not be cost-effective to give away LEDs, but individuals who take part in an HES or HES-IE audit or visit a lighting promotional event or a booth at a fair could receive coupons for LEDs that would lower the price of the bulb beyond even the incentive price. Another strategy could involve including LEDs in raffles at promotional events or fairs.

Conclusion 4: Although relatively few sockets in Connecticut are dimmable, dimmable sockets—particularly those with a candelabra shape and base—are often found in dining rooms. Respondents to the onsite survey also indicate that aesthetics matter more in dining rooms compared to other rooms. Not surprisingly, dining rooms hold the greatest potential for CFLs and LEDs.

> ***Recommendation 4:*** Although the technology is young, LEDs seem to offer more consistent dimmability than CFLs. The Companies may want to consider promoting LEDs as the preferred choice for applications controlled by dimmer switches. Candelabra based and shaped LEDs are available on the market and should be included in the mix of products offered by the Companies, if they are not currently.

Comment [GR9]: Note that while LEDs typically do dim better than CFLs, LEDs still experience dimming problems; and there are dimmer compatibility issues and lack of a national standard and test procedures

Conclusion 5: Although nearly all households in Connecticut use at least one CFL, consumers resist *changing out* still-working but inefficient lighting for more efficient CFLs and LEDs rather than simply installing these more efficient bulb types after the inefficient bulb burns out.

> ***Recommendation 5:*** In addition to continuing their effort to change out inefficient lighting during HES and HES-IE audits, the Companies should continue their efforts to explain to consumers how much money they can save by getting rid of inefficient lighting *now* rather than waiting for the products to burn out. Additional information about the positive impacts of changing bulbs out on resource availability, the environment, and greenhouse gas reduction may also sway a portion of consumers to switch their bulbs out sooner rather than later.

Conclusion 6: Onsite respondents who shopped for CFLs and LEDs in the past year reported that they would have gone to another store to find these efficient lighting products if the first place they shopped did not carry them. These responses suggest that Connecticut consumers are committed to energy efficient lighting, but this commitment is most easily reinforced by making certain CFLs and LEDs are widely available at places consumers shop for light bulbs.

***Recommendation 6*:** The Companies should continue to promote CFLs and LEDs in a diversity of stores that carry lighting products. Home improvement stores and hardware stores appear to be the "go to" stores for efficient lighting in Connecticut, but drugstores, grocery stores, and other common places to shop for lighting should not be overlooked.

1 Introduction

The residential lighting market in Connecticut and beyond is facing a period of rapid change. The new lighting efficiency standards mandated by the Energy Independence and Security Act of 2007 (EISA) went into effect on January 1, 2012.[1] These standards effectively phase out the traditional incandescent light bulbs over a three year period. In response, lighting manufacturers have been preparing for the increased efficiency standards by developing new products such as "incandescent" halogen bulbs and A-line light emitting diodes (LEDs) that adhere to the law while also expanding the production of compact fluorescent lamps (CFLs), including offering CFLs in a wider variety of styles and shapes. Consumers now must choose among a greater number and diversity of bulb choices than in the past, but the familiar incandescent bulb will soon not be among the bulbs available.

Comment [GR10]: Halogens are not a new product, they have been available for years

Moreover, the State of Connecticut has mandated that 36% of residential light sockets in the state be filled with CFLs.[2] Given the increased availability of CFLs designed for specialty applications or to look more like incandescent bulbs, consumers can now buy CFLs for nearly all types of lighting applications in their home from nearby hardware, grocery, or home improvement stores rather than having to order them via the internet or catalogs as was the case until recently. Yet, focus groups conducted in the fall of 2012 for the EEB make clear that some consumers still dislike CFLs for a variety of reasons; even those who embrace the technology for some applications still rejected CFLs for certain applications in their homes. The lukewarm reaction to—or rejection of—CFLs in some households could challenge the state's ability to reach 36% CFL socket saturation.

Comment [GR11]: Again, mandate - and shareholder penalty – had a 12/31/12 date (or thereabouts given evaluation lag)

Comment [GR12]: Would be better to cite order in which DPUC established the goal

Given this period of rapid change in legislative mandates and lighting technology coupled with continued skepticism about CFLs, the Connecticut Energy Efficiency Board, in cooperation with Connecticut Light and Power (CL&P) and the United Illuminating Company (UI) hired NMR Group, Inc. (NMR) and its subcontractor Tetra Tech (collectively referred to as the evaluation team) to explore the current conditions of residential lighting in Connecticut as well likely consumer reactions to EISA. This report summarizes the results of the second stage of this exploration, and compares them to the findings of focus groups performed as the first stage of this exploration in the fall of 2011.

1.1 Research Objectives

The exploration of EISA on the residential lighting market in Connecticut had the following objectives, as outlined in the work plan:

[1] Although Congress did not provide funds to enforce implementation of the law for most of 2012, most of the major light bulb manufactures and retailers vowed to adhere to the mandated efficiency standards despite the lack of federal enforcement for most of 2012.

[2] CL&P, UI, Yankee Gas, CNG, and SCG. *2012 Electric and Natural Gas Conservation and Load Management Plan*. Docket No. 11-10-03. Submitted September 30, 2011. Page 66 cites need to achieve 36% socket saturation.

- Establish consumers' awareness of various lighting options and of the upcoming changes in the light market stemming from EISA
- Understand consumers current and likely reactions to EISA, such as stockpiling of bulbs and the type of bulbs they except to buy after the incandescent phase-out
- Determine the current rates of use and storage for various lighting technologies and the reasons that underlie current lighting choices
- Identify ways in which the Companies could assist consumers in making more efficient lighting choices, including exploring issues related to incentives, education, and program design, among others

In order to meet these objectives, the evaluation team relied on a telephone survey of 551 residential customers of CL&P and UI and onsite visits to a subset of survey respondents' homes (100 in all). Table 1-1 summarizes the objectives, related research questions, and the approaches used to address the questions. In short, the telephone survey primarily provided information on customers' current awareness and knowledge of various lighting technologies and of the EISA legislation as well as their opinions about and reactions to those technologies and the incandescent phase-out. The onsite visits served to describe the use, saturation, and storage of various lighting technologies in the home through a detailed lighting inventory; a follow-up survey delivered onsite also explored how respondents make decisions about lighting their home, their commitment to purchasing efficient lighting, and their willingness to pay for CFLs and LEDs at various price points.

Table 1-1: Summary of Objectives, Research Questions, and Methods

Objective	Research Questions	Methodology
1. Establish consumer awareness of lighting options and changes in the lighting market	• Are customers aware of various lighting technologies meant to replace incandescent light bulbs? • Have customers heard about EISA? What have they heard? What do they understand to be the immediate and long-term implications of the changes to lighting efficiency standards?	Primarily addressed through the Consumer Survey, although questions and observations during the Onsite Saturation Study also inform this objective
2. Understand consumers current and likely reactions to EISA	• Have consumers noticed any changes in the bulbs available for purchase in recent months? If so, what have they noticed? • Are consumers currently changing their bulb use, purchase, or storage habits in anticipation of the incandescent phase-out? If so, how? • What bulbs are consumers likely to purchase after 100 Watt incandescents are no longer available on store shelves? • Are consumers currently stockpiling bulbs, or do they have plans to do so? If so, are they stockpiling for use in specific applications or for general lighting purposes?	Addressed in both the Consumer Survey and Onsite Saturation Study
3. Determine current rates of use and storage for various light bulbs	• What types of light bulbs do consumers currently use in their homes, where do consumers use them, and why do they use them in certain locations? • For those consumers who purchase CFLs, are they primarily installing them immediately or are they storing them? What types of bulbs will newly purchased CFLs replace (*e.g.,* incandescents, CFLs, or other bulb types)? • What are the key characteristics of the bulbs (*e.g.,* wattage, specialty features, *etc*.) found installed and in storage in the home? • Which types of bulbs are installed in particular types of fixtures (*e.g.,* mount, screw-base, shade style, *etc*.) and under what type of controls (*e.g.,* dimmable, three-way)?	Primarily addressed through the Onsite Saturation Study, although the Consumer Survey probed for general information on use and storage

Objective	Research Questions	Methodology
4. Identify ways to assist consumers in making efficient lighting choices	• How much are consumers willing to pay for standard CFLs, specialty CFLs, and LEDs? • Is it advisable to continue offering incentives for standard and specialty CFLs and LEDs, and, if so, what would be reasonable incentive amounts? • Would alternatives to upstream incentives, such as bulb give-aways or coupons, induce more consumers to try specialty CFLs and LEDs? • Do consumers consider shelf-price, annual operating costs, lifetime operating costs, and lifetime savings when choosing light bulbs? Why or why not? • Would they use information on lifetime operating costs and savings if it was made available to them? Why or why not? • Are consumers familiar with lighting related terminology such as lumens, color appearance, and color rendition that will become increasingly important after the incandescent phase-out?	Onsite Saturation Study provided information on willingness to pay and reasonable incentive amounts; Consumer Survey addressed key lighting terminology

1.2 Methodology

The team relied on a study design approach in which we first called randomly selected customers of CL&P and UI and delivered a telephone survey that explored various lighting and EISA related issues. At the end of that call, we asked respondents if they would be willing to take part in onsite visits to their homes that would be used to gather more information about their lighting use. This section provides an overview of the consumer survey and onsite saturation methodologies, while Appendix A presents more detail on sample design, sampling error, and the weighting scheme.

1.2.1 Consumer Survey

The team conducted a consumer survey from February through March 2012 of 551 randomly selected CL&P and UI residential customers, achieving 90% confidence and 10% sampling error for the state overall and for both Companies. The team used three methods to increase the representativeness of the survey. First, we obtained lists of residential customers from the Companies and sent them letters prior to fielding the survey alerting them to the possibility that we might call. The letter also described the study in a very general way. Second, we also offered respondents the opportunity to answer the survey in Spanish, and 6 respondents did so. Finally, we also called households ten times before removing them from our callback list.

The content of the survey included an initial set of screening questions that ensured that the respondent was eligible for the study (*e.g.*, that they at least 18 years old and reside at least part of the year in Connecticut). The respondents were then asked a series of questions designed to provide information on the objectives and research questions described above. The final series of questions in the survey recruited for the onsite saturation study, as described below. Appendix C includes the full survey questionnaire.

1.2.2 Onsite Saturation Study

The team fielded the onsite lighting saturation study in March through April of 2012, visiting 100 homes throughout the CL&P and UI service territories. This sample size was designed to estimate energy savings with a margin of error of plus or minus 10% with 90% confidence across both service territories, but not for each Company individually.

As mentioned above, we identified households interested in the onsite saturation study through the telephone survey. At the end of the telephone survey, each respondent was offered a $125 incentive to participate in an onsite visit to their home. NMR randomly selected households from among all respondents voicing interest and called to set up an onsite visit. NMR successfully completed the desired 100 onsite visits, with 75 onsite visits in CL&P service territory and 25 in the UI service territory.

NMR employed and trained two part-time technicians to conduct the onsite data collection. A typical onsite visit proceeded as follows: a technician arrived at the home at a pre-scheduled

time, introduced himself, and asked for the contact person who had been identified when scheduling the visit. The technician walked through each room of the home examining all lighting sockets and gathering data on fixture type, bulb type, bulb shape, socket type, wattage, and specialty characteristics for all installed lighting products. The technician and householder also examined bulbs in storage, again noting similar detailed information on each type of bulb. Participants were also asked the reason each bulb type was being stored and which type of bulb the stored bulbs were likely to replace.

Comment [GR13]: So interior sockets only? No exterior? May want to be clear on this point

The technician also conducted a short survey with participants addressing willingness to pay for standard CFLs, specialty CFLs and LEDs. The survey also asked participants to identify important characteristics looked for in a light bulb and to explain in a general sense how they decide to light kitchens, bedrooms, dining rooms or dining areas, living or family rooms, and bathrooms. If a specific room did not have a CFL installed, technicians asked participants to explain the primary reason for not installing CFLs in that room. Visits typically took less than two hours.

In addition to reviewing the onsite forms submitted by the technicians, a third NMR staff member called 20% of participants to ensure that their experiences with the field technician were satisfactory. An NMR staff member also revisited approximately 5% of the homes and repeated the data collection process to make sure the technician had performed the inventory in a satisfactory manner.

1.2.3 Weighting Schemes

The consumer survey and onsite saturation samples both contained a greater proportion of households with people who had some education beyond the high school diploma and who owned homes than exist in the population of Connecticut households.[3] In response, the team weighted the consumer survey and onsite visit data by education and home ownership status so that the reported results would better reflect the characteristics of the actual population of households in the state. Although the actual weights are provided in Appendix A, Table A-3 and Table A-4, here it is important to note that the onsite saturation study utilizes two weighting schemes. The scheme we call the "proportionate" scheme weights households back to the proportions in the state; when applied, the total sample size remains 100. In contrast, the "population" scheme weights responses back to the *total number of households in the state for that group*. This method allows us to estimate the *number* of households, sockets, or bulbs found in homes. When applied, this scheme yields household counts of 1,300,000, while socket counts exceed 80,000,000. The results section always notes which onsite weighting scheme we applied to the analysis.

Comment [GR14]: Which is too high – so not sure what to make of the discussion in this paragraph

[3] Underrepresentation of renters and respondents with lower levels of educational attainment is common in telephone surveys. For example, see Galesic, M., R. Tourangeau, M.P. Couper (2006) "Complementing Random-Digit-Dial Telephone Surveys with Other Approaches to Collecting Sensitive Data." *American Journal of Preventive Medicine*. Volume 35, Number 5.

1.2.4 Analyses

The team analyzed the consumer survey and onsite saturation data in SPSS and Excel. The majority of analyses are descriptive in nature, noting the number or percentage of respondents who hold an opinion or the number or percentage of homes, sockets, or light bulbs with certain characteristics. The willingness to pay analysis, however, relied on logistic regression modeling, performed in Excel.

The team used a series of willingness-to-pay (WTP) questions asked during the onsite visit to provide NMR with information on whether incentives should be continued for standard and specialty CFLs as well as LEDs, and to suggest reasonable incentive amounts. To implement the approach, during the onsite saturation study, the technician asked respondents who bought or were given standard or specialty CFLs or LEDs in or after July 2011 a series of questions about the product *most recently purchased*. We limited our inquiry to this time period to increase accurate respondent recall about the bulb purchase. We next asked respondents how much they recalled paying for the bulb in question. Given this "anchor" price point, we then asked respondents if they would have purchased the bulb at additional price points above the anchor. With this information, we estimated how many bulbs would be purchased at the various price points, which helped to suggest reasonable incentive levels. More information on the analysis is provided in Section 2.4.1 and Appendix A, Section A.3.

1.2.5 Relationship of Current Approaches to Focus Group Results

Although the telephone surveys and onsite visits yielded interesting qualitative insights into the current state of residential lighting and likely reactions to EISA, they are primarily quantitative in nature. As such, they complement the qualitative information from the focus groups performed in the fall of 2011; moreover focus group participants were not selected randomly and, therefore, should not be seen as representative of the population of Connecticut residential households. We present relevant results from those focus groups throughout this report, but we characterize those findings as qualitative insights to complement and inform the results from the telephone survey and onsite visits.

2 Key Findings

The exploration of the current state of residential lighting and anticipated reactions to EISA yielded a great deal of information that informs our understanding of these issues in general and the four study objectives specifically. In this section, we focus on the findings that are most pertinent informing the study objectives by presenting a high level of summary of key findings and then discussing those findings in more depth. Appendix B provides even greater detail of the results discussed here through the presentation of tables that include the full range of responses to questions and additional questions that provided important context for the survey but did not directly inform the study objectives.

2.1 Awareness of Lighting Options and Changes in Market

The first objective of the study was to establish customer awareness of lighting options and changes in the lighting market. Addressed primarily through the consumer survey, the key findings related to this objective include:

- Three-fourths of respondents were familiar with standard CFLs, but typically no more than one-half of respondents were familiar with specialty CFLs, A-line LEDs, and A-line halogen bulbs.[4]
- Only thirty-nine percent of respondents reported that they had heard something about changes to lighting standards, and just 30% had specifically heard about the incandescent phase-out resulting from EISA.
- When asked what they had heard about the changes in lighting efficiency standards, 78% said that some light bulbs would not be available, and 17% thought they that they would be required to use CFLs or LEDs.

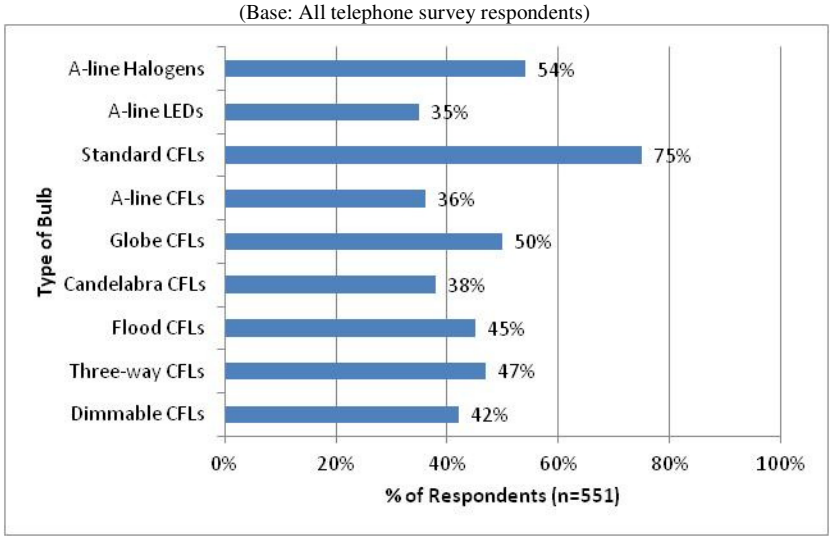
2.1.1 Awareness and Familiarity with Energy-efficient Light Bulbs

Nearly all survey respondents (91%) reported that they were aware of CFLs, either recognizing the name of the technology (69%) or a description of the shape of the bulb (71%). The survey further probed respondents to rate their level of familiarity not only with standard CFLs, but also with specialty CFLs and A-line LEDs and halogen bulbs. The results demonstrate that 75% of respondents are "somewhat" or "very familiar" with CFLs but the percentage of respondents "somewhat" or "very familiar" with specialty CFLs (50% or less), A-line LEDs (35%), and A-line halogen bulbs (54%) is far lower. See Table B-1 and Table B-2 in Appendix B for more detailed results on familiarity for all of these products.

[4] A-line halogen bulbs meet current EISA standards and are more energy efficient than incandescent bulbs. However, they are far less efficient than CFLs or LEDs and will not meet the expanded EISA standards that take effect in 2020. For ease of reading, we group them with CFLs and LEDs under the general term "energy-efficient light bulbs" but we stress that halogens are the least efficient of the bulbs that current meet EISA standards.

Figure 2-1: Familiarity with Various Types of Energy Efficient Light Bulbs

(Base: All telephone survey respondents)



These findings coincide with those of the focus groups, in which all focus group participants were familiar with CFLs but very few had previously known about A-line LEDs and halogens. The fact that familiarity is lowest for A-line LEDs (35%) and A-line CFLs (36%) presents a distinct challenge for future residential lighting program activity. Specifically these bulbs offer the most promising opportunity from an efficiency perspective to capture the subset of incandescent bulb users who reject CFLs based on the bulb shape for reasons of appearance or compatibility with certain fixtures or lampshades. The focus group findings suggested that consumers who had previously been unaware of A-line CFLs actually preferred the technology to halogens, LEDs, and standard CFLs. Together with the focus group findings, then, the research here suggest that future program activity find ways of increasing consumer awareness of and familiarity with A-line CFLs in order to help capture those consumers who want a bulb that looks like the incandescent and can work with all their fixtures and lampshades, , a point to which we return in the Conclusions and Recommendation (Section 3).

2.1.2 Awareness of Changes in Efficiency Standards

In order to gauge awareness and understanding of the higher lighting efficiency standards mandated by EISA, the team asked respondents a series of questions about the legislation. The first question was meant to ascertain if respondents had heard about any changes in standards and was followed by a question to clarify what they had heard. Importantly, these questions did not explicitly mention EISA or the incandescent phase-out so we could understand the baseline knowledge of respondents of the changes. In contrast, a third question directly asked respondents whether they had heard of EISA and the incandescent phase-out, specifically naming the

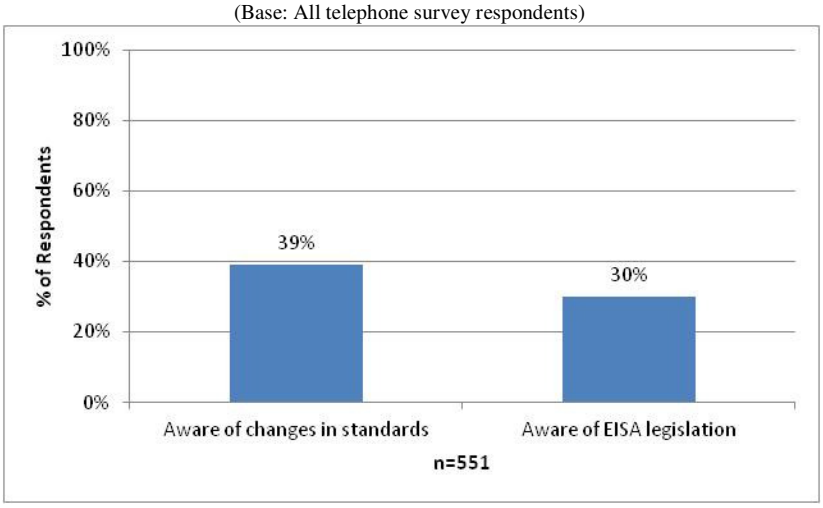
legislation and the restriction on manufacture and sale of 100 Watt incandescents as of January 1, 2012.

Comment [GR15]: Is this correct? Lot of 100W lamps still on the shelves

Figure 2-2 summarizes the two questions about awareness, and shows that 39% of respondents had heard something about changes in lighting standards and 30% had specifically heard about EISA and incandescent phase-out. These results are statistically different from each other, suggesting that more people had heard *something* was changing than had heard the specific details of the legislation.

Figure 2-2: Awareness of Changes in Lighting Standards and of EISA

(Base: All telephone survey respondents)



The team asked respondents who had heard about any changes to lighting standards to explain what they had heard; Most of these respondents had heard that some or all light bulbs would not be available (78%); however, about 17% thought they would be required to use CFLs or LEDs, while 11% said they would have to use a different type of light bulb but did not specifically state which kind. Table B-3 in Appendix B summarizes all the responses to this follow-up question. Some illustrative comments from survey respondents include the following:

> "The incandescent bulbs are not going to be as available and they are pushing the other bulbs. I had the experience of trying to find the 100 Watt bulbs and I had to go to three different stores to find them."
>
> "They are going to stop making the incandescent ones and they are going to be all energy efficient ones."
>
> "Basically they are trying to get us away from the incandescent lamps to save energy."

The focus groups conducted in the fall of 2011 pointed to similar results in that many participants had not heard of any lighting standard changes, and most of those who had a general understanding that the incandescent bulb was being "banned" but did not understand the details of the legislation.

2.2 Current and Likely Consumer Reactions to EISA

A second objective of the study was to gauge consumers' current and likely reaction to the increased lighting efficiency standards—especially the incandescent bulb phase-out—resulting from EISA. The team addressed this objective through both the telephone survey and the onsite saturation components of the study. The exploration into reactions to EISA yields the following key conclusions:

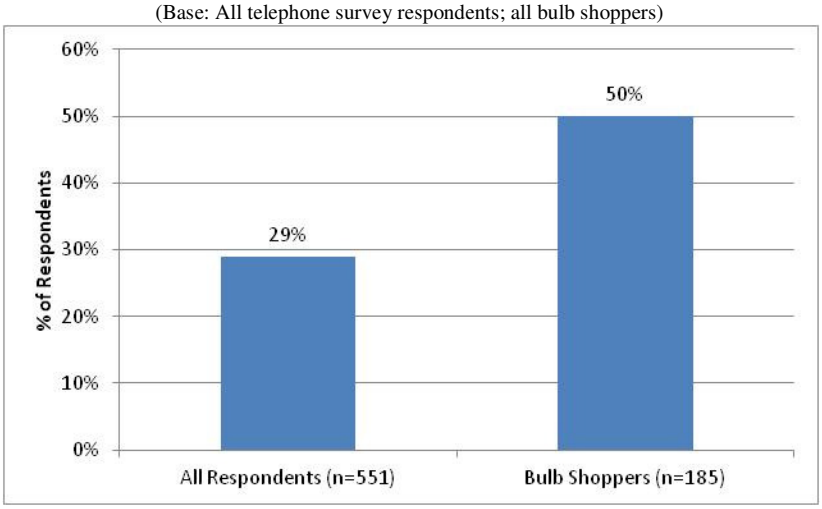
- More than three-fourths of the respondents who were aware of some change to the lighting standards understood that some light bulbs would no longer be available.
- About 30% of all respondents had noticed changes in the availability of light bulbs in the past three months, but this increased to 50% among those respondents who had actually shopped for light bulb in the past three months. Those who had noticed changes typically cited a greater availability of CFLs and LEDs, a lower availability of incandescents, or an overall increase in the variety of bulbs on store shelves.
- When asked which type of bulb they would most likely purchase to replace a 100 Watt incandescent, 39% of respondents chose a lower wattage incandescent and 34% chose a CFL. These results are statistically different from each other. Common reasons for choosing an incandescent included preference for the light quality and familiarity with the product, while many respondents noted energy or bill savings for CFLs. Focus group results suggest that more exposure to A-line (covered) CFLs through light displays or demonstrations could sway incandescent purchasers to buy covered CFL instead.
- About one-third of telephone survey respondents reported purchasing light bulbs in the three months prior to the study. Most of these respondents bought CFLs (58% of purchasers who were also aware of CFLs) and incandescent bulbs (55% of purchasers; we assumed all were aware of incandescent bulbs).
- Households in the onsite saturation sample stored an average of 11 incandescent bulbs versus five CFLs. Although, none of the households storing incandescents reported doing so in reaction to EISA, households that said they were "very likely" to stockpile incandescent bulbs also had more 100 Watt and all wattage incandescents in storage than those who indicated that they were less likely to stockpile.

2.2.1 Awareness of Changes in Light Bulb Availability

The team also sought to understand whether respondents had noticed any changes in light bulb availability in the three months prior to the survey (*i.e.,* November 2011 to January 2012), that is, just prior to and at the start of EISA implementation. First, we asked respondents whether they had noticed any changes in the types of bulbs available on the market, analyzing the results for all respondents and for those who had actually shopped for light bulbs in that three month period. The analysis indicates that only 29% of all respondents had noticed a change in bulb availability, but 50% of respondents who had actually shopped for bulbs had noticed a change in bulb availability (Figure 2-3). These results are statistically different from each other.

Figure 2-3: Noticed Change in Bulb Availability in Past Three Months

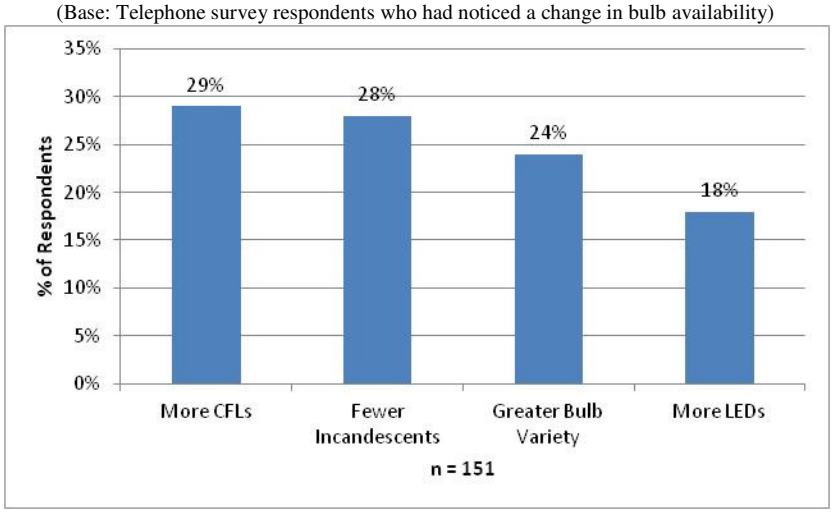
(Base: All telephone survey respondents; all bulb shoppers)



When asked to elaborate on what changes they had noticed, respondents generally noted that store shelves seems to carry more CFLs or LEDs, display a greater variety of bulbs, and contain fewer incandescents (Figure 2-4). Recent bulb shoppers cited the same top four reasons as all respondents aware of changes in bulb availability (see Table B-4 in Appendix B for the responses of recent bulb shoppers and a full listing of responses to this question for all respondents).

Figure 2-4: Type of Changes in Bulb Availability

(Base: Telephone survey respondents who had noticed a change in bulb availability)



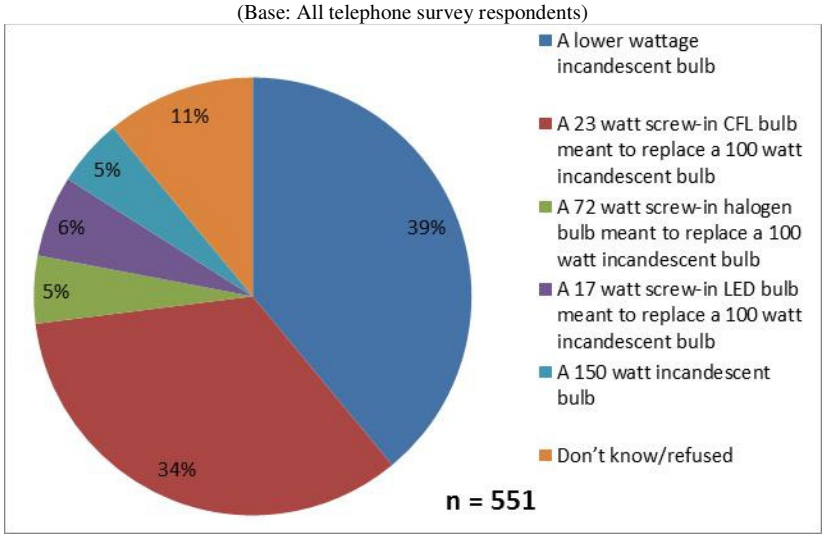
2.2.2 Consumer Changes in Lighting Habits due to EISA

In order to assess whether consumers had changed or would change their lighting-related habits due to the phase-out of 100 Watt incandescent bulbs, the team asked telephone survey respondents what types of bulbs they would be likely to buy when 100 Watt incandescents were no longer available.[5] A lower wattage incandescent was the most popular bulb choice, cited by 39% of respondents (Figure 2-5 below; see also Table B-5 in Appendix B). Second most popular—but statistically lower than incandescents—was a 23 Watt CFL, selected by 34% of respondents. Halogen bulbs (5%), LEDs (6%), and 150 Watt incandescents (5%) were less popular choices. About one out of ten respondents, however, said that they did not know what bulb type they would choose to replace a 100 Watt incandescent.

[5] It must be remembered that 100 Watt incandescents are not the most common incandescent bulb used in homes; only 29% of the telephone survey sample self-reported using 100 Watt incandescents, although the onsite survey found 100 Watt bulbs in 48% of the homes (all onsite homes used at least one incandescent, and 73% of survey respondents self-reported using at least one incandescent). See Section 2.3.1 for more on use and Appendix B, Figure B-1 for more on why telephone survey households reported they did not use 100 Watt incandescents.

Figure 2-5: Bulb Choice under EISA

(Base: All telephone survey respondents)



Respondents offered a variety of reasons for their respective bulb choices, usually citing their own familiarity with the product or perceptions of the strengths and weaknesses of different bulb technologies.[6] Respondents choosing a lower wattage incandescent as well as halogen and 150 Watt incandescent bulbs, for example, most often cited their preference for the light quality, color temperature, or brightness of the bulb. They also mentioned already being familiar with incandescent bulbs or finding the halogen to be most similar to incandescent bulbs. Some illustrative comments from respondents choosing the lower wattage incandescent include the following:

> "We do use some of the other kinds of light bulbs, but there are some negatives to them. When you need something to come on immediately as its fullest brightness, you go with an incandescent."

> "Because that is what I have always used, and I have heard negative things about CFLs."

Conversely, energy efficiency served as the most popular reason for choosing a 23 Watt CFL or a 17 Watt LED. Respondents choosing LEDs also cited the long life of the bulb. Some illustrative comments from those choosing the CFL or LED include the following:

> "From what I understand the LED has the longest shelf life and runs the coolest. The bulbs are high up and they are hard to change. The LEDs will save me money and they don't use much energy."

> "The 100 Watt bulb would burn a lot, so I would buy the bulb with the most savings and the longest life span. The LED would make the most sense."

[6] The frequencies of responses for all bulb types are shown in Table B-6 in Appendix B.

> "CFLs are cost effective, inexpensive, the filter coding has gotten so that they are reasonably like incandescent in color, and they use very little energy."
>
> "They [CFLs] seem to use a smaller amount of energy and a lot of times I can get them fairly cheap at stores. I think they last ten times longer than an incandescent. As far as I know, they're cheaper, they last longer, and they use less energy."

Finally, some comments from respondents choosing 150 Watt or halogen bulbs include the following:

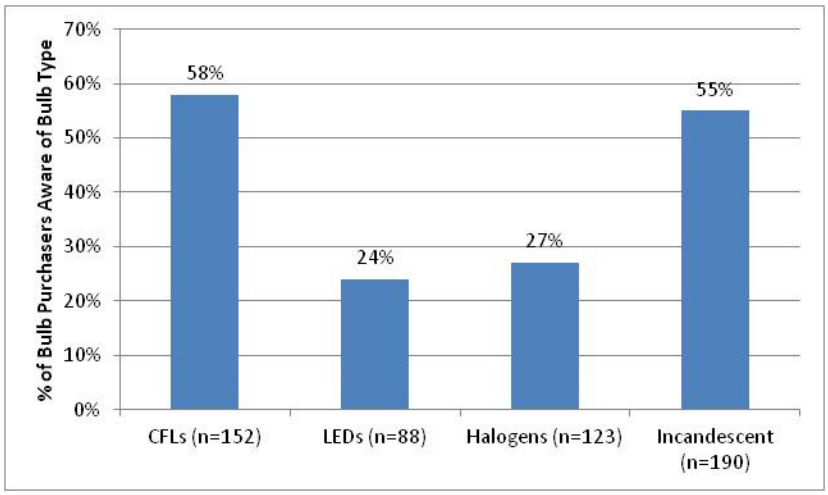
> "I need a lot of brightness due to my eyesight." (Chose 150 Watt)
>
> "Because the first one, the CFLs, are too expensive for me; I cannot afford them. I would be willing to use the energy efficient bulbs if they weren't so expensive." (Chose 150 Watt)
>
> "Because it is an incandescent, it lights up right away, and I know how bright it is." (Chose 150 Watt, but similar responses given for halogens)
>
> "I am more familiar with the halogen than with other bulbs."
>
> "I think halogen light is brighter."

The focus group results provide an interesting counterpoint to the results from the telephone survey. After being told about the incandescent phase-out, almost all focus group participants assumed that they would *have* to buy standard CFLs in place of incandescent bulbs, and some were displeased with what they saw as taking a bulb choice away from them; they indicated they may even stockpile incandescents. Later during the focus group discussion, participants viewed a lighting display that contained standard CFLs as well as A-line (covered) CFLs, halogens, and LEDs. After the display, most participants still believed they *would* buy CFLs, but they then understood that they would not *have* to buy standard CFLs and, most participants, in fact, preferred A-line (covered) CFLs over most of the other products in the display; a handful still intended to stockpile incandescents but more saw a CFL as a viable choice. Based on the focus group findings, it is likely that some of the telephone survey respondents could be swayed to choose A-line (covered) CFLs instead of lower-wattage incandescent bulbs if they saw these bulbs "in action" through lighting displays or demonstrations. This topic is addressed in the Conclusions and Recommendations (Section 3).

Bulbs Purchased in the Past Three Months. This objective also sought to understand if respondents had actually changed their bulb use or purchase habits because of EISA. Although a cross-sectional survey such as the one we fielded in early 2012 cannot demonstrate change over time, a review of recent self-reported purchase behavior provides some insight into whether consumers are changing their habits as a result of EISA and the diversification of the bulbs on the market that in large part stems from the new lighting standards. About one-third (34%) of telephone survey respondents reported purchasing any light bulbs in the three months prior to the survey. Figure 2-6 summarizes the purchases of bulbs meant to screw into medium based

lighting sockets (Appendix B, Table B-8 provides responses for additional base and bulb types); note that the sample size changes because we could only ask bulb shoppers aware of a particular bulb type whether they had purchased it. The results demonstrate that bulb purchasers most frequently reported buying CFLs (58%) and incandescent bulbs (55%); these purchase rates are not statistically different from each other. Smaller percentages of bulb purchasers aware of halogens and LEDs had bought them recently, 27% and 24% respectively. Section 2.3.3 also addresses this question by comparing saturation rates in 2012 with those found in a 2009 study conducted for the EEB.[7]

Figure 2-6: Types of Bulbs Purchased in Past Three Months



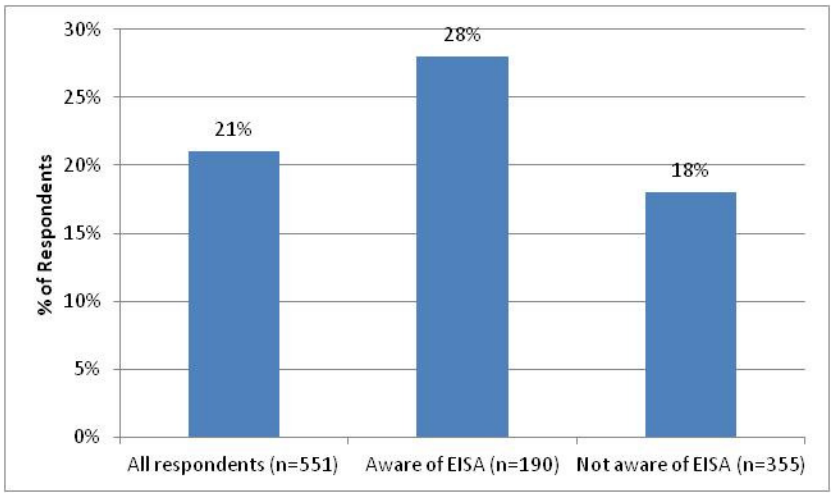
2.2.3 Stockpiling of Incandescent Bulbs due to EISA

The team addressed the issue of possible stockpiling (aka hoarding) bulbs in two ways. First, we asked telephone survey respondents about their likelihood of buying and saving extra 100 Watt Incandescent bulbs for use after they are phased out. Second, we examined the characteristics of bulbs found in storage in onsite respondents' homes and explored with the householder the reasons for bulb storage.

[7] NMR Group, Inc. 2010. *The Market for CFLs in Connecticut*. Delivered to the CEEB on March 2, 2010. NMR Group, Inc. 2010. *Results of the Multistate CFL Modeling Effort: Final*. Delivered to the CEEB on February 2, 2010.

Among the telephone survey respondents, 21% indicated they would be "somewhat or very likely" to stockpile 100 Watt incandescent bulbs. However, when limiting the analysis to those aware of EISA prior to the survey, the number rose to 28%. In contrast, 18% of respondents not previously aware of EISA indicated that they would likely stockpile bulbs, significantly lower from a statistical perspective than those already aware of EISA (See Table B-7 in Appendix B for more detailed responses to this question). These results are similar to those from the focus groups in which we found that most participants were not very likely to stockpile incandescents, although the tendency to do so was higher among those who used fewer CFLs.

Figure 2-7: Likelihood to Store 100 Watt Incandescent Bulbs



The team did not directly ask onsite participants who were storing incandescent bulbs if they were stockpiling incandescent bulbs in anticipation of the incandescent phase-out, but instead asked onsite householders to explain why they were storing incandescent bulbs.[8] No respondents volunteered the phase-out as a reason for storing incandescent bulbs, but, the average number of incandescent bulbs in storage per household in the state (10.8) is more than double the average number of CFLs in storage (4.7). Twenty-eight percent of households were storing more than sixteen incandescent bulbs, while only 7% were storing sixteen or more CFLs; in contrast, 39% of households were storing between one and five CFLs while only 15% were storing that many incandescent bulbs. The maximum number of incandescents stored by an onsite participant was 89 bulbs, 24 of which were 100 Watt bulbs. Overall, 100 Watt bulbs were the second most common type of incandescents (14%) stored by Connecticut households, preceded only by 60 Watt bulbs (32%); the remaining 56% of incandescents in storage ranged in wattage.

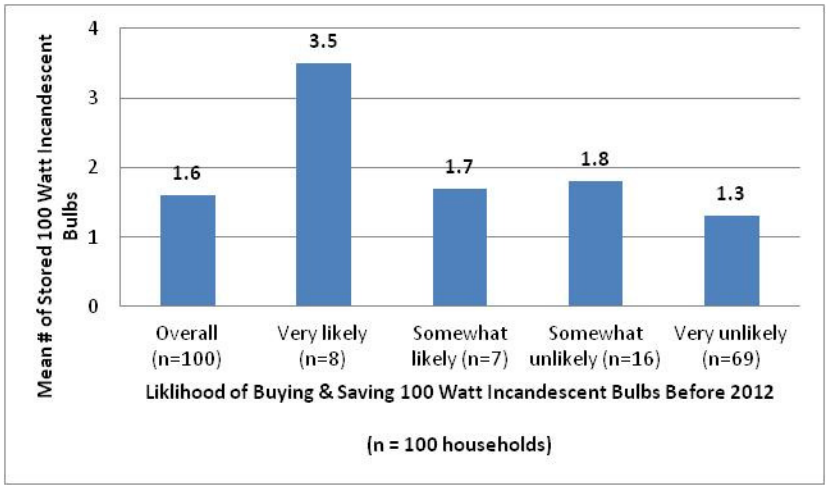
Telephone survey participants were asked how likely they would be to buy and save extra 100 Watt incandescent bulbs for use after 2012. The team compared the self-reported likelihood to

[8] Section 2.3.7 contains more detail about storage of all bulb types, not just incandescent bulbs.

stockpile 100 Watt incandescents for the onsite participants with the actual number of 100 Watt bulbs in storage. Those who had said they would be very likely to buy and save extra 100 Watt bulbs in fact held more 100 Watt incandescent bulbs in storage (3.5) than those who indicated that they were very unlikely (1.3, this result is significantly different), somewhat unlikely (1.8), or somewhat likely (1.7) to do the same (Figure 2-8). Those who claimed to be very likely to stock up on 100 Watt bulbs also stored more 40, 60, 75 and 100 Watt bulbs (12.1) than the onsite households who were less than very likely to store 100 Watt bulbs (7.8). These results suggest that at least some respondents will—and already are—storing incandescent bulbs for use at a later time. However, we cannot be certain that his behavior diverges from what they did prior to EISA because NMR is not aware of any studies that have systematically tracked storage of incandescent bulbs prior to EISA. Therefore, we caution against concluding with certainty that all of the incandescent storage is due to EISA, but it is probably safe to assume that some of it is.

Figure 2-8: Onsite Stored 100 Watt Incandescent Bulbs by Likelihood of Buying and Saving Extra 100 Watt Incandescent Bulbs for Use After 2012

(Base: All onsite households)



2.3 Light Bulb Use, Saturation, Storage, and Purchase

A third objective of the Stage 2 EISA exploration was to establish the types and characteristics of lighting technologies in use and in storage in homes and understand socket saturation and bulb purchasing habits. Highlights from this section include the following:

- CFL saturation stood at 27% in spring 2012, 9% short than the goal set by the state. Another one percent of sockets are filled with LEDs, bringing the total percentage of energy efficient installed in Connecticut residences to 28% of sockets.
- Almost all homes (94%) in Connecticut used at least one CFLs, but most households tended to use them in only some sockets, hence the saturation rate of only 27%.
- A total of 49.3 million sockets (61%) could be converted to CFLs or LEDs. Of these potential sockets, 21.4 million (49%) have an A-line profile meaning they could be filled with standard or covered CFLs or A-line LEDs. Ample opportunity exists for globe, spot, and candelabra CFLs and LEDs as well. Approximately seven million sockets could be filled with a dimmable or three-way LEDs or CFL.
- The 60 Watt bulb or its equivalent remains the most common in homes. CFLs are more likely to be 13 or 14 Watt, which are sold as 60 Watt equivalents (60% of CFLs) than any other wattage. In contrast, only 36% of incandescent bulbs are 60 Watt, which is the highest percentage of any wattage; however, incandescents come in a much wider variety of wattages than CFLs, so the 60 Watt does not dominate in the same manner as the 13 or 14 Watt CFL.
- While the team did not directly measure change in bulb use due to EISA, over the past three years, households have shown a reduced tendency to use incandescent bulbs and have instead turned more to CFLs, LEDs, fluorescent tubes, and halogen bulbs to fill sockets. Importantly, the availability and diversity of CFLs, halogens, and LEDS has increased due to EISA, making it likely that the legislation is leading, directly or indirectly, to changes in residential light bulb use patterns.
- Bedrooms and bathrooms are the most popular places to install CFLs, with 22% of CFLs installed in bedrooms and 17% installed in bathrooms. However, more than 56% of bedroom sockets and 57% of bathroom sockets could still be filled with CFLs or LEDs. Most LEDs are installed in the kitchen (51%), but they remain the older style under-the-cabinet, pin-based lights and not the A-line screw-in type.
- When asked an open-ended question about how they decide to light a room, respondents most frequently mentioned price, brightness, energy efficiency, wattage, and a preference for a particular bulb type. Close-ended questions about the preferred characteristics for a room revealed that brightness was most important in all rooms, typically followed by price; the exceptions were bedrooms and dining rooms, where price was more importance than brightness, and the living room, where energy efficiency nudged out price for the second most important factor.
- When asked why they did not have CFLs installed in some rooms, most respondents indicated that they were waiting for an installed bulb to burn out or had not gotten around to it. However, 13% of respondents indicated that CFLs did not fit properly.
- Dining rooms have the highest remaining potential for CFLs and LEDs (88%), and more than one-half of onsite household did not use any CFLs in their dining room. More than any other rooms in the home, respondents that did not use CFLs in the dining room noted

Comment [GR16]: Again, note prior comment about linear fluorescents: often 7-9% of sockets

Comment [GR17]: Does the 49.3 represent all sockets, or just inefficient ones that remain to be converted?

OK from Figure 2-9 it appears that the 49.3 is the sum of incandescent and halogens. And maybe other? Yes? Should be more clear as to total socket number and what is filling them before getting to the Figure

that the bulbs did not work with dimmers, that they did not like the appearance of CFLs in the dining room, or that they could not find a bulb for the application.

- Satisfaction with CFLs and LEDs is high, with 77% of CFL users and 83% of LED users rating themselves as "somewhat or very satisfied" with the products. Consumers appreciate the energy savings of CFLs and the light quality of LEDs. Persistent concerns about CFLs include light quality and brightness, being slow to brighten, and mercury content, while LED users also cite price and the appearance of the bulb itself.
- Households in Connecticut collectively stored about 22.6 million bulbs, of which 65% are incandescents and 28% are CFLs.
- By and large, consumers are not *changing out* inefficient bulbs for CFLs. Instead, they fill whatever sockets need replacing at that moment and then they store the remaining CFLs until another bulb—which may or may not be an incandescent—burns out. In fact, 57% of stored CFLs will likely replace another CFL, 36% will replace whatever bulb type burns out first, and 6% will replace incandescent bulbs.

This section discusses each of these findings as well as additional information in more detail.

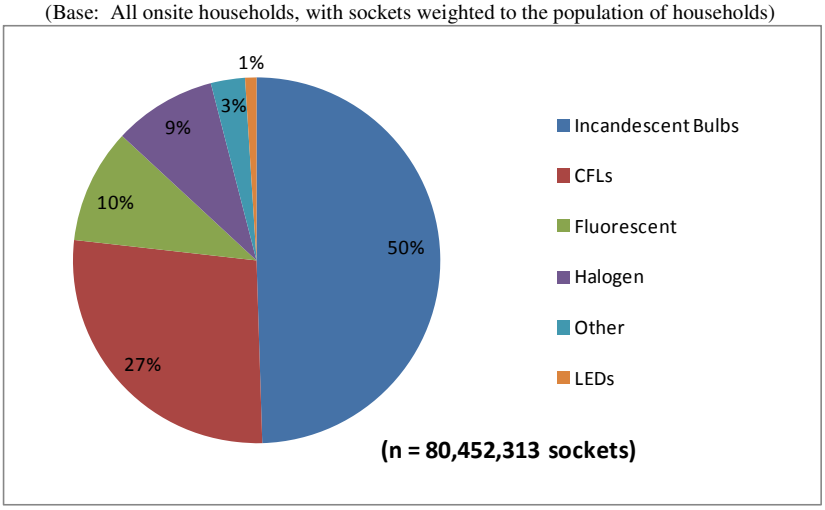
2.3.1 Socket Saturation and Types of Bulbs in Use

According to the onsite saturation study, CFL saturation stood at 27% in spring 2012, 9% short of the 36% state goal. Incandescent bulbs continued to be the most common type of bulb technology in use in Connecticut with approximately half (49%) of all sockets occupied by an incandescent bulb (Figure 2-9). Overall, more than 49.3 million sockets, 61% of sockets in the state, have the potential to be filled with CFLs or LEDs (Table 2-3).[9] When examining the potential of CFLs or LEDs by bulb shape, bulbs that fit an A-line profile (which includes most standard CFLs) have the highest potential (21.4 million), followed by spot/reflector/flood shaped bulbs (11.0 million).

[9] Some of these sockets (about two million) are currently empty, but they still represent potential for CFLs and LEDs. Table B-22 through Table B-28 in Appendix B include summaries of potential for bulb shape and other factors that are limited to currently filled sockets.

Figure 2-9: Socket Saturation in Connecticut

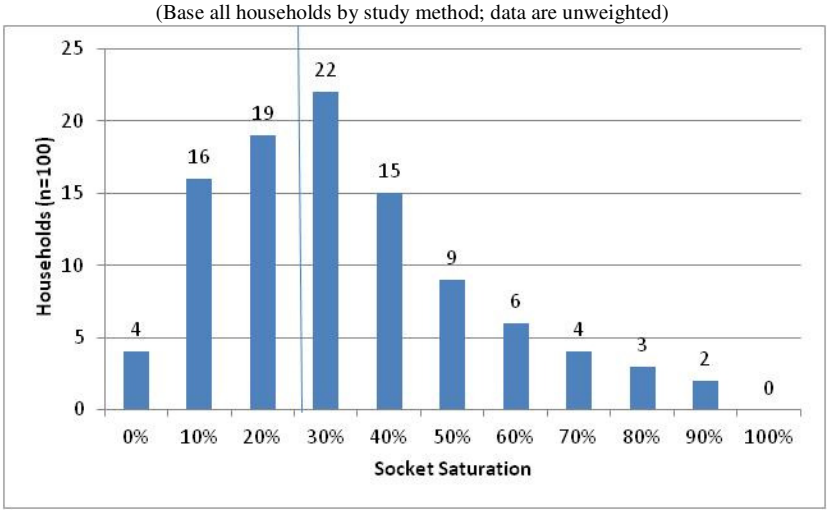
(Base: All onsite households, with sockets weighted to the population of households)



CFL saturation, however, is not evenly spread across households in the state. Figure 2-10 shows CFL saturation for the 100 households in the onsite sample; the solid line designates the average saturation rate of 27% while the columns are "bins" with the number listed representing the highest saturation rate in that bin. For example, 10% includes 1% to 10%, while 90% includes 81% to 90%. The figure shows that 61 of the 100 households had 30% (average saturation of 27% is within the 30% bin) or fewer of their sockets filled with CFLs. Only fifteen households had more than 50% of their sockets filled with CFLs. As the following discussion will demonstrate, our analyses show that nearly all sockets in homes could be filled with currently available styles of CFLs and LEDs, but consumers have not yet converted these remaining sockets despite the energy and bill savings they could achieve by doing so.

Figure 2-10: CFL Saturation by Household

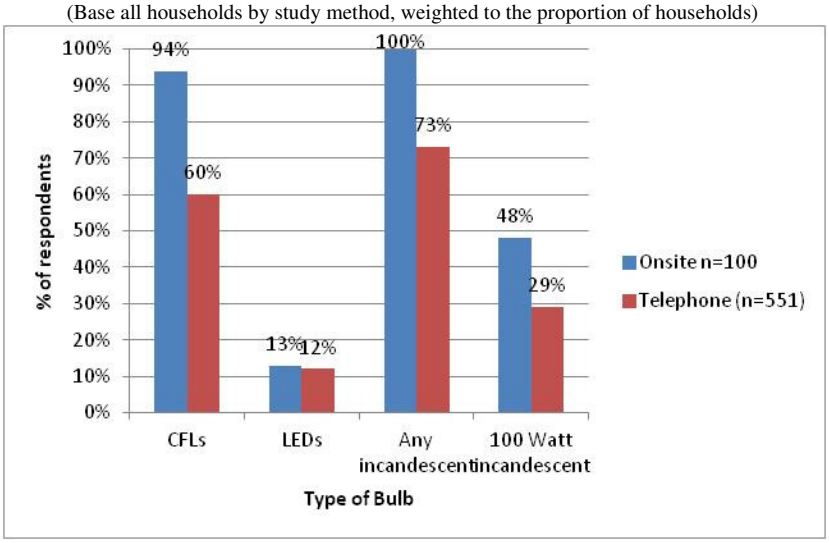
(Base all households by study method; data are unweighted)



Household Penetration. In addition to socket saturation, we also examined the penetration of bulb types, that is, the percentage of households with at least one bulb installed of a particularly lighting technology. The onsite saturation study found that, statewide, all households used at least one incandescent (100%) and nearly all used at least one CFL (94%) (Figure 2-11). Fewer than one-half of households (48%) had a 100 Watt incandescent installed, and only 13% of households had at least one LED installed. The onsite results are similar to the findings from the focus groups in that nearly all focus group participants used CFLs and incandescent bulbs, but very few used LEDs. The telephone survey estimates of penetration stand in contrast to those of the onsites and focus groups. With the exception of LEDs, self-reported use of CFLs, incandescents, and 100 Watt incandescents was statistically lower among telephone survey respondents than verified onsite. While it is certainly likely that households interested in lighting—and perhaps even those predisposed to energy-efficient lighting—were more likely to take part in the onsite visits and focus groups, the findings here are consistent with those reported by NMR previously for Connecticut and other states that concluded that telephone survey estimates of light bulb use were less reliable than onsite estimates of the same.[10] The current findings suggest that consumers remain confused about the types of light bulbs they use in their own homes, offering an opportunity for continued consumer education as EISA diversifies the lighting products available on the market, as discussed in the Conclusions and Recommendations (Section 3).

Figure 2-11: Penetration by Lighting Technology

(Base all households by study method, weighted to the proportion of households)



[10] NMR Group, Inc. 2010. *The Market for CFLs in Connecticut*. Delivered to the CEEB on March 2, 2010. NMR Group, Inc. 2010. *Results of the Multistate CFL Modeling Effort: Final*. Delivered to the CEEB on February 2, 2010.

The households that had no CFLs installed were asked why they did not use them. Collectively, they provided 15 responses, six of which indicated they did not need to replace bulbs yet (e.g., using up old stock, waiting for bulbs to burn out), six reported that they had never purchased them, and one was unaware of the energy savings. Only one respondent indicated that CFLs were too expensive; likewise, just one respondent did not think CFLs looked as good as other bulb types.

Bulb Shape. . The most common bulb shape installed overall was A-line, though only 4% of all CFLs and 11% of all LEDs were A-line bulbs, although it must be remembered that most standard, spiral CFLs will fit A-line sockets (Figure 2-12; see also Table B-27 and Table B-28 in Appendix B). The majority of CFLs (77%) installed in homes had the standard twist or spiral shape, thus fitting the A-line profile. Nearly all sockets (96%) currently filled with an A-line bulb could hold CFLs or LEDs with an A-line profit. Focus group participants showed strong preferences for A-line, covered CFLs in a lighting display during the group, though most had not been familiar with this type of CFL prior to the focus group, suggesting that greater exposure to A-line CFLs could increase their adoption. Increasing the adoption of A-line CFLs will likely be a necessary component of strategies to increase CFL socket saturation in Connecticut, as the bulbs may be more appealing to consumers who are concerned about the shape of the bulb for reasons of aesthetics or fit in fixture, a point to which we return in the Conclusions and Recommendations (Section 3).

Figure 2-12: Bulb Shape by Type of Bulb

(Base all onsite households, weighted to the population of households)

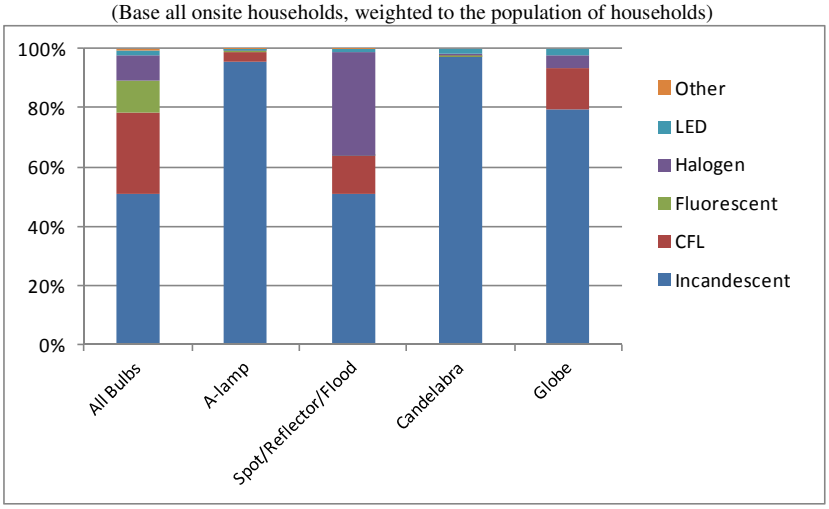


Figure 2-12 also shows that 16% of spot, reflector, and flood bulbs were CFLs, but halogen bulbs (not the newer A-line but the flood style that has long been on the market) comprised (65%) of this bulb shape. Potential for CFLs and LEDs among spot, reflector, and flood shapes was 86%. CFLs made up 13% of all globe bulb installed, but CFLs and LEDs could fill the

remaining 86% of globe sockets. Finally, nearly all candelabra bulbs in the state are still filled with incandescent technology; virtually all of the remaining bulbs could be filled with CFLs and LEDs with a candelabra shape and, sometimes, base.

Although filling specialty sockets with shaped CFLs and LEDs or those that fit a small candelabra base will be an important strategy for increasing socket saturation, the vast amount of remaining potential still rests with applications currently filled with a bulb with an A-line profile. For some reason, however, consumers have not accepted standard spiral CFLs as the best bulb to fill these sockets despite the fact that most households use at least one CFL. A-line, covered CFLs could help to fill many of these A-line profile applications with an energy efficient bulb. Importantly, although most had never seen a covered CFLs prior to the focus group, focus group participants showed a strong preference for covered CFLs after having the opportunity to compare various lighting technologies during the groups. Thus, the findings from the telephone and onsite samples confirm what we found in the focus groups—few people know about A-line, covered CFL, and, as a result, few people are using them. Yet, it is likely that Connecticut households would adopt covered CFLs in greater numbers if they were more aware of the technology and had the opportunity to compare the bulb's performance against those of the bulb types.

Bulb Wattages. The majority of CFLs installed in Connecticut are 13 or 14 Watt bulbs (60%), which is usually sold as the equivalent of a 60 Watt incandescent (Table B-21). Not surprisingly, the most common wattage for incandescent bulbs was 60 Watt bulbs (36%) followed by 40 Watt bulbs (19%). Because incandescent bulbs have long been available in a wide variety of shapes and sizes, they also come in a wider variety of wattages.

Fixture Controls. A small portion of socket controls overall had dimmable (10%) or three-way (2%) capabilities (see also Table B-27 in Appendix B). The majority of these sockets (92% of dimmable and 69% of three-way) have the potential to be filled with CFLs or LEDs. At the time of the visit, only 2% of 21.6 million CFLs installed in Connecticut were dimmable and only 2% were three-way suggesting that consumers are having difficulty finding these bulbs or have chosen not to use them in dimmable or three-way applications. In contrast, almost two-fifths (18%) of the 1.1 million LEDs installed were installed in dimmable fixtures, indicating a greater rate of acceptance of LED technology in dimmable applications than CFLs.

Fixture Types. Flush mount fixtures were the most common fixture type found in Connecticut households overall, as well as the most common fixture type for CFLs (30%), fluorescent bulbs (60%), and incandescent bulbs (25%) (See also Table B-24 and Table B-25 in Appendix B). No LEDs were found in this type of fixture. However, flush mount fixtures also have the greatest number of sockets that have the potential to be filled by CFLs or LEDs (10.8 million).

The second most common fixture types with CFLs were wall mounts (16%) and portable table lamps (15%). The most common type with LEDs installed was under cabinet fixtures (43%). Overall, at least 52% of sockets in each fixture type have the potential to be filled with CFLs or LEDs.

The majority (84%) of all sockets, CFL bulbs (99%) and halogen bulbs (59%) installed in Connecticut households were screw based; the majority of LED bulbs (60%) were pin based (see also Table B-26 in Appendix B).

2.3.2 In-depth Questions on A-line LEDs

The availability of A-line, screw-in LEDs has expanded greatly in the past year, and we wanted to learn more about why consumers might use this emerging technology. Therefore, the telephone survey asked the 76 respondents who reported using A-line LEDs why they did so. As shown in Table 2-1, responses varied, considerably. The most common response is that LEDs save energy (24%), while the second was that the bulbs were given to them (19%), although none specified by a Company program. Other reasons included wanting a bulb that lasted a long time (16%), giving them a try (15%), and saving money on an electricity bill (14%). Four percent of the responses noted that the LEDs were on sale, which could signify that they were bought through the CEEF lighting program. A few responses however, suggest that respondents confused A-line, screw-in LEDs with other types of LEDs by noting that the bulb was needed to fit an existing socket or that they bought them out of habit (15%) or that the LEDs were decorative or nightlights (9%).

Table 2-1: Reasons to Use Screw-In LEDs

(Base: Respondents who said they were currently using screw-in LED bulbs)

Reasons to Use Screw-In LEDs (Multiple Response)	
Sample size	*76*
To save electricity/energy	24%
Given to me by someone else	19
Wanted a bulb that lasts a long time	16
To give them a try	15
Fit a pre-existing need/habit	15
To save money/reduce electricity bill	14
Liked the light quality	9
They are decorative lights/nightlights	4
They were on sale	4
Bought for no reason/availability	7
Liked them better than CFLs	6
Recommended to me	2
Not as hot	1
Better functionality	1
Don’t know	6

2.3.3 Changes in Bulb Use due to EISA

Although neither the onsite nor the telephone survey directly asked respondents if they had changed their bulb use or purchase behavior because of EISA, a comparison of 2009 and 2010 saturation rates reveals changes in the saturation of bulb types found in Connecticut homes. While we cannot conclude with certainty that EISA is behind these changes, the results make clear that the saturation of incandescent bulbs has decreased over the past three years (from 64% to 50%), while use of all other bulb types has increased. (Table 2-2)

Comment [GR18]: 2012?

Table 2-2: Comparison of Saturation Rates 2009 and 2012

(Base: All onsite households, weighted to the population of households)

Sockets Containing	**2009**	**2010**
Sample Size	*95*	*100*
Total Sockets[a]	**61,205,621**	**80,452,313**
Incandescent bulbs	64%	50%
CFLs	23%	27%
Fluorescent	7%	10%
Halogen	6%	9%
LED	<1%	1%
Other	n/a	3%

Comment [GR19]: 2012?

Comment [GR20]: Any attempt made to examine the number of CFLs moved through the utility Programs in the time between the two surveys to see if the change in saturation follows?

[a] The weighted total number of sockets in the state is highly dependent on the size of the homes included in the study. NMR believes the number of sockets in Connecticut residences has increased overall since 2009, but most likely not by 19 million sockets. Because all sockets in the home are multiplied by the same weight, the *saturation* estimate is not affected by this eccentricity of the weighting scheme and should be considered reliable.

2.3.4 Location of Bulb Use

Out of the 21.6 million CFLs installed in Connecticut, more than one-fifth (22%) were installed in bedrooms and just under one-fifth were found in bathrooms (17%). Even though bedrooms were the most common room where CFLs were found, 7.6 million bedroom sockets (60%) have the potential to be filled with CFLs or LEDs, the second highest number of sockets by room that remain without CFLs or LEDs.

More than half (51%) of the 1.1 million LEDs in Connecticut were installed in kitchen fixtures; however, the majority (84%) of those LEDs were installed in under cabinet fixtures.

Overall, with the exception of basements, garages, and workshops, more than half of the sockets in each room type have the potential to be filled with CFLs or LEDs (Table 2-3).

Table 2-3: Socket Saturation - Room Types by Percent of Sockets

(Base: All sockets, weighted to population of households)

Comment [GR21]: Why did the study exclude exterior lighting?

	All Sockets	CFL	Fluorescent	Halogen	Incandescent	LED	Other[1]	Potential for CFLs and LEDs[3]
Number of households	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Total Sockets	**80,452,313**	**21,646,670**	**8,381,148**	**6,871,946**	**39,675,972**	**1,088,095**	**2,788,483**	**49,336,401**
Bedroom	16%	22%	7%	6%	15%	11%	20%	56%
Kitchen	14%	11%	13%	42%	9%	51%	29%	64%
Bathroom	12%	17%	5%	3%	13%	2%	6%	57%
Exterior	11%	8%	3%	23%	12%	8%	11%	77%
Living Room	11%	11%	3%	10%	12%	9%	12%	67%
Basement	8%	8%	32%	1%	4%	0%	7%	28%
Hall/Stairs	6%	7%	2%	1%	6%	2%	4%	62%
Dining Room	5%	2%	1%	4%	9%	5%	0%	88%
Garage	4%	3%	13%	1%	4%	1%	3%	48%
Closet	3%	1%	6%	2%	3%	0%	1%	66%
Family Room	2%	2%	2%	2%	3%	1%	2%	69%
Foyer/Mudroom	2%	1%	0%	1%	3%	0%	0%	85%
Laundry/Utility	2%	2%	6%	<1%	2%	0%	1%	51%
Office	2%	2%	2%	2%	2%	6%	2%	58%
Workshop/Studio	1%	<1%	3%	2%	<1%	3%	<1%	46%
Other[2]	2%	2%	2%	<1%	3%	0%	2%	67%

[1] "Other bulb type" includes: sodium bulbs, xenon bulbs, bulbs whose type could not be identified and empty sockets.

[2] "Other room" includes: Attic, Game Room, Greenhouse, Loft, Crawl Space, Mudroom, Storage, Shed, Solarium, Pantry, etc.

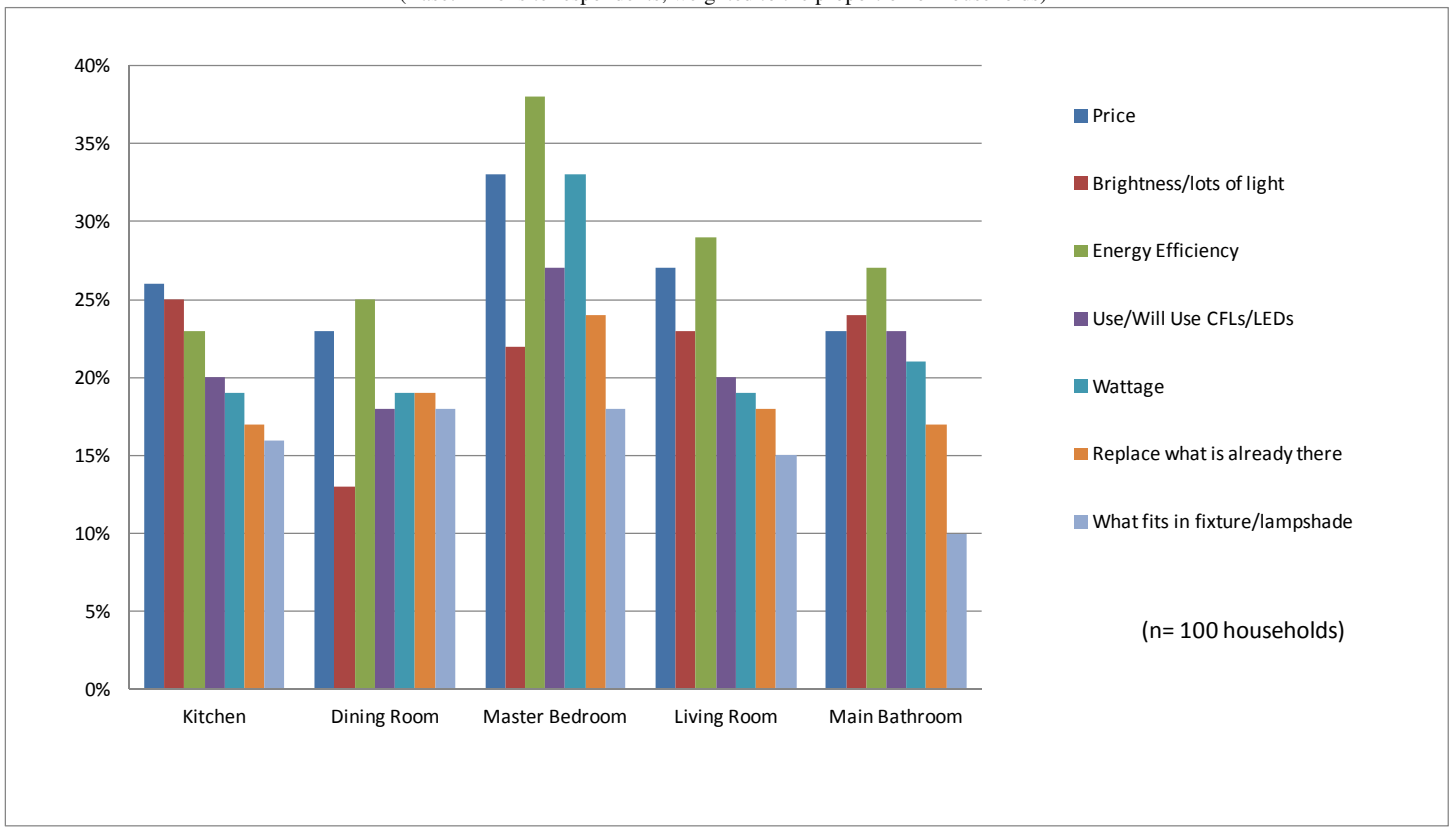
[3] This category is not calculated by adding the preceding columns, but by summing the number of sockets filled with halogen, incandescent, or other bulb types in each room type and dividing by the total sockets in the room type.

2.3.5 Lighting Decisions by Room Type

When onsite participants were asked to describe how they decided what bulbs to use in different parts of the home, responses were fairly similar across room types. The top five factors most commonly cited were price, energy efficiency, brightness, and wattage as well as a preference for CFLs and LEDs (Figure 2-13 and Table B-42).

Figure 2-13: Lighting Decisions by Room

(Base: All onsite respondents, weighted to the proportion of households)

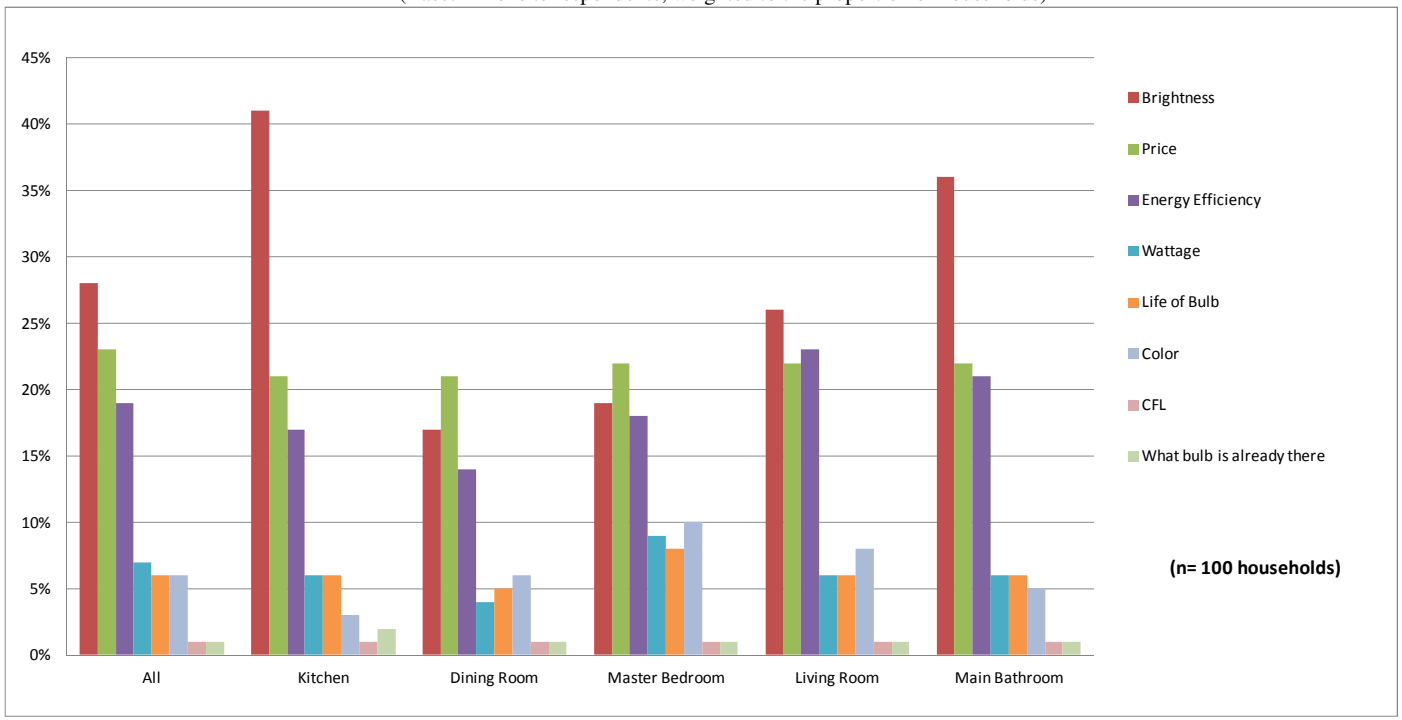


Onsite participants gave similar responses when asked to identify important bulb characteristics by room. Brightness was the most important characteristic across all rooms, followed by price and energy efficiency (Figure 2-14). More participants highlighted brightness as the most important in the kitchen and the bathroom and the other three room types. Bulb shape, aesthetics or ambiance, and dimmability (not shown in figure but see Table B-43 in Appendix B) were more important in the dining room than in other rooms. Finally, onsite participants also often noted that they decided what bulb to use in a room by getting a replacement bulb that matched what had been there before or filling an empty socket with whatever bulb type they had in storage.

Onsite responses to questions regarding lighting decisions were similar to low CFL user focus group participants who were most concerned about the price and lack of brightness of CFLs. When examining onsite responses in terms of low, moderate, and high users, low users were more likely to highlight bulb price as an important characteristic than both moderate and high users. Moderate to high users in the focus groups, on the other hand, were more concerned about aesthetics, safety and whether the bulb fit in the fixture or not; moderate and high user onsite participants were most concerned with the brightness of the bulb. (Table B–44)

Figure 2-14: Preferred Lighting Characteristics by Room

(Base: All onsite respondents, weighted to the proportion of households)



For onsite participants who did not have CFLs installed in a specific room, three of the four most common responses could largely be attributed to circumstance as opposed to preference: current bulbs have not burnt out yet, the participant has not gotten around to buying CFLs, and the participant has not gotten around to installing CFLs. These reasons indicate that the participant intends to buy or install CFLs in the future. CFLs not fitting properly in a fixture was also a common responses across all room types. As with previous responses, the dining room again stands somewhat in contrast to other rooms, with participants noting issues related to dimmability, aesthetics, and finding a CFL for the application more frequently than for other room types. Lack of CFL brightness was also mentioned more for kitchens than other rooms. (Table B-45)

Table 2-4: Why No CFLs Installed by Room

(Base: All onsite households, weighted to proportion of households)

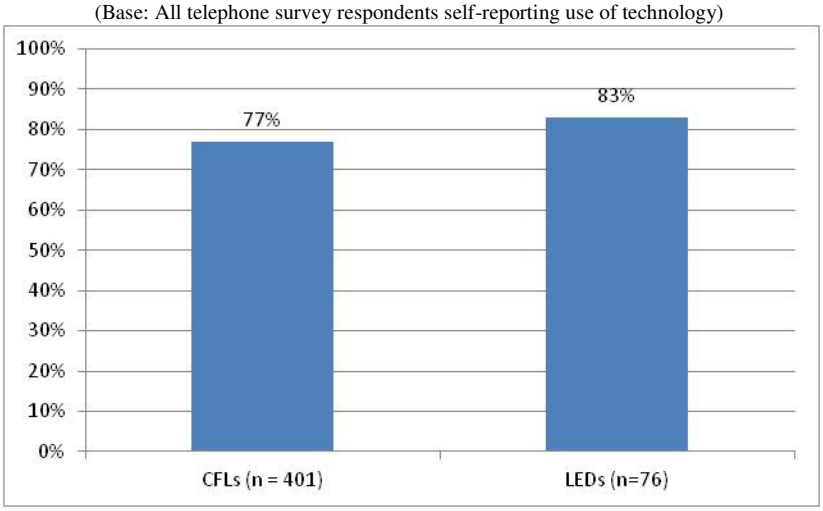
	All	Kitchen	Dining Room	Master Bedroom	Living Room	Main Bathroom
Number of households	*68*	*38*	*57*	*29*	*27*	*32*
Current bulbs haven't burnt out yet	27%	24%	17%	37%	37%	10%
Have not gotten around to buying CFLs	18	16	17	20	19	22
Do not fit properly	13	16	18	8	4	4
Have not gotten around to installing CFLs	8	11	1	10	12	23
CFLs do not work with dimmer	7	5	15	4	2	2
Do not like appearance	6	3	10	2	6	7
Not aware of CFL for application	5	2	9	4	4	5
CFLs not bright enough	4	8	3	4	2	2
Delay in light coming on	3	5	1	4	2	7
Using up old stock	3	4	0	4	5	5
No reason	2	4	3	0	0	0
Mercury	2	2	1	2	2	2
Do not like color	1	0	3	0	2	0
Prefer "Reveal" incandescents	1	0	0	0	5	5
Do not use lamp often	<1	0	0	2	0	0
Cost	<1	0	1	0	0	2
Design	<1	0	1	0	0	2

2.3.6 Satisfaction with CFLs and LEDs

The focus groups findings made clear that many households that used CFLs—sometimes large numbers of them—still voiced concerns about the products. Moreover, very few focus group participants liked the look of the LED bulb on display, despite the fact that it is one of the most readily available—and program supported—A-line LED on the market. Given the concerns raised by the focus groups about CFL and LED satisfaction, we asked telephone survey respondents who used these bulbs to rate their satisfaction with them. The results indicated that 77% of CFL users and 83% of LED users are "somewhat or very satisfied" with these products.

Figure 2-15: Satisfaction with Standard CFLs and A-line LEDs

(Base: All telephone survey respondents self-reporting use of technology)



The team also delved more deeply into the question of what CFLs and LED users liked and did not like about the products. *All users* of CFLs and LEDs were asked to name what they did and did not like about these products despite the respondent's stated level of satisfaction. In addition, dimmable CFL users were also asked to name anything they did not like about those products. The full range of responses to these questions are presented in Table B-10 through Table B-14 in Appendix B, and Table 2-5 below summarizes the most frequently cited "likes" and "dislikes" about CFLs and LEDs.

Users of CFL most frequently mentioned that the bulbs saved energy or had a long life; notably, 10% of CFLs users said there was nothing they at all that they liked about CFLs. When asked what they did not like about standard CFLs, 39% of CFLs users could not name one thing they disliked (Table 2-5). Moreover, 59% of dimmable CFLs users also said there was nothing they disliked about the bulbs. Therefore, although other consumers do have complaints about standard and dimmable CFLs—slow to brighten, contain mercury, have poor light color, flicker, etc.—satisfaction and acceptance of the products is relatively strong. Turning to LEDs, light quality (34%) serves as the most frequently mentioned "like" followed by energy savings (23%). As with CFL users, most LED users had no complaints about the products, but the few concerns raised included their price, poor light color, the actual color of the bulb itself, and some difficulties with warm up time and dimmability. To summarize, satisfaction with CFLs and LEDs is high, and while consumers still have some concerns about both technologies, they generally appear to have accepted the bulbs as a viable lighting option for their home.

Table 2-5: Top Five "Likes" and "Dislikes" for CFLs and LEDs

Like		Dislike		
CFL (n=401)	LEDs (n=76)	Standard CFLs (n=41)	Dimmable CFLs (n=69)	LEDs (n=76)
Save energy (47%)	Light quality / brightness (34%)	No dislikes (39%)	No dislikes (59%)	No dislikes (59%)
Bulb life (26%)	Save energy (23%)	Slow to brighten (24%)	Limited dimmability (11%)	Price (16%)
Bill savings (17%	Bulb life (17%)	Mercury (15%)	Flicker (9%)	Poor light color (6%)
Like nothing (10%)	Design/shape (13%)	Not bright enough (12%)	Price (7%)	Color of bulb[a] (6%)
Brightness (9%)	Availability (12%)	Poor light color (8%)	Slow to brighten (5%)	Long warm up time or poor dimming (6%)

[a] One of the most common LEDs has a yellow filter to make the light warmer.

Some illustrative quotes about what respondents like about CFLs and LEDs include the following:

> "I like that they come with different types of light. I don't like the original bright white that the original CFLs came with. Newer ones come with different shades of light."
>
> "The lighting is fine and in terms of the cost its negligible, regular bulbs are cheap but I feel like we never have to replace CFLs."
>
> "I feel like I am getting my money's worth [with LEDs], even though the upfront cost is high."
>
> "It's a soothing temperature for me to sit next to. The CFLs can be too bright and incandescent can be too soft, but the LED is more soothing. It gives off a better type of light than the incandescent. They seem more sturdy and won't crack like an eggshell when I hold it."

In contrast, the following opinions summarize what respondents disliked about CFLs and LEDs:

"The CFLs don't work in lamps ... with shades that grip onto the bulb."

"The fact that [CFLs] need to be recycled instead of me just throwing them out in the trash."

"It is hard to understand the equivalency of the wattage or brightness."

"[CFLs] are not that attractive. If you put them in some fixtures they are exposed and do not look too good."

"The initial cost of buying [LEDs] at the stores."

"The fact that [the LED] is yellow on top when it's turned off is weird to me. Everything I see it, I think it's on when it's not."

Comment [GR22]: Every time?

"In general, they take a while to warm up." (Offered for both CFLs and LEDs)

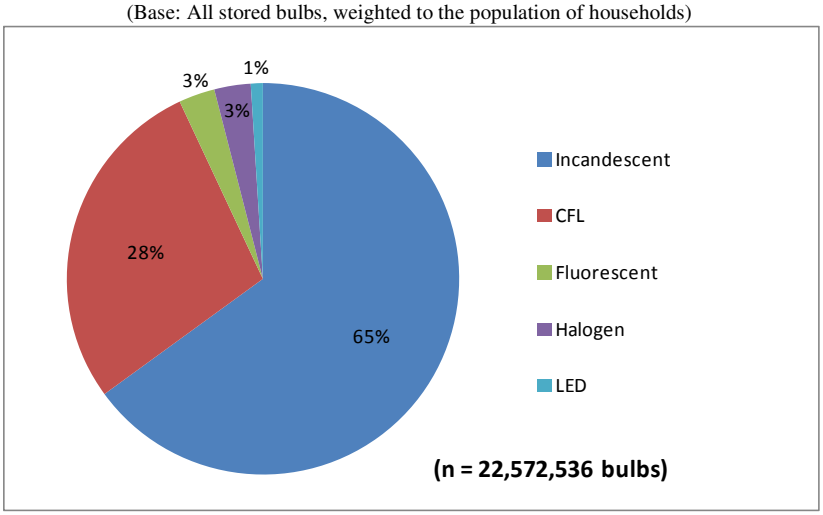
"They don't work in the dimmable fixtures." (Offered for both CFLs and LEDs)

2.3.7 Stored Bulbs

Incandescent bulbs were the most common type of stored bulbs in Connecticut, comprising 65% of the 22.6 million stored bulbs. CFLs made up just over one fourth (28%) of the stored bulbs, a percentage similar to their socket saturation (Figure 2-16). We found very few bulbs of any other type found in storage. (Table B-30)

Figure 2-16: Stored Bulbs by Bulb Type

(Base: All stored bulbs, weighted to the population of households)



Stored incandescent ranged in wattage from four to 200 watts. About one-quarter (23%) of the incandescent bulbs that were stored were 60 Watt bulbs; the phase-out of this wattage does not begin until 2014, but it is the most common type of incandescent in use. Only 13% of stored incandescents were 100 Watt (Table B-35). The majority (59%) of incandescent bulbs in storage were the standard A-line shape and more than one tenth (22%) were candelabras (22%). Other specialty incandescent in storage included globe (9%), spotlight/reflector/flood (9%), and bullet/torpedo (1%) (Table B-31).

Stored CFLs ranged from nine to thirty watts; thirty percent of stored CFLs were 14 Watt bulbs. More than three-quarters (77%) of the stored CFLs were the standard spiral CFL bulb; specialty CFLs in storage included spot/reflector/flood (7%), capsule/post/barrel (6%), globe (6%), tube (2%), and A-line (1%).

Additionally, two types of halogens were stored—spot/reflector/flood (85%) and bullet/torpedo (14%)—and, two types of fluorescents were stored—tube (93%) and circline (7%). Out of all 100 onsite homes, only one household had three 1.5 Watt globe shaped LED bulb in storage for future use (Table B-31).

The majority (93%) of all stored bulbs—and 98% of CFLs—were being saved for future use. The majority (57%) of stored CFLs are intended to replace CFL bulbs as needed. Over one third (36%) of the stored CFLs will replace whichever type needs replacing first, either CFL or incandescent. A small percentage (6%) of stored CFLs was being stored solely to replace incandescent bulbs; fortunately, very few incandescent (1%) were beings stored solely to replace CFL bulbs. One onsite participant stated that they would replace all bulbs with CFLs as much as possible (Table B-34).

These results help to provide an answer to the research question about whether consumers are storing or installing recently purchased CFLs. In reality, the answer is “a little bit of both”. Socket saturation indicates that consumers install some of the CFLs they buy immediately; but, instead of changing out still working but less efficient bulb types, they are also storing CFLs until other bulbs out. Moreover, the fact that more than one-half of CFLs are expected to replace other CFLs is a case of good news/bad news. The good news is that many consumers appear to have embraced CFLs as an accepted bulb technology in the home and intend to continue using CFLs in the same sockets they currently use them. The bad news is consumers are not reporting that CFLs will *certainly* replace the still numerous incandescents in most homes; a CFL may replace an incandescent bulb, but this is necessarily the case for only a handful of stored CFLs. Lighting-related programs funded by the CEEF, therefore, should continue their efforts to educate the consumers about *changing out* still-working but inefficient lighting with more efficient CFLs and LEDs rather than simply installing these more efficient bulb types after the inefficient bulb burns out, as discussed in the Conclusions and Recommendations (Section 3).

2.3.8 Commitment to Purchasing Energy Efficiency Lighting

We also asked onsite respondents a series of questions to determine their commitment to buying energy efficient lighting—specifically standard and specialty CFLs and LEDs. This series began by determining when participants had last purchased these efficient light bulbs. As shown in Table 2-6, 51% of onsite households had bought CFLs in the past year, but only 15% had purchased specialty CFLs and 6% LEDs. Note that most households did not have any specialty CFLs or LEDs installed. (Table B-38)

Table 2-6: When Last Purchased Standard CFLs, Specialty CFLs, or LEDS

(Base: All onsite households)

	Standard CFLs	Specialty CFLs	LEDs
Number of households	*100*	*100*	*100*
Purchased within the past year	51%	15%	6%
Purchased more than a year ago	29	28	1
No bulbs of type currently in home	20	57	92

The majority if purchasers of these products obtained them from home improvement stores such as Home Depot or Lowes—56% for CFLs, 52% for specialty CFLs, and 75% for LEDs. Home Improvement stores were also the most likely place a participant would shop for a CFL or LED if they had not found them at the first store, but discount (e.g., Wal-Mart), hardware stores, or warehouse clubs were also sometimes mentioned (Appendix B, Table B-15 and Table B-16 presents the full range of responses to these two questions).

We determined the actual commitment to buying energy efficient lighting, however, by asking respondents what they would have done if they had not found standard or specialty CFLs or LEDs at the first store at which they shopped for these products. About two-thirds or more of respondents for each bulb type said they would have looked for them at another store within a short time, demonstrating a commitment to buying the efficient light bulbs (Table 2-7). However, most of the remaining respondents admitted that they would probably have bought an incandescent bulb instead of the efficient choice. These responses suggest that Connecticut consumers are committed to energy efficient lighting, but this commitment is most easily reinforced by making certain CFLs and LEDs are widely available at places consumers shop for light bulbs, a topic addressed again in the Conclusions and Recommendations (Section 3).

Table 2-7: Action if No Standard CFLs, Specialty CFLs, or LEDS at Store

(Base: Households Currently Using Standard CFLs/Specialty CFLs/LEDs installed)

	Standard CFLs	Specialty CFLs	LEDs
Number of households	*89*	*56*	*12*
Gone to another store within a short time to buy bulb	67%	66%	83% (10)
Bought an incandescent	30	30	17 (2)
Waited and purchased bulb at a different time	1	2	0
Someone else would give/buy bulbs	1	2	0
Wouldn't buy the bulb without a sale	1	0	0

2.4 Assisting Consumers to make Efficient Lighting Choices

Along with understanding respondents' likely reactions to EISA and determining their current usage of efficient lighting technologies, a fourth objective of the current study was determining how to assist consumers in making more efficient lighting choices. To do so, the Team employed three approaches, as follows:

- A willingness-to-pay analysis (WTP) to determine the advisability of offering incentives—and for what amounts—for CFLs and LEDs
- A series of telephone survey questions designed to the determine factors that respondents consider when shopping for light bulbs, including upfront costs and bill savings
- A series of telephone survey questions aimed at understanding respondent's current knowledge of key lighting terms

Note that an additional research question about alternatives to incentives is addressed in the Conclusions and Recommendations (Section 3). The conclusions section also discussed reasonable amounts for incentives that could be offered.

Key findings from this section include the following:

- A willingness-to-pay analysis reveals that consumers are sensitive to price changes in standard and specialty CFLs, suggesting the continued need for incentives, the amounts of which are discussed in the conclusions and recommendations.
- Consumers will balance upfront costs with bill savings and operating costs if they believe the upfront cost is reasonable. At this time, most telephone survey respondents (77%) said they were likely to buy a six dollar bulb that lasts seven years and saves $10 a year, but less than half thought they were likely to purchase a $20 that lasts for 20 years and saves $10 a year (46%).
- A majority of telephone survey respondents reported being familiar with the terms "lumens" (56%) and "warm white and cool white" (62%) in reference to lighting. Most respondents familiar with the term lumens correctly identified it as a measure of light output or brightness (62%), but 27% admitted that they really did not know what the term meant. A similar percentage of respondents familiar with the terms "warm white and cool white" knew they referred to color appearance. However, 27% thought those terms referred to brightness or the amount of light, and 17% admitted they did not really know what the terms meant.

2.4.1 Advisability of Continuing Incentives and for Which Amounts

The WTP analysis relied on a series of questions asked during the onsite visit in which respondents that had recently bought standard CFLs, specialty CFLs, or LEDs indicated how much they paid for those bulbs and how much more they would have been willing to pay for them. After determining the price at which the bulb was purchased, the respondent answered up to four additional questions following the form "Would you have purchased this bulb if it had cost $X?" For standard CFLs, the price points were $3, $4.50, $9, and $15. For specialty CFLs, the price points were $5, $7.50, $15, and $25, and for LEDs, the price points were $15.25, $20.25, $25.25, and $30.25. In total 63 onsite respondents answered the standard CFL series and 20 answered the specialty CFL series. Although we asked them the WTP questions, we do not report final WTP or price elasticity estimates for LEDs because only 10 onsite respondents had recently bought LEDs. In this section, we first provide figures that demonstrate how WTP for standard and specialty CFLs differs at given price points and then provide a final elasticity estimate that indicates how demand for the product is likely to change when price changes.

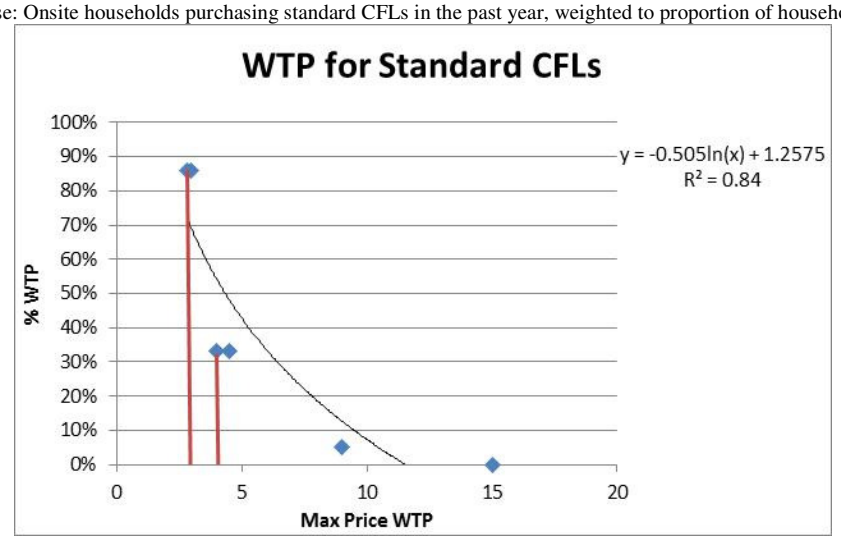
The results for standard CFLs are shown in Figure 2-17, which plots the percentage of respondents willing to pay for the bulbs at the various administered price points. The team fit a logarithmic trend-line to the data points, to model how WTP decreases as price increases. Using prices determined in shelf price surveys performed in Massachusetts in late 2010,[11] 86% of the

[11] NMR, *et al.*. 2011. *Massachusetts ENERGY STAR Lighting Program: 2010 Annual Report. Appendix B CFL Willingness to Pay Analysis Results and Appendix E Residential Lighting Shelf Stocking Survey, Pricing Analysis, and Conjoint Analysis*. We use the Massachusetts amounts because no recent shelf-stocking and pricing study has been conducted for lighting products in Connecticut. If the Companies have Connecticut specific data on average

recent CFL purchasers were willing to pay the average incented standard CFL price of $2.83. At the average non-incented standard CFL price of $3.98, the percentage of recent CFL purchasers willing to pay dropped to 33%. Only 5% were willing to pay for CFLs at $9. The estimated elasticity of standard CFLs is -1.50, indicating that the price of standard CFLs is elastic (see Section B.2 in Appendix B for detailed calculations).[12] As such, the demand for the product is sensitive to price changes, suggesting the continued need for incentives (see the Conclusions and Recommendations in Section 3 for discussion of reasonable incentive amounts).

Figure 2-17: Willingness-to-pay for Standard CFLs

(Base: Onsite households purchasing standard CFLs in the past year, weighted to proportion of households)



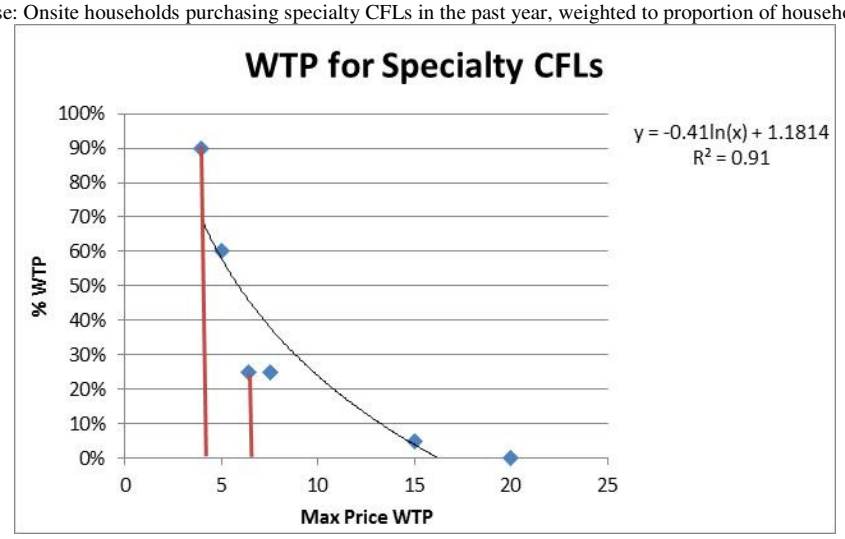
incented and average non-incented prices of standards and specialty CFLs, we can use them in revisions to this report.

[12] See Section A.3 Willingness to Pay in Appendix A for more detailed information on these calculations

The results for specialty CFLs are shown in Figure 2-18. Once again, the team fit a logarithmic trend-line to the data points, to model how WTP decreases as price increases. At the average incented specialty CFL price of $3.96, 90% of recent specialty CFLs purchasers were willing to pay for specialty CFLs. At the average non-incented specialty CFL price of $6.43, the percentage decreased to 25%. The estimated elasticity of specialty CFLs is -1.16. As with standard CFLs, this number indicates that the price of specialty CFLs is elastic, and the demand for the product is sensitive to price changes, suggesting the need for continued incentives.

Figure 2-18: Willingness-to-pay for Specialty CFLs

(Base: Onsite households purchasing specialty CFLs in the past year, weighted to proportion of households)



Net-to-Gross Ratio. Because the WTP method allows for one method of estimating a NTG ratio, the team calculated a ratio for standard and specialty CFLs. We strongly caution *against* using these ratios for program planning or review, and instead present them for informational purposes. Based on our experience in other areas, NMR is of the opinion that NTG ratios that will be used for planning or reviewing lighting program should be measured using a triangulated approach relying on estimation using multiple methods and integrated through a Delphi panel or similar method that involves the input of a team of experts on lighting.

With these important caveats in place, the WTP method suggests that the NTG ratio was 0.62 for standard CFLs and 0.72 for specialty CFLs. Note that this approach does *not* include spillover, so it should be seen as a conservative estimate of NTG. More details on these calculations can be found in Appendix B, Table B-18.

2.4.2 Consumer Lighting Decisions

Respondents were asked to identify the information they typically look for on bulb packaging when making a purchase. The question was posed first as an open end and then followed by a similar question where the interviewer read a list of possibilities and respondents would affirm whether or not that was a piece of information they typically looked for, multiple responses were allowed for both forms of the question. Overall, participants most commonly looked for information on wattage (94%) followed by price (88%), and Watt equivalency (74%). However, while more than two-thirds (67%) of respondents indicated that Watt-equivalency was important in the prompted version of the question, only seven percent named it in the unprompted version. Similarly, more than one-half indicated that the Energy Star label (57%) and bulb life (52%) were important in the prompted version, a very small percentage named those same pieces of information in the unprompted version (6% and 14% respectively).

Onsite participants also listed price, wattage, and energy efficiency in the top five important factors when asked about how they make lighting decisions and important bulb characteristics in specific rooms in the home, as shown earlier in Figure 2-13 and Figure 2-14. However, onsite participants identified brightness as an important factor in lighting decisions and preferred bulb characteristics, while only a 4% of telephone participants gave brightness as a response. This could be due to the fact that "brightness" was not included in the prompted version of the question for telephone participants and, as the focus groups made clear, most consumers still equate "wattage" with "brightness," although this will likely be changing as they become more educated about the term "lumens."

Table 2-8: Information Looked for on Bulb Packaging

(Base: All respondents)

Information on packaging (Multiple Response)	Unprompted Response	Prompted Response	Total Prompted and Unprompted
Sample size	*551*	*551*	*551*
Wattage	45%	49%	94%
Price	27%	61%	88%
Watt Equivalency	7%	67%	74%
Bulb life	14%	52%	66%
Energy Star label	6%	57%	63%
Shape or appearance of bulb	5%	54%	59%
Color Appearance	12%	43%	55%
3-way	2%	46%	48%
Dimming	1%	33%	34%
Lumens	5%	24%	29%
UL or Underwriters laboratory	0%	29%	29%
Lighting facts/energy facts label	4%	21%	25%
Mercury content	<1%	20%	20%
CRI, or Color Rendition Index	1%	15%	16%
Brand/manufacturer	4%	2%	6%
Energy usage/efficiency (did not specify label)	11%	N/A	N/A
Nothing in particular	6%	N/A	N/A
Brightness	4 %	N/A	N/A
Familiarity/I use the same bulb every time	4%	N/A	N/A
Type of fixture it fits in	4%	N/A	N/A
Bulb type e.g. CFL or Halogen	3%	N/A	N/A
Someone else buys bulbs	2%	N/A	N/A
Purpose/location for use in the home	2%	N/A	N/A
Size	2%	N/A	N/A
Heat/safety/disposal instructions	1%	N/A	N/A
Other	3%	2%	5%
Don't know/Refused	6%	N/A	N/A

Consideration of Shelf Price, Bulb Life, and Bill Savings. As discussed above in Section 2.2.2 and Section 2.3.5, open-ended questions about why consumers would choose particular bulbs in place of 100 Watt incandescents as well as responses about how consumers decide to light rooms in the home make clear that energy efficiency and energy savings are an important consideration to consumers. Yet, the Stage 2 research effort, together with insights gained from the focus groups, also suggests that consumers balance their desire for energy savings with the shelf price of bulbs; rarely do consumers perform an explicit assessment of the annual or lifetime operating costs of bulbs. Instead, they rely on information that promises energy and bill savings over the course of the bulb rather than on their own calculation of this information.

Based on the insights from the focus group, NMR decided to survey telephone respondents about their likelihood of buying energy efficient bulbs when given realistic scenarios about upfront costs and annual operating costs of these bulbs. The first question offered a realistic scenario for CFLs by asking respondents the following:

> "How likely would you be to buy a bulb that costs $6, lasts seven years, and saves you $10 a year on your electricity bill, compared to a traditional incandescent light bulb?"

The second scenario described the *current* situation for LEDs, although it should be noted that LED price is expected to decrease and the lumens per Watt increase in the near future:

> "How likely would you be to buy a bulb that costs $20, lasts 20 years, and saves you $10 a year on your electricity bill over those 20 years, compared to a traditional incandescent light bulb?"

Table 2-9 summarizes the percentage of respondents willing to buy the bulbs described in these two scenarios. The results demonstrate that 77% of respondents were likely to buy the bulb in Scenario 1, while only 46% would likely buy the bulb in Scenario 2. In fact, 48% of respondents indicated they most likely *would not* buy the Scenario 2 bulb. Thus, it appears that consumers will consider operating costs if given the opportunity to do so, but only if they believe the upfront costs to be reasonable.

Table 2-9: Likelihood That Respondent Would Purchase a Bulb at Different Price Points, Lifetimes, and Savings Bill

(Base: All respondents)

	Scenario 1*	Scenario 2**
Sample size	*551*	*551*
Very likely	53%	25%
Somewhat likely	24	21
Neither likely nor unlikely	4	4
Somewhat unlikely	6	13
Very unlikely	11	35
Don't know/refused	3	2

*Scenario 1: Bulb that costs $6, lasts 7 years, and saves $10 a year on electricity bill
**Scenario 2: Bulb that costs $20, lasts 20 years, and saves $10 a year on electricity bill

2.4.3 Familiarity with Key Lighting Terms

The telephone survey assessed respondents' familiarity and understanding of the terms "lumens," "warm white," and "cool white." Overall, 56% of respondents voiced familiarity with the term "lumens" and 62% reported being familiar with the terms "warm white" and "cool white" (See Table B-17 in Appendix B). We asked these questions because of changes in the way light bulbs will be marketed to consumers in the post-EISA period. Previously, consumers largely chose bulbs based on wattage alone—they knew the wattage of the incandescent bulb they needed and purchased that bulb or the CFL equivalent of it. However, now that most incandescent bulbs are being phased out, consumers will need to think beyond wattage when selecting which bulbs to

buy and use in their homes. Lumens (i.e., bulb brightness) and color appearance (i.e., warm or cool white light, or color temperature) are among the concepts that will become important considerations in the selection of bulbs. Consumers have often voiced concerns that CFLs do not have the same brightness or light quality as incandescent bulbs, and so making certain that they understand the concept of lumens and color appearance will be vital to helping them select the correct energy efficient bulb for their needs.

In order to understand if these consumers truly understood the concepts of lumens and color temperature, we then asked what the terms meant to them. Of the respondents familiar with the term lumens, 62% correctly identified that the term refers to light output or brightness. However, 27% of respondents admitted they really did not know what lumens meant. Other responses, mentioned with lower frequency, were candlelight/power, illumination, or the same as watts. It is worth noting that eight of the eleven focus group participants who had heard of lumens correctly identified the term as referring to bulb brightness or light output.

Table 2-10: Understanding of the Term "Lumens"

(Base: Respondents who said they had seen or heard the term "lumens")

Respondents' understanding of "lumens" (Multiple Response)	
Sample size	*347*
Light output or brightness	62%
Candlelight/power	3
The same as watts	2
Illumination	3
Unit or measure of lighting	2
Light color or quality	2
Distance light will penetrate	1
Energy emitted	1
Efficiency	1
Number of light particles	<1
Wire inside of the bulb	<1
Don't know	27

Sixty-four percent of respondents familiar with the terms "warm white" and "cool white" correctly identified the terms as referring to the bulb's color appearance, although 6% of these described color appearance in terms of whether the color of bulb resembled that of fluorescent tubes or not. Another 17% of respondents, however, said they did not know what the terms meant, even though they had heard of them. Other common responses confused color appearance with brightness, color rendition, the heat emitted from the bulb, or wavelengths of light. In the focus groups, the moderator had inquired about the term "color temperature" and not "warm or cool light", so the results are not comparable between approaches; yet, it is worth recalling that only six focus group participants had heard of the term color temperature, but all of them correctly knew it referred to how warm or cool the light appeared.

Table 2-11: Understanding of the Terms "Warm White" and "Cool White"

(Base: Respondents who said they had seen or heard the terms "warm white" and "cool white")

Respondents' understanding of "warm white" and "cool white" – as in the color white (Multiple Response)	
Sample size	*365*
Color appearance	64%
Brightness/amount of light	27
Color rendition (how eyes perceive the light)[a]	9
Heat of the bulb	4
Wavelength/frequency/spectrum of the light	2
Coated vs. clear bulb	1
The way you look in the bulbs light	1
Lumens	<1
Other	1
Don't know	17

[a] This is actually the color rendition index, a concept not tested in the survey because of its complicated nature. However, it appears that at least some Connecticut households know the rating exist, but they have confused it with the color temperature of the bulb.

3 Conclusions and Recommendations

The EISA Lighting Exploration tasks—Stage 1 Focus Groups and Stage 2 Consumer Telephone Survey and Onsite Lighting Inventory—have yielded a number of important conclusions and recommendations regarding CEEF-funded programs that include residential lighting elements. Prior sections of this report have summarized the key findings; this section knits these key findings together to offer overall conclusions and recommendations that stem from them. We present recommendations focused on the two following themes:

3. What the CEEF-funded programs and Companies can do to help consumers make efficient lighting choices in the post-EISA period, and
4. What the CEEF funded programs and Companies can do to boost saturation of CFLs and LEDs in residential homes in Connecticut in order to achieved 36% socket saturation

The research presented here and in the earlier focus groups makes clear that a multi-prong approach that involves education, incentives, and additional promotional efforts will be needed to help consumers make better lighting choices and to achieve 36% socket saturation. NMR believes that the research supports continuation of incentives on standard and specialty CFLs as well as LEDs. Yet, the Companies must continue to promote programs that educate consumers about the lighting market and the bulb choices available to them. They must also *expose* consumers to the range of lighting available by providing consumers with low-cost or no cost opportunities to see the bulbs "in action". The recommendations presented below, then, highlight programmatic efforts that go beyond the retail setting to include programs such as Home Energy Solutions and Home Energy Solutions-Income Eligible as well as community and neighborhood outreach and educational efforts.

Conclusion 1: The WTP analysis and survey questions about the likelihood of purchase bulbs at give prices and bill savings make clear that retail-based incentives on standard and specialty CFLs and LEDs should be continued in the immediate future. Moreover, consumers will consider operating costs and energy savings if the initial bulb price seems reasonable to them.

> ***Recommendation 1a:*** The recommendations below provide guidance on incentive amounts, but small sample sizes and hypothetical situations render the results somewhat unreliable. Therefore, NMR recommends that the CEEF fund market-based research focused on determining *optimal* incentive levels for CFLs and LEDs, taking into account the *reasonable* amounts offered here but also tests for cost effectiveness.
>
> ***Recommendation 1b:*** A reasonable incentive amount for standard CFLs would reduce the shelf price of the bulbs to approximately $3.50. Reasonable incentive amounts for specialty bulbs would approach $5.25 to $6.00, and NMR particularly recommends the lower amount for A-line covered CFLs, which are likely the most attractive to consumers who avoid standard CFLs for aesthetic or fit in fixture reasons. We were not able to obtain an estimate of a reasonable incentive for LEDs, but the consumer survey suggests that only about one-half of consumers would purchase LEDs at $20 per bulb. Therefore,

it may be reasonable to reduce the price to approximately $12 to $15 per bulb, tracking sales to see if they increase at the lower price points.

Conclusion 2: Consumers generally accept CFL-based technology in their homes, but they continue to voice reservations about the ability of CFLs to meet all of their lighting needs. Concerns remain about CFL brightness, light quality and color, slowness to brighten, mercury content, fit in fixtures, and dimmability. Consumers are less familiar with specialty CFLs and A-line, screw-in LEDs. In fact, the disconnect between self-reported use of products during the telephone survey and actual product use found onsite demonstrates that consumers remain confused about the types of lighting products *already in use* in their homes. Many of the CFL and LED products on the market could respond to some of the persistent concerns about CFLs.

Recommendation 2a: Programs should continue their efforts to raise awareness of the diversity of energy efficient lighting products available to consumers through lighting displays in stores. Such displays could include bulb comparisons, end-cap promotions, and pamphlets and signs that demonstrate the range of products available and allow consumers to see the products "in action."

***Recommendation 2b*:** While the A-line covered CFL is correctly classified as a "specialty" bulb from a CFL history and manufacturing perspective, it is intended to fill the same applications as a standard A-line incandescent bulb. Therefore, NMR recommends treating the A-line covered CFL as a "standard" bulb offering in promotional materials and even from a future evaluation perspective.

Conclusion 3: Many consumers are just learning about the new EISA efficiency standards, and a great deal of misinformation persists about the changes that will accompany the new lighting standards. Coupled with a lack of familiarity of the diversity of efficient bulbs available, consumers may be wary to try products that look or feel "different" than the incandescent bulb. Yet, the relatively high levels of satisfaction among CFL and LED users suggests that once consumers are exposed to the technology in real world settings they tend to accept it as a viable option for at least some of their lighting needs.

Recommendation 3: The Companies should continue giving away bulbs—particularly A-line, covered CFLs—through such programs as Home Energy Solutions and Home Energy Solutions – Income Eligible as well as during in-store promotions, fairs, and special events. Because of their higher price, it may not be cost-effective to give away LEDs, but individuals who take part in an HES or HES-IE audit or visit a lighting promotional event or a booth at a fair could receive coupons for LEDs that would lower the price of the bulb beyond even the incentive price. Another strategy could involve including LEDs in raffles help at promotional events or fairs.

Conclusion 4: Although relatively few sockets in Connecticut are dimmable, dimmable sockets—particularly those with a candelabra shape and base—are often found in dining rooms. Respondents to the onsite survey also indicate that aesthetics matter more in dining rooms

compared to other rooms. Not surprisingly, dining rooms hold the greatest potential for CFLs and LEDs.

> ***Recommendation 4:*** Although the technology is young, LEDs seem to offer more consistent dimmability than CFLs. The Companies may want to consider promoting LEDs as the preferred choice for applications controlled by dimmer switches. Candelabra based and shaped LEDs are available on the market and should be included in the mix of products offered by the Companies, if they are not currently.

Conclusion 5: Although nearly all households in Connecticut use at least one CFL, consumers resist *changing out* still-working but inefficient lighting for more efficient CFLs and LEDs rather than simply installing these more efficient bulb types after the inefficient bulb burns out.

> ***Recommendation 5:*** In addition to continuing their effort to change out inefficient lighting during HES and HES-IE audits, the Companies should continue their efforts to explain to consumers how much money they can save by getting rid of inefficient lighting *now* rather than waiting for the products to burn out. Additional information about the positive impacts of changing bulbs out on resource availability, the environment, and greenhouse gas reduction may also sway a portion of consumers to switch their bulbs out sooner rather than later.

Conclusion 6: Onsite respondents who shopped for CFLs and LEDs in the past year reported that they would have gone to another store to find these efficient lighting products if the first place they shopped did not carry them. These responses suggest that Connecticut consumers are committed to energy efficient lighting, but this commitment is most easily reinforced by making certain CFLs and LEDs are widely available at places consumers shop for light bulbs.

> ***Recommendation 6*****:** The Companies should continue to promote CFLs and LEDs in a diversity of stores that carry lighting products. Home improvement stores and hardware stores appear to be the "go to" stores for efficient lighting in Connecticut, but drugstores, grocery stores, and other common places to shop for lighting should not be overlooked.

Appendix A Methodological Details

This appendix provides more detail on methodological concerns, such as sample design and sampling error, the weighting scheme, and the methodology used to determine willingness to pay, net-to-gross, and price elasticity.

A.1 Sample Design

The consumer survey sample was designed so as to achieve 3.5% precision overall at the 90% confidence level, assuming a 50/50 break in responses. Thus, for any question asked to all 551 respondents in which one-half answered one way (e.g., "yes") and the other one-half another way (e.g., "no"), the confidence interval around their responses would be ±3.5%. The consumer survey was also able to achieve better than 10% precision at the 90% confidence level for both UI and CL&P.

Table A-1: Consumer Survey Sample Design and Sampling Error

Area	Population: Households[1]	Sample: Households	Sampling Error
CL&P	966,616	414	4.1%
UI	322,205	137	7.1%
Overall	1,288,822	551	3.5%

[1] Population of households as estimated by the 2010 *Census of Population and Housing*, adjusted downward by six percent to account for households served by municipal utilities. Estimates of CL&P households based on 75% of the population, while UI accounts for the remaining 25%.

The onsite sample achieved 8.3% precision overall at the 90% confidence level, again assuming a 50/50 break in responses. The smaller sample size for the onsite visits means that we were not able to achieve 10% precision for UI without expanding the sample size to a level that would have been cost prohibitive for the evaluation.

Table A-2: Onsite Visits Sample Design and Sampling Error

Area	Population: Households[1]	Sample: Households[2]	Sampling Error
CL&P	966,616	75	**9.6%**
UI	322,205	25	**16.8%**
Overall	1,288,822	100	**8.3%**

A.2 Weighting Scheme

The consumer survey and onsite visit samples both contained a greater proportion of households with people who had some education beyond the high school diploma and who owned homes than exist in the population of Connecticut households.[13] In response, the team weighted the consumer survey and onsite visit data by education and home ownership status so that the reported results would better reflect the characteristics of the actual population of households in the state. Due to its larger sample size, the team was able to weight the consumer survey by finer gradations of educational attainment than in the onsite survey.

Table A-3: Consumer Survey Weighting Scheme

	Households	Sample Size	Weight
State Total	*1,359,218*	*541**	
Owner-occupied housing units			
Less than high school graduate	65,937	12	2.19
High school graduate	230,143	90	1.02
Some college or Associate's degree	241,225	104	0.92
Bachelor's degree or higher	402,679	229	0.70
Renter-occupied housing units			
Less than high school graduate	81,995	4	8.16
High school graduate	129,220	31	1.66
Some college or Associate's degree	110,115	29	1.51
Bachelor's degree or higher	97,904	42	0.93

* Ten respondents refused to answer either the home ownership or the education question, or both. They were assigned a weight of one.

[13] Underrepresentation of renters and respondents with lower levels of educational attainment is common in telephone surveys. For example, see Galesic, M., R. Tourangeau, M.P. Couper (2006) "Complementing Random-Digit-Dial Telephone Surveys with Other Approaches to Collecting Sensitive Data." *American Journal of Preventive Medicine*. Volume 35, Number 5.

In addition to collapsing educational attainment into two, instead of four, categories the onsite weighting scheme also differs from the consumer survey scheme team through its reliance on two different weights throughout the analysis of the onsite visit data. The proportionate weight is used when we are describing the characteristics of households or the responses of the householder present during the onsite visit. As with the consumer survey, when weighted, the sample size still sums to 100 respondents but the results are reallocated to represent the proportion of owners and renters in the state by educational attainment. In contrast, the population weight is used to extrapolate the results to all households, lighting sockets, or light bulbs in the state. When summed, the number of households is equal to that to the population of occupied housing units in Connecticut and the number of lighting sockets or bulbs describes the total number we would expect to find in all homes in Connecticut based on our observations of these 100 households. The main body of the document clearly notes which weighting scheme the team used when analyzing the onsite data.

Table A-4: Onsite Visits Weighting Scheme

	Households	Sample Size	Proportionate Weight	Population Weight
State Total	*1,359,218*	*100*		
Owner-occupied housing units				
High school diploma or less	296,080	14	1.56	21,149
Some college or more	643,904	73	0.65	8,821
Renter-occupied housing units				
High school diploma or less	211,215	3	5.18	70,405
Some college or more	208,019	10	1.53	20,802

A.3 Willingness to Pay Analysis

NMR turned to a willingness-to-pay approach (WTP) to explore whether continuation of incentives for CFLs and LEDs was advisable, and, if so, to suggest reasonable incentive levels. The strength of the WTP approach to address these research questions is that it was relatively simple to administer. It followed logically from the other questions onsite respondents were asked during the site visit, meaning that they were already thinking in more depth about their lighting behavior than during the typical phone survey. This increased the likelihood that the respondents provided more accurate estimates of what they originally paid for bulbs and how much they would be willing to pay for them. We entered the responses to these questions into a logarithmic regression analysis to estimate the demand curve and calculate price elasticity, as described below. We also used the results to develop a net-to-gross ratio that should be used *for informational purposes only*. NMR does not at all advise this ratio to be used for planning purposes or to measures program performance. As found in recent evaluations in California and Massachusetts, NTG for lighting products is difficult to pin down and highly volatile; therefore, it is inadvisable to rely on one method for estimating this measure of program performance.

The willingness to pay approach does have a weakness: In the best-case scenario, it requires a large enough number of households recently obtaining the products to provide reliable estimates of WTP and price elasticity. For the purposes of this evaluation, we intended to develop these estimates for products purchased by 25 or more households during the specific time period. In reality, we achieved this sample size only for standard CFLs, with 63 respondents providing data. Although we were able to secure data from only 20 respondents for specialty CFLs, we nevertheless conducted the WTP analysis and price elasticity believing the information would ultimately be useful in a qualitative sense, if not reliable in a quantitative sense. We present the results, but we caution that the small sample size limits the ability to generalize the results to all lighting consumers in Connecticut. We did not, however, believe it was advisable to perform the analysis for the ten respondents who had purchased LEDs; the results would simply be unreliable and potentially biased. Note that the warnings about small samples sizes, even for standard CFLs, only serves to strengthen our recommendation to treat the NTG ratios as informative only.

The following procedure, including equations, was used for calculating elasticity:

First the Team calculated the percentage change in quantity demanded. The formula used to calculate the percentage change in quantity demanded is:

[QDemand(NEW) - QDemand(OLD)] / QDemand(OLD)

Next, the Team calculated the percentage change in price. The formula used to calculate the percentage change in price is similar to that for change in quantity demanded:

[Price(NEW) - Price(OLD)] / Price(OLD)

To come up with a final elasticity number, we substituted the change in demand and change in price into the following equation:

Price elasticity of demand: PEoD = (% Change in Quantity Demanded)/(% Change in Price)

The following decision scheme designates whether the price is elastic or inelastic:

- If PEoD > 1 then Demand is Price Elastic (Demand is sensitive to price changes)
- If PEoD = 1 then Demand is Unit Elastic
- If PEoD < 1 then Demand is Price Inelastic (Demand is not sensitive to price changes)

A.4 Net-to-Gross Calculations

We used the equation NTG = (1 – FR) to convert our free-ridership estimates into a NTG estimate. Free-ridership among our respondents, calculated as the ratio of %WTP full price / %WTP discounted price, is discussed in more detail in B.2.2 in Appendix B, as are the final NTG calculations. Note that this approach does not include spillover, so it is a conservative estimate of NTG.

Appendix B Detailed Findings

This appendix contains detailed findings for most of the analyses presented in the main body of the report. Specifically, the types of results presented here include the following:

- More detailed response categories
- Responses to questions not directly used to inform study objectives
- Equations used for the willingness to pay analysis
- Demographic characteristics

In most cases, we simply present the detailed results, as the pertinent findings have been addressed in the main body of the text. However, at time we provide more explanation for the results, such as with the willingness to pay section.

B.1 Consumer Survey Results

Table B-1: Familiarity with Specialty CFLs

(Base: Respondents who had heard of CFLs and were very, somewhat or not too familiar with CFLs)

Familiarity	Dimmable	3-way	Flood or Recessed	Candelabra	Globe	A-line
Sample size	*551*	*551*	*551*	*551*	*551*	*551*
Very familiar	18%	20%	20%	15%	23%	14%
Somewhat familiar	24	27	25	23	27	22
Not too familiar	11	8	11	13	10	13
Not at all familiar	32	30	29	34	25	35
Not aware of CFLs	15	15	15	15	15	15
Don't know / refused	<1	<1	<1	<1	<1	1

Table B-2: Familiarity with Energy-Saving Bulb Types 2011

(Base: All respondents)

Familiarity	CFLs	LEDs	Halogen Bulbs
Sample size	*551*	*551*	*551*
Very familiar	34%	14%	23%
Somewhat familiar	41	21	31
Not too familiar	11	20	19
Not at all familiar	14	44	27
Don't know / refused	1	<1	<1

Table B-3: Information Heard About Changes in Lighting Standards

(Base: Respondents who were aware of changes in lighting standards)

What respondents have heard about changes in lighting standards (Multiple Response)	
Sample size	*249*
Some or all bulbs would not be available	78%
Requirement to start using CFLs or LEDs	17
There were new efficiency standards/regulations	13
Have to change light bulbs or buy new type, but not specified	11
There would be a cutoff date	9
The government rescinded or postponed the mandate	9
Indicated frustration at being forced to do something	9
There would be a wattage cutoff	6
Other	2
Don't know/remember	5

Table B-4: Changes Respondents Noticed in Types of Bulbs Available

(Base: Respondents aware of changes to lighting market; respondents aware of changes to lighting market who recently purchased bulb)

Changes noticed (Multiple Response)	**Those Aware of Changes**	**Those Aware of Changes and Purchased Bulbs Recently**
Sample size	*151*	*94*
More CFLs on the market	29%	37%
Fewer incandescent bulbs on the market	28	35
Greater bulb variety (type unspecified)	24	17
More LEDs on the market	18	20
Greater availability of efficient bulbs (bulb type unspecified)	7	8
Cannot find my favorite or needed bulb type (unspecified)	7	1
The changes are confusing or a pain	6	5
The wattages are different	6	6
More Halogens on the market	4	7
Bulbs are more expensive	4	4
Bulbs are less expensive	4	4
Different kinds of light	3	4
Bulb size is different	2	2
Better quality	2	2
Price mentioned (no mention of change or direction of price)	2	1
Worse or inconsistent quality	1	1
Some CFLs being discontinued	1	1
Government is trying to control us	1	0
Did not notice a change	-	-

As a follow-up, the 67% of respondents who indicated not having them installed gave their reasons for not utilizing that technology. Figure B-1 displays the reasons mentioned by 3% of respondents or more, the most popular of which was that they use too much energy, or the respondent is trying to save energy. Also popular was the rationale that 100 Watt incandescent bulbs are too bright or too hot, or that respondent prefers efficient lighting choices.

Figure B-1: Reasons 100 Watt Incandescent Bulbs Not Installed in Home

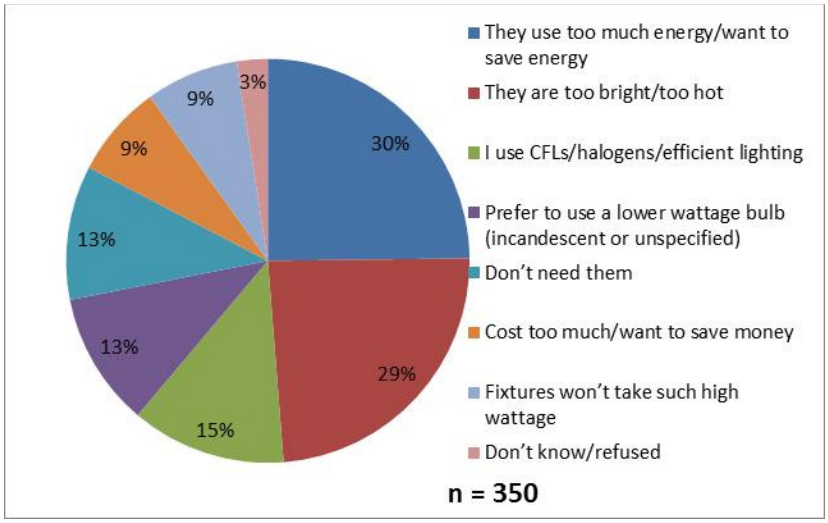


Table B-5: Bulb Choice under EISA

(Base: All Respondents)

Bulb type	
Sample size	*551*
A lower wattage incandescent bulb	39%
A 23 Watt screw-in CFL bulb meant to replace a 100 Watt incandescent bulb	34
A 72 Watt screw-in halogen bulb meant to replace a 100 Watt incandescent bulb	5
A 17 Watt screw-in LED bulb meant to replace a 100 Watt incandescent bulb	6
A 150 Watt incandescent bulb	5
Don't know/refused	11

Table B-6: Reasons for Bulb Choice under EISA

(Base: Respondents who said they would most likely choose relevant bulb)

Reasons (Multiple Response)	Lower wattage incandescent	23 Watt CFL	72 Watt Halogen	17 Watt LED	150 Watt Incandescent
Sample size	*179*	*213*	*29*	*39*	*29*
Prefer this light/color temperature/brightness	34%	13%	43%	24%	76%
Uses less energy/efficient/lower wattage	19%	41%	10%	41%	0%
Familiar with/already use this bulb/just like bulb type	15%	17%	13%	21%	10%
Fit fixtures/recommended for fixture	8%	1%	0%	3%	0%
Low price/on sale	5%	10%	3%	0%	3%
Lower energy bills/lower lifetime cost/cost effective	4%	16%	0%	12%	0%
Warm up quicker/dimmers	1%	0%	3%	3%	4%
Exchanging incandescents to other bulbs as needed	1%	5%	0%	3%	0%
Someone recommended it/gave it to me	1%	3%	3%	3%	0%
Good quality bulb/trustworthy	1%	1%	0%	3%	0%
Concerned about dimmability	1%	0%	0%	6%	3%
Don't like the government telling me what bulb to use	1%	0%	0%	0%	0%
Prefer or like shape of bulb	<1%	0%	0%	3%	0%
Wattage equivalency	0%	11%	17%	0%	0%
Don't like CFLs because of mercury/dangerous/other health	0%	0%	0%	3%	3%
Convenience/availability/easy to use	0%	3%	7%	6%	3%
Most similar to incandescent I used/use	0%	1%	13%	3%	3%
Lasts longer	0%	7%	0%	24%	0%
Not as hot	0%	4%	0%	3%	0%
Because of EISA/following the market	0%	1%	0%	0%	0%
Environmentally friendlier	0%	2%	0%	0%	0%
Other	4%	3%	0%	6%	3%
Don't know/refused	12%	6%	23%	3%	3%

Table B-7: Likelihood of Buying and Saving Extra 100 Watt Incandescent Bulbs for Use After 2012

(Base: All Respondents)

Level of likelihood	Overall	Aware of EISA	Not Aware of EISA
Sample size	*551*	*190*	*355*
Mean	3.4	3.1	3.5
Very likely	10%	19%	6%
Somewhat likely	11	9	12
Somewhat unlikely	11	11	11
Very unlikely	66	61	68
Don't know/refused	1	0	2

Table B-8: Bulb Types Purchased in the Past Three Months

(Base: Respondents with familiarity of relevant bulb type)

	Sample Size	Yes	No	Don't know/refused
CFLs that screw into regular light sockets	152	58%	42%	1%
LEDs that screw into regular light sockets	88	24	76	0
Halogens that screw into regular light sockets	123	27	73	0
Incandescent or regular light bulbs	190	55	43	2
Pin-based fluorescent tubes that can only be used in fluorescent light fixtures	190	22	77	1
Pin-based CFLs that can only be used in special light fixtures	190	5	95	1
Pin-based LEDs that can only be used in special light fixtures	190	3	95	2
Nightlight/candelabra/other specialty bulb	8	Responses volunteered by respondents		
Other CFL	6			
Flood lights	3			
Holiday/string lighting	3			
Tube fluorescents	3			
Pin-based Halogen	2			
Outdoor (various)	2			
Incandescents	2			
Strip or under cabinet LED	1			
Bulb for recessed lighting	1			
Warming bulbs	1			

Table B-9: Satisfaction with Standard CFLs and LEDs

(Base: Respondents who said they had ever used a CFL or LED)

Level of satisfaction	CFLs	LEDs
Sample size	*401*	*76*
Very satisfied	47%	59%
Somewhat satisfied	30	24
Neither satisfied nor dissatisfied	7	6
Somewhat dissatisfied	10	6
Very dissatisfied	5	3
Don't know/refused	1	1

Table B-10: Reasons Respondents Like CFL Bulbs

(Base: Respondents who said they had ever used a CFL on the interior or exterior of home)

Reasons (Multiple Response)	
Sample size	*401*
Save energy	47%
Longer bulb life	26
Save money on bills	17
Brighter/brightness	9
Do not like anything about them/negative impression	10
Light quality e.g. soft, clear	7
Don't get hot	5
Help environment	5
Cheaper	4
Like the incentive program	2
Familiar/work just as well	2
Convenience/availability/easy to install	2
Design/shape	2
Color/color choices	2
Durability	1
It is necessary to have them	1
Like everything about them	1
They are versatile/many uses	1
Other	<1
Don't know/nothing in particular/no preference	10

Table B-11: Dimmable CFL Features Respondents Do Not Like

(Base: Respondents who said they had ever used a CFL on the interior or exterior of home and were somewhat or very familiar with dimmable CFLs)

Reasons (Multiple Response)	
Sample size	*69*
Nothing I don't like about them	59%
Do not dim to low light levels/Do not dim as low as incandescents	11
Flicker	9
Price/too expensive	7
Slow to turn on/brighten	5
Shorter bulb life than promised	5
Design/shape	3
They are hard to find	2
Require installation of special dimmers/sockets	2
Don't fit in my fixtures	2
Light level is not the same for all bulbs	2
Poor light color	1
Not bright enough	1
Mercury/disposal issues	1
Don't know/refused	3

Table B-12: Other CFL Features Respondents Do Not Like

(Base: Respondents who said they had ever used a CFL on the interior or exterior of home)

Reasons (Multiple Response)	
Sample size	*401*
Nothing I don't like about them	39%
Slow to turn on/brighten	24
Mercury/disposal issues	15
Not bright enough	12
Poor light color	8
Design/shape	7
Poor light output	6
Price	6
Shorter bulb life than promised	5
Not compatible with fixtures	3
Poor manufacturing	2
Not dimmable	2
Not durable/break easily	1
Too bright	1
Flicker	1
Buzz	1
Nothing I like about them	1
The government makes me use them	1
Not made in USA	1
Other	1
Don't know/refused	3

Table B-13: What Respondents Like About Screw-in LEDs

(Base: Respondents who said they were currently using screw-in LED bulbs)

Reasons to Use Screw-In LEDs (Multiple Response)	
Sample size	*76*
Like the light quality/brightness	34%
Save energy	23
Longer bulb life	17
Design/shape/size	13
Convenience/availability	12
Save money on bills	9
Don't like anything about them	6
Not as hot	6
Better than CFLs	6
Like everything about them	4
Easy to use	4
Quick to turn on	3
Dimmable	2
Help environment	1
Came with the lamp	1
Don't know	5

Table B-14: What Respondents DO NOT Like About Screw-in LEDs

(Base: Respondents who said they were currently using screw-in LED bulbs)

Reasons to Dislike Screw-in LEDs (Multiple Response)	
Sample size	*76*
Nothing I don't like about them	59%
Price	16
Poor light color	6
Color of the light	6
Long warm up time/poor dimming	6
Not bright enough	4
Too bright	3
Poor light output	2
Ugly	1
Shorter bulb life than promised	1
Disposing of them	1
Not as efficient as promised	1
Don't know/refused	2

Table B-15: Where Current Users Purchased Standard CFLs, Specialty CFLs, or LEDS

(Base: Households with Standard CFLs/Specialty CFLs/LEDs installed)

	Standard CFLs	Specialty CFLs	LEDs[a]
Number of households	*89*	*56*	*12*
Home Depot	46%	38%	33% (4)
Ocean State Job Lot	13	7	0
Wal-Mart	11	7	8 (1)
Lowes	10	14	42 (5)
Grocery Store	7	3	0
Costco/BJs/Sam's Club	6	10	0
Home Furniture/Lighting Store	2	9	0
Energy fair/fundraiser	2	0	0
Hardware Store	1	11	8 (1)
Online	0	0	8 (1)
Dollar Store	1	0	0
Other	1	2	0

[a] Number of products presented in parentheses due to small sample size of LED purchasers.

Table B-16: Second Store Option to Buy CFL or LED

(Base: Participants who would have gone to another store within a short time to buy bulb if first store had not had CFLs or LEDs)

	Standard CFLs	Specialty CFLs	LEDs
Number of households	*62*	*38*	*9*
Lowes	32%	35%	33% (3)
Home Depot	16	19	33 (3)
Wal-Mart	16	20	0
Hardware Store	14	12	0
Dollar Store	9	0	0
Home Furniture/Lighting Store	5	2	0
Grocery Store	2	2	0
Target	2	0	0
Costco/BJs/Sam's Club	1	2	22 (2)
Drug Store	1	2	0
Online	0	0	11 (1)
Other	1	5	0

Table B-17: Whether Respondents Had Seen or Heard the Term "Lumens" and "Warm White" and "Cool White"

(Base: All Respondents)

	Have Heard of Lumens	Have Heard "Warm White" and "Cool White"
Sample size	*551*	*551*
Yes	56%	62%
No	43	36
Don't know/Refused	2	1

B.2 Price Elasticity and Net-to-Gross Calculations

The team used the following procedure for calculating price elasticity and net-to-gross for standard spiral CFLs.

B.2.1 Price Elasticity Calculations

The price elasticity of demand (PEoD) is calculated using the following formula:

Equation 1: PEoD = (% Change in Quantity Demanded)/(% Change in Price)

The first component of this procedure is to calculate the percentage change in quantity demanded**.** The formula used to calculate the percentage change in quantity demanded is:

Equation 2: [QDemand(NEW) - QDemand(OLD)] / QDemand(OLD)

Based on responses from the onsite WTP series, we calculated the change in quantity demanded as follows:

Standard CFLs: (21 – 54)/54 = -.6111

Specialty CFLs: (5-18)/18 = -.7222

The second component of this procedure involves calculating the percentage change in price, using the following formula:

Equation 3: [Price(NEW) - Price(OLD)] / Price(OLD)

Based on responses from the onsite WTP series, we calculated the percentage change in price as follows:

Standard CFLs: $3.98 - $2.83/$2.83 = .4064

Specialty CFLs: $6.43 - $3.96/$3.96 = .6237

Inputting these values into the Equation 1 yields the following:

Standard CFLs PEoD= -.6111/.4064 = -1.5037

Specialty CFLs PEoD = -.7222/.6237 = -1.1579

For determining whether a commodity is price elastic or inelastic, one compares the absolute value obtained from the previous equations to the following algorithm:

- If PEoD > 1 then Demand is Price Elastic (Demand is sensitive to price changes)
- If PEoD = 1 then Demand is Unit Elastic
- If PEoD < 1 then Demand is Price Inelastic (Demand is not sensitive to price changes)

Based on our analysis, the prices for both standard and specialty CFLs are elastic, suggesting they are sensitive to changes in price.

B.2.2 Net-to-Gross Calculations

The impact of the discounts for standard and specialty CFLs is the difference between the percentages of customers who said they would be willing to pay the full price versus the percentage willing to pay the discounted price. Free-ridership is calculated as the ratio of %WTP full price / %WTP discounted price. Note that this approach does not include spillover and should be seen as a conservative estimate of NTG. The results are shown in Table B-18.

Table B-18: Percent Willing to Pay for Standard and Specialty CFLs with and without Discount

	Discount $2.83/ $3.96 bulb	No Discount $3.98/$6.43 bulb	Free-Ridership $2.83/$3.96 bulb	NTG
Standard CFL	86%	33%	38%	.62
Specialty CFL	90%	25%	28%	.72

When instead using the modeled percentage of respondents WTP (the numbers that are suggested by the logarithmic equation) at the incented and non-incented prices, the NTG estimates decrease. These results are shown in Table B-19.

Table B-19: Modeled Percent Willing to Pay for Standard and Specialty CFLs with and without Discount

	Discount $2.83/$3.96 bulb	No Discount $3.98/$6.43 bulb	Free-Ridership $2.83/$3.96 bulb	NTG
Standard CFL	73%	56%	77%	.23
Specialty CFL	62%	42%	68%	.32

B.3 Onsite Study Results

B.3.1 Installed Bulbs

Table B-20: Socket Saturation

(Base: All sockets, weighted to the population of households)

Bulb Type	Onsite Socket Count	State Socket Count	Socket Saturation
Number of households	*100*	*1,359,218*	*1,359,218*
Total Sockets	**5,929**	**80,452,313**	**80,452,313**
Incandescent bulbs	2,924	39,675,972	49%
CFLs	1,595	21,646,670	27%
Fluorescent	618	8,381,148	10%
Halogen	506	6,871,946	9%
LEDs	80	1,088,095	1%
Other[1]	205	2,788,483	3%
Potential for CFLs and LEDs[2]	**3,636**	**49,336,401**	**61%***

[1] "Other" includes: sodium bulbs, xenon bulbs, bulbs whose type could not be identified and empty sockets.
[2] Potential is equal to the sum of sockets that could be filled with a screw base CFL or LED bulbs divided by the total number of screw base sockets; fluorescents are not included as they are pin-based.

Table B-21: Wattage of Installed Incandescent Bulbs

(Base: All sockets, weighted to the population of households)

Wattage	All Bulbs	Incandescents
Total Sockets	*80,452,313*	*39,675,972*
0 to 39 Watts	45%	15%
40 Watts	14	19
41 to 60 Watts	24	39
61 to 75 Watts	9	15
76 to 100 Watts	4	6
101 + Watts	3	4
3-way	2	2

Table B-22: Socket Saturation by Room Type - Percent of Sockets

(Base: All sockets, weighted to the population of households)

	All Sockets	CFL	Fluorescent	Halogen	Incandescent	LED	Other[1]	Potential for CFLs and LEDs
Number of households	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Total Sockets	**80,452,313**	**21,646,670**	**8,381,148**	**6,871,946**	**39,675,972**	**1,088,095**	**2,788,483**	**49,336,401**
Bedroom	16%	22%	7%	6%	15%	11%	20%	56%
Kitchen	14%	11%	13%	42%	9%	51%	29%	64%
Bathroom	12%	17%	5%	3%	13%	2%	6%	57%
Exterior	11%	8%	3%	23%	12%	8%	11%	77%
Living Room	11%	11%	3%	10%	12%	9%	12%	67%
Basement	8%	8%	32%	1%	4%	0%	7%	28%
Hall/Stairs	6%	7%	2%	1%	6%	2%	4%	62%
Dining Room	5%	2%	1%	4%	9%	5%	0%	88%
Garage	4%	3%	13%	1%	4%	1%	3%	48%
Closet	3%	1%	6%	2%	3%	0%	1%	66%
Family Room	2%	2%	2%	2%	3%	1%	2%	69%
Foyer/Mudroom	2%	1%	0%	1%	3%	0%	0%	85%
Laundry/Utility	2%	2%	6%	<1%	2%	0%	1%	51%
Office	2%	2%	2%	2%	2%	6%	2%	58%
Workshop/Studio	1%	<1%	3%	2%	<1%	3%	<1%	46%
Other[2]	2%	2%	2%	<1%	3%	0%	2%	67%

[1] "Other" includes: sodium bulbs, xenon bulbs, bulbs whose type could not be identified and empty sockets.

[2] "Other" includes: Attic, Game Room, Greenhouse, Loft, Crawl Space, Mudroom, Storage, Shed, Solarium, Pantry, etc.

Table B-23: Socket Saturation by Room Type - Number of Sockets

(Base: All sockets, weighted to the population of households)

	All Sockets (millions)	**CFL** (millions)	**LED** (hundreds of thousands)	**Halogen** (hundreds of thousands)	**Potential for CFLs and LEDs** (millions)
Number of households	*100*	*100*	*100*	*100*	*100*
Total Sockets (millions)	**80.5**	**21.6**	**1.1**	**6.9**	**49.3**
Bedroom	12.5	4.9	114,668	400,088	7.6
Kitchen	11.5	2.4	555,698	2,855,934	8.5
Bathroom	9.6	3.7	26,462	238,156	5.9
Exterior	8.8	1.7	91,367	1,574,963	7.0
Living Room	8.5	2.4	97,027	679,186	5.9
Basement	6.1	1.7	-	44,103	4.4
Dining Room	4.4	0.4	52,924	282,259	3.9
Hall/Stairs	4.4	1.5	26,462	95,221	2.9
Garage	3.5	0.8	8,821	79,385	2.7
Closet	2.2	0.3	-	146,338	2.0
Laundry/Utility	2.0	0.5	-	17,641	1.5
Family Room	1.9	0.4	8,821	105,847	1.5
Office	1.5	0.4	70,565	167,591	1.0
Foyer/Mudroom	1.2	0.2	-	52,924	1.0
Workshop/Studio	0.7	0.04	35,282	114,668	0.6
Other[1]	2.0	0.4	-	17,641	1.2

[1] "Other" includes: Attic, Game Room, Greenhouse, Loft, Crawl Space, Mudroom, Storage, Shed, Solarium, Pantry, etc.

Table B-24: Socket Saturation by Fixture Type - Percent of Sockets

(Base: All sockets, weighted to the population of households)

Socket Type	All Sockets	CFL	Fluorescent	Halogen	Incandescent	LED	Other	Potential for CFLs or LEDs
Number of households	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Total Sockets	**80,452,313**	**21,646,670**	**8,381,148**	**6,871,946**	**39,675,972**	**1,088,095**	**2,788,483**	**49,336,401**
Flush mount	28%	30%	60%	5%	25%	0%	25%	71%
Recessed	14%	11%	11%	22%	15%	12%	2%	77%
Wall mount	12%	16%	7%	4%	12%	0%	6%	63%
Table	11%	15%	4%	2%	12%	7%	9%	62%
Pendant	9%	6%	7%	2%	13%	5%	8%	81%
Ceiling Fan	6%	8%	<1%	1%	7%	0%	14%	65%
Porch	4%	4%	1%	2%	5%	3%	4%	71%
Floods	3%	2%	0%	16%	3%	3%	4%	85%
Floor	3%	6%	2%	1%	3%	3%	5%	52%
Track	3%	1%	0%	18%	1%	2%	2%	86%
Under cabinet	3%	0%	5%	16%	<1%	43%	20%	82%
Night light	1%	0%	0%	<1%	1%	11%	0%	74%
Range hood	1%	1%	<1%	6%	1%	1%	1%	84%
Walkway	1%	0%	0%	3%	<1%	3%	1%	91%
In cabinet	<1%	<1%	<1%	1%	1%	3%	0%	86%
Motion Sensor	<1%	0%	0%	1%	1%	0%	1%	100%
Post Mount	<1%	<1%	0%	0%	<1%	0%	0%	67%
Other	1%	<1%	2%	1%	1%	3%	0%	76%

Table B-25: Socket Saturation by Fixture Type – Number of Sockets

(Base: All sockets, weighted to the population of households)

	All Sockets (millions)	**CFL** (millions)	**LED** (hundreds of thousands)	**Halogen** (millions)	**Potential for CFLs and LEDs** (millions)
Number of households	*100*	*100*	*100*	*100*	*100*
Total Sockets (millions)	**80.5**	**21.6**	**1.1**	**6.9**	**49.3**
Flush mount	22.3	6.4	-	0.3	10.8
Recessed	10.9	2.4	132,309	1.5	7.5
Wall mount	9.4	3.4	-	0.3	5.4
Table	8.6	3.2	79,385	0.2	5.0
Pendant	7.3	1.3	52,924	0.2	5.4
Ceiling Fan	4.8	1.6	-	0.1	3.1
Porch	3.3	0.9	35,282	0.1	2.3
Floods	2.7	0.4	35,282	1.1	2.3
Floor	2.7	1.2	35,282	0.1	1.2
Under cabinet	2.7	-	467,492	1.1	1.8
Track	2.0	0.3	17,641	1.2	1.7
Range hood	1.2	0.2	8,821	0.4	1.0
Night light	0.5	-	123,488	0.0	0.4
Walkway	0.4	-	35,282	0.2	0.4
Motion Sensor	0.4	-	-	0.1	0.4
In cabinet	0.4	0.0	35,282	0.0	0.3
Post Mount	0.3	0.1	-	-	0.2
Other	0.6	0.1	29,623	0.0	0.3

Table B-26: Socket Saturation by Socket Type - Percent of Sockets

(Base: All sockets, weighted to the population of households)

Socket Type	All Sockets	CFL	Halogen	LED
Number of households	*100*	*100*	*100*	*100*
Total Sockets	**80,452,313**	**21,646,670**	**6,871,946**	**1,088,095**
Screw base (small/medium)	84%	99%	59%	36%
Pin base	15%	1%	37%	60%
Other / Unknown	1%	<1%	4%	4%

Table B-27: Socket Saturation by Bulb Feature - Percent of Sockets

(Base: All sockets, weighted to the population of households)

Sockets Containing	All Sockets	CFL	Fluorescent	Halogen	Incandescent	LED	Other	Potential for CFLs or LEDs
Number of households	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Total Sockets	**78,360,450**	**21,646,670**	**8,381,148**	**6,871,946**	**39,675,972**	**1,088,095**	**696,620**	**47,224,538**
A-line	29%	4%	<1%	1%	54%	11%	1%	96%
Twist/Spiral	22%	77%	<1%	1%	<1%	1%	0%	1%
Spot/Reflector/Flood	16%	7%	<1%	65%	16%	12%	1%	86%
Tube	11%	1%	91%	4%	1%	0%	7%	7%
Candelabra	10%	<1%	0%	1%	18%	12%	0%	98%
Globe	5%	2%	0%	2%	8%	9%	0%	86%
Bullet/Torpedo	4%	<1%	0%	23%	1%	51%	83%	81%
Capsule/Post/Barrel	3%	8%	0%	1%	1%	0%	0%	15%
Circline	1%	0%	8%	0%	<1%	0%	0%	3%
Bug light	<1%	<1%	0%	0%	<1%	0%	0%	57%
Other	<1%	0%	0%	2%	<1%	4%	8%	75%
*Dimmable***	10%	2%	1%	28%	14%	18%	-	92%
*Three-way***	2%	2%	1%	1%	2%	<1%	-	69%

*A-line bulbs are the typical shape for standard incandescent bulbs. A-line CFLs are made to look and feel like traditional incandescent bulbs.
**Dimmable and three-way bulbs also fall within shape categories and therefore are not additive.

Table B-28: Socket Saturation by Bulb Feature – Number of Sockets

(Base: All sockets, weighted to the population of households)

Sockets Containing	**All Sockets** (millions)	**CFL** (millions)	**LED** (hundreds of thousands)	**Halogen** (millions)	**Potential for CFLs or LEDs** (millions)
Number of households	*100*	*100*	*100*	*100*	*100*
Total Sockets (millions)	78.4	21.6	1.1	6.9	47.2
A-line	22.4	0.8	123,488	0.1	21.4
Twist/Spiral	16.9	16.6	8,821	0.0	0.2
Spot/Reflector/Flood	12.8	1.6	132,309	4.5	11.0
Tube	8.4	0.2	-	0.3	0.6
Candelabra	7.5	0.0	132,309	0.0	7.4
Globe	3.7	0.5	97,027	0.2	3.2
Bullet/Torpedo	3.1	0.0	555,698	1.6	2.6
Capsule/Post/Barrel	2.0	1.7	-	0.0	0.3
Circline	0.7	-	-	-	0.0
Bug light	0.2	0.1	-	-	0.1
Other	0.4	-	38,443	0.2	0.4
*Dimmable***	7.9	0.5	88,206	1.9	7.3
*Three-way***	1.3	0.3	-	0.0	0.9

Table B-29: Installed Incandescent Bulbs and CFL Equivalents

(Base: All sockets, weighted to the population of households)

	Incandescent (millions)	**CFL (millions)**
Number of households	*100*	*100*
40 Watts /~7 Watts	7.4	0.2
60 Watts /~13 Watts	14.0	12.7
75 Watts /~20 Watts	2.9	2.0
100 Watts /~23 Watts	2.3	2.9

B.3.2 Stored Bulbs

Table B-30: Stored Bulbs

(Base: All stored bulbs, weighted to the population of households)

Number of households	*100*
Total Stored Bulbs	**22,572,536**
Incandescent	65%
CFL	28%
Fluorescent	3%
Halogen	3%
LED	<1%

Table B-31: Stored Bulbs by Bulb Shape

(Base: Households with stored bulbs, weighted to the population of households)

	All	Incandescent	CFL	Fluorescent	Halogen
Number of households with stored bulbs	*87*	*87*	*87*	*87*	*87*
Total Stored Bulbs	**22,572,536**	**14,721,562**	**6,364,113**	**774,198**	**686,201**
A-line	39%	59%	1%	-	-
Twist/Spiral	22%	<1%	77%	-	-
Candelabra	14%	22%	-	-	-
Spot/Reflector/Flood	10%	9%	7%	-	85%
Globe	7%	9%	6%	-	-
Tube	4%	<1%	2%	93%	-
Capsule/Post/Barrel	2%	<1%	6%	-	-
Bullet/Torpedo	1%	1%	-	-	14%
Bug light	<1%	<1%	-	-	-
Circline	<1%	-	<1%	7%	-
Other	<1%	<1%	-	-	1%

Table B-32: Reason for Storing Bulbs by Bulb Type

(Base: All stored bulbs, weighted to the population of households)

	All Bulbs	Incandescent	CFL	Fluorescent	Halogen	LED
Number of households with stored bulbs	*87*	*87*	*87*	*87*	*87*	*87*
Total Stored Bulbs	**22,572,536**	**14,721,562**	**6,364,113**	**774,198**	**686,201**	**26,462**
Storing for future use	93%	92%	98%	94%	77%	100%
Do not fit or work with fixture	3%	4%	1%	2%	0%	0%
Will throw away/recycle	1%	1%	1%	0%	0%	0%
Don't plan to use them	3%	4%	0%	3%	19%	0%
Other	<1%	<1%	0%	0%	4%	0%

Table B-33: Current Storage of CFLs and Incandescents by Households

(Base: All stored CFLs, weighted to the population of households)

	CFLs	Incandescents
Number of households	*100*	*100*
Zero	39%	39%
One to five	39	15
Six to fifteen	15	17
Sixteen or more	7	28
Number of households in state	*1,359,218*	*1,359,218*
Total Stored Bulbs	**6,364,113**	**14,721,562**
Mean number of bulbs in storage	4.7	10.8
Median number of bulbs in storage	1.0	4.0

Table B-34: Type of Bulb Stored Bulb Will Replace

(Base: All stored bulbs, weighted to the population of households)

Type of bulb	All Bulbs	CFL	Fluorescent	Halogen	Incandescent	LED
Number of households with stored bulbs	*87*	*87*	*87*	*87*	*87*	*87*
Total Stored Bulbs	**22,572,536**	**6,364,113**	**774,198**	**686,200**	**14,721,562**	**26,462**
Incandescent	39%	6%	6%	19%	57%	0%
Both/whichever needs replacing first	33%	36%	7%	22%	34%	0%
CFL	17%	57%	0%	0%	1%	0%
Replace the same type of bulb as the stored bulb	5%	NA	85%	59%	NA	100%
Can't use but still storing	<1%	0%	0%	0%	<1%	0%
Other	3%	1%	0%	0%	4%	0%
DK	2%	0%	0%	0%	3%	0%
NA	2%	1%	2%	0%	2%	0%

Table B-35: Stored 40-100 Watt A-Line Incandescent Bulbs

(Base: All stored CFLs, weighted to the population of households)

	Count (in millions)	Percentage of all stored incandescent bulbs
Number of households	*100*	*100*
All stored incandescent bulbs	14.7	NA
All stored 40-100 Watt A-line incandescent bulbs	11.1	75%
40 Watt A-line incandescent bulbs	1.0	7%
60 Watt A-line incandescent bulbs	3.4	23%
75 Watt A-line incandescent bulbs	1.0	7%
100 Watt A-line incandescent bulbs	2.0	13%

Table B-36: Stored 100W Incandescent Bulbs vs. Reported likelihood

(Base: All stored CFLs, weighted to the proportion of households)

Likelihood of buying and saving 100 Watt incandescent bulbs before 2012	Mean # of Stored 100 Watt bulbs	Mean # of 40 to 100 Watt bulbs
Number of households	*100*	*100*
Very likely	3.5	12.1
Somewhat likely	1.7	7.8
Somewhat unlikely	1.8	7.8
Very unlikely	1.3	7.8
Overall	1.6	8.2

Table B-37: Reason No CFL Bulbs Installed in Home

(Base: Households with no CFLs installed; multiple response, not weighted)

Reason	Count
Number of households	*10*
Using up old stock	1
Bulbs were already installed	3
No need yet	2
Too expensive	1
CFLs don't look as good	1
Have never purchased them	6
Unaware of energy savings	1

B.3.3 Onsite Customer Survey Results

Table B-38: When Last Purchased Standard CFLs, Specialty CFLs, or LEDS

(Base: All onsite households)

	Standard CFLs	Specialty CFLs	LEDs
Number of households	*100*	*100*	*100*
Purchased within the past year	51%	15%	6%
Purchased more than a year ago	29	28	1
No bulbs of type currently in home	20	57	92

Table B-39: Where Current Users Purchased Standard CFLs, Specialty CFLs, or LEDS

(Base: Households with Standard CFLs/Specialty CFLs/LEDs installed)

	Standard CFLs	Specialty CFLs	LEDs
Number of households	*89*	*56*	*12*
Home Depot	46%	38%	33% (4)
Ocean State Job Lot	13	7	0
Wal-Mart	11	7	8 (1)
Lowes	10	14	42 (5)
Grocery Store	7	3	0
Costco/BJs/Sam's Club	6	10	0
Home Furniture/Lighting Store	2	9	0
Energy fair/fundraiser	2	0	0
Hardware Store	1	11	8 (1)
Online	0	0	8 (1)
Dollar Store	1	0	0
Other	1	2	0

Table B-40: Action if No Standard CFLs, Specialty CFLs, or LEDS at Store

(Base: Households Currently Using Standard CFLs/Specialty CFLs/LEDs installed)

	Standard CFLs	Specialty CFLs	LEDs
Number of households	*89*	*56*	*12*
Gone to another store within a short time to buy bulb	67%	66%	83% (10)
Bought an incandescent	30	30	17 (2)
Waited and purchased bulb at a different time	1	2	0
Someone else would give/buy bulbs	1	2	0
Wouldn't buy the bulb without a sale	1	0	0

Table B-41: Second Store Option to Buy CFL or LED

(Base: Participants who would have gone to another store within a short time to buy bulb if first store had not had CFLs or LEDs)

Store	Standard CFLs	Specialty CFLs	LEDs
Number of households	*62*	*38*	*9*
Lowes	32%	35%	33% (3)
Home Depot	16	19	33 (3)
Wal-Mart	16	20	0
Hardware Store	14	12	0
Dollar Store	9	0	0
Home Furniture/Lighting Store	5	2	0
Grocery Store	2	2	0
Target	2	0	0
Costco/BJs/Sam's Club	1	2	22 (2)
Drug Store	1	2	0
Online	0	0	11 (1)
Other	1	5	0

Table B-42: Lighting Decisions by Room

(Base: All onsite households; multiple response)

	Kitchen	Dining Room	Master Bedroom	Living Room	Main Bathroom
Number of households	*100*	*98*	*100*	*99*	*100*
Price	26%	23%	33%	27%	23%
Brightness/lots of light	25	13	22	23	24
Energy Efficiency	23	25	38	29	27
Use/Will Use CFLs/LEDs	20	18	27	20	23
Wattage	19	19	33	19	21
Replace what is already there	17	19	24	18	17
What fits in fixture/lampshade	16	18	18	15	10
Soft/warm lighting	8	7	9	5	3
Based on usage	6	4	9	5	4
Appearance/Attractiveness	5	8	5	4	4
What is on hand	4	4	6	4	4
Dimmability/Three-way	3	8	4	2	1
Prefer Incandescents	3	1	3	6	5
Life of Bulb	2	2	2	2	2
Manufacturer	2	3	2	2	2
Instant light/No delay	2	1	3	1	1
Save on energy bill	2	2	2	2	2
Color	1	2	1	1	3
Have not replaced bulbs yet	1	1	1	1	1
Other	3	1	1	0	1

Table B-43: Important Bulb Characteristics by Room

(Base: All onsite households)

	All	Kitchen	Dining Room	Master Bedroom	Living Room	Main Bathroom
Number of households	*100*	*100*	*98*	*100*	*99*	*100*
Brightness	28%	41%	17%	19%	26%	36%
Price	23	21	21	22	22	22
Energy Efficiency	19	17	14	18	23	21
Wattage	7	6	4	9	6	6
Life of Bulb	6	6	5	8	6	6
Color	6	3	6	10	8	5
Bulb Shape	4	2	9	4	2	3
Aesthetics/Ambiance	3	0	7	2	4	0
Dimmability	2	0	7	2	1	0
Three-way	1	0	0	3	1	0
CFL	1	1	1	1	1	1
What bulb is already there	1	2	1	1	1	1
Immediate Lighting	<1	0	0	1	0	0
Other	1	0	2	2	0	0

Table B–44: Important Bulb Characteristics by Number of CFLs Installed

(Base: All onsite households)

	None	1 to 5	6 to 15	16 or more
Number of households	*100*	*98*	*100*	*99*
Brightness	23	23	39	24
Life of Bulb	0	0	19	1
Price	55	30	11	21
Energy Efficiency	0	27	11	23
Color	11	4	6	7
Wattage	6	2	4	10

Table B-45: Why No CFLs Installed by Room

(Base: All onsite households)

	All	Kitchen	Dining Room	Master Bedroom	Living Room	Main Bathroom
Number of households	*68*	*38*	*57*	*29*	*27*	*32*
Current bulbs haven't burnt out yet	27%	24%	17%	37%	37%	10%
Have not gotten around to buying CFLs	18	16	17	20	19	22
Do not fit properly	13	16	18	8	4	4
Have not gotten around to installing CFLs	8	11	1	10	12	23
CFLs do not work with dimmer	7	5	15	4	2	2
Do not like appearance	6	3	10	2	6	7
Not aware of CFL for application	5	2	9	4	4	5
CFLs not bright enough	4	8	3	4	2	2
Delay in light coming on	3	5	1	4	2	7
Using up old stock	3	4	0	4	5	5
No reason	2	4	3	0	0	0
Mercury	2	2	1	2	2	2
Do not like color	1	0	3	0	2	0
Prefer "Reveal" incandescents	1	0	0	0	5	5
Do not use lamp often	<1	0	0	2	0	0
Cost	<1	0	1	0	0	2
Design	<1	0	1	0	0	2

B.3.4 Customer Demographics

We do not show tables for education and homeownership because our weighting scheme is based on these two variables.

Table B–46: Type of Home

(Base: All Respondents)

Type of home	Connecticut Census	Telephone Survey	Onsite Survey
Sample size	*1,358,809*	*551*	*100*
Single-family detached house	61%	60%	60%
Single-family attached house (townhouse, row house, or duplex)	5	12	16
Apartment building with 2-4 units	17	10	11
Apartment building with 5 or more units	17	17	14
Mobile home or house trailer	1	1	0
Other	-	0	0
Don't know/Refused	-	0	0

* Total occupied housing units

** Duplexes counted with single-family attached in 2009, but with all two-to-four unit buildings in 2010, which is more in keeping with Census reporting.

Table B–47: Decade in Which Home was Built

(Base: Those living in houses)

Decade	Connecticut Census	Telephone Survey	Onsite Survey
Sample size	*1,358,809*	*435*	*100*
1930s or earlier	22%	26%	18%
1940s	23	8	7
1950s		22	23
1960s	28	10	8
1970s		14	14
1980s	13	10	10
1990s	7	6	6
2000 or later	7	5	5
Don't know/Refused (sample size)	-	22	8

* Total occupied housing units

Table B–48: Size of Home

(Base: All Respondents)

Square Feet	Telephone Survey	Onsite Survey
Sample size	*551*	*100*
Less than 1,400	39%	25%
1,400 – 1,999	31	28
2,000 –2,499	14	12
2,500 – 3,499	12	7
3,500 – 3,999	2	3
4,000 – 4,999	2	0
5,000 or more	<1	0
Don't know/Refused (sample size)	140	25

Table B–49: Rooms in Home

(Base: All Respondents)

Total Rooms	Connecticut Census	Telephone Survey	Onsite Survey
Sample size	*1,358,809*	*551*	*100*
1	2%	1%	0%
2	11	5	4
3		9	2
4	33	13	27
5		19	12
6	32	18	22
7		12	17
8	23	9	8
9		5	3
10 or more		9	3
Don't know/Refused (sample size)	-	8	2

*Total occupied housing units

** The ACS reports only 9 or more rooms.

Table B–50: Number of Persons Living the Home

(Base: All Respondents)

Number of household members	Connecticut Census	Telephone Survey	Onsite Survey
Sample size	*1,358,809*	*551*	*100*
1	28%	24%	25%
2	32	42	44
3	16	15	12
4	15	10	15
5	6	6	3
6 or more	3	2	1
Don't know/refused (sample size)	-	8	1

* Total occupied housing units

** The ACS reports only 4-or-more person household

Table B–51: Household Income

(Base: All Respondents)

Household Income	Connecticut Census	Telephone Survey	Onsite Survey
Sample size	*1,358,809*	*551*	*100*
Less than $15,000	10%	11%	7%
$15,000 to less than $20,000	5	10	6
$20,000 to less than $30,000	9	10	10
$30,000 to less than $40,000	8	9	12
$40,000 to less than $50,000	8	8	7
$50,000 to less than $75,000	17	18	22
$75,000 to less than $100,000	13	14	9
$100,000 to less than $150,000	16	11	10
$150,000 or more	14	10	7
Don't know (sample size)	-	14	2
Refused (sample size)	-	101	9

*All households

Table B–52: Gender

(Base: All Respondents)

Gender	Connecticut Census	Telephone Survey	Onsite Survey
Sample size	*3,574,097*	*551*	*100*
Female	51%	52%	58%
Male	49	48	42

* The census no longer lists the gender of the householder for married-couple families, so this is based on the total population of the state.

Appendix C Research Protocols

Telephone Survey Questionnaire

Hello, my name is _____ and I am calling from Tetra Tech on behalf of the Connecticut Energy Efficiency Fund with the cooperation of Connecticut Light and Power and The United Illuminating Company. May I please speak with [INSERT NAME ON THE ACCOUNT].

We are conducting a survey about household lighting. I'm not selling anything. I just want to ask you some questions about lighting in your home. You may have received a letter explaining the purpose of this call. For quality assurance and training purposes, this call will be recorded. [IF ACCOUNT HOLDER ISN'T AVAILABLE, READ] Is there an adult over the age of 18 available who is responsible for purchasing the light bulbs for your household? [IF NOT AVAILABLE, TRY TO RESCHEDULE AND THEN TERMINATE]

[IF NECESSARY, READ: THE CONNECTICUT ENERGY EFFICIENCY FUND IS SPONSORING THIS PROGRAM AND STUDY. THE CEEF CONTACT PERSON IS TIM COLE. IF YOU HAVE QUESTIONS, YOU CAN REACH HIM AT (860) 874-5813. IF YOU PREFER EMAIL, CT_EEB@ATT.NET.

AWARENESS OF ENERGY-SAVING LIGHT BULBS

S1. Before this call today, had you ever heard of Compact fluorescent light bulbs or CFLs?

1. Yes **[GO TO S2a]**
2. No **[GOT TO S2b]**
96. DON'T KNOW **[GOT TO S2b]**
97. REFUSED **[GOT TO S2b]**

S2a Just to confirm that we are talking about the same thing, compact fluorescent light bulbs – also known as CFLs – usually do not look like regular incandescent bulbs. The most common type of compact fluorescent bulb is made with a glass tube bent into a spiral, resembling soft-serve ice cream, and it fits in a regular light bulb socket. Was this light bulb what you were thinking of?

1. Yes **[GO TO S3]**
2. No **[GO TO S4]**
96. DON'T KNOW **[GO TO S4]**
97. REFUSED **[GO TO S4]**

S2b Compact fluorescent light bulbs – also known as CFLs – usually do not look like regular incandescent bulbs. The most common type of compact fluorescent bulb is made with a glass tube bent into a spiral, resembling soft-serve ice cream, and it fits in a regular light bulb socket. Thinking about it again, before today, had you heard of CFLs?

1. Yes **[GO TO S3]**
2. No **[GO TO S4]**

96. DON'T KNOW **[GO TO S4]**
97. REFUSED **[GO TO S4]**

S3. How familiar are you with CFLs? Would you say that you are…?

1. Very familiar
2. Somewhat familiar
3. Not too familiar
4. Not at all familiar

96. DON'T KNOW
97. REFUSED

S4. Another type of light bulb that is used in homes is called an L-E-D **[SAY THE LETTERS L-E-D]**, also known as a light emitting diode bulb. These bulbs have regular screw bases that fit into most sockets, but they are heavier than most other bulbs and have a white or yellow plastic cover over the light portion of the bulb. They are not battery-operated LEDs, holiday lights, or decorative strands and do not need special attachments to work in regular sockets. How familiar are you with L-E-D light bulbs that screw into regular light sockets? Would you say that you are…?

1. Very familiar
2. Somewhat familiar
3. Not too familiar
4. Not at all familiar

96. DON'T KNOW
97. REFUSED

S5. Another type of light bulb is a halogen bulb. These bulbs have regular screw bases that fit into most sockets; they do not need special attachments to work in regular sockets. The halogen looks similar to incandescent bulbs but they have a glass tube filled with halogen gas in the middle of the bulb. How familiar are you with halogen bulbs that screw into regular light sockets? Would you say that you are…?

1. Very familiar
2. Somewhat familiar
3. Not too familiar
4. Not at all familiar

96. DON'T KNOW
97. REFUSED

S6. **[ASK IF S3 = 1, 2, 3 OTHERWISE SKIP TO EISA1.]** While most CFLs are spiral shaped, CFLs also come in other shapes and some have special features. I'm going to read you a list of different types of CFLs. For each type, please tell me if you are very familiar, somewhat familiar, not too familiar, or not at all familiar with that type of CFL. **[RANDOMIZE ORDER OF A THROUGH F]**

[READ IF NECESSARY WITH EACH ITEM] Are you very familiar, somewhat familiar, not too familiar, or not at all familiar with this type of CFLs?

a. Dimmable CFLs. This refers to a CFL that can be used with a dimmer switch to adjust the level of brightness
b. 3-way CFLs. This refers to a CFL that has the ability to shine at 3 different levels of brightness in a 3-way lamp
c. Flood or recessed lighting CFLs—shaped like a regular incandescent floodlight
d. Candelabra CFLs. This refers to a CFL with a small base for use in a decorative fixture such as a chandelier. The spiral part of the bulb is usually covered so that it resembles the "flame" shape of most other chandelier bulbs.
e. Globe CFLs. This refers to a CFL that has a round shape and might be used in a fixture such as a vanity light
f. A-shaped CFLs. This refers to a covered CFL that is made to look and feel like a traditional incandescent or regular light bulb.

1. Very familiar
2. Somewhat familiar
3. Not too familiar
4. Not at all familiar
96. DON'T KNOW
97. REFUSED

EISA Awareness & Future Expectations

EISA1. Have you heard or read any information concerning upcoming changes in lighting standards from the federal government that have to do with incandescent light bulbs?

1. Yes **[GO TO EISA2]**
2. No **[GO TO EISA3]**
96. DON'T KNOW **[GO TO EISA3]**
97. REFUSED **[GO TO EISA3]**

EISA2. What you have heard? [RECORD VERBATIM; CONTINUE TO EISA3

EISA3. **[IF EISA1=1 READ** "We are interested in talking with you today about one change in lighting standards."] A new federal law, the Energy Independence and Security Act of 2007, restricts the sale of 100 Watt incandescents, or regular 100 Watt bulbs, manufactured after January 1, 2012. Had you heard about this new federal law before this call? **[IF NEEDED FOR EISA1=1 READ** "I understand you just described this change, but we still need you to confirm that you have heard about it."]

1. Yes
2. No
96. DON'T KNOW
97. REFUSED

EISA4. Do you currently use any 100 Watt incandescent light bulbs in your home?

1. Yes
2. No
96. DON'T KNOW
97. REFUSED

EISA5. **[IF EISA4 = 2]** Some people use 100 Watt incandescent bulbs and others do not. What are the reasons you don't use 100 Watt bulbs in your home? [**DO NOT READ RESPONSES; MULTPLE RESPONSE]**

1. (They are too bright)
2. (They use too much energy)
3. (My socket says only to use a certain Watt bulb/fixtures won't take such high wattage)
4. (Other [Specify: _____])
96. DON'T KNOW
97. REFUSED

EISA6. **[IF EISA4 NE 1]** Do you currently use ANY incandescent light bulbs, of any wattage, in your home?

1. Yes
2. No
96. DON'T KNOW
97. REFUSED

EISA7. **[READ ONLY IF EISA4 NE 2]** We are interested to know the type of bulb you would be likely to use instead of a 100-Watt incandescent bulb once this is no longer available for purchase. I'm going to name different types of bulbs that may be options and after I read the list, I'd like you to tell me which one you would be most likely to use instead of the 100-Watt incandescent bulb. **[READ ONLY IF EISA4=2]** We understand that you do not currently use any 100 Watt incandescent bulbs, but please tell me which of the following bulb types you would be most likely to use.

The options are **[READ ENTIRE LIST BASED ON INSTRUCTIONS BELOW]. THEN IMMEDIATELY ASK**: Which one of these bulbs would you be **most** likely to use [READ ONLY IF EISA4 NE 2] instead of the 100-Watt incandescent?
[PROGRAMMER: RANDOMIZE LIST. INCLUDE 2 IN LIST ABOVE AND IN THE ACCEPTABLE RESPONSES ONLY IF S5=1 OR 2; SIMILARLY, INCLUDE 3 ONLY IF (S3=1 OR 2) AND INCLUDE 4 ONLY IF S4=1 OR 2]

BULB TYPES
1. A lower wattage incandescent bulb
2. A 72 Watt screw-in halogen bulb meant to replace a 100 Watt incandescent bulb
3. A 23 Watt screw-in compact fluorescent bulb meant to replace a 100 Watt incandescent bulb
4. A 17 Watt screw-in LED [SAY THE LETTERS L-E-D] or light-emitting diode bulb meant to replace a 100 Watt incandescent bulb
5. A 150 Watt incandescent bulb
96. DON'T KNOW **[ONLY ALLOW FOR ENTIRE QUESTION]**
97. REFUSED **[ONLY ALLOW FOR ENTIRE QUESTION]**

EISA8. You said you would be most likely to instead use **[IF EISA7=1 SHOW:** a lower wattage incandescent bulb]/**[EISA7=2 SHOW:** a 72 Watt screw-in halogen bulb]**[IF EISA7=3 SHOW:** a 23 Watt screw-in compact fluorescent bulb]/**[IF EISA7=4 SHOW:** a 17 Watt screw-in LED bulb]/**[IF EISA7=5 SHOW:** a 150 Watt incandescent bulb)**].** Why that bulb?

1. **[RECORD VERBATIM]**

96. DON'T KNOW

97. REFUSED

EISA9. How likely are you to buy extra 100 Watt incandescent light bulbs and save them to use after they are no longer available at stores? Would you say you are . . . **[READ LIST]. [RECORD ONE ANSWER]**:

1. Very likely
2. Somewhat likely
3. Somewhat unlikely, or
4. Very unlikely to buy and save 100 Watt incandescent light bulbs for use after they are no longer available in stores?

96. DON'T KNOW
97. REFUSED

CFL USE AND SATISFACTION

[ASK CFL USE AND SATISFATION IF S3 = 1, 2, 3 OTHERWISE SKIP TO AT1 Alternative Lighting Technologies Section.]

USE1. Have you EVER used a compact fluorescent light bulb, or CFL, on the interior or exterior of your home?

1. Yes
2. No

96. DON'T KNOW
97. REFUSED

[IF USE1= 2, 96, 97, GO TO INTRO PRECEDING AT1 Alternative Lighting Technologies Section]

USE2. Do you CURRENTLY have CFLs installed on the interior or exterior of your home?

1. Yes
2. No

96. DON'T KNOW
97. REFUSED

USE3. How satisfied are you with the compact fluorescent light bulbs currently in your home or, if you have no CFLs installed right now, the ones you have used in the past? Would you say you are….?

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied

96. DON'T KNOW
97. REFUSED

USE4. In your experience, what do you like about compact fluorescent light bulbs? **[DO NOT READ; ALLOW MULTIPLE RESPONSE; IF RESPONDENT SAYS 'LIGHT QUALITY', PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. (Save energy)
2. (Save money on bills)
3. (Help environment)
4. (Longer bulb life)
5. (Other [SPECIFY])
6. (Do not like anything about them)

96. (DON'T KNOW)
97. (REFUSED)

USE5. **[IF S6a=1 or 2 (Very or Somewhat Familiar with dimmable CFLs); OTHERWISE SKIP USE7]** Do you currently use any dimmable CFLs in your home?

1. Yes **[GO TO USE6]**
2. No **[GO TO USE7]**

96. DON'T KNOW **[GO TO USE7]**
97. REFUSED **[GO TO USE7]**

USE6. Is there anything that you do NOT like about dimmable CFLs? [**DO NOT READ; ALLOW MULTIPLE RESPONSE; IF RESPONDENT SAYS 'LIGHT QUALITY', PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. (Do not dim to low light levels/Do not dim as low as incandescents)
2. (When dimmed with other CFLs, light LEVEL/BRIGHTNESS is not the same for all bulbs)
3. (When dimmed with other CFLs, light COLOR is not the same for all bulbs)
4. (Poor light color)
5. (Poor light output)
6. (Not bright enough)
7. (Too bright)
8. (Slow to turn on/brighten)
9. (Flicker)
10. (Buzz)
11. (Poor manufacturing (unspecified))
12. (Shorter bulb life than promised)
13. (Mercury/disposal issues)
14. (Other [SPECIFY])
15. (Nothing I don't like about them)

96. (DON'T KNOW)
97. (REFUSED)

USE7. Is there anything that you do NOT like about **[IF ASKED USE6, SAY: 'Other types of'] compact fluorescent light bulbs?] [DO NOT READ; ALLOW MULTIPLE RESPONSE; IF RESPONDENT SAYS 'LIGHT QUALITY' PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. (Poor light color)
2. (Poor light output)
3. (Not bright enough)
4. (Too bright)
5. (Slow to turn on/brighten)
6. (Flicker)
7. (Buzz)
8. (Poor manufacturing (unspecified))
9. (Shorter bulb life than promised)
10. (Mercury/disposal issues)
11. (Other **[SPECIFY]**)
12. (Nothing I don't like about them)

96. (DON'T KNOW)
97. (REFUSED)

ALTERNATIVE LIGHTING TECHNOLOGIES

[**ASK AT1 IF S4= 1, 2, OR 3**]

[**SKIP TO RECENT LIGHTING PURCHASES Section IF S4= 4, 96, 97**]

I'd like to ask you a few questions about your use of other types of light bulbs.

AT1. Are you currently using L-E-D screw in bulbs in your home—the kind that screw into regular light fixtures? **[IF NEEDED, READ "**I'm not interested in holiday lights, flashlights or any other kind of L-E-Ds. I only want to know about the ones that screw into regular light fixtures."**]**

1. Yes **[GO TO AT2]**
2. No **[GO TO BUY1]**

96. DON'T KNOW **[GO TO BUY1]**
97. REFUSED **[GO TO BUY1]**

AT2. Why did you decide to use the screw-in L-E-D? **[DO NOT READ; ALLOW MULTIPLE RESPONSE]**

1. (To give them a try)
2. (To save money/reduce my electricity or energy bill)
3. (To save electricity/energy)
4. (To help the environment/reduce greenhouse gases)
5. (Wanted a bulb that lasts a long time)
6. (It was given to me by a utility program)
7. (It was given to me by someone else **[PROBE TO MAKE SURE NOT A UTILITY PROGRAM; IF SO, RECORD AS '6']**
8. (Friend, family member, coworker recommended)
9. (It looked cool)
10. (Other **[SPECIFY]**)

96. DON'T KNOW
97. REFUSED

AT3. [IF AT1=1] In what types of fixtures do you have screw-in L-E-D bulbs installed in your home? Again these are only the LEDs that screw into regular light sockets. **[DO NOT READ. ALLOW MULTIPLE RESPONSES]**

1. (Ceiling/overhead lighting)
2. (In an appliance)
3. (In a particular room) [SPECIFY]
4. (General lighting/Wherever I can)
5. (Floor/Table/Portable lamps)
6. (Ceiling fans with lighting)
7. (Holiday lighting/Candle)
8. (Outdoor [various])
9. (Other) [SPECIFY]

96 (Don't know)
97 (Refused)

AT4. How satisfied are you with the screw-in L-E-Ds that you currently use in your home? Would you say you are….?

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied

96. DON'T KNOW
97. REFUSED

AT5. In your experience, what do you like about screw-in L-E-Ds? **[DO NOT READ; ALLOW MULTIPLE RESPONSE; IF RESPONDENT SAYS 'LIGHT QUALITY', PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. (Save energy)
2. (Save money on bills)
3. (Help environment)
4. (Longer bulb life)
5. (Can dim them)
6. (Other **[SPECIFY]**)
7. (Do not like anything about them)

96. (DON'T KNOW)
97. (REFUSED)

AT6. Is there anything that you do NOT like about screw-in L-E-Ds? **[DO NOT READ; ALLOW MULTIPLE RESPONSE; IF RESPONDENT SAYS 'LIGHT QUALITY', PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. (Price)
2. (Poor light color)
3. (Poor light output)
4. (Not bright enough)
5. (Too bright)
6. (Color of the light)
7. (Flicker)
8. (Buzz)
9. (Poor manufacturing (unspecified))
10. (Shorter bulb life than promised)
11. (Other **[SPECIFY]**)
12. (Nothing I don't like about them)

96. (DON'T KNOW)
97. (REFUSED)

RECENT LIGHTING PURCHASES

BUY1. Have you noticed any changes in the types of bulbs available for purchase in stores in the past three months, that is, since November 2011]?

1. Yes **[GO TO BUY2]**
2. No **[GO TO BUY3]**

96. DON'T KNOW **[GO TO BUY3]**
97. REFUSED **[GO TO BUY3]**

BUY2. What have you noticed? **[RECORD VERBATIM; PROBE FOR DETAILS]**

BUY3. Have you purchased any of the following types of light bulbs in the past three months? **[RANDOMIZE AND READ a-g THEN h; RECORD RESPONSE FOR EACH]**.

a. [**SKIP IF S3 GT 3**] Compact fluorescent light bulbs or CFLs that screw into regular light sockets

b. [**SKIP IF S4 GT 3**] L-E-Ds that screw into regular light sockets

c. [**SKIP IF S5 GT 2**] Halogen bulbs that screw into regular light sockets

d. Incandescent or regular light bulbs

e. Pin-based fluorescent tubes that can only be used in fluorescent light fixtures

f. Pin-based CFLs that can only be used in special light fixtures

g. Pin-based L-E-Ds that can only be used in special light fixtures

h. OTHER **[SPECIFY]**_____

1. Yes
2. No
96. DON'T KNOW
97. REFUSED

BUY4. What information do you look for when buying a bulb to help you decide which bulb to purchase? **[DO NOT READ. RECORD VERBATIM ANY RESPONSES THAT DO NOT FIT PRECODES. ACCEPT MULTIPLE RESPONSES.]**

01 (PRICE)
02 (LIGHTING FACTS/ENERGY FACTS LABEL)
03 (WATTAGE)
04 (WATT EQUIVALENCY)
05 (ENERGY STAR LABEL)
06 (UL, OR UNDERWRITERS LABORATORIES LABEL)
07 (LUMENS)
08 (CRI, OR COLOR RENDITION INDEX)
09 (BULB LIFE)
10 (DIMMING)
11 (3-WAY)
12 (SHAPE)
13 (MERCURY CONTENT)
14 (COLOR APPEARANCE, WARM/COOL, DAYLIGHT, ETC.)
95 (OTHER) **[SPECIFY]**
96 DON'T KNOW
97 REFUSED

BUY5. I'm going to read a list of types of information you might look for when buying a bulb. Please tell me whether or not you have looked for it. **[READ LIST]. [DO NOT SHOW ITEMS 01-14 RECORDED IN BUY4 [RANDOMIZE A-N, THEN READ M. RECORD AS YES/NO FOR EACH. ACCEPT MULTIPLE RESPONSE.]**

A. Price?
B. Lighting Facts Label?
C. Wattage?
D. Watt equivalency?
E. The ENERGY STAR label?
F. The UL, or Underwriters Laboratories Label?
G. Lumens?
H. CRI, or color rendition index?
I. Bulb life?
J. Dimming?
K. 3-Way ability?
L. Certain bulb shape?
M. Mercury content?
N. Color appearance?
O. Anything else I didn't already mention?**[SPECIFY]**

1. Yes
2. No
96. DON'T KNOW
97. REFUSED

BUY6. How important are the following in your decision on which light bulb to buy? For each, please use the following scale **[READ SCALE; REPEAT AS NEEDED]**.

1. Not at all important
2. Not very important
3. Neither important nor unimportant
4. Somewhat important
5. Very important
96. DON'T KNOW
97. REFUSED

[RANDOMIZE AND READ EACH]

A. How much the bulb costs to buy
B. How much the bulb costs to run [**IF NEEDED**, "That is, how much it will cost on your electricity bill"]
C. How long the bulb lasts before it burns out
D. How much energy the bulb uses

BUY7. How likely would you be to buy a bulb that costs $6, lasts seven years, and saves you $10 a year on your electricity bill, compared to a traditional incandescent light bulb?

1. Very unlikely
2. Somewhat unlikely
3. Neither likely nor unlikely
4. Somewhat likely
5. Very likely
96. DON'T KNOW
97. REFUSED

BUY8. How likely would you be to buy a bulb that costs $20, lasts 20 years, and saves you $10 a year on your electricity bill over those 20 years, compared to a traditional incandescent light bulb?

1. Very unlikely
2. Somewhat unlikely
3. Neither likely nor unlikely
4. Somewhat likely
5. Very likely
96. DON'T KNOW
97. REFUSED

Lumens & Key Lighting Knowledge

P1. Before this call, have you seen or heard of the terms "warm white" and "cool white"- as in the color white – used in relation to lighting?

1. Yes **[GO TO P2]**
2. No **[GO TO P3]**
96 DON'T KNOW **[GO TO P3]**
97 REFUSED **[GO TOP3]**

P2. What does the terms "warm white" and "cool white" – as in the color white - mean to you? [**DO NOT READ. RECORD VERBATIM. ALLOW MULTIPLE RESPONSE. IF RESPONDENT SAYS 'LIGHT QUALITY', PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. [RECORD VERBATIM]
96 REFUSED
97 DON'T KNOW

P3. Have you seen or heard of the word "lumens" used in relation to lighting?

1. Yes **[GO TO P4]**
2. No **[GO TO DEM1]**

96 DON'T KNOW **[GO TO DEM1]**
97 REFUSED **[GO TO DEM1]**

P4. What does the word "lumen" mean to you? [**RECORD VERBATIM. ALLOW MULTIPLE RESPONSE. IF RESPONDENT SAYS 'LIGHT QUALITY', PROBE FOR EXACTLY WHAT 'QUALITY' THEY MEAN]**

1. (LIGHT OUTPUT OR BRIGHTNESS)
2. (LIGHT COLOR)
3. (THE SAME AS WATTS)
4. (OTHER)[RECORD VERBATIM]

96 DON'T KNOW
97 REFUSED

CUSTOMER DEMOGRAPHICS

Now I have a few questions for statistical purposes only.

DEM1. What type of home do you live in? Is it a . . .?

1. Single-family detached house
2. Single-family attached house (townhouse, row house, or duplex)
3. Apartment building with 2-4 units
4. Apartment building with 5 or more units
5. Mobile home or house trailer
6. Other (Specify): _____

96. DON'T KNOW
97. REFUSED

[ASK DEM2 IF DEM1 = 1, 2. OTHERWISE, SKIP TO DEM3.]

DEM2. When was your home built? Please stop me when I get to the appropriate category.

1. 1930s or earlier
2. 1940s
3. 1950s
4. 1960s
5. 1970s
6. 1980s
7. 1990s
8. 2000 or later

96. DON'T KNOW
97. REFUSED

DEM3. Do you or members of your household own this home or do you rent?

1. Own/Buying
2. Rent/Lease
3. Occupied without Payment or Rent
4. OTHER (SPECIFY): _____

96. DON'T KNOW
97. REFUSED

DEM4. About how large is your home? [READ LIST IF NECESSARY]

1. Less than 1,400 square feet
2. 1,400 – less than 2000 square feet
3. 2,000 – less than 2500 square feet
4. 2,500 – less than 3500 square feet
5. 3,500 – less than 4000 square feet
6. 4,000 – less than 5000 square feet
7. 5,000 square feet or more

96. DON'T KNOW
97. REFUSED

DEM5. How many rooms are in your home, not counting bathrooms? [**HELP RESPONDENTS COUNT ROOMS IF NEEDED, KEEPING TRACK ON A PIECE OF PAPER OF THE NUMBER OF ROOMS AS THEY NAME THEM]**

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 or more
96. DON'T KNOW
97. REFUSED

DEM6. What is the highest level of education that you have completed so far?

[READ CATEGORIES, IF NECESSARY.]

1. Less than Ninth Grade
2. Ninth to Twelfth Grade, No Diploma
3. High School Graduate (includes GED)
4. Some College, No Degree
5. Associates Degree
6. Bachelor's Degree
7. Graduate or Professional Degree
96. DON'T KNOW
97. REFUSED

DEM7. Counting yourself, how many people normally live in this household on a full time basis? Please include everyone who lives in your home whether or not they are related to you and exclude anyone who is just visiting or children who may be away at college or in the military.

RECORD NUMBER OF PEOPLE ____
96. DON'T KNOW
97. REFUSED

DEM8. Which category best describes your total household income in 2010 before taxes? Please stop me when I get to the appropriate category.

1. Less than $15,000
2. $15,000 to less than $20,000
3. $20,000 to less than $30,000
4. $30,000 to less than $40,000
5. $40,000 to less than $50,000
6. $50,000 to less than $75,000
7. $75,000 to less than $100,000
8. $100,000 to less than $150,000
9. $150,000 or more

96. DON'T KNOW
97. REFUSED

DEM9. [INTERVIEWER: DO NOT READ.]

Sex:

1. Female
2. Male

RECRUIT FOR ONSITE SURVEY

R1. On behalf of the Connecticut Energy Efficiency Fund with the cooperation of Connecticut Light and Power and The United Illuminating Company, we are offering eligible households in your area $125 to allow a trained technician to visit their homes to gather more detailed information about the lighting and consumer electronics products used. The visit should take about an hour. By saying yes, you are simply agreeing to be considered for the follow-up study. We need to have a wide range of households across the state take part in the follow-up study, and you household may or may not be selected. Please do not call or write us to express your interest in this follow-up study. If we do select you for the study, we will contact you to set up an appointment. During the visit, there will be no attempt to sell you anything. The information gathered will be used to evaluate and improve the energy efficiency programs offered by your electric utility.

Would you be interested in being a part of this type of visit?

1. Yes **[CONTINUE TO R2]**
2. No **[THANK AND TERMINATE]**
3. (Don't know/Refused)

[IF R1=3] That's OK, you do not have to decide now. Would it be OK if I take your name and have someone call you when we are scheduling these visits?

1. Yes **[CONTINUE TO R2]**
2. No **[THANK AND TERMINATE]**

R2. **[IF YES]** What is your name? **[RECORD]**_____

R3. **[IF YES**] What is your address, city, state, and zip?
[RECORD]_____

R4. **[IF YES]** And what is the best number to call you about a visit?

[RECORD]_____

Thank you very much. As I said, we will be scheduling these visits in the next few weeks and will call you then.

Light Bulb REFERENCE

Bulb Shape	Code	Image	Bulb Shape	Code	Image
1. Twister/Spiral	**T**		7. Circline	**C**	
2. Globe (e.g., for bathroom vanity fixtures)	**G**		8. Tube Style	**TUB**	
3. A-lamp (shaped like standard incandescent)	**A**		9. Candelabra (pointed top with a candelabra screw base)	**CAN**	
4. Bullet/ Torpedo (pointed top, standard screw base)	**B**		10. Post, Capsule, Barrel (round top, standard screw base)	**CAP**	
5. Bug light (yellow color; do not confuse with LEDs with yellow filters)	**BUG**		11. Other (Describe to right of table)	**O**	
6. Spotlight/ reflector/flood	**S**		12. LED Globe	**LG**	
Bulb Style	**Code**	**Image**	**Bulb Style**	**Code**	**Image**
13. LED A-Bulb: note that appearance could differ, with a yellow filter or with the electronics hidden	**LA**		14. LED Bullet/Torpedo	**LB**	

15. LED Spotlight/ reflector/flood	**LS**		16. LED Circline	**LC**	
17. LED Tubes	**LTUB**		18. LED Candelabra	**LCAN**	
19. LED Capsule	**LCAP**		20. LED Rope	**LR**	

Connecticut Retrofit and Retail Products Study

Onsite Data Collection Form

Customer Name: _____Customer ID #_____

Customer Address: _____Inspector: _____

Date _____ Time _____

Introduction

"Hello, my name is _____, and I am working with NMR Group, Inc. NMR is working under contract with Connecticut Energy Efficiency Fund with the cooperation of Connecticut Light and Power and The United Illuminating Company. I'm here to meet with _____. As mentioned on the phone, I'm here to walk through your home and record the types of lighting fixtures and bulbs installed in each socket. [Customer should be expecting inspector]. During my visit I'll also be asking a few questions about your home's general characteristics and about lighting. In appreciation for your time, on behalf of Connecticut Energy Efficiency Fund with the cooperation of Connecticut Light and Power and The United Illuminating Company, we are offering you a payment of $125. Do you have any questions regarding my visit?"

Lighting Count

- **Record information on all interior and exterior lighting sockets on the attached sheets. Refer to bulb shape code list. Then ask:**

  "Now, I would like to see all light bulbs and fixtures that are not currently installed. This would include those you have bought and not yet installed as well as those that were installed and then removed."

- **Record information on all bulbs in storage on the attached sheet.**

Customer Survey

- **Then ask:** "I would like to ask you some questions."
- **Ask the resident the questions listed on the last page of the form**

Home Schematic

[Sketch a simple dimensionless diagram of home layout. Label rooms.]

Room	Fixture Type by Location				# of Fixtures	# of Sockets	Bulb Type	Bulb Shape	Socket Type	Watts	Dimmable ?	3-Way?	# Bulbs	Notes
	Ceiling R=Recessed P=Pendant F=Flush mount T=Track CF=Ceiling Fan O=Other [Specify]	**Wall** W=Wall mount N=Night light O=Other [Specify]	**Portable** T=Table F=Floor O=Other [Specify]	**Other/Outdoor** U=Under cabinet [See Outdoor types under 'Rooms']	#	#	I=Incandescent CFL=CFL F=Fluorescent LED=LED O=Other [Specify] E=Empty Socket	T=Twist/Spiral G=Globe A=A-lamp B=Bullet/Torpedo Bug=Bug light S=Spot/Reflector/Flood C=Circline Tub=Tube Cap=Capsule/Post/Barrel Can=Candelabra O=Other [Specify]	S=Screw P=Pin G=GU O=Other [Specify]	#	Y=Yes N=No	Y=Yes N=No	#	

Customer ID: _____ **Page __ of__ Pages**

Data Collection Form for ALL bulbs in Storage [Including CFL, Incandescent, Halogen, LED, etc]

Bulb Type	Bulb Shape	Base Type	Watts	Dim?	3-way?	# Bulbs	# stored bulbs removed from sockets/fixtures	Where bulbs removed from	Why are you storing these bulbs?	What types of bulbs will these bulbs likely replace?
I=Incandescent CFL=CFL F=Fluorescent LED=LED O=Other [Specify]	T=Twist/Spiral G=Globe A=A-lamp B=Bullet/Torpedo Bug=Bug light S=Spot/Reflector/Flood C=Circline Tub=Tube O=Other [Specify]	S=Screw P=Pin G=GU Can=Candelabra O=Other [Specify]	#	Y=Yes N=No	Y=Yes N=No	#	#	Room	1= Storing for future use 2= Do not fit or work with fixture 3= Other [Specify]	1= CFL 2= Incandescent 3= Both/whichever needs replacing first 4= Other [Specify]

Customer Survey

IF NO CFLS INSTALLED OR IN STORAGE

[Show interviewee an actual CFL bulb]

[ASK] Are you familiar with this type of energy efficient light bulb that you could use in place of a traditional screw-in incandescent bulb?

Yes ***[IF YES; Ask]*** Is there a reason you haven't installed any CFL Bulbs in your home?

No

IF AT LEAST ONE <u>SPIRAL</u> CFL INSTALLED OR IN STORAGE

[SHOW RESPONDENT A SPIRAL CFL. ASK] When was the last time you purchased a **<u>spiral</u>** CFL?

In the past 12 months ***[ASK WILLINGNESS TO PAY SPIRAL QUESTIONS]***

More than 12 months ago ***[SKIP TO CH1]***

<u>WILLINGNESS TO PAY - SPIRAL CFLs.</u> **IF RESPONDENT PURCHASED ANY <u>SPIRAL CFLS</u> IN THE PAST YEAR, ASK THEM TO SHOW YOU THE MOST RECENTLY PURCHASED <u>SPIRAL CFL</u>, EVEN IF IN STORAGE**

[ASK] Thinking about the most recent spiral CFL you purchased, about how much do you remember paying for this spiral CFL? If the bulb was a part of a multipack, tell me how much you paid for the entire pack and the number of CFLs in it.

[IF PURCHASED WITH A COUPON, ASK FOR THE FINAL PRICE, AFTER APPLYING THE COUPON]

Single Bulb Price:

Multi Pack Price: Pack Size: Price/Bulb =

[READ:] This would be about [INSERT RESULT] per bulb, right? ***[IF OKAY, CONTINUE, IF NOT TRY TO GET BETTER ESTIMATE, THEN CONTINUE]***

[IF THEY DON'T KNOW THE PRICE, ASK:] Was it more or less than $3 per bulb?

More Less DK ***[IF STILL DON'T KNOW, GO TO PRICE1A]***

PRICE1 **IF PRICE = $0 to $2.75**

PRICE1 **IF PRICE = $2.76 to $4.25**

A

Would you have purchased this CFL if it had cost $3?

Yes ☐ **GO TO PRICE1B**

No ☐ **GO TO CH1**

B

Would you have purchased this CFL if it had cost $4.50?

Yes ☐ **GO TO PRICE1C**

IF YES AND ASKED PRICE1A, GO TO PRICE2E

No ☐ **GO TO CH1**

PRICE1C **IF PRICE = $4.26 to $8.75**

Would you have purchased this CFL if it had cost $9?

Yes ☐ **GO TO PRICE1D**

IF YES AND ASKED PRICE1B, GO TO PRICE2E

No ☐ **GO TO CH1**

PRICE1D **IF PRICE = $8.76 to $14.75**

Would you have purchased this CFL if it had cost $15?

Yes ☐ **GO TO PRICE1E**

No ☐ **GO TO CH1**

PRICE1E **IF PRICE = $14.75 or more**

What is the price at which this CFL would have become too expensive to consider buying?

Price ☐

DK ☐

At no price is it too expensive ☐

CH1. [ASK ONLY IF BULB WAS NOT GIVEN TO RESPONDENT (FREE or PRICE = $0)]

Thinking about the same spiral CFL, where did you purchase this spiral CFL? ☐☐

If this store had not carried CFLs would you have:

Bought an incandescent (regular light bulb) ☐

Gone to another store within a short time to buy a CFL ☐ What store? ☐☐

Or done something else? ☐ Record other: ☐☐

IF AT LEAST ONE <u>SPECIALTY</u> CFL INSTALLED OR IN STORAGE

[SHOW RESPONDENT A SPECIALTY CFL. ASK] When was the last time you purchased a **<u>specialty</u>** CFL?

In the past 12 months		***[ASK WILLINGNESS TO PAY SPECIALTY QUESTIONS]***
More than 12 months ago		***[SKIP TO CH2]***

<u>WILLINGNESS TO PAY - SPECIALTY CFLs.</u> **IF RESPONDENT PURCHASED ANY <u>SPECIALTY CFLS</u> IN THE PAST YEAR, ASK THEM TO SHOW YOU THE MOST RECENTLY PURCHASED <u>SPECIALTY CFL</u>, EVEN IF IN STORAGE**

TYPE OF SPECIALTY BULB:

[ASK] Thinking about the most recent specialty CFL you purchased, about how much do you remember paying for this specialty CFL? If the bulb was a part of a multipack, tell me how much you paid for the entire pack and the number of CFLs in it.

[IF PURCHASED WITH A COUPON, ASK FOR THE FINAL PRICE, AFTER APPLYING THE COUPON]

Single Bulb Price:

Multi Pack Price: Pack Size: Price/Bulb =

[READ:] This would be about [INSERT RESULT] per bulb, right? ***[IF OKAY, CONTINUE, IF NOT TRY TO GET BETTER ESTIMATE, THEN CONTINUE]***

[IF THEY DON'T KNOW THE PRICE, ASK:] Was it more or less than $5 per bulb?

More Less DK ***[IF STILL DON'T KNOW, GO TO PRICE1A]***

PRICE2A **IF PRICE = $0 to $4.75**

Would you have purchased this CFL if it had cost $5?

Yes **GO TO PRICE1B**

PRICE2B **IF PRICE = $4.76 to $7.25**

Would you have purchased this CFL if it had cost $7.50?

Yes **GO TO PRICE1C**

IF YES AND ASKED PRICE1A, GO TO PRICE2E

No ☐ **GO TO CH1**

PRICE2C **IF PRICE = $7.26 to $14.75**

Would you have purchased this CFL if it had cost $15?

Yes ☐ **GO TO PRICE1D**

IF YES AND ASKED PRICE1B, GO TO PRICE2E

No ☐ **GO TO CH1**

No ☐ **GO TO CH1**

PRICE2D **IF PRICE = $14.76 to $24.75**

Would you have purchased this CFL if it had cost $25?

Yes ☐ **GO TO PRICE1E**

No ☐ **GO TO CH1**

PRICE2E **IF PRICE = $24.75 or more**

What is the price at which this CFL would have become too expensive to consider buying?

Price ☐ At no price is it too expensive ☐

DK ☐

CH2. [ASK ONLY IF BULB WAS <u>NOT</u> GIVEN TO RESPONDENT (FREE or PRICE = $0)]

Thinking about the same spiral CFL, where did you purchase this spiral CFL? ☐☐

If this store had not carried CFLs would you have:

Bought an incandescent (regular light bulb) ☐

Gone to another store within a short time to buy a CFL ☐ What store? ☐☐

Or done something else? ☐ Record other: ☐☐

Lighting Decisions

- Ask for all rooms below.
- Ask for two fixture types with the highest number of bulbs in each room.
- If interviewee does not use the Master Bedroom or if there is no Master Bedroom, ask the interviewee about the bedroom he/she uses.
- If interviewee does not use the Main Bathroom or if there is no Main Bathroom, ask the interviewee about the bathroom he/she uses.

LD1. Now I'd like to ask you about how you decide what bulbs to use in different parts of your home. **[proceed to nearest room on the list]** How did you decide what kind of bulbs to install in [fixture type]? **[proceed to next nearest room on the list and repeat]**

Room	**Most Common**	**Fixture Type**	**How do you decide what types of bulbs to install in your_____**
Kitchen	First		
	Second		
Dining Room/Area	First		
	Second		
Master Bedroom	First		
	Second		
Living or Family Room	First		
	Second		
Main Bathroo	First		

m	Second		

LD2. What are the most important characteristics you look for in a light bulb for your [room]?
[Probe for additional responses: Are there any other characteristics that are important to you?**]**

Room	Kitchen	Dining Room/ Dining Area	Master Bedroom	Living/ Family Room	Main Bathroom
Price					
Wattage					
Life of Bulb					
Energy Efficiency					
Brightness					
Bulb Size					
Color					
Bulb Shape					
Manufacturer					
Durability					
Dimmability					
Three-way					
Other (Specify)					

LD3. **[IF NO CFLS IN HOME AT ALL SKIP] [IF NO CFLS INSTALLED IN SPECIFIED ROOM, ASK]** What is the one more important reason you do not have any CFLs installed in [*room*]? **[DO NOT READ. SELECT ONE RESPONSE]**

Reason	Kitchen	Dining Room/ Dining Area	Master Bedroom	Living/ Family Room	Main Bathroom
Do not fit properly					
Do not like light color					
Interference with radio, TV, other electronics					
Delay in light coming on					
CFLs not bright enough					
CFLs do not work with dimmer					
Do not like appearance					
Have not gotten around to buying CFL(s)					
Have not gotten around to installing CFL(s)					
Not aware of CFL for application					
Waiting to be given CFL(s)					
Do not use lamp often					
Other (Specify): _____					
Refused					

Homeowner Verification of Receipt of Incentive Payment

My signature below is provided only to verify that I did receive a $125 incentive check from the visiting inspector, as previously agreed upon, on the date indicated.

Name: _____

Address: _____

Signature: _____ Date: _____