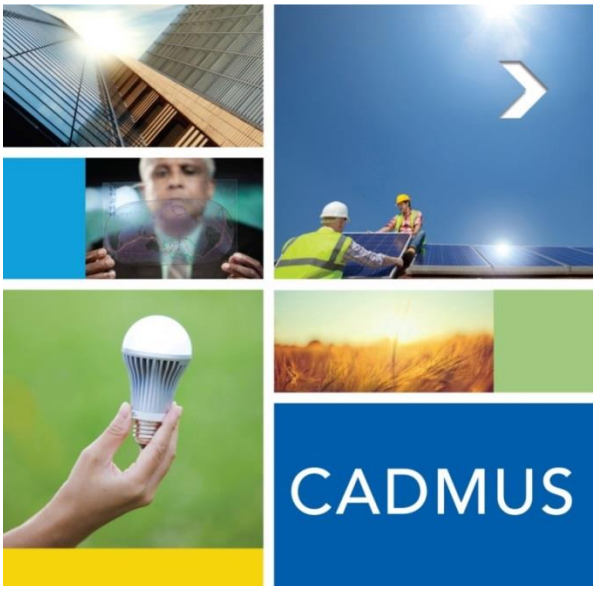


NMR Group, Inc.

# Residential Lighting Shelf Survey and Pricing Analysis

FINAL REPORT

June 8, 2013

**Cape Light Compact**
**National Grid**
**NSTAR Electric**
**Unitil**
**Western Massachusetts Electric Company**
**Energy Efficiency Advisory Council Consultants**

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## Executive Summary

On behalf of the Massachusetts ENERGY STAR® Lighting program administrators (PAs), the NMR Group, Inc. subcontracted with Cadmus and KEMA (collectively referred to as the Team) to perform research to assess the effect of the Mass Save® residential lighting program on the following:

- CFL prices in the state, relative to competing lighting products.
- The amount of shelf area dedicated to CFLs for participating retailers.
- The pricing, number of packages of bulbs, and shelf location of CFLs and LEDs relative to other lighting types in participating and former participating stores.
- Compare the results of the current survey to results from a similar survey conducted in 2010

To perform this analysis, the Team designed and analyzed a shelf-stocking survey and a hedonic pricing regression analysis. Lockheed Martin and KEMA performed the in-store data collection for the shelf-stocking survey. This work serves as one task being completed as a part of the broader Residential Retail Products residential lighting evaluation.

The Team performed the shelf-stocking study between August and September 2012. During visits to a representative sample of 101 stores in Massachusetts, 70 of which were participants and 31 of which were former participants, we collected data on 2,236 CFL packages. We also matched the shelf-stocking data to the PAs' tracking database of both CFL sales and the paid incentives, so that we could compare the advertised retailer discount amount to the incentives paid by the PAs to the manufacturer and retail partners.

In contrast to the previous shelf-stocking study performed in 2010, starting this year we also collected data on shelf space, shelf location, and pricing of non-CFL bulbs. We collected data for 1,073 halogen, 2,634 incandescent, and 755 LED packages. We compared the average price and number of packages displayed of competing bulbs (incandescents, halogens, and LEDs) to CFLs).

In the hedonic pricing regression analysis, we used data collected in the shelf-stocking study to create a regression model in which the price of a product is regressed on the product's characteristics. The idea behind the hedonic pricing model is that variation in the product's price can be explained by the product's observable attributes, which are not explicitly traded in the market. The shelf-stocking survey and hedonic pricing regression analysis considered both standard bare-spiral and specialty CFLs. We used the results to estimate the average price differentials between program and non-program bulbs, which are indications of the program incentives' impact on retail prices.

The Team's key findings are these:

- After controlling for differences in wattage, sales channel, manufacturer, and other characteristics between discounted and undiscounted standard CFLs, the impact of the PA discount was to reduce the register price of program-discounted CFLs by an average of $1.76 (with a 90% confidence interval ranging from $1.36 to $2.15). The point estimate of $1.76 is 86% of the amount of the PA incentive. This compares to an average impact of $1.46 in 2010, which was 117% of the PA incentive amount in that year. Thus, in 2012, it appears that partners are not passing the full PA incentive onto consumers. A limited Internet search of current (June 2013) prices for 13-Watt spirals supported by the PAs in 2012 in Massachusetts and a non-program area also shows some evidence for this same conclusion, but future research will be needed to provide more systematic evidence.
    - ***Consideration 1:*** In the next evaluation cycle, the PAs should consider supplementing the hedonic pricing analysis with an internet based comparison of light bulb prices in Massachusetts and comparison areas. The team would compare the price difference for each bulb to the incentive amount provided for that bulb, and summarize the results across all bulbs and bulb categories (e.g., 13-Watt spirals, CFL candelabras, CFL reflectors, 9-12 Watt LEDs, 13-17 Watt LEDs, etc.) and individual retail chains.
    - ***Consideration 2:*** Alternatively or in addition to the above approach to examining prices, the program implementation contractor could be given greater responsibility for verifying or quantifying the amount of PA discounts being applied to promoted products. This could be done through a combination of internet research and their in-field presence in other jurisdictions where some of the Massachusetts supported products are not supported. Special attention should be paid to LEDs given their rapidly increasing importance in the program but also the continual decrease in their unsupported prices.
- The PA incentive was associated with a decrease in A-bulb, reflector, and globe CFLs bulb prices ranging from $0.96 to $2.15. This price reduction was less than we observed in 2010 when the price decrease ranged from $2.33 to $3.61.
- Stores selling PA-discounted CFLs tend to have a higher percentage of CFL packages than former participating stores. Approximately 51% of packages on sale at participating stores are CFLs compared to 28% at former participating stores, a difference of 23%. This difference is important given that the former participating stores were historically touched by the program. In 2010 we compared shelf space allocated to CFLs between participating and former participating stores (rather than packages for sale) and that difference was 18%. The 2010 data were unweighted and therefore results are not directly comparable to 2010 at the total program level.
- In participating stores, the percentage of shelf space allocated to CFLs increased across most distribution channels from 2010 to 2012.

Figure 1 illustrates the allocation of packages among participating and former participating stores for various bulb types. CFLs and LEDs make up a larger share of inventory among participants than former participants.

**Figure 1. Allocation of Bulb Types for Participants and Former Participants**

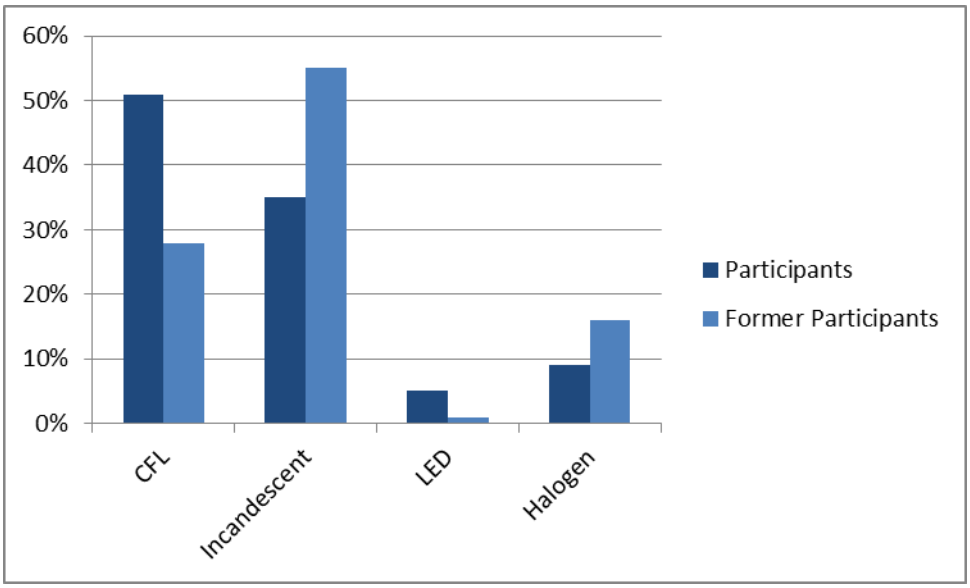
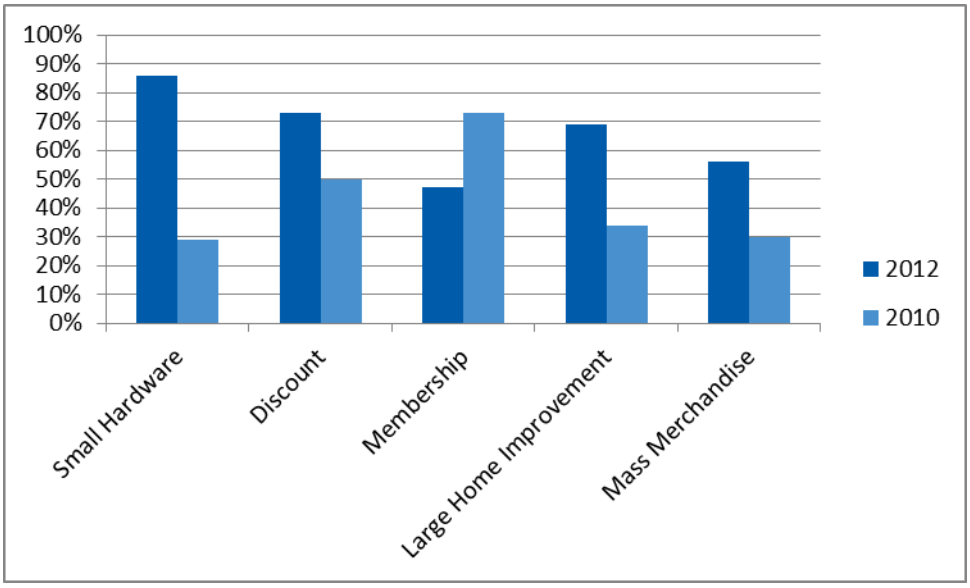



Figure 2 shows how shelf space for comparable retail channels between 2012 and 2010 have changed between shelf surveys. In all retail categories except Membership, CFL shelf space has increased.

Figure 2. Participant CFL Shelf Space Comparison from 2012 to 2010



# Introduction

On behalf of the Massachusetts ENERGY STAR® Lighting program administrators (PAs), the NMR Group, Inc. subcontracted with Cadmus and KEMA (hereafter referred to as the Team) to perform research to assess the effect of the Mass Save® residential lighting program on the following:

- CFL prices in the state, relative to competing lighting products.
- The amount of shelf area dedicated to CFLs in participating stores.
- The pricing, number of packages of bulbs, and shelf location of CFLs relative to other lighting types in participating and former participating stores.
- Compare the results of the current survey to results from a similar survey conducted in 2010

To perform this analysis, The Team designed and analyzed a shelf-stocking survey of 2,236 CFL, 1,073 halogen, 2,634 incandescent, and 755 LED packages at 101 retail stores. We also developed a hedonic pricing regression analysis to isolate the effects of the program on CFL prices. Lockheed Martin and KEMA performed the in-store data collection. This work serves as one task being completed as a part of the broader Residential Retail Products residential lighting evaluation.[1]

## *Shelf-Stocking Survey*

We designed the shelf-stocking survey to gather price data, number of models, and bulb location on all lighting products in a sample of participating and former participating retail stores, stratified by retail channel. In addition, we measured shelf space devoted to CFLs and LEDs versus other types of light bulbs in each participant store. The shelf survey data collection forms for both participant and former participant stores are included in Appendix A. The analysis provides a snapshot of the range of product types offered in both participating and former participating stores. It allows for program designers to assess the product coverage and program impacts on stocking in participating stores relative to former participating stores.

## *Hedonic Pricing Regression Analysis*

The main goal for using the hedonic pricing regression analysis was to estimate the impact of PA incentives on the retail price of CFLs sold in a representative sample of Massachusetts retailers. We also discuss whether the entire PA incentive is being passed along to consumers, but it should be kept in mind that this is a secondary result of the analysis, with the main result being to understand the program impact on retail prices.

## *Economic Theory of Program Incentives*

The economic theory behind this analysis focuses on profit-maximizing retailers such as drug stores or home improvement stores that sell CFLs. These retailers have some ability to choose prices for CFLs

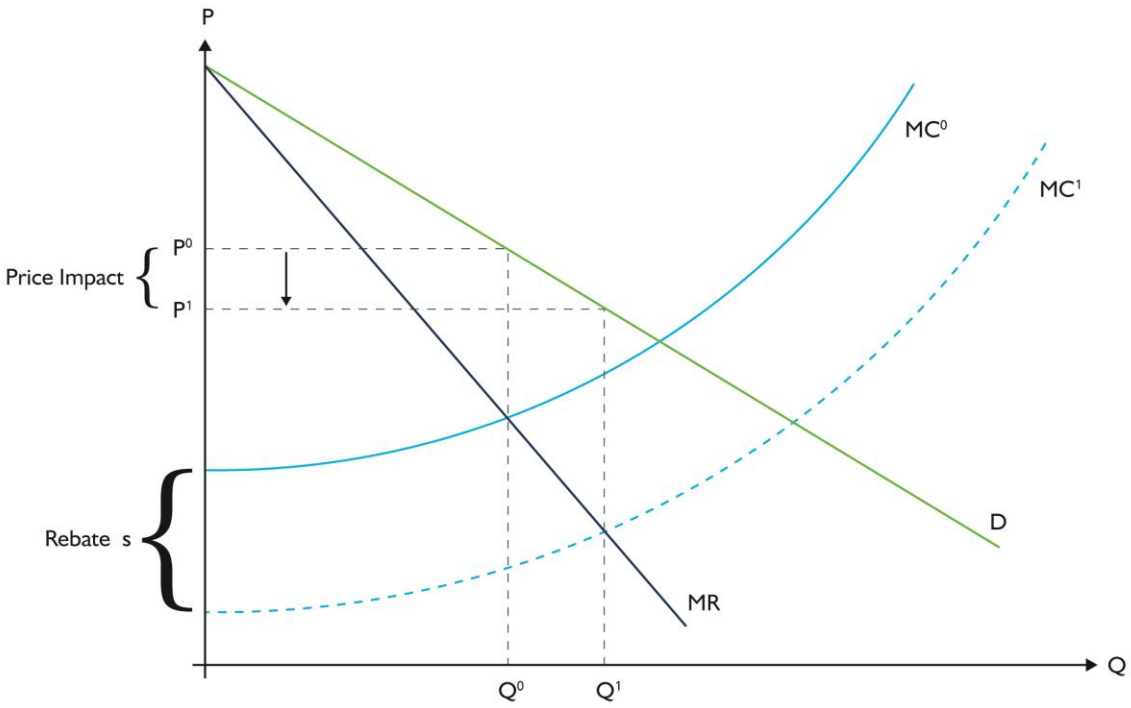
[1] The other components include consumer lighting surveys, onsite saturation studies, supplier interviews, and the market adoption model.

because of product and store differentiation and, thus, the retailers face a downward-sloping demand curve rather than a flat, perfectly elastic one. However, while these retailers have some ability to select a price for CFLs, their ability to raise prices is limited by competition from similar retailers offering the same products.

Figure 3 shows the downward-sloping demand curve of CFLs for a typical Massachusetts retailer. The horizontal axis shows the quantity of CFLs, and the vertical axis shows the retail price. Below the demand (D) curve is the marginal revenue (MR) curve, which shows the additional revenue earned by the retailer for each CFL it sells.

The figure also shows the retailer's marginal cost of sales curve ($MC^0$), which is the cost of selling each additional CFL. This curve is upward sloping, indicating that the marginal cost of sales is increasing and that the retailer requires a higher price to sell more CFLs. The profit-maximizing price is chosen by equating marginal revenue and marginal cost. This occurs at $Q^0$ and results in a price of $P^0$.

**Figure 3. Illustration of Retail Price Impact of PA Incentives**




The figure also shows the impact of a program incentive per CFL (*s*) on the retail price of CFLs. For example, if a manufacturer passes the full amount of the subsidy to retailers, then at every quantity of output, a subsidy of *s* shifts the marginal cost curve down by the amount of the subsidy. Consequently, instead of a price of P to sell Q units of CFLs, the retailer now requires only a price of P-*s*.

The retailer selects a new price by choosing a quantity ($Q^1$) that equates marginal revenue with the new marginal cost ($MC^1$). This new equilibrium price is $P^1$. The new subsidized price will always be below the original price if the demand curve is downward sloping. The difference in the prices before and after the subsidy will depend on the price elasticity of demand and the shape of the marginal cost curves, and it may be less than or equal to the amount of the subsidy. The impact of the subsidy on retail price will be smaller when demand is very inelastic.

The hedonic pricing analysis is important because it estimates the program impact on final retail energy-efficiency lighting prices, accounting for all the other price-impacting variables (wattage, bulb type, ENERGY STAR designation, etc.).

Despite the strength of the theoretical model, there are, however, several reasons why the estimated impact of the PA incentive may differ from the impact predicted in the model, two of which are pertinent to this analysis. First, retailers may reduce or increase the prices of discounted CFLs relative to the theoretical price, so that prices end in 9 or 99 cents. Second, the actual and theoretical price effects may differ because PA subsidies may lead retailers to reduce the prices of undiscounted bulbs (although we cannot determine whether that is the case). In a cross-sectional analysis of CFL prices, this would have the effect of reducing the impact of the subsidy on CFL prices.

## Shelf Stocking Survey

### *Methodology*

The shelf-stocking surveys covered a geographically representative sample of stores across Massachusetts. The store sample was also designed to be representative of the retail channels through which CFL sales occur in the state. Lockheed Martin provided the Team with lists of the 1,430 participating and 1,105 nonparticipating retailers (past participants that were currently inactive, which we refer to as former participants)[2], which the Team then segmented by retail channel. These retail channels include drug and grocery (combined for participants), mass merchandise, home improvement, and membership (not available for former participants). The Team also stratified participants by size (according to total incentive dollars paid) to ensure we included different participation levels. We did, however, exclude stores whose total incentive payments were in the lowest 2% of total incentives paid to ensure we were focusing on active participants. Table 1 and Table 2 contain summary statistics for the both participant and former participant stores in the survey as well as the population of stores.[3] Results were weighted to address differences in distribution channels (discussed in more detail below), however we did not weight the sample by metropolitan area as the sample distribution is similar to the population and we did not anticipate major differences by metropolitan area.

[2] The Team recognizes that drawing the sample of nonparticipating stores from among former program participants likely biases the results somewhat, possibly towards those nonparticipating stores carrying more energy-efficient lighting than stores that have never been a program partner. However, the Massachusetts lighting program has such a long history and has involved so many retailers that the Team and implementer could not identify a method of sampling stores with no history of program participation. They elected to use this approach. In the 2010 study the team utilized lists of stores identified by survey participants in a general population CFL User Survey. The final list of stores in the 2010 sample also included a large number of formerly participating stores.

[3] The metropolitan statistical area is based on the U.S. Census Bureau definitions. Each metropolitan statistical area "…is a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration" and that "must have at least one urbanized area of 50,000 or more inhabitants." http://www.census.gov/population/www/metroareas/aboutmetro.html

Table 1. Store and Population Allocation by Distribution Channel (n=101)

| Distribution Channel | Participants | | Former participants | |
|---|---|---|---|---|
| | Percent in Sample | Percent in Population | Percent in Sample | Percent in Population |
| Discount | 25.7 | 30.9 | 25.8 | 12.4 |
| Drug Store | N/A | N/A | 6.5 | 22.9 |
| Grocery* | 14.3 | 27.9 | 9.7 | 34.3 |
| Large Home Improvement | 24.3 | 6.8 | 22.6 | 5.2 |
| Mass Merchandise | 11.4 | 8.6 | 19.4 | 2.5 |
| Membership** | 7.1 | 5.4 | N/A | N/A |
| Small Hardware | 17.1 | 20.5 | 16.1 | 22.6 |
| **Total** | **100%** | **100%** | **100%** | **100%** |

* For participants, the grocery category includes drug stores

** No membership stores were included on the former participant list

Table 2. Store and Population Allocation by Metropolitan Area (n=101)

| Metropolitan Area | Participants | | Former participants | |
|---|---|---|---|---|
| | Percent in Sample | Percent in Population | Percent in Sample | Percent in Population |
| Barnstable Town | 5.7 | 10.2 | 3.2 | 3.8 |
| Boston-Quincy | 35.7 | 26.6 | 25.8 | 29.4 |
| Cambridge-Newton-Framingham | 20.0 | 18.4 | 12.9 | 21.3 |
| Peabody | 14.3 | 7.0 | 9.7 | 11.1 |
| Pittsfield | 4.3 | 3.6 | 6.5 | 2.6 |
| Providence-New Bedford-Fall River | 7.1 | 9.8 | 9.7 | 8.9 |
| Springfield | 8.6 | 14.0 | 6.5 | 9.3 |
| Worcester | 4.3 | 10.4 | 25.8 | 13.6 |
| **Total** | **100%** | **100%** | **100%** | **100%** |

## *Key Details about the Sample*

Discount stores comprised the largest single retail channel category, accounting for 26% of stores in the sample and 22% of the total population of stores. Large home improvement stores accounted for 24% of the sample, which was disproportionately high given that this group accounts for only 6% of the population; however, we oversampled from this channel because of its large contribution to overall and program-supported light bulb sales. Small hardware accounted for 17% of the sample compared to 21% for the population. When conducting the analysis, the Team weighted the final sample by retail channel to be representative of the population. The largest number of stores was in the Boston-Quincy and Cambridge-Newton-Framingham metropolitan areas (collectively 51% of the sample and 48% of the total population of stores). The distribution of the sample by metropolitan area was representative of that of the total population of stores.

When designing the sample, the Team also included "backup" stores in each category to allow for maintaining the sample distribution in the case of store refusals to participate. Table 3 shows how the original shelf-survey sample compares to actual completions, with the actual number of completions meeting or exceeding the sample goals due to the built-in backup stores. In reporting our findings we weighted the final sample to be representative of the total population of participant and former participant stores. The weights were calculated as the population size divided by the sample size by retail distribution channel for participants and former participants separately. This is a change from 2010, when no weights were applied to the sample; while we still compare 2010 and 2012 results, the lack of weighting in 2010 limits our ability to draw strong conclusions about changes in the market over the past two years.

**Table 3. Sample and Completed Shelf Survey Store Population by Store Type and Participation Status**

| Store Type | Participants | | | Former participants | | |
|---|---|---|---|---|---|---|
| | Population | Sample Goal | Completed | Population | Sample Goal | Completed |
| Discount | 242 | 19 | 18 | 83 | 8 | 8 |
| Large Home | 53 | 16 | 17 | 35 | 7 | 7 |
| Membership and Mass Merchandise | 109 | 14 | 13 | 17 | 6 | 6 |
| Small Hardware | 160 | 12 | 12 | 151 | 5 | 5 |
| Grocery and Drug | 218 | 9 | 10 | 382 | 4 | 5 |
| **Totals** | **782** | **70** | **70** | **668** | **30** | **31** |

At each store, surveyors collected information about the product characteristics and the prices of distinct packages of bulbs on the shelves. Each observation in the data was a unique type of bulb package sold at each store. Information on a total of 2,236 CFLs, 1,073 halogen, 2,634 incandescent, and 755 LED packages was collected. Note that identical CFL models in different package groupings (e.g., two pack and four-pack) were counted as two observations in the shelf-stocking data.

The product information collected for each package consisted of the following:

- Bulb type (CFL, incandescent, specialty, etc.)
- Bulb style (A-line, bare-Spiral , etc.)
- Wattage
- Lumens
- Number of bulbs in the package
- Number of packs on shelf.

Our Team also recorded special features such as dimmable, three-way, and ENERGY STAR designation.

Table 4 shows the CFLs recorded by wattage, package size, manufacturer, and retail channel of the four CFL bulb types for which the pricing analysis was conducted: (1) standard bare-spirals; (2) A-line bulbs;

(3) floods; and (4) globes. These types accounted for 89% of all CFLs in the shelf-stocking survey. The remaining bulb types, which were not included in the pricing analysis, were three-way or dimmable bare-spiral, bug/party, flame/decorative, nightlights, torpedo/bullet, or tube CFLs. The table shows a wider coverage of available bulb types and wattages in participating stores compared to the former-participant stores. It is worth noting that, weighing the data by the number of stores in the distribution channel contributes to the high percentage of CFLs in single-packs (63%). However, stores typically associated with the highest CFLs sales (e.g., Home Improvement) have the highest inventory of multipacks and the lowest inventory of single-packs.

Table 4. CFLs Recorded by Wattage, Package Size, Manufacturer, and Retail Channel*

| | Participants | | | | Former Participants | | | |
|---|---|---|---|---|---|---|---|---|
| | Standard Bare-Spiral | A-line | Flood | Globe | Standard Bare-Spiral | A-line | Flood | Globe |
| **Wattage (%)** | | | | | | | | |
| Less than 11 Watts | 7.8% | 17.5% | 0.7% | 42.7% | 5.3% | 26.3% | 0.0% | 11.7% |
| 11 to 15 Watts | 35.0% | 61.5% | 47.3% | 54.3% | 43.6% | 48.9% | 53.3% | 88.3% |
| 16 to 20 Watts | 16.5% | 17.7% | 13.7% | 2.1% | 13.4% | 0.0% | 19.6% | 0.0% |
| 21 to 25 Watts | 17.3% | 0.0% | 21.4% | 0.0% | 19.2% | 0.0% | 24.5% | 0.0% |
| Greater than 25 Watts | 23.4% | 3.3% | 17.0% | 0.8% | 18.5% | 0.0% | 2.6% | 0.0% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 75.2% | 100.0% | 100.0% |
| **Number of CFLs in Package (%)** | | | | | | | | |
| Quantity 1 | 63.1% | 66.7% | 76.0% | 61.8% | 69.5% | 96.7% | 100.0% | 94.5% |
| Quantity 2 | 11.9% | 24.3% | 16.1% | 30.4% | 14.6% | 3.3% | 0.0% | 5.5% |
| Quantity 3 | 4.1% | 8.2% | 2.0% | 7.8% | 7.9% | 0.0% | 0.0% | 0.0% |
| Quantity 4 | 10.8% | 0.8% | 2.9% | 0.0% | 6.8% | 0.0% | 0.0% | 0.0% |
| Quantity 5+ | 10.1% | 0.0% | 3.0% | 0.0% | 1.2% | 0.0% | 0.0% | 0.0% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| **Manufacturer (%)** | | | | | | | | |
| Bright Effects | 18.8% | 20.2% | 16.2% | 18.4% | 0.0% | 0.0% | 0.0% | 0.0% |
| Feit | 0.0% | 0.0% | 0.0% | 0.0% | 12.3% | 20.0% | 19.3% | 77.3% |
| GE | 14.6% | 23.4% | 13.5% | 8.5% | 29.9% | 46.6% | 25.9% | 11.0% |
| Home Depot | 18.2% | 14.1% | 24.6% | 12.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| Sylvania | 12.3% | 23.4% | 12.6% | 30.3% | 39.7% | 24.2% | 47.1% | 11.7% |
| TCP | 2.4% | 0.9% | 4.3% | 0.8% | 0.0% | 0.0% | 0.0% | 0.0% |
| Other | 33.7% | 17.9% | 28.8% | 29.9% | 18.2% | 9.2% | 7.7% | 0.0% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.1% | 100.0% | 100.0% | 100.0% |

| | Participants | | | | Former Participants | | | |
|---|---|---|---|---|---|---|---|---|
| | Standard Bare-Spiral | A-line | Flood | Globe | Standard Bare-Spiral | A-line | Flood | Globe |
| **Retail Channel (%)** | | | | | | | | |
| Discount | 18.8% | 20.2% | 16.2% | 18.4% | 5.2% | 6.3% | 0.0% | 0.0% |
| Drug Store** | N/A | N/A | N/A | N/A | 31.0% | 46.6% | 19.5% | 0.0% |
| Grocery | 14.6% | 23.4% | 13.5% | 8.5% | 0% | 0% | 0% | 0% |
| Large Home Improvement | 18.2% | 14.1% | 24.6% | 12.2% | 9.3% | 16.8% | 14.1% | 27.5% |
| Mass Merchandise | 12.3% | 23.4% | 12.6% | 30.3% | 12.3% | 2.6% | 12.3% | 6.2% |
| Membership*** | 2.4% | 0.9% | 4.3% | 0.8% | N/A | N/A | N/A | N/A |
| Small Hardware | 33.7% | 17.9% | 28.8% | 29.9% | 42.3% | 27.7% | 54.1% | 66.3% |
| Total | 100.0% | 100.0% | 100.0% | 100.0% | 100.1% | 100.0% | 100.0% | 100.0% |
| **Sample size (n)** | **1003** | **211** | **380** | **119** | **188** | **21** | **36** | **9** |

Note: This table does not include 269 packages that were other CFL types such as bug, tube, etc.

* The Team weighted the results by retail distribution channel in order to represent the population of stores.

** Drug stores are combined with grocery stores in the participant sample.

*** No former participant membership stores were included in the former participant store list provided by Lockheed Martin.

The Team also noted whether the CFL bulbs were discounted by the PAs, had another discount[4], or were ENERGY STAR rated. Table 5 shows the percentage of CFLs of each type with these characteristics. It is important to note that the former participating stores carry a much smaller proportion of ENERGY STAR qualified standard bare-spiral CFLs and A-line bulbs; this is despite the fact that they once had been program partners, providing some evidence that they have not shown a continued commitment to the highest quality energy-efficient lighting after ceasing program participation.

**Table 5. Percentage of CFLs with Discounts or ENERGY STAR Label**

| | Participants | | | | Former Participants | | | |
|---|---|---|---|---|---|---|---|---|
| | Standard Bare-Spiral | A-line Bulbs | Flood | Globe | Standard Bare-Spiral | A-line Bulbs | Flood | Globe |
| PA Discounted (%) | 29.6% | 44.1% | 34.5% | 36.8% | - | - | - | - |
| Other Discounted (%) | 9.4% | 6.8% | 10.2% | 15.7% | 8.4% | 0.0% | 0.0% | 0.0% |
| ENERGY STAR labeled (%) | 88.8% | 83.9% | 82.7% | 91.0% | 68.7% | 44.1% | 81.1% | 89.0% |

Note: Columns do not sum to 100% because categories are not mutually exclusive.

The highlights of the CFL shelf-stocking survey were as follows:

- Standard, bare-spiral CFLs accounted for 55% of all the CFL bulb styles on shelves. Floods, the next largest share of the estimation sample, accounted for 16.4%.
- When looking at the distribution of bulbs by retail channel, the highest percentage of bare-spiral CFLs were displayed in small hardware stores (36%) as opposed to other store types in 2012. This represents an increase since 2010 when only 18% of bare-spirals in the sample were displayed in small hardware stores.
- Twenty-three percent of standard, bare-spiral CFLs in all stores (participant and former participant) received a PA incentive (6% in 2010).[5]
- Another 9% of standard, bare-spiral CFLS received a non-PA discount (6% in 2010).
- Larger percentages of A-line, Flood, and Globe CFL types received PA discounts[6] than bare-spirals.

[4] Other discounts were noted when the final retail price was marked down from the original as noted with a displayed sign. Unless a package was linked to the Mass Save database or there was a sign indicating a PA discount, the other discounts were assumed to be retailer promotions.

[5] This change could reflect a greater number of incentivized bulbs in the store, but alternative explanations could also include that the matching process identified more incentive bulbs this year or stores' willingness to participate based on the number of incentivized bulbs they carry (nonresponse bias). Also note that 2010 results were not weighted and the change could also be reflective of the differences in distribution channels.

Among the CFLs in the estimation sample, we found significant variation in the wattage, the quantity of CFLs per package, the manufacturer, and the sales channel. However, the most common CFLs were:

- Rated between 11 and 15 Watts (typically assumed to have the equivalent lumens rating as a 60 Watt incandescent bulb)
- Packaged in a single or double pack
- Manufactured by General Electric

The Team also collected data on bulb types other than CFLs and compares them to the CFL stocking. Table 6 shows the wattage, package size, manufacturer, and retail channel among each type of bulb[7]. The largest share of packages is CFLs rated 11 to 15 Watts. Incandescents and LEDs have a larger share of bulbs that are less than 11 CFL lumen-equivalent Watts, while halogens bulbs are most likely to have lumen-equivalent greater than 25 watt CFL. Single and double packs are most common for all bulb types. Small hardware stores sell the greatest number of packages for all bulb types except LEDs, which are concentrated in large home-improvement stores. Note that we did not collect the same information in 2010, so we cannot assess whether these stocking practices have changed since EISA implementation began in January 2012.

6 There may be several reasons that a higher percentage of other bulb types received PA discounts than standard bare-spiral CFLs. The PAs could have been targeting specialty bulbs, so greater percentage of these were incented than spirals. Stores may also be less likely to carry specialty bulbs unless they have a PA discount. Finally, another possibility could be that we were simply able to match a higher percentage of other bulb types to the Mass Save database given the bulb characteristics reported in each database.

7 The wattages for incandescent and halogen bulbs are reported as the CFL lumen equivalent. Incandescents rated <=40 W and halogens rated <=29 Watts are included in the <11 Watt category. Incandescents rated 41-60 Watts and halogens rated 30-43 Watts are included in the 11-15 CFL Watt category. Incandescents rated 61-75 Watts and halogens rated 44-53 Watts are included in the 16-20 CFL Watt category. Incandescents rated 76-100 Watts and halogens rated 54-72 Watts are included in the 21-25 CFL Watt category. Incandescents rated >100 Watts and halogens rated >72 Watts are included in the >25 CFL Watt category.

Table 6. Wattage, Package Size, Manufacturer, and Retail Channel by Bulb Type

| | CFL | Incandescent | LED | Halogen A-line* | Halogen |
|---|---|---|---|---|---|
| **Lumen-Equivalent CFL Wattage (%)** | | | | | |
| Less than 11 Watts | 13.0% | 35.9% | 60.5% | 7.0% | 7.2% |
| 11 to 15 Watts | 41.9% | 25.9% | 23.4% | 20.0% | 12.0% |
| 16 to 20 Watts | 14.0% | 16.4% | 11.3% | 10.6% | 34.3% |
| 21 to 25 Watts | 13.4% | 9.3% | 1.7% | 44.1% | 12.9% |
| Greater than 25 Watts | 17.7% | 12.5% | 3.1% | 18.3% | 33.6% |
| **Number of Bulbs in Package (%)** | | | | | |
| Quantity 1 | 69.8% | 34.3% | 97.3% | 34.3% | 82.6% |
| Quantity 2 | 13.9% | 52.0% | 1.0% | 52.0% | 12.2% |
| Quantity 3 | 5.4% | 0.2% | 1.6% | 0.2% | 3.0% |
| Quantity 4 | 6.0% | 11.7% | 0.0% | 11.7% | 0.7% |
| Quantity 5+ | 5.0% | 1.7% | 0.0% | 1.7% | 1.6% |
| **Manufacturer (%)** | | | | | |
| Feit | 5.2% | 0.5% | 7.3% | 2.8% | 0.8% |
| GE | 35.2% | 48.9% | 16.5% | 59.6% | 50.7% |
| Home Depot | 10.0% | 0.0% | 26.4% | 0.0% | 0.0% |
| Sylvania | 13.4% | 24.4% | 4.2% | 12.2% | 16.4% |
| TCP | 0.9% | 0.0% | 0.0% | 0.0% | 0.2% |
| Other | 35.2% | 26.2% | 45.6% | 25.4% | 32.0% |
| **Retail Channel (%)** | | | | | |
| Discount | 15.3% | 13.7% | 8.3% | 18.7% | 14.3% |
| Drug Store | 4.8% | 6.6% | 0.0% | 5.3% | 0.0% |
| Grocery | 12.1% | 19.5% | 0.7% | 4.5% | 12.7% |
| Large Home Improvement | 18.0% | 18.6% | 67.7% | 16.6% | 25.9% |
| Mass Merchandise | 14.1% | 11.2% | 4.4% | 18.3% | 6.8% |
| Membership | 1.8% | 0.2% | 7.1% | 1.7% | 0.5% |
| Small Hardware | 33.9% | 30.1% | 11.8% | 34.8% | 39.8% |
| **Sample size (n)** | **2,236** | **2,634** | **755** | **169** | **904** |

* Halogen A-lines are a subset of halogens that are medium screw based and look similar to incandescents.

Approximately 76% of participating stores and 96% of former participating stores have at least one 100 Watt incandescent bulb in stock, indicating a significant holdover of inventory from pre-EISA. Table 7 shows the percentages of stores in the sample by retail channel that have an incandescent rated 100 Watts or more.

**Table 7. Percentage of Stores with 100 Watt Incandescent Bulbs**

| Distribution Channel | Participants | Former Participants |
|---|---|---|
| Discount | 61% | 75% |
| Drug Store | N/A | 100% |
| Grocery | 70% | 100% |
| Large Home Improvement | 100% | 100% |
| Mass Merchandise | 88% | 100% |
| Membership | 20% | N/A |
| Small Hardware | 83% | 100% |
| All Stores* | 76% | 96% |

* Unweighted average

## *Shelf-Space Data*

Surveyors collected information about the dimensions (length, width, and height) of the shelf and display areas dedicated to different light bulb types: CFL, incandescent, halogen, LED, fluorescent, krypton, metal halide, neon, and high pressure sodium. This information was used to analyze the share of participating store shelf space dedicated to different lighting types.

## *Results*

The Team analyzed data collected from the 70 participating stores regarding the shelf location and amount of shelf space allocated to different lighting products.[8] Shelf space data were not collected from former participant stores. Shelf space was measured in three dimensions as volume (shelf length x width x height).

Table 8 shows the percentage allocation of shelf space to lighting products by retail distribution channel for participating stores. Since we segmented results by distribution channel, sample sizes are less than 20 in each category which means wider precision levels. Among participants in 2012, small hardware and discount stores allocated the most CFL shelf space, 86% and 73%, respectively. Grocery stores were the only channel that allocated more space to incandescents than CFLs. In 2010, participating discount and membership stores allocated the most shelf space to CFLs. The percentage of shelf space allocated to CFLs has increased for participating mass merchandise, grocery, and small hardware stores since 2010. Again, it is worth recalling that the former participating stores were once program partners, but they do not demonstrate a continued commitment to energy-efficient lighting.

[8] These are the same 70 stores listed as participants in Table 2.

Table 8. Allocation of Space by Retail Distribution Channel

| Store Type | 2012 | | | | | | | 2010 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Count of Partici-pants | Average Display Space (CuFt) | CFL | Incan-descent | LED | Halogen | Other | Count of Partici-pants | Average Display Space (CuFt) | CFL | Incan-descent | LED | Halogen | Other |
| Small Hardware | 12 | 169 | 86% | 9% | 0% | 4% | 0% | 12 | 378 | 29% | 40% | 3% | 15% | 13% |
| Discount | 18 | 34 | 73% | 19% | 2% | 6% | 0% | 8 | 101 | 50% | 34% | 3% | 11% | 2% |
| Grocery | 10 | 23 | 36% | 57% | 2% | 5% | 0% | 11 | 113 | 27% | 64% | 2% | 8% | 0% |
| Membership | 5 | 345 | 47% | 7% | 44% | 2% | 0% | 2 | 542 | 73% | 20% | 5% | 3% | 0% |
| Drug Store | 0 | - | - | - | - | - | - | 7 | 20 | 41% | 58% | 0% | 1% | 0% |
| Large Home Improvement | 17 | 962 | 69% | 16% | 9% | 7% | 0% | 3 | 955 | 34% | 40% | 4% | 14% | 7% |
| Mass Merchandise | 8 | 88 | 56% | 39% | 1% | 4% | 0% | 11 | 844* | 30% | 46% | 1% | 10% | 14% |
| All Stores | 70 | 143 | 68% | 16% | 5% | 10% | 0% | 61 | 369 | 33% | 43% | 2% | 11% | 10% |

* It appears that an outlier data point from 2010 is driving the large difference in shelf space reported in 2010 vs. 2012.

Another approach for understanding the allocation of different lighting products in a store is to compare the total number of packs displayed for each bulb type. Table 9 shows the allocation of the total number of packs of light bulbs displayed by bulb type and retail distribution channel for both participating and former participating stores in 2012[9]. Participating stores have a higher percentage of CFL and LED packages than former participants for all store types, suggesting that current PA support is associated with increased availability of efficient lighting on store shelves[10].

**Table 9. Allocation of Packages by Bulb Type and Retail Distribution Channel**

| Store Type | Participants | | | | | Former Participants | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Count | CFL | Incandescent | LED | Halogen | Count | CFL | Incandescent | LED | Halogen |
| Discount | 17,775 | 76% | 18% | 1% | 5% | 416 | 17% | 77% | 0% | 6% |
| Drug Store | 0 | - | - | - | - | 122 | 35% | 62% | 0% | 2% |
| Grocery | 5,054 | 38% | 56% | 0% | 6% | 16 | 0% | 100% | 0% | 0% |
| Large Home Improvement | 55,710 | 31% | 40% | 15% | 14% | 2,008 | 26% | 59% | 2% | 13% |
| Mass Merchandise | 8,998 | 33% | 59% | 1% | 7% | 3,307 | 23% | 70% | 1% | 6% |
| Membership | 2,450 | 53% | 11% | 29% | 7% | 0 | - | - | - | - |
| Small Hardware | 11,281 | 54% | 33% | 1% | 12% | 1,133 | 32% | 43% | 0% | 25% |
| All Stores | 101,268 | 51% | 35% | 5% | 9% | 7,002 | 28% | 55% | 1% | 16% |

[9] Although shelf space data was only available for participating stores, package data was collected for all 101 of the stores. This allows comparison between participants and former participants.

[10] This may reflect program influence or that store's emphasizing energy efficient lighting products are more likely to be participants, or some combination of the two.

Table 10 shows the allocation of total packs of bulbs by shelf location. A higher percentage of incandescent bulb packages were displayed in middle and high shelves versus CFLs. CFLs were more commonly displayed on end caps compared to incandescents, particularly in participant stores. LEDs were most commonly displayed on middle shelves.[11] End cap and middle shelves tend to me the most desirable locations in a store because they are most easily seen by consumers and are more likely to encourage purchase.

**Table 10. Allocation of Packages by Shelf Location and Bulb Type**

| Shelf Location | Participants | | | | | Former Participants | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Count | CFL | Incandescent | LED | Halogen | Count | CFL | Incandescent | LED | Halogen |
| End cap | 13,662 | 21% | 7% | 23% | 3% | 253 | 5% | 4% | 15% | 5% |
| High shelf | 20,230 | 16% | 20% | 10% | 33% | 2,251 | 17% | 38% | 50% | 49% |
| Lower shelf | 19,422 | 13% | 22% | 19% | 18% | 1,931 | 41% | 22% | 2% | 7% |
| Middle shelf | 33,919 | 22% | 35% | 41% | 43% | 2,523 | 37% | 36% | 33% | 39% |
| Other* | 14,035 | 28% | 16% | 8% | 2% | 44 | 0% | 0% | 0% | 0% |

***** Other types of locations include at the register and wing stacks.

Table 11 shows the allocation of total packs of bulbs by type and style of bulb. Approximately 74% of A-line packages are incandescent packages and only 18% are CFLs. However, the percentages of A-line shaped CFLs, LEDs, and halogen bulbs are greater in participating stores than in former participating ones. For other bulb styles, 20% are incandescents and 64% are CFL packages, again, with CFLs, LEDs, and halogens being more common in participating than in former participating stores.

**Table 11. Allocation of Packages by Bulb Style and Bulb Type**

| Store Type | A-line Bulbs | | | | | All Other Bulb Styles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Count | CFL | Incan-descent | LED | Halo-gen | Count | CFL | Incan-descent | LED | Halo-gen |
| Participants | 31,240 | 19.6% | 72.3% | 3.0% | 5.2% | 70,028 | 65.7% | 18.1% | 5.5% | 10.7% |
| Former Participants | 2,835 | 6.2% | 91.1% | 0.6% | 2.1% | 4,167 | 39.7% | 36.6% | 0.6% | 23.2% |
| All | 34,075 | 18.4% | 73.9% | 2.8% | 4.9% | 74,195 | 63.7% | 19.5% | 5.1% | 11.7% |

[11] We conducted a regression analysis of the percentage of shelf space allocated to CFLs as a function of sales channel, MSA, and survey month. However, the results were statistically insignificant and are not reported.

# Hedonic Pricing Regression Model

## *Methodology*

As part of the shelf-inventory survey, the Team's surveyors collected information about CFL bulb prices displayed on packages and/or on shelves for the full sample of stores included in the inventory.[12] Our surveyors recorded:

- Register price (the price paid by customers at the register)
- Full or original price, if the bulb was discounted and the original price was observable
- The amount of any discount for each package, again if observable
- Whether there was point-of-purchase signage indicating that the CFLs were discounted by Mass Save.

### Definition of PA-Discounted Bulbs

Although many CFLs in sampled stores were labeled as "PA discounted," the Team knew from prior experience that the PAs supported additional bulbs not labeled as such on store shelves. Moreover, the amount of the discount was usually not displayed, and, even in instances where the retailer displayed the original and discounted retail prices on the sales tag, the Team was uncertain of the incentive amount because retailers were able to discount the CFLs by a different amount from the PA incentive. Therefore, the Team needed something other than an in-store label to identify program-discounted bulbs and the amount of discount offered. Based on the data available, we applied the following approach to identify PA-discounted, undiscounted, and other discounted CFLs:[13]

- If a bulb was advertised in the store as having a discount sponsored by Mass Save, it was counted as PA-discounted.
- If the bulb could be matched to those in the Mass Save discount database, it was counted as PA-discounted.

[12] At this time, the availability of LEDs is too limited to yield reliable and valid results. As the availability and diversity of LEDs increases, hedonic pricing models could be developed for them.

[13] Recognizing that this inclusive definition could affect the results, during analysis we performed robustness tests to check the sensitivity of our results to our definition of PA discount. We estimated the models omitting PA labeled CFLs, so that only CFLs matched to the Mass Save database were included in the regression. We then ran another regression omitting matched CFLs but including PA-labeled CFLs. This was done only for twister-spiral CFLs as there were not enough CFLs of other types that were PA-labeled. We obtained results similar to those reported here.

- If a CFL did not satisfy either requirement, it was considered not discounted by Mass Save.
- CFLs noted to be discounted during the shelf-stocking survey that were not labeled as PA-discounted or could not be matched to the PA incentive data were classified as "other discounted" CFLs[14].

The Mass Save tracking database contains the following information:

- PA incentive amount
- CFL model number
- Manufacturer
- Store where the discounted bulbs were sold
- Quantity of discounted bulbs sold.

Typically, for a match to occur in the Mass Save database, the bulb had to have the same manufacturer, model number, wattage, and store location; however, we recognized that the same CFL was sometimes listed under two model numbers. CFLs without corresponding model numbers in either the sample or Mass Save data were matched on manufacturer, wattage, and store location. Unless the characteristics clearly indicated the CFLs were different, we treated these CFLs as successful matches.

Table 12 contains a summary of our efforts to match CFLs in the shelf-stocking survey to the PA incentives. The Team successfully matched 483 CFLs from the shelf-stocking data to the PA tracking database. The percentage of matches was 21% (254/1,191) of the bare-spiral CFLs in the shelf-stocking survey. The Team was able to match a higher percentage of A-line bulbs (33%), globes (25%), and floods (29%). It is worth noting, however, that, with the exception of floods, at least one-half of the PA-supported bulbs are not labeled as such on store shelves.

**Table 12. Packages of Bulbs Linked to PA Incentive Data**

| | Bare-Spiral | A-line Bulbs | Flood | Globe |
|---|---|---|---|---|
| PA In-store label only | 67 | 31 | 64 | 18 |
| Matched to Mass Save Database only | 196 | 54 | 62 | 25 |
| PA Labeled and Matched to Mass Save Database | 58 | 23 | 57 | 8 |
| Not Labeled and Not in Mass Save Database | 870 | 124 | 233 | 77 |
| n in shelf-stocking survey | 1191 | 232 | 416 | 128 |

[14] We assume these "other discounts" are promotional discounts offered by the retailer and are unrelated to the PA discounts.

## *Statistical Analysis Approach*

The statistical analysis approach analyzes the average retail prices of CFLs in Massachusetts to identify the impact of PA incentives. The analysis takes two forms.

1. The first is a series of simple averages of prices for PA-discounted, other discounted, and undiscounted CFLs. For example, the average prices of incentive-based standard, bare spiral CFLs and undiscounted CFLs in Massachusetts are compared. Formal tests confirm whether any differences are statistically significant.
2. The second is a series of multivariate regression analyses. The regression models quantify the relationship between CFL prices per bulb and various characteristics (e.g., wattage, the number of bulbs in the package, and retail channel). The multivariate analysis estimates the effect of the PA incentive on the price of CFLs, after controlling for the other characteristics.

By allowing for interactions between the incentive amount and the store or the CFL characteristics, the analysis can investigate whether the impact of a PA-discount varies by sales channel, wattage, and other characteristics.

### Summary of Average Prices

Table 13 and Table 14 show the final register price information for PA-discounted, other-discounted, and undiscounted CFLs in the dataset. Mean prices per bulb are presented for each of the four CFL types considered. Prices are weighted by retail distribution channel to be representative of the population.

To control for bulb characteristics that are correlated with price, prices are distinguished by wattage category. For example, the average price of an undiscounted 11- to 15-Watt standard, bare-spiral CFL was $5.67. With an average PA incentive, the same type of CFL cost $3.04, for a decrease in register price of $2.62.

In the last column of each table, we report the average PA incentive, which was obtained by linking CFLs to the PA program tracking database as described above. The average PA incentive for standard, bare-spiral 11- to 15-Watt CFL was $1.72. The store discount was 152% of the average incentive (i.e., $2.62/$1.72).

Note that the Team does not know the pre-discounted prices of discounted bulbs. Without accounting for all the factors that impact price, comparing the average incentive to the difference in average retail price of discounted and non-discounted bulbs may not accurately reflect the impact the incentive has in lowering the retail price for discounted bulbs.

Table 13. Standard Bare-Spiral CFL Prices and PA Incentives by Wattage

| Wattage | n | Price - All CFLs | Price PA Discounted Bulbs | Price Other Discounted Bulbs | Price Not Discounted Bulbs | Difference Between PA Discounted and Undiscounted Bulbs | Average PA Incentive Per Bulb |
|---|---|---|---|---|---|---|---|
| <11 Watts | 92 | $4.77 | $4.39 | $3.46 | $5.00 | ($0.61) | $1.32 |
| 11-15 Watts | 474 | $4.73 | $3.04 | $4.05 | $5.67 | ($2.62) * | $1.72 |
| 16-20 Watts | 176 | $5.02 | $3.98 | $3.93 | $5.47 | ($1.49) * | $1.89 |
| 21-25 Watts | 228 | $4.04 | $2.60 | $5.63 | $4.49 | ($1.89) * | $2.27 |
| >25 Watts | 221 | $8.55 | $6.17 | $7.50 | $9.18 | ($3.00) * | $4.05 |
| Total | 1191 | $5.51 | $3.50 | $5.34 | $6.25 | ($2.75)* | $2.03 |

* denotes statistically significant at the 5% level

Table 14. Specialty CFL Prices and PA Incentives by Wattage

| CFL Type | Watt Category | N | Price All CFLs | Price PA Discounted Bulbs | Price Other Discounted Bulbs | Price Not Discounted Bulbs | Difference Between PA Discounted And Undiscounted Bulbs | Average PA Incentive Per Bulb |
|---|---|---|---|---|---|---|---|---|
| A-line | <11 Watts | 43 | $4.31 | $3.01 | $14.89 | $4.52 | ($1.51) | $3.51 |
| | 11-15 Watts | 152 | $4.57 | $2.90 | $2.94 | $5.98 | ($3.09) * | $3.02 |
| | 16-20 Watts | 27 | $5.12 | $3.39 | $4.32 | $6.31 | ($2.92) | $3.71 |
| | 21-25 Watts | 0 | - | - | - | - | - | - |
| | >25 Watts | 10 | $5.96 | $3.57 | $4.97 | $6.02 | ($2.45) | *. |
| **A-line** | **Total** | **232** | **$4.67** | **$3.00** | **$4.99** | **$5.80** | **($2.80)** | **$3.20** |
| Flood | <11 Watts | 6 | $9.99 | - | - | $9.99 | - | . |
| | 11-15 Watts | 196 | $6.45 | $3.76 | $4.62 | $8.51 | ($4.75) * | $3.75 |
| | 16-20 Watts | 66 | $6.49 | $5.51 | $6.20 | $6.87 | ($1.36) * | $6.30 |
| | 21-25 Watts | 104 | $7.88 | $4.35 | $6.73 | $10.39 | ($6.04) * | $4.61 |
| | >25 Watts | 44 | $10.73 | $9.04 | $9.31 | $11.35 | ($2.32) | $6.00 |
| **Flood** | **Total** | **416** | **$7.47** | **$4.58** | **$6.01** | **$9.18** | **($4.60)*** | **$4.52** |
| Globe | <11 Watts | 46 | $2.24 | $2.83 | $3.59 | $3.18 | ($0.34) | $3.59 |
| | 11-15 Watts | 79 | $3.57 | $4.90 | $4.24 | $5.66 | ($0.76) | $3.00 |
| | 16-20 Watts | 2 | - | $4.73 | $4.73 | - | - | . |
| | 21-25 Watts | - | - | - | - | - | - | - |
| | >25 Watts | 1 | - | $5.27 | 5.27 | - | - | . |
| **Globe** | **Total** | **128** | **$4.05** | **$2.88** | **$4.10** | **$4.81** | **($1.93)** | **$3.22** |

Note: All prices are per bulb at the register. "n" represents the number of CFL packages in sample. PA incentives are only for CFLS matched to PA tracking database.( ) denotes a negative value. * denotes statistically significant at the 5% level. * No incentivized bulbs.

Table 13 and Table 14 show that PA incentives are associated with significant decreases in the average retail prices of CFLs (although these averages do not account for other factors influencing the price and discounts as will be addressed by the hedonic regression model).

- The difference in average price between PA-discounted and undiscounted standard, bare-spiral CFLs was $2.75. This was 44% of the retail price of undiscounted CFLs and 135% of the amount of the PA incentive, which was $2.03. The 90% confidence interval for the average incentive for Bare-Spiral CFLs is $1.89 and $2.18.
- For A-line bulbs, the difference in average retail price between PA-discounted and undiscounted CFLs was $2.80, which is equal to 48% of the undiscounted purchase price and 88% of the PA incentive. The fact that the difference in retail price is smaller than the incentive may be a function of the mix of bulb offerings or simply a result of the variance in the estimate. The 90% confidence interval for the average incentive for A-line bulbs is $3.01 to $3.39. The hedonic pricing model discussed later accounts for differences in bulb offerings.
- For floods and globes, the differences in average retail prices were 50% and 40%, respectively, of the undiscounted prices of $9.18 and $4.81, respectively. These differences were approximately 102% and 60% of the PA incentive, respectively.

Table 15 reports average price by year for standard bare-spiral CFL bulbs for participants and former participants. While it appears that price differences between participants and former participants have increased, the results may be influenced by the sample distribution as 2010 results are not weighted.

**Table 15. Average Price of Standard CFLs by Wattage and Year**

| Wattage Category | 2012 | | | 2010* | | |
|---|---|---|---|---|---|---|
| | Participants | Former participants | Difference | Participants | Non participants [15] | Difference |
| <11Watts | $4.04 | $6.08 | -$2.04 | $3.96 | $5.02 | -$1.06 |
| 11-15 Watts | $4.79 | $7.20 | -$2.42 | $4.41 | $4.89 | -$0.48 |
| 16-20 Watts | $4.86 | $7.76 | -$2.89 | $4.69 | $5.50 | -$0.81 |
| 21-25 Watts | $4.59 | $7.04 | -$2.45 | $5.24 | $6.33 | -$1.09 |
| >25 Watts | $8.59 | $10.89 | -$2.30 | $6.62 | $7.67 | -$1.05 |
| **All** | **$5.34** | **$7.69** | **-$2.35** | **$4.91** | **$5.73** | **-$0.82** |

* 2010 prices are not weighted by year. 2012 prices are weighted by retail distribution channel to reflect the population.

The Team collected retail price for bulb types other than CFLs. Table 16 reports average price per bulb by type and wattage[16]. For A-line bulbs, incandescents tended to be the least expensive category by

[15] While selected differently in 2010 (from CFL Survey Responses) the nonparticipant stores in 2010 also included a large number of formerly participant stores.

wattage, followed by halogens. Incandescent bulbs are the least expensive for other bulb styles, followed by CFLs.

**Table 16. Average Price by Bulb Type and Wattage**

| CFL Lumen-Equivalent Wattage Category | A-line Bulbs | | | | All Other Bulb Styles | | | |
|---|---|---|---|---|---|---|---|---|
| | CFL | Incan-descent | LED | Halogen | CFL | Incan-descent | LED | Halogen |
| <11W | $6.08 | $2.13 | $21.83 | $5.73 | $4.04 | $3.28 | $20.75 | $5.34 |
| 11-15W | $7.20 | $2.08 | $24.86 | $3.46 | $4.79 | $2.82 | $25.99 | $6.46 |
| 16-20W | $7.76 | $3.73 | - | $7.06 | $4.86 | $5.43 | $34.34 | $8.93 |
| 21-25W | $7.04 | $3.47 | - | $5.04 | $4.59 | $8.66 | $30.03 | $6.08 |
| >25W | $10.89 | $4.02 | - | $6.71 | $8.59 | $7.71 | $23.42 | $9.34 |
| All | $7.69 | $2.83 | $22.62 | $6.15 | $5.34 | $4.53 | $23.84 | $7.92 |
| **Observations** | **297** | **541** | **26** | **127** | **1,939** | **2,093** | **729** | **946** |

## Regression Analysis

The summary statistics above show that PA-discounted CFLs cost less than undiscounted or other discounted CFLs. However, there are various critical questions regarding the price difference, such as:

- How much of the price differences shown in Table 13 and Table 14 reflects the effect of PA discounts?
- How much of the differences reflects other factors that may be correlated with discount of CFLs, such as retailers discounting lower-quality, cheaper CFLs?
- What fraction or multiple of incentives is passed on to consumers in the form of lower retail prices? That is, is there a "multiplier effect" by which one dollar of PA discount results in more than one dollar reduction in retail price?
- Does the impact of the PA incentive vary by retail sales channel?

The Team's strategy for answering these questions was to estimate a hedonic pricing model in which the price of a product is regressed on the PA incentive and product's characteristics.[17] The theory underlying the hedonic pricing model is that variation in the price of a product can be explained by the product's

[16] The wattages for incandescent and halogen bulbs are reported as the CFL lumen equivalent. Incandescents rated <=40 W and halogens rated <=29 Watts are included in the <11 Watt category. Incandescents rated 41-60 Watt and halogens rated 30-43 Watts are included in the 11-15 CFL Watt category. Incandescents rated 61-75 Watt and halogens rated 44-53 Watts are included in the 16-20 CFL Watt category. Incandescents rated 76-100 Watt and halogens rated 54-72 Watts are included in the 21-25 CFL Watt category. Incandescents rated >100 Watt and halogens rated >72 Watts are included in the >25 CFL Watt category.

[17] See Malpezzi, Stephen (2002). " Hedonic Pricing Models: A Selective and Applied Review." In Housing Economics: Essays in Honor of Duncan Maclennan. Also, Sheppard, Stephen (1999). Hedonic Analysis of Housing Markets. In Paul C. Chesire and Edwin S. Mills (eds.), Handbook of Regional and Urban Economics, v3. Elsevier.

observable attributes, which are not explicitly traded in the market. In the model, the coefficient corresponding to an attribute represents the "implicit price" of the untraded attribute. The hedonic pricing model, therefore, allows one to recover prices or values of attributes or goods that are not observed.

The CFL pricing model used in this study followed the basic hedonic formulation:

$$\text{Register price per bulb} = \beta_0 + \beta_1 \text{DiscountPA} + \beta_2 \text{DiscountOther} + \beta_3 \text{Product Characteristics} + \beta_4 \text{Retail Channel} + \beta_5 \text{MetroArea} + \beta_6 \text{MonthYear} + \varepsilon$$

Where:

- The dependent variable was the price per bulb in the package
- The independent variables were the characteristics of the CFL (wattage and ENERGY STAR Label, where 1=Yes, 0=No)
- Dummy variables were used for product characteristics of the number of bulbs in the package and the fixed effects (the manufacturer, metropolitan statistical area, and year-month).

We allowed the impact of the number of CFLs in the package on the price per bulb to vary non-parametrically (that is, without making functional form assumptions about the relationship) with the number of bulbs in the package. This was achieved by including separate indicator variables for the number of CFLs in the package.[18]

In addition, the right-side variables included indicators for whether the package was discounted by a PA (1=Yes, 0=No) or by another source, such as the retailer (1=Yes, 0=No). We expected both variables to have negative and statistically significant effects on register price, but the magnitudes of the coefficients are *a priori* unclear.

Finally, to test the hypothesis about the relationship between retail channel and the impact of the PA discounts, our Team needed to augment the main regression equation with interaction terms between PA incentives and the sales channel variables.

## Results

In this section, we report the results of the Ordinary Least Squares (OLS) estimation of the hedonic CFL pricing model. We estimated separate models for each bulb type. We report estimates of the coefficients for only select variables, including the PA discount and other discount variables. (The complete regression results for each CFL type are in Appendix B.)

[18] The price per bulb is typically decreasing in the number of bulbs in the package. However, the relationship may be non-linear. We selected a functional form that allows the relationship between price per bulb and number of bulbs to vary in a general way. If we were make assumptions about the functional relationship between price per bulb and the number of bulbs that were incorrect, this would have the effect of introducing additional error in the model and reducing the statistical precision of the estimates.

Table 17 shows results from the estimation of several specifications of the hedonic model for standard, bare-spiral CFLs. We began by estimating a very parsimonious specification (Model 1) that contained only the following:

- PA discount and other discount variables
- ENERGY STAR label
- Watts
- Package quantity variables.

In models 2 through 5 (we discuss Model 6 later), we progressively added dummy variables for the following[19]:

- Manufacturer (Feit Electric, General Electric, Sylvania, Bright Effects, TCP, Home Depot)
- Sales channel (Discount, Grocery, Hardware, Home Improvement, Mass Merchandise)
- Metro area
- Month.

[19] In each of these dummy variable groups, the impact of the variables is measured relative to an omitted category which serves as the base or benchmark for the comparison. The omitted sales channel category is grocery store, which means dummy variables are created for all sales channels except grocery store, which is the benchmark. For example, if the coefficient on Drug is 0.54, then *ceteris paribus* the price per bulb is $0.54 greater on average in drug stores than in grocery stores. The omitted manufacturer is "Other". The omitted metro area category is a store in the Providence –New Bedford-Fall River metro area. The omitted month is August.

Table 17. Regression Analysis of Standard, Bare-Spiral CFL Retail Prices

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Intercept | 10.89* | 8.16* | 7.42* | 7.19* | 7.63* | 7.58* |
| | (0.30) | (0.34) | (0.42) | (0.63) | (0.68) | (0.69) |
| PA Discount | -2.08* | -1.70* | -1.74* | -1.85* | -1.76* | -1.05* |
| | (0.23) | (0.22) | (0.23) | (0.24) | (0.24) | (0.38) |
| Other Discount | -1.10* | -0.55 | -0.54 | -0.76* | -0.63* | -0.79* |
| | (0.33) | (0.30) | (0.30) | (0.31) | (0.32) | (0.32) |
| ENERGY STAR | -1.66* | -1.51* | -1.63* | -1.51* | -1.51* | -1.52* |
| | (0.28) | (0.26) | (0.25) | (0.25) | (0.25) | (0.25) |
| Small Hardware Store * PA Discount | | | | | | -2.84* |
| | | | | | | (0.57) |
| Discount Store * PA Discount | | | | | | 0.04 |
| | | | | | | (0.58) |
| Membership Store *PA Discount | | | | | | -1.60 |
| | | | | | | (2.99) |
| Mass Merchandise Store * PA Discount | | | | | | 0.15 |
| | | | | | | (0.90) |
| Wattage | Yes | Yes | Yes | Yes | Yes | Yes |
| Pack Quantity | Yes | Yes | Yes | Yes | Yes | Yes |
| Manufacturer | No | Yes | Yes | Yes | Yes | Yes |
| Retail Channel | No | No | Yes | Yes | Yes | Yes |
| MSA | No | No | No | Yes | Yes | Yes |
| Site Visit Month | No | No | No | No | Yes | Yes |
| F-Value | 51.35 | 48.80 | 37.36 | 33.07 | 32.94 | 30.17 |
| Adjusted R-Squared | 0.32 | 0.41 | 0.42 | 0.46 | 0.46 | 0.47 |
| n | 1,153 | 1,153 | 1,153 | 1,153 | 1,153 | 1,153 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS. * denotes statistically significant at the 5% level.

In Model 1, the impact of the PA discount was to reduce the average retail price of a standard, bare-spiral CFL by $2.08. The addition of manufacturer dummy variables (fixed effects; inclusion denoted by a "yes" in Table 17) in Model 2 and retail channel in Model 3 changed the estimated impact to approximately $1.70. After adding controls for the Metropolitan Statistical Area and the Site Visit Month in models 4 and 5, the estimated impact of the PA discount increased to $1.76. The 90% confidence interval for the average impact of the PA discount under model 5 is to reduce the register price by $1.36 to $2.15. All of the estimated PA discount coefficients in models 1 through 5 are statistically significant at the 1% level. Of these first five models, Model 5 is our preferred specification because it contains a large number of explanatory variables we expected to be included and has the greatest explanatory power (based on the adjusted $R^2$).

In Model 6, we tested the hypothesis that the impact of a PA discount on retail price varied by sales channel by interacting the sales channel with PA discount. The model did not include an interaction variable between home improvement store and PA discount because none of the standard bare-spiral CFLs in home improvement stores were labeled as PA-discounted or were matched to the Mass Save database. The interaction between a PA discount and small hardware was the only one that was statistically significant at the 5% level. Our study revealed that PA-discounted CFLs sold for approximately $2.84 less per bulb in small hardware stores than in grocery stores (the omitted category).

Table 18 reports the results of only Model 5's specification for A-line bulbs, floods, and globes. (The results of the other model specifications are in Appendix B.)

The average impact of a PA discount was to reduce the register price of an A-line bulb by $1.53, a reflector CFL by $2.15, and a globe by $1.36[20]. These price reductions are statistically significant at the 90% level.

**Table 18. Regression Model Results of A-line, Reflector, and Globe CFLs**

| Variable | A-line Bulb | Flood | Globe |
|---|---|---|---|
| Intercept | 7.19* | 9.15* | 3.83* |
| | (1.53) | (1.57) | (2.27) |
| PA Discount | -0.96* | -2.15* | -1.36* |
| | (0.43) | (0.55) | (0.49) |
| Other Discount | 1.05 | -1.05 | 0.42 |
| | (0.77) | (0.77) | (0.63) |
| ENERGY STAR | -2.41* | -3.89* | -0.62* |
| | (0.55) | (0.57) | (0.68) |
| Wattage | Yes | Yes | Yes |
| Pack Quantity | Yes | Yes | Yes |
| Manufacturer | Yes | Yes | Yes |
| Retail Channel | Yes | Yes | Yes |
| MSA | Yes | Yes | Yes |
| Site Visit Month | Yes | Yes | Yes |
| F-Value | 15.97 | 19.30 | 10.79 |
| Adjusted R-Squared | 0.63 | 0.57 | 0.67 |
| N | 227 | 405 | 124 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS. * denotes statistically significant at the 5% level.

[20] The 90% confidence intervals for the estimated PA discount are -$0.26 to -$1.67 for a-line bulbs, -$1.24 to -$3.05 for floods, and -$0.56 to -$2.17 for globes.

Table 19 reports the Model 5 results for standard bare-spiral bulbs in 2012 and 2010. The impact of the PA discount increased from a reduction in price of $1.46 in 2010 to $1.76 in 2012, which supports the similar conclusion as shown in Table 13.

**Table 19. Bare-Spiral Regression Model 5 Results by Year**

| Variable | 2012 | 2010 |
|---|---|---|
| Intercept | 7.63* | 7.42* |
| | (0.68) | (0.32) |
| PA Discount | -1.76* | -1.46* |
| | (0.24) | (0.19) |
| Other Discount | -0.63* | -1.37* |
| | (0.32) | (0.17) |
| ENERGY STAR | -1.51* | -0.88* |
| | (0.25) | (0.11) |
| Wattage | Yes | Yes |
| Pack Quantity | Yes | Yes |
| Manufacturer | Yes | Yes |
| Retail Channel | Yes | Yes |
| MSA | Yes | Yes |
| Site Visit Month | Yes | Yes |
| F-Value | 32.94 | 64.36 |
| Adjusted R-Squared | 0.46 | 0.60 |
| N | 1,153 | 1,406 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS. * denotes statistically significant at the 5% level.

In addition to estimating the average impact of a PA discount on the retail price of CFLs, the Team estimated the average reduction in retail price per dollar of the PA incentive. This is a "realization rate," indicating how much of the PA incentive was passed along to the consumer in the final sales price. In Figure 3 above, the realization would be $(P^0-P_1)/s$.

Realization rates were calculated by dividing the average impact of the PA discount estimated in the regression model by the average incentive value for each bulb type. Table 20 reports estimates of the realization rates for the different CFL types using our preferred Model 5 specification for 2012 and 2010.[21] At face value it appears that retailers in 2012 are not passing on the entire incentive onto consumers which is a significant shift from 2010 when the model indicates they passed on more than the incentive for standard, bare-spirals.

[21] The realization rates shown for 2010 were estimated by substituting the incentive amount for the dummy variable for PA discount in the CFL price regressions.

Table 20. Estimated PA Discount Realization Rates by Bulb Type

| Bulb Type | Realization Rate 2012 | Realization Rate 2010 |
|---|---|---|
| Bare-Spiral | -0.86 | -1.17 |
| A-line Bulb | -0.30 | -0.71 |
| Flood | -0.47 | -0.83 |
| Globe | -0.42 | -0.76 |

The realization rate was less than one for all types of CFLs in 2012. Specifically,

- The regression analysis estimated that the PA discount reduced the average retail price of a standard, bare-spiral CFL by $1.76. The average discount provided for standard, bare-spiral CFLs was $2.03. This amounts to an estimated realization rate of 86%[22].
- The realization rates for A-line bulbs, floods, and globes ranged from 30% for a-lines to 47% for floods.

Thus, in 2012, it appears that program partners may not have been passing the full PA incentive amount onto consumers.

In a qualified way, this finding is supported by a limited Internet search of current (June 2013) prices for 13-Watt spirals supported by the Massachusetts PAs in 2012.[23] NMR conducted the Internet search focused on suburban Boston locations and suburban New York City locations of three major national retailers. We chose New York as the comparison area because NYSERDA territory does not currently support bare spirals (although it does support specialty CFLs), and because New York is economically and demographically more similar to Massachusetts than most other possible non-program comparison areas.

For one retail chain, there was one 13-Watt CFL package listed online that had been supported by the Massachusetts PAs in 2012; the prices for this package were the same in Massachusetts and New York. For a second retail chain, there were two 13-Watt CFL packages listed online that had been supported by the Massachusetts PAs in 2012; one of these packages was priced the same in Massachusetts and New York, and the second was $1.00 per bulb cheaper in Massachusetts than in New York. For the third retail chain, there were four 13-Watt CFL packages listed online that had been supported by the Massachusetts PAs in 2012; all four were cheaper in Massachusetts than in New York, with per-bulb price differences of $0.86, $1.23, $1.23, and $1.40.

We say this provides *qualified* support to the finding that partners may not be passing the full PA incentive onto consumers because we do not know the incentive amounts provided for these particular bulbs, or even if they are currently being incented by the Massachusetts program. This implies two considerations for this study:

[22] This is not a sales weighted average effect. The treats each CFL package equally without regard to sales.

[23] NMR had tried this approach a few years ago, but there were not enough bulbs listed online to make it viable. Obviously, the Internet retailing landscape has changed considerably since then.

***Consideration 1.*** These preliminary findings suggest a methodology to be used in the future to assess the proportion of incentives that are going to consumers. Evaluators would focus on prices for individual supported bulbs at particular retailers in Massachusetts and comparison areas, using Internet research where possible, supplemented by on-site shelf studies. The team would compare the price difference for each bulb to the incentive amount provided for that bulb, and summarize the results across all bulbs and bulb categories (e.g., 13-Watt spirals, CFL candelabras, CFL reflectors, 9-12 Watt LEDs, 13-17 Watt LEDs, etc.) and individual retail chains. This would be in addition to the current statistical modeling approach, which provides average discount amounts, and can be used in net-to-gross estimation. The new suggested approach has the advantage of providing estimates of the incentive amounts passed on to consumers for each individual bulb, based on absolute differences rather than probabilities. Given the implications for program design if the team finds that retailers are *not* in fact passing the full incentive on to consumers, it would be important to conduct this research as early as possible in the next evaluation cycle.

***Consideration 2.*** Alternatively or in addition to the above approach to examining prices, the program implementation contractor could be given greater responsibility for verifying or quantifying the amount of PA discounts being applied to promoted products. This could be done through a combination of internet research and their in-field presence in other jurisdictions where some of the Massachusetts supported products are not supported. Special attention should be paid to LEDs given their rapidly increasing importance in the program but also the continual decrease in their unsupported prices.

# Appendix A

### Table 21. Participant Store Shelf Survey Data Fields

| Data Name | Description | Form Field Name |
|---|---|---|
| ProductType | Product Type (CFL) | cbo_ProductType |
| Model | Model number | cbo_Model |
| Brand | Brand | txt_Brand |
| UnitsDisplayed | Products Displayed (#) | txt_UnitsDisplayed |
| ESTARLabeled | ESTAR label appears on the product or product packaging | cbo_ESTARLabeled |
| RegPrice | Regular Price ($$) (Exclude rebate) | txt_RegPrice |
| SalePrice | Sale Price ($$)(Exclude rebate) | txt_SalePrice |
| UnitsPerPack | For fixtures, this is the number of bulbs/units required, otherwise it is the number of bulbs in the package. | txt_UnitsPerPack |
| WattsPerUnit | For 3-way bulbs enter highest. | txt_WattsPerUnit |
| HrsLife | Hours of expected life. | txt_HrsLife |
| ColorTemp | Specified by Kelvins indicated on packaging. | txt_ColorTemp |
| Lumens | Lumens indicated on packaging | txt_Lumens |
| LumensPerWatt | Lumens per watt indicated on packaging (if Lumens & watts are given this will be calculated.) | txt_LumensPerWatt |
| CRI | Color Rendering Index | txt_ColorRenderingIndex |
| WarrantyYears | Number of Years indicated by packaging. | txt_WarrantyYears |
| LightingFactsLabeled | Indicates if a Lighting Facts Label on the packaging. | cbo_LightingFacts |
| BulbTypeNotice | Indicates if product is labeled as Program sponsored | cboBulbTypeNoted |
| EISANotice | Do you see an EISA Notice displayed? | cbo_EISANotice |
| EISA Compliant | Is this incandescent EISA Compliant? (Y or N) | txt_EISA |
| Style | Selected a Style from dropdown list. | cbo_Style |
| BaseType | Select a Base Type from dropdown list. | cbo_BaseCde |
| Display Location | Indicates where this product was displayed. | cbo_DisplayLocation |
| InsulationContactRating | Select the insulation contact rating as indicated on the packaging. | cbo_InsulationContact |
| Energy Star Qualified | This model is on the E* qualified model list | N/A |

Table 22. [LED] Solid-State Lighting

| Data Name | Description | Form Field Name |
|---|---|---|
| ProductType | Product Type (LED) | cbo_ProductType |
| Model | Model number | cbo_Model |
| Brand | Brand | txt_Brand |
| UnitsDisplayed | Products Displayed (#) | txt_UnitsDisplayed |
| ESTARLabeled | ESTAR label appears on the product or product packaging | cbo_ESTARLabeled |
| RegPrice | Regular Price ($$) (Exclude rebate) | txt_RegPrice |
| SalePrice | Sale Price ($$)(Exclude rebate) | txt_SalePrice |
| UnitsPerPack | For fixtures, this is the number of bulbs/units required, otherwise it is the number of bulbs in the package. | txt_UnitsPerPack |
| WattsPerUnit | For 3-way bulbs enter highest. | txt_WattsPerUnit |
| HrsLife | Hours of expected life. | txt_HrsLife |
| ColorTemp | Specified by Kelvins indicated on packaging. | txt_ColorTemp |
| Lumens | Lumens indicated on packaging | txt_Lumens |
| LumensPerWatt | Lumens per watt indicated on packaging (if Lumens & watts are given this will be calculated.) | txt_LumensPerWatt |
| CRI | Color Rendering Index | txt_ColorRenderingIndex |
| WarrantyYears | Number of Years indicated by packaging. | txt_WarrantyYears |
| LightingFactsLabeled | Indicates if a Lighting Facts Label on the packaging. | cbo_LightingFacts |
| BulbTypeNotice | Indicates if product is labeled as Program sponsored | cboBulbTypeNoted |
| EISANotice | Do you see an EISA Notice displayed? | cbo_EISANotice |
| EISA Compliant | Is this incandescent EISA Compliant? (Y or N) | txt_EISA |
| Style | Selected a Style from dropdown list. | cbo_Style |
| BaseType | Select a Base Type from dropdown list. | cbo_BaseCde |
| Display Location | Indicates where this product was displayed. | cbo_DisplayLocation |
| InsulationContactRating | Select the insulation contact rating as indicated on the packaging. | cbo_InsulationContact |
| Energy Star Qualified | This model is on the E* qualified model list | N/A |

Notes: 1. Field descriptions in red are added during QC process of master db.

2. Cells filled in yellow are not used with the indicated product type(s).

### *[H] Halogen,*

**Table 23. [ I ] Incandescent**

| Data Name | Description | Form Field Name |
|---|---|---|
| ProductType | Product Type (I,H) | cbo_ProductType |
| Model | Model number | cbo_Model |
| Brand | Brand | txt_Brand |
| UnitsDisplayed | Products Displayed (#) | txt_UnitsDisplayed |
| ESTARLabeled | ESTAR label appears on the product or product packaging | cbo_ESTARLabeled |
| RegPrice | Regular Price ($$) (Exclude rebate) | txt_RegPrice |
| SalePrice | Sale Price ($$)(Exclude rebate) | txt_SalePrice |
| UnitsPerPack | For fixtures, this is the number of bulbs/units required, otherwise it is the number of bulbs in the package. | txt_UnitsPerPack |
| WattsPerUnit | For 3-way bulbs enter highest. | txt_WattsPerUnit |
| HrsLife | Hours of expected life. | txt_HrsLife |
| ColorTemp | Specified by Kelvins indicated on packaging. | txt_ColorTemp |
| Lumens | Lumens indicated on packaging | txt_Lumens |
| LumensPerWatt | Lumens per watt indicated on packaging (if Lumens & watts are given this will be calculated.) | txt_LumensPerWatt |
| CRI | Color Rendering Index | txt_ColorRenderingIndex |
| WarrantyYears | Number of Years indicated by packaging. | txt_WarrantyYears |
| LightingFactsLabeled | Indicates if a Lighting Facts Label on the packaging. | cbo_LightingFacts |
| BulbTypeNotice | Indicates if product is labeled as Program sponsored | cboBulbTypeNoted |
| EISANotice | Do you see an EISA Notice displayed? | cbo_EISANotice |
| EISA Compliant | Is this incandescent EISA Compliant? (Y or N) | txt_EISA |
| Style | Selected a Style from dropdown list. | cbo_Style |
| BaseType | Select a Base Type from dropdown list. | cbo_BaseCde |
| Display Location | Indicates where this product was displayed. | cbo_DisplayLocation |
| InsulationContactRating | Select the insulation contact rating as indicated on the packaging. | cbo_InsulationContact |
| Energy Star Qualified | This model is on the E* qualified model list | N/A |

Notes: 1. Field descriptions in red are added during QC process of master db.

2. Cells filled in yellow are not used with the indicated product type(s).

3. EISA compliance only applies to Incandescent.

4. Incandescent are never ESTAR Labeled.

*[S] Suspended/Pendant,*

*[CM] Ceiling mounted,*

*[W]  Wall mounted,*

*[R] Recessed Fixture,*

*[T,F] Torchieres / Floor Lamp,*

*[D,TL] Desk / Table Lamp,*

*[E] Exterior Fixture,*

*[CL] Ceiling Fans with Lights,*

*[CK] Ceiling Fan Light Kits,*

Table 24. [VL] Ventilation Fans with Lights

| Data Name | Description | Form Field Name |
|---|---|---|
| ProductType | Product Type (S, C, W, R,T,F,D,TL,E,CL,CK,VL) | cbo_ProductType |
| Model | Model number | cbo_Model |
| Brand | Brand | txt_Brand |
| UnitsDisplayed | Products Displayed (#) | txt_UnitsDisplayed |
| ESTARLabeled | ESTAR label appears on the product or product packaging | cbo_ESTARLabeled |
| RegPrice | Regular Price ($$) (Exclude rebate) | txt_RegPrice |
| SalePrice | Sale Price ($$)(Exclude rebate) | txt_SalePrice |
| UnitsPerPack | For fixtures, this is the number of bulbs/units required, otherwise it is the number of bulbs in the package. | txt_UnitsPerPack |
| WattsPerUnit | For 3-way bulbs enter highest. | txt_WattsPerUnit |
| HrsLife | Hours of expected life. | txt_HrsLife |
| ColorTemp | Specified by Kelvins indicated on packaging. | txt_ColorTemp |
| Lumens | Lumens indicated on packaging | txt_Lumens |
| LumensPerWatt | Lumens per watt indicated on packaging (if Lumens & watts are given this will be calculated.) | txt_LumensPerWatt |
| CRI | Color Rendering Index | txt_ColorRenderingIndex |
| WarrantyYears | Number of Years indicated by packaging. | txt_WarrantyYears |
| LightingFactsLabeled | Indicates if a Lighting Facts Label on the packaging. | cbo_LightingFacts |
| BulbTypeNotice | Indicates if product is labeled as Program sponsored | cboBulbTypeNoted |
| EISANotice | Do you see an EISA Notice displayed? | cbo_EISANotice |
| EISA Compliant | Is this incandescent EISA Compliant? (Y or N) | txt_EISA |
| Style | Selected a Style from dropdown list. | cbo_Style |
| BaseType | Select a Base Type from dropdown list. | cbo_BaseCde |
| Display Location | Indicates where this product was displayed. | cbo_DisplayLocation |
| InsulationContactRating | Select the insulation contact rating as indicated on the packaging. | cbo_InsulationContact |
| Energy Star Qualified | This model is on the E* qualified model list | N/A |

Notes: 1. Field descriptions in red are added during QC process of master db.

2. Insulation Contact Rating is applicable only to Ventilation Fans.

3. Tan cells are optional and data only needs to be captured if they are obvious on the labeling.

4. Cells filled in yellow are not used with the indicated product type(s).

Table 25. Product Type Code

| ProductTypeCode | Description | ProductTypeName |
|---|---|---|
| CFL | Compact Fluorescent Light Bulb | CFL |
| CK | Ceiling Fan Light Kit | Ceiling Fan Kit |
| CL | Ceiling Fans with Lights | Ceiling Fan |
| CM | Ceiling Mounted Light | Ceiling Light |
| D | Desk Lamp | Desk Lamp |
| E | Exterior Fixture | Exterior Light |
| F | Floor Lamp | Floor Lamp |
| H | Halogen | Halogen Light |
| I | Incandescent (EISA) | Incandescent Light |
| LED | Solid-State Lighting | LED Light |
| R | Recessed Fixture | Recessed Fixture |
| S | Suspended-Pendant Light | Suspended Light |
| T | Torchieres | Torchieres |
| TL | Table Lamp | Table Lamp |
| VL | Ventilation Fan with light | Ventilation Fan |
| W | Wall Mounted Light | Wall Mount Light |
| TST | Programmable Thermostat | Thermostat |

Table 26. Base Type Codes

| BaseCode | BaseType |
|---|---|
| CA | Candelabra |
| ED | Edison |
| GU | GU24 |
| OT | Other |
| PN | Pin Based - Not GU24 |

Table 27. StyleCodes

| Style Code | Style Name | CFL Style | SSL Style | Incandescent | Halogen |
|---|---|---|---|---|---|
| AB | A Bulb | TRUE | TRUE | TRUE | TRUE |
| AB3 | A Bulb 3-way | TRUE | FALSE | FALSE | FALSE |
| AB3O | A Bulb 3-way (NON-Edison) | FALSE | TRUE | FALSE | FALSE |
| ABD | A Bulb dimmable | TRUE | TRUE | FALSE | FALSE |
| ABDO | A Bulb dimmable (NON-Edison) | FALSE | TRUE | FALSE | FALSE |
| ABO | A Bulb (NON-Edison) | FALSE | TRUE | FALSE | FALSE |
| BG | Bug Lamp | TRUE | FALSE | TRUE | TRUE |
| BL | Bullet | TRUE | FALSE | TRUE | TRUE |
| BL3 | Bullet 3-wqy | TRUE | FALSE | TRUE | TRUE |
| BLD | Bullet dimmable | TRUE | FALSE | FALSE | FALSE |
| BO | Bollards - Lamp mounts on post | TRUE | TRUE | FALSE | FALSE |
| CL | Circline | TRUE | FALSE | FALSE | FALSE |
| CL3 | Circline 3-way | TRUE | FALSE | FALSE | FALSE |
| CLD | Circline dimmable | TRUE | FALSE | FALSE | FALSE |
| CM | Ceiling Mounted Lights | TRUE | TRUE | FALSE | FALSE |
| CV | Cove Lighting | TRUE | TRUE | FALSE | FALSE |
| DT | Double Tube | TRUE | FALSE | FALSE | FALSE |
| DT3 | Double Tube 3-way | TRUE | FALSE | FALSE | FALSE |
| DTD | Double Tube dimmable | TRUE | FALSE | FALSE | FALSE |
| DWN | Down Lights-Recessed, Surface & Pendant Mounts | FALSE | TRUE | TRUE | TRUE |
| FL | Flood Lamp | TRUE | TRUE | TRUE | TRUE |
| FL3 | Flood Lamp 3-way | TRUE | TRUE | TRUE | TRUE |
| FL3O | Flood Lamp 3-way (NON-Edison) | FALSE | TRUE | TRUE | TRUE |
| FLD | Flood Lamp dimmable | TRUE | TRUE | FALSE | FALSE |
| FLDO | Flood Lamp dimmable (NON-Edison) | FALSE | TRUE | FALSE | FALSE |
| FLO | Flood Lamp (NON-Edison) | FALSE | TRUE | FALSE | FALSE |
| GL | Globe | TRUE | TRUE | TRUE | TRUE |
| GL3 | Globe 3-way | TRUE | TRUE | TRUE | TRUE |
| GL3O | Globe 3-way (NON-Edison) | TRUE | TRUE | TRUE | TRUE |
| GLD | Globe dimmable | TRUE | TRUE | FALSE | FALSE |
| GLDO | Globe dimmable (NON-Edison) | FALSE | TRUE | FALSE | FALSE |
| GLO | Globe (NON-Edison) | FALSE | TRUE | TRUE | TRUE |
| MR | Multifaceted reflector lamp | FALSE | TRUE | TRUE | TRUE |
| OWP | Outdoor Wall Mounted Porch Lights | FALSE | TRUE | TRUE | TRUE |
| PDL | Portable Desk Lamp | FALSE | TRUE | FALSE | FALSE |
| PL | Outdoor Pole Lamp | FALSE | TRUE | FALSE | FALSE |

| | | | | | |
|---|---|---|---|---|---|
| PTH | Outdoor Pathway | FALSE | TRUE | TRUE | TRUE |
| QT | Quad Tube | TRUE | FALSE | FALSE | FALSE |
| QT3 | Quad Tube 3-way | TRUE | FALSE | FALSE | FALSE |
| QTD | Quad Tube dimmable | TRUE | FALSE | FALSE | FALSE |
| SLF | Shelf-mounted Lights | TRUE | TRUE | TRUE | TRUE |
| SMD | Surface Mounted Directional Head Lights | TRUE | TRUE | TRUE | TRUE |
| SP | Spiral | TRUE | FALSE | FALSE | FALSE |
| SP3 | Spiral 3-way | TRUE | FALSE | FALSE | FALSE |
| SPD | Spiral dimmable | TRUE | FALSE | FALSE | FALSE |
| STP | Outdoor Step Lights | FALSE | TRUE | FALSE | FALSE |
| TCC | Torpedo cold cathode | TRUE | FALSE | FALSE | FALSE |
| TP | Torpedo | TRUE | FALSE | TRUE | TRUE |
| TP3 | Torpedo 3-way | TRUE | FALSE | TRUE | TRUE |
| TPC | Torpedo candelabra base | TRUE | FALSE | TRUE | TRUE |
| TPD | Torpedo dimmable | TRUE | FALSE | FALSE | FALSE |
| TT | Triple Tube | TRUE | FALSE | FALSE | FALSE |
| TT3 | Triple Tube 3-way | TRUE | FALSE | FALSE | FALSE |
| TTD | Triple Tube dimmable | TRUE | FALSE | FALSE | FALSE |
| UC | Under Cabinet Kitchen Light | FALSE | TRUE | TRUE | TRUE |
| WW | Wall Wash | FALSE | TRUE | FALSE | FALSE |

**Figure 4. Bulb Types**

Figure 5. Input Screen Sample

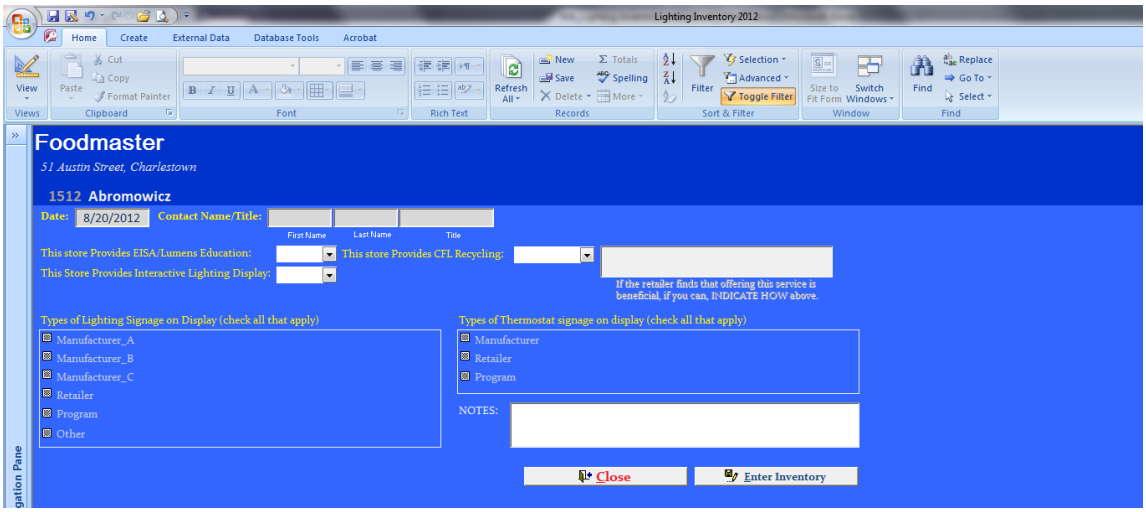



Figure 6. Input Screen Sample

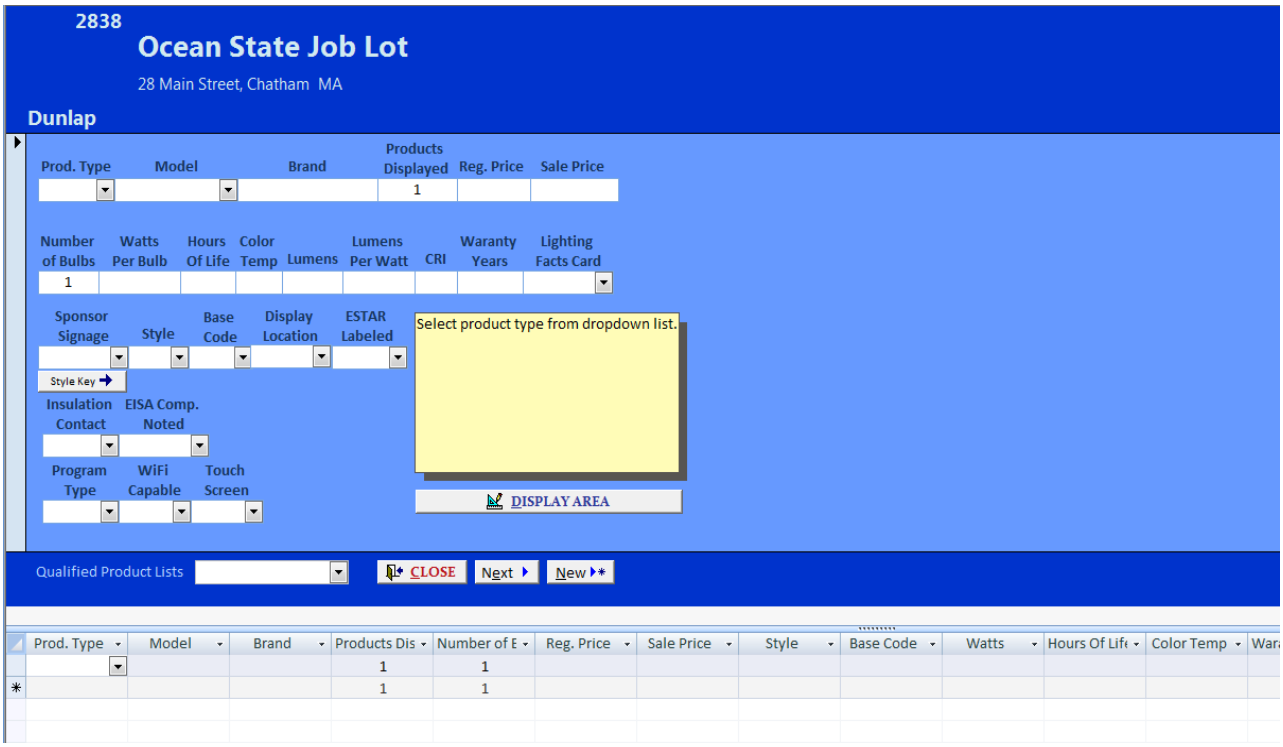
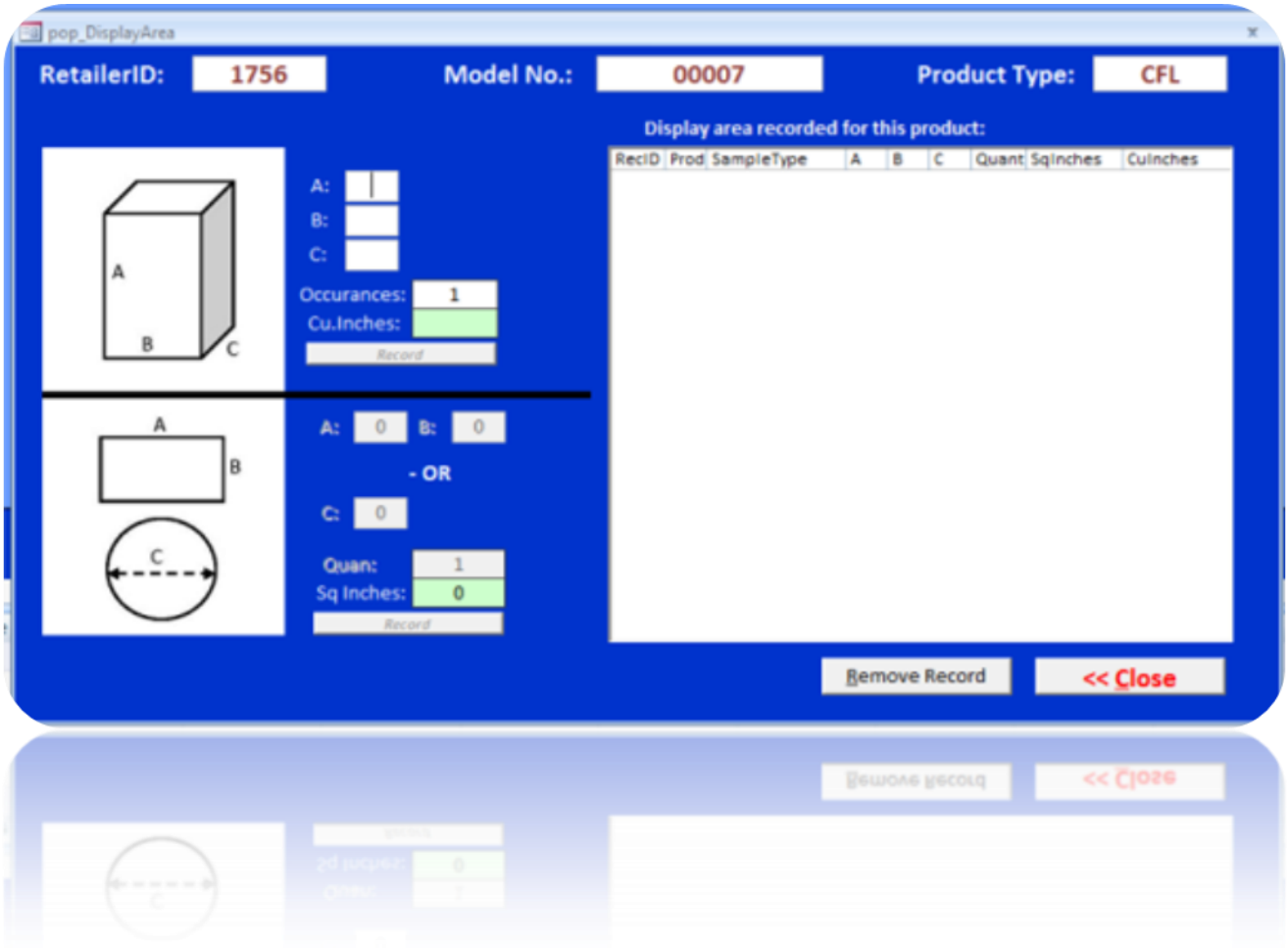


Figure 7. Figure Title



### *Former Participant Store Shelf Stocking Survey*

| | |
|---|---|
| ID #: | Field staff name: |
| Store name: | Date & Time: |
| Store street address: | Store city and state: |
| Store type: | Store zip code: |
| Contact name: | Sponsor: |
| Notes: | |

The NMR Group, along with the Cadmus Group Inc. and KEMA, is conducting a study on behalf of the energy efficiency program administrators in the State of Massachusetts regarding compact fluorescent lighting in an effort to evaluate and improve their energy efficiency programs. As part of this study, we are going to retail stores across the state to learn about their sales and stocking practices for light bulbs and lighting fixtures. Your responses are confidential and will not be linked to your particular store by name or address.

### *Section I. CFL, LED, Halogen, and Incandescent Inventory Data Collection*

The table below describes each of the fields of information to be gathered on all CFL, LED, Halogen, and Incandescent bulbs found in the store.

Table 28. Shelf Survey Data Collected

| Bulb Type | CFL, LED, or Halogen | Watts/Bulb | Bulb Wattage |
|---|---|---|---|
| Bulb Type on Pack? | Is the bulb type noted on the package? | Lumens | Lumens listed on package |
| Mfg. | Manufacturer | Lifetime Hrs | Lifetime hours listed on package |
| Model # | Model Number | Color Temp in Kelvin | Color Temp in Kelvin listed on package |
| ESTAR Label? | In the ENERGY STAR label on the package? | Warranty | Warranty years listed on package |
| Bulbs/Pack | Number of bulbs per package | CRI # | Color Rendering Index number listed on package |
| # of packs | Number of packs with same manufacturer & model number | Light Facts? | Is there a lighting facts label on the package? |
| Bulb Style | Bulb shape, spec features (use codes sheet) | Sponsor Sign? | Is there a sponsor sign in the area of these packages? |
| Base Type | Pin, Screw, GU…write in any other type you find | Loc | Location of packages: End cap, low, middle or high shelf, wing stack, register, clearance |
| Reg. Price | Regular Store Price | EISA Comp? | Energy Independence and Securities Act of 2007Compliance noted on package? (For Incandescent Bulb Only) |
| Sale Price | Sale Price | | |

Table 29. Data Collection Sheet

| Bulb Type | Bulb Type on Pack? | Mfg | Model # | ESTAR Label? | Bulbs /Pack | # of Packs | Bulb Style (see codes) | Base Type (Pin, Screw, GU) | Reg. Price | Sale Price | Watts /Bulb | Lum-ens | Life-time Hrs | Color Temp in Kelvin | Warr-anty (in years) | CRI # | Light Facts? | Spon-sor Sign? | Loc | EISA Comp? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | $ | $ | | | | | | | | | | |
| | | | | | | | | | $ | $ | | | | | | | | | | |
| | | | | | | | | | $ | $ | | | | | | | | | | |

### *Section II. Fixture Inventory Data Collection*

The table below describes each of the fields of information to be gathered on all fixtures found in the store.

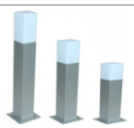
**Table 30. Data Collection Sheet**

| Fixt Type | Fixture Type | Lumens | Lumens listed on package |
|---|---|---|---|
| Bulb Type on Pack | Is the bulb type noted on the package? If so, write in type of bulb noted. If not, leave blank. | Lifetime Hrs | Lifetime hours listed on package |
| Mfg. | Manufacturer | Color Temp in Kelvin | Color Temp in Kelvin listed on package |
| Model # | Model Number | Warranty | Warranty years listed on package |
| ESTAR Label? | In the ENERGY STAR label on the package? | CRI # | Color Rendering Index number listed on package |
| Bulbs/Fixt | Number of bulbs per fixture | Light Facts? | Is there a lighting facts label on the package? |
| # of Fixt | Number of fixtures with same manufacturer & model number | Sponsor Sign? | Is there a sponsor sign in the area of these packages? |
| Reg. Price | Regular Store Price | Loc | Location of packages: End cap, low, middle or high shelf, wing stack, register, clearance |
| Sale Price | Sale Price | Insul Contact | Only applicable to ventilation fans. Choices: IC=Insulation Contact, ICAT=Insulation Contact Air Tight, or N/A. |
| Watts/Bulb | Bulb Wattage | | |

Table 31. Data Collection Sheet

| Fixt Type Codes: S=Suspended/Pendant, CM=Ceiling Mount, W=Wall Mount, R=Recessed Can, T=Torchiere, F=Floor Lamp, TL=Table Lamp, E=Exterior Fixture, CL=Ceiling Fan With Lights, CK=Ceiling Fan Light Kits, VL=Ventilation Fan With Lights | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fixt Type | Bulb Type on Pack | Mfg | Model # | ESTAR Label? | Bulbs /Fixt | # of Fixt | Reg. Price | Sale Price | Watts /Bulb | Lum-ens | Life-time Hrs | Color Temp in Kelvin | Warr-anty (in years) | CRI # | Light Facts? | Spon-sor Sign? | Loc | Insul Contact |
| | | | | | | | $ | $ | | | | | | | | | | |
| | | | | | | | $ | $ | | | | | | | | | | |
| | | | | | | | $ | $ | | | | | | | | | | |
| | | | | | | | $ | $ | | | | | | | | | | |
| | | | | | | | $ | $ | | | | | | | | | | |

Table 32. Style Codes

| Style Code | Style Name | Image |
|---|---|---|
| AB | A Bulb (Screw based) | |
| ABO | A Bulb (Pin-based) | |
| AB3 | A Bulb 3-way (Screw based) | |
| AB3O | A Bulb 3-way (Pin-based) | |
| ABD | A Bulb dimmable (Screw based) | |
| ABDO | A Bulb dimmable (Pin-based) | |
| BO | Bollards (LED) |  |
| BG | Bug Lamp | |
| BL | Bullet | |
| BL3 | Bullet 3-way | |
| BLD | Bullet dimmable | |
| CM | Ceiling Mounted Lights | Any ceiling fixture |
| CL | Circline | |
| CL3 | Circline 3-way | |
| CLD | Circline dimmable | |
| CV | Cove Lighting (LED) | |
| DT | Double Tube | |
| DT3 | Double Tube 3-way | |
| DTD | Double Tube dimmable | |
| DWN | Down Lights (LED) | |
| FL | Flood Lamp (Screw based) | |
| FLO | Flood Lamp (Pin-based) | |
| FL3 | Flood Lamp 3-way (Screw based) | |
| FL3O | Flood Lamp 3-way (Pin-based) | |
| FLD | Flood Lamp dimmable (Screw based) | |
| FLDO | Flood Lamp dimmable (Pin-based) | |
| GL | Globe (Screw based) | |
| GLO | Globe (Pin-based) | |
| GL3 | Globe 3-way (Screw based) | |
| GL3O | Globe 3-way (Pin-based)) | |
| GLD | Globe dimmable (Screw based) | |
| GLDO | Globe dimmable (Pin-based) | |

| Style Code | Style Name | Image |
|---|---|---|
| MR | Multifaceted reflector lamp | |
| PTH | Outdoor Pathway | |
| PL | Outdoor Pole Lamp | Self-Explanatory |
| STP | Outdoor Step Lights | Says “step lights” on package |
| OWP | Outdoor Wall Mounted Porch Light | Self-Explanatory |
| PDL | Portable Desk Lamp | Self-Explanatory |
| QT | Quad Tube | |
| QT3 | Quad Tube 3-way | |
| QTD | Quad Tube dimmable | |
| UC | Under Cabinet | Self-Explanatory |
| RB | Replacement Bulb -Edison Base | Says “replacement bulb” on package |
| SLF | Shelf-mounted Lights | Says “shelf lights” on package |
| SP | Spiral | |
| SP3 | Spiral 3-way | |
| SPD | Spiral dimmable | |
| SMD | Surface Mounted Lights (LED) | |
| TP | Torpedo | |
| TP3 | Torpedo 3-way | |
| TPC | Torpedo candelabra base | |
| TCC | Torpedo cold cathode | |
| TPD | Torpedo dimmable | |
| TT | Triple Tube | |
| TT3 | Triple Tube 3-way | |
| TTD | Triple Tube dimmable | |
| WW | Wall Wash | |

# Appendix B

### Table 33. Regression Outputs for Retail Price Analysis of Standard, Bare-Spiral CFLs

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Intercept | 10.89 | 8.16 | 7.42 | 7.19 | 7.63 | 7.58 |
| | (0.30) | (0.34) | (0.42) | (0.63) | (0.68) | (0.69) |
| IOU Discount | -2.08 | -1.70 | -1.74 | -1.85 | -1.76 | -1.05 |
| | (0.23) | (0.22) | (0.23) | (0.24) | (0.24) | (0.38) |
| Other Discount | -1.10 | -0.55 | -0.54 | -0.76 | -0.63 | -0.79 |
| | (0.33) | (0.30) | (0.30) | (0.31) | (0.32) | (0.32) |
| ENERGY STAR | -1.66 | -1.51 | -1.63 | -1.51 | -1.51 | -1.52 |
| | (0.28) | (0.26) | (0.25) | (0.25) | (0.25) | (0.25) |
| Less or Equal to 10 W | -3.05 | -3.00 | -2.96 | -2.88 | -2.86 | -2.79 |
| | (0.41) | (0.38) | (0.37) | (0.36) | (0.36) | (0.36) |
| 11 to 15 W | -3.04 | -2.43 | -2.34 | -2.32 | -2.34 | -2.35 |
| | (0.26) | (0.25) | (0.24) | (0.24) | (0.24) | (0.24) |
| 16 to 20 W | -2.63 | -2.06 | -2.04 | -2.02 | -2.04 | -1.98 |
| | (0.32) | (0.30) | (0.29) | (0.29) | (0.29) | (0.29) |
| 21 to 25 W | -3.36 | -1.97 | -1.85 | -1.91 | -1.94 | -1.89 |
| | (0.31) | (0.31) | (0.31) | (0.31) | (0.31) | (0.30) |
| Quantity - 2-Pack | -1.54 | -2.52 | -2.54 | -2.52 | -2.55 | -2.59 |
| | (0.29) | (0.29) | (0.28) | (0.28) | (0.28) | (0.28) |
| Quantity - 3-Pack | -3.59 | -4.28 | -4.11 | -4.24 | -4.24 | -4.26 |
| | (0.44) | (0.41) | (0.42) | (0.42) | (0.42) | (0.41) |
| Quantity - 4-Pack | -3.21 | -2.92 | -3.19 | -3.32 | -3.33 | -3.51 |
| | (0.34) | (0.34) | (0.34) | (0.34) | (0.34) | (0.34) |
| Quantity - 5-Pack or More | -3.98 | -4.94 | -5.24 | -5.15 | -5.17 | -5.28 |
| | (0.36) | (0.34) | (0.35) | (0.35) | (0.35) | (0.34) |
| Manufacturer: GE | | 3.39 | 3.76 | 3.55 | 3.56 | 3.42 |
| | | (0.24) | (0.24) | (0.25) | (0.25) | (0.25) |
| Manufacturer: Sylvania | | 2.87 | 2.87 | 2.56 | 2.40 | 2.37 |
| | | (0.29) | (0.30) | (0.34) | (0.35) | (0.35) |
| Manufacturer: Bright Effects | | -0.20 | -1.43 | -1.47 | -1.51 | -1.44 |
| | | (4.93) | (4.83) | (4.76) | (4.75) | (4.70) |
| Manufacturer: TCP | | 3.62 | 3.09 | 3.19 | 3.20 | 3.00 |
| | | (0.89) | (0.90) | (0.89) | (0.89) | (0.88) |
| Manufacturer: Home Depot | | 2.62 | 1.71 | 1.88 | 1.89 | 1.50 |
| | | (0.36) | (0.48) | (0.47) | (0.47) | (0.48) |
| Manufacturer: Feit | | 1.42 | 0.57 | 0.24 | 0.21 | 0.07 |
| | | (0.48) | (0.51) | (0.52) | (0.52) | (0.52) |
| Small Hardware Store | | | 1.28 | 0.95 | 0.72 | 1.35 |
| | | | (0.30) | (0.34) | (0.37) | (0.39) |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Discount Store | | | 0.36 | 0.10 | -0.09 | -0.15 |
| | | | (0.33) | (0.36) | (0.38) | (0.44) |
| Drug Store | | | -0.60 | -1.11 | -1.57 | -1.11 |
| | | | (0.44) | (0.47) | (0.55) | (0.56) |
| Membership Store | | | 2.52 | 2.78 | 2.73 | 3.90 |
| | | | (0.71) | (0.71) | (0.71) | (2.94) |
| Mass Merchandise Store | | | 0.08 | 0.10 | 0.00 | 0.17 |
| | | | (0.36) | (0.39) | (0.39) | (0.42) |
| Large Home Improvement Store | | | 1.87 | 1.42 | 1.32 | 1.61 |
| | | | (0.44) | (0.47) | (0.48) | (0.48) |
| Boston MSA | | | | 0.92 | 0.91 | 0.64 |
| | | | | (0.46) | (0.46) | (0.46) |
| Barnstable MSA | | | | -0.96 | -0.90 | -1.03 |
| | | | | (0.69) | (0.69) | (0.68) |
| Pittsfield MSA | | | | 1.52 | 1.52 | 1.11 |
| | | | | (0.64) | (0.64) | (0.64) |
| Worcester MSA | | | | 1.22 | 1.18 | 0.84 |
| | | | | (0.54) | (0.54) | (0.54) |
| Cambridge MSA | | | | 0.51 | 0.48 | 0.36 |
| | | | | (0.48) | (0.48) | (0.47) |
| Peabody MSA | | | | -0.42 | -0.33 | -0.66 |
| | | | | (0.51) | (0.51) | (0.51) |
| Springfield MSA | | | | 0.09 | 0.08 | -0.09 |
| | | | | (0.52) | (0.52) | (0.52) |
| September Survey | | | | | -0.41 | -0.27 |
| | | | | | (0.25) | (0.25) |
| Small Hardware Store * IOU Discount | | | | | 0.00 | -2.84 |
| | | | | | (0.00) | (0.57) |
| Discount Store * IOU Discount | | | | | 0.00 | 0.04 |
| | | | | | (0.00) | (0.58) |
| Membership Store * IOU Discount | | | | | | -1.60 |
| | | | | | | (2.99) |
| Mass Merchandise Store * IOU Discount | | | | | | 0.15 |
| | | | | | | (0.90) |
| F-Value | 63.16 | 61.82 | 50.55 | 41.27 | 40.09 | 37.33 |
| Adjusted R-Squared | 0.37 | 0.47 | 0.50 | 0.51 | 0.51 | 0.52 |
| N | 1153 | 1153 | 1153 | 1153 | 1153 | 1153 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS.

Table 34. Regression Outputs for Retail Price Analysis of A-Line Bulbs

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Intercept | 8.68 | 5.61 | 4.48 | 5.31 | 7.19 | 6.62 |
| | (1.27) | (1.07) | (1.12) | (1.31) | (1.53) | (1.58) |
| IOU Discount | -1.96 | -1.28 | -0.94 | -1.07 | -0.96 | -0.80 |
| | (0.46) | (0.41) | (0.40) | (0.43) | (0.43) | (0.47) |
| Other Discount | 0.07 | 1.36 | 0.89 | 0.66 | 1.05 | 0.82 |
| | (0.92) | (0.77) | (0.74) | (0.76) | (0.77) | (0.78) |
| ENERGY STAR | -4.57 | -3.38 | -2.56 | -2.55 | -2.41 | -2.44 |
| | (0.56) | (0.49) | (0.55) | (0.56) | (0.55) | (0.55) |
| Less or Equal to 10 W | 1.35 | 1.24 | 1.33 | 1.59 | 1.31 | 1.52 |
| | (1.36) | (1.10) | (1.06) | (1.10) | (1.10) | (1.10) |
| 11 to 15 W | 1.06 | 0.15 | 0.19 | 0.56 | 0.19 | 0.31 |
| | (1.28) | (1.04) | (1.00) | (1.05) | (1.05) | (1.06) |
| 16 to 20 W | 0.68 | 0.83 | 0.69 | 1.02 | 0.61 | 0.77 |
| | (1.34) | (1.08) | (1.06) | (1.12) | (1.12) | (1.12) |
| 21 to 25 W | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (.) | (.) | (.) | (.) | (.) | (.) |
| Quantity - 2-Pack | -2.66 | -2.60 | -1.49 | -1.55 | -1.52 | -1.59 |
| | (0.54) | (0.51) | (0.60) | (0.61) | (0.60) | (0.59) |
| Quantity - 3-Pack | -1.66 | -3.27 | -2.29 | -2.12 | -2.03 | -2.13 |
| | (0.85) | (0.70) | (0.73) | (0.75) | (0.75) | (0.74) |
| Manufacturer: GE | | 4.42 | 3.97 | 3.93 | 3.72 | 3.70 |
| | | (0.44) | (0.44) | (0.46) | (0.47) | (0.46) |
| Manufacturer: Sylvania | | 4.83 | 4.82 | 4.91 | 4.40 | 4.61 |
| | | (0.68) | (0.69) | (0.72) | (0.75) | (0.74) |
| Manufacturer: Bright Effects | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | (.) | (.) | (.) | (.) | (.) |
| Manufacturer: TCP | | -0.16 | 1.51 | 1.83 | 1.77 | 1.61 |
| | | (1.99) | (1.95) | (2.03) | (2.01) | (1.98) |
| Manufacturer: Home Depot | | 2.99 | 1.60 | 1.85 | 1.98 | 0.67 |
| | | (0.75) | (0.95) | (0.99) | (0.98) | (1.19) |
| Manufacturer: Feit | | 2.12 | 1.04 | 0.58 | 0.53 | 0.08 |
| | | (0.92) | (0.90) | (1.10) | (1.09) | (1.08) |
| Small Hardware Store | | | 1.93 | 1.83 | 1.42 | 2.18 |
| | | | (0.58) | (0.70) | (0.71) | (0.81) |
| Discount Store | | | -0.54 | -0.46 | -0.99 | -0.88 |
| | | | (0.55) | (0.61) | (0.64) | (0.63) |
| Drug Store | | | 2.95 | 2.87 | 1.51 | 2.01 |
| | | | (0.92) | (1.00) | (1.15) | (1.19) |
| Mass Merchandise Store | | | -0.76 | -1.17 | -1.17 | -1.06 |
| | | | (0.63) | (0.70) | (0.69) | (0.68) |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Large Home Improvement Store | | | 0.62 | 0.43 | 0.10 | 0.03 |
| | | | (0.80) | (0.92) | (0.92) | (0.99) |
| Boston MSA | | | | -1.06 | -0.99 | -1.03 |
| | | | | (0.85) | (0.84) | (0.83) |
| Barnstable MSA | | | | -1.11 | -0.89 | -0.80 |
| | | | | (1.19) | (1.18) | (1.17) |
| Pittsfield MSA | | | | -1.27 | -1.34 | -1.49 |
| | | | | (1.22) | (1.20) | (1.20) |
| Worcester MSA | | | | -0.49 | -1.62 | -1.30 |
| | | | | (1.26) | (1.34) | (1.33) |
| Cambridge MSA | | | | -0.59 | -0.82 | -0.75 |
| | | | | (0.88) | (0.87) | (0.86) |
| Peabody MSA | | | | -2.14 | -1.82 | -2.04 |
| | | | | (1.03) | (1.03) | (1.02) |
| Springfield MSA | | | | -1.03 | -0.94 | -0.92 |
| | | | | (0.90) | (0.90) | (0.88) |
| September Survey | | | | | -1.60 | -1.21 |
| | | | | | (0.70) | (0.71) |
| Small Hardware Store * IOU Discount | | | | | 0.00 | -2.36 |
| | | | | | (0.00) | (1.09) |
| Large Home Improvement Store * IOU Discount | | | | | 0.00 | 1.64 |
| | | | | | (0.00) | (1.27) |
| F-Value | 15.33 | 24.23 | 22.00 | 16.06 | 15.97 | 15.56 |
| Adjusted R-Squared | 0.34 | 0.57 | 0.63 | 0.62 | 0.63 | 0.64 |
| N | 227 | 227 | 227 | 227 | 227 | 227 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS.

### Table 35. Regression Outputs for Retail Price Analysis of Reflector CFLs

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Intercept | 14.23 | 9.40 | 7.11 | 7.14 | 9.15 | 8.33 |
| | (0.73) | (0.88) | (1.08) | (1.43) | (1.57) | (1.55) |
| IOU Discount | -2.83 | -2.78 | -2.73 | -2.63 | -2.15 | 0.35 |
| | (0.56) | (0.54) | (0.53) | (0.53) | (0.55) | (0.94) |
| Other Discount | -2.61 | -1.92 | -1.54 | -1.84 | -1.05 | -1.63 |
| | (0.82) | (0.76) | (0.71) | (0.73) | (0.77) | (0.76) |
| ENERGY STAR | -3.63 | -4.06 | -4.16 | -4.09 | -3.89 | -3.95 |
| | (0.63) | (0.62) | (0.58) | (0.57) | (0.57) | (0.56) |
| Less or Equal to 10 W | -4.24 | 0.76 | -0.59 | 1.10 | 1.86 | 1.88 |
| | (3.02) | (2.93) | (2.77) | (2.76) | (2.74) | (2.69) |
| 11 to 15 W | -2.24 | -0.06 | -0.36 | -0.55 | -0.61 | -0.58 |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | (0.70) | (0.70) | (0.65) | (0.64) | (0.64) | (0.62) |
| 16 to 20 W | -2.91 | 0.67 | -0.02 | 0.02 | 0.09 | 0.04 |
| | (0.86) | (0.96) | (0.88) | (0.87) | (0.86) | (0.84) |
| 21 to 25 W | -1.49 | 1.76 | 1.66 | 1.65 | 1.53 | 1.68 |
| | (0.78) | (0.88) | (0.82) | (0.81) | (0.80) | (0.78) |
| Quantity - 2-Pack | -3.46 | -3.47 | -2.42 | -2.46 | -2.48 | -2.52 |
| | (0.69) | (0.73) | (0.69) | (0.68) | (0.67) | (0.66) |
| Quantity - 3-Pack | -3.91 | -5.36 | -8.50 | -9.02 | -8.82 | -8.81 |
| | (1.78) | (1.67) | (2.13) | (2.08) | (2.06) | (2.01) |
| Quantity - 4-Pack | -5.40 | -3.09 | -5.59 | -6.77 | -7.06 | -7.20 |
| | (1.48) | (1.39) | (2.06) | (2.04) | (2.02) | (1.96) |
| Quantity - 5-Pack or More | -4.88 | -4.41 | -3.86 | -4.00 | -4.15 | -4.22 |
| | (1.50) | (1.49) | (1.35) | (1.32) | (1.31) | (1.29) |
| Manufacturer: GE | | 5.51 | 6.27 | 6.01 | 6.08 | 5.79 |
| | | (0.65) | (0.63) | (0.62) | (0.62) | (0.61) |
| Manufacturer: Sylvania | | 3.53 | 5.08 | 4.41 | 3.94 | 3.78 |
| | | (0.75) | (0.74) | (0.85) | (0.85) | (0.83) |
| Manufacturer: Bright Effects | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | (.) | (.) | (.) | (.) | (.) |
| Manufacturer: TCP | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | (.) | (.) | (.) | (.) | (.) |
| Manufacturer: Home Depot | | 2.53 | 1.11 | 1.73 | 2.23 | 1.87 |
| | | (0.81) | (1.00) | (0.99) | (1.00) | (0.97) |
| Manufacturer: Feit | | -0.18 | 0.02 | -0.66 | -0.81 | -0.85 |
| | | (1.01) | (0.95) | (1.00) | (0.99) | (0.96) |
| Small Hardware Store | | | 3.45 | 2.64 | 1.62 | 2.69 |
| | | | (0.70) | (0.82) | (0.88) | (0.89) |
| Discount Store | | | 2.75 | 2.56 | 1.77 | 1.32 |
| | | | (0.84) | (0.93) | (0.95) | (0.93) |
| Drug Store | | | 5.13 | 4.24 | 2.27 | 3.22 |
| | | | (1.40) | (1.47) | (1.59) | (1.57) |
| Membership Store | | | 5.13 | 6.41 | 6.14 | 3.92 |
| | | | (2.17) | (2.16) | (2.14) | (2.18) |
| Mass Merchandise Store | | | -2.13 | -2.24 | -2.81 | -2.07 |
| | | | (0.85) | (0.92) | (0.93) | (1.00) |
| Large Home Improvement Store | | | 3.44 | 2.53 | 1.69 | 2.08 |
| | | | (1.06) | (1.19) | (1.21) | (1.26) |
| Boston MSA | | | | 1.25 | 0.99 | 1.18 |
| | | | | (0.96) | (0.95) | (0.93) |
| Barnstable MSA | | | | -1.93 | -1.72 | -1.31 |
| | | | | (1.48) | (1.47) | (1.43) |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Pittsfield MSA | | | | -0.21 | -0.40 | -1.08 |
| | | | | (1.26) | (1.25) | (1.23) |
| Worcester MSA | | | | 2.37 | 1.71 | 1.70 |
| | | | | (1.13) | (1.14) | (1.12) |
| Cambridge MSA | | | | 0.57 | 0.05 | 0.71 |
| | | | | (1.00) | (1.00) | (0.99) |
| Peabody MSA | | | | -1.16 | -1.15 | -1.10 |
| | | | | (1.04) | (1.02) | (1.00) |
| Springfield MSA | | | | 0.63 | 0.44 | 0.86 |
| | | | | (1.08) | (1.07) | (1.07) |
| September Survey | | | | | -1.86 | -1.36 |
| | | | | | (0.62) | (0.61) |
| Small Hardware Store * IOU Discount | | | | | 0.00 | -7.23 |
| | | | | | (0.00) | (1.48) |
| Membership Store * IOU Discount | | | | | 0.00 | 0.00 |
| | | | | | (0.00) | (.) |
| Large Home Improvement Store * IOU Discount | | | | | | -2.17 |
| | | | | | | (1.29) |
| Mass Merchandise Store * IOU Discount | | | | | | -3.47 |
| | | | | | | (1.58) |
| F-Value | 17.35 | 21.27 | 23.17 | 19.27 | 19.30 | 19.32 |
| Adjusted R-Squared | 0.31 | 0.43 | 0.54 | 0.56 | 0.57 | 0.59 |
| N | 405 | 405 | 405 | 405 | 405 | 405 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS.

### Table 36. Regression Outputs for Retail Price Analysis of Globe CFLs

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Intercept | 7.45 | 3.59 | 3.84 | 3.46 | 3.83 | 3.78 |
| | (2.97) | (2.48) | (2.16) | (2.18) | (2.27) | (2.06) |
| IOU Discount | -1.68 | -2.10 | -1.71 | -1.46 | -1.36 | -0.57 |
| | (0.56) | (0.51) | (0.44) | (0.47) | (0.49) | (0.60) |
| Other Discount | -0.50 | 0.22 | -0.11 | 0.28 | 0.42 | -0.04 |
| | (0.80) | (0.64) | (0.55) | (0.58) | (0.63) | (0.57) |
| ENERGY STAR | -1.53 | -1.02 | -0.89 | -0.64 | -0.62 | -1.11 |
| | (0.98) | (0.77) | (0.69) | (0.68) | (0.68) | (0.62) |
| Less or Equal to 10 W | -1.86 | 0.82 | -0.05 | -0.34 | -0.27 | -0.62 |
| | (3.01) | (2.45) | (2.09) | (2.02) | (2.03) | (1.84) |
| 11 to 15 W | -0.06 | 1.66 | 0.44 | 0.21 | 0.28 | -0.17 |
| | (3.00) | (2.40) | (2.05) | (1.97) | (1.99) | (1.79) |
| 16 to 20 W | -0.64 | 0.98 | -0.10 | -0.02 | 0.05 | -0.96 |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | (3.36) | (2.69) | (2.26) | (2.19) | (2.20) | (1.98) |
| 21 to 25 W | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (.) | (.) | (.) | (.) | (.) | (.) |
| Quantity - 2-Pack | -1.68 | -1.92 | -0.40 | -1.00 | -1.00 | -1.01 |
| | (0.62) | (0.58) | (0.57) | (0.58) | (0.58) | (0.54) |
| Quantity - 3-Pack | -1.06 | -3.06 | -1.75 | -1.63 | -1.69 | -1.92 |
| | (0.97) | (0.82) | (0.73) | (0.74) | (0.75) | (0.68) |
| Manufacturer: GE | | 3.38 | 3.80 | 3.06 | 3.07 | 2.57 |
| | | (0.61) | (0.52) | (0.56) | (0.56) | (0.52) |
| Manufacturer: Sylvania | | 5.63 | 5.57 | 5.51 | 5.39 | 4.96 |
| | | (1.07) | (1.00) | (1.03) | (1.05) | (0.97) |
| Manufacturer: Bright Effects | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | (.) | (.) | (.) | (.) | (.) |
| Manufacturer: TCP | | -2.77 | 0.09 | -1.11 | -1.15 | -0.93 |
| | | (1.27) | (1.17) | (1.17) | (1.17) | (1.07) |
| Manufacturer: Home Depot | | 3.25 | 1.33 | 1.71 | 1.77 | 0.56 |
| | | (0.84) | (1.04) | (1.02) | (1.03) | (0.97) |
| Manufacturer: Feit | | 1.18 | 0.65 | -0.95 | -1.09 | -1.37 |
| | | (0.91) | (0.77) | (1.04) | (1.06) | (0.96) |
| Small Hardware Store | | | 1.71 | 2.36 | 2.18 | 3.65 |
| | | | (0.72) | (0.79) | (0.85) | (0.83) |
| Discount Store | | | -0.48 | -0.48 | -0.60 | -0.88 |
| | | | (0.76) | (0.86) | (0.89) | (0.81) |
| Drug Store | | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | (.) | (.) | (.) | (.) |
| Mass Merchandise Store | | | -1.86 | -1.12 | -1.17 | -1.04 |
| | | | (0.79) | (0.84) | (0.84) | (0.81) |
| Large Home Improvement Store | | | 1.01 | 1.21 | 1.02 | 1.72 |
| | | | (1.07) | (1.13) | (1.17) | (1.07) |
| Boston MSA | | | | 0.59 | 0.52 | 0.41 |
| | | | | (0.70) | (0.71) | (0.64) |
| Barnstable MSA | | | | -0.84 | -0.84 | -0.50 |
| | | | | (1.50) | (1.51) | (1.38) |
| Pittsfield MSA | | | | -0.13 | -0.28 | -0.87 |
| | | | | (1.25) | (1.27) | (1.16) |
| Worcester MSA | | | | 1.47 | 1.35 | 1.35 |
| | | | | (1.04) | (1.07) | (0.96) |
| Cambridge MSA | | | | -1.04 | -1.10 | -0.93 |
| | | | | (0.77) | (0.77) | (0.70) |
| Peabody MSA | | | | 0.32 | 0.38 | -0.29 |
| | | | | (0.88) | (0.89) | (0.81) |

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Springfield MSA | | | | 1.31 | 1.29 | 0.99 |
| | | | | (0.81) | (0.81) | (0.75) |
| September Survey | | | | | -0.39 | 0.60 |
| | | | | | (0.64) | (0.61) |
| Small Hardware Store * IOU Discount | | | | | 0.00 | -4.25 |
| | | | | | (0.00) | (0.96) |
| Mass Merchandise Store * IOU Discount | | | | | 0.00 | 0.75 |
| | | | | | (0.00) | (1.01) |
| F-Value | 4.16 | 9.97 | 13.82 | 11.29 | 10.79 | 13.37 |
| Adjusted R-Squared | 0.17 | 0.49 | 0.64 | 0.67 | 0.67 | 0.73 |
| N | 124 | 124 | 124 | 124 | 124 | 124 |

Notes: Dependent variable in all models is price per bulb. Standard errors in parentheses. All models estimated by OLS.