

# California Residential Efficiency Market Share Tracking: Lamps 2005

Prepared for:

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# California Lamp Report 2005

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## 1. Introduction

The California Lamp Report 2005 presents the analysis of lamp sales for residential use in California and the U.S. from 1998 through 2005.<sup>1</sup> This research is one component of the larger California Residential Market Share Tracking (RMST) project, which has monitored the market penetration of energy efficient measures in California since 1999. The RMST supports California's investor-owned utilities (IOUs) in their program planning and efforts to measure statewide and IOU-specific program milestones for promoting short-term adoption of measures and longer-term market acceptance of energy efficient technologies. In addition to lamps, the RMST estimates the average efficiency rating and market penetration of high efficiency residential gas furnaces, central air conditioners, refrigerators, clothes washers, dishwashers, and room air conditioners.<sup>2</sup> In addition to the California IOUs, beneficiaries of this research includes federal and state agencies, regional and state energy efficiency organizations, trade organizations, and equipment manufacturers, distributors, and retailers.

Efficient lighting has been of increasing interest since the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) created the dedicated fluorescent fixtures and screw-based compact fluorescent lamp (CFL) portion of the ENERGY STAR<sup>®</sup> program. Many areas of the country have focused on efficient lighting in order to implement a variety of market transformation programs, and many utilities and energy efficiency organizations have adopted the ENERGY STAR platform as the basis for their lighting initiatives. California IOUs have supported energy efficient lamps through the statewide residential lighting and appliance program.

Historically, estimates of the market penetration of highly efficient lighting technologies relied on industry shipments data, consumer self-reports, and surveys. These data sources lacked the detail necessary for a comprehensive analysis of unit sales and market penetration. The data used for the analysis in this report are timely and contain the level of detail needed to offer a comprehensive look at the market for lamps. Specifically, point-of-sale (POS) data

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<sup>1</sup> A four-page companion report titled *California Lamp Trends 2005* summarizes the findings in this report.

<sup>2</sup> Separate annual reports are available for HVAC equipment and appliances and are available for download from [www.calmac.org](http://www.calmac.org). The most recent available titles are *California Residential Efficiency Market Share Tracking – Appliances 2004*; *California Residential Efficiency Market Share Tracking – HVAC 2004*. The 2005 updates will be available in the second quarter of 2006. Note also that the RMST tracked measures for residential new construction through 2001. See *California Residential Efficiency Market Share Tracking – New Construction 2001*.

representing five major retail channels through which lamps are sold (food, drug, mass merchandiser, home improvement, and hardware stores) contain line-item detail<sup>3</sup> on monthly lamp sales for both California<sup>4</sup> and the U.S. These data are used to obtain information about overall lamp sales in the residential lighting market and to characterize lamp sales trends over time, by lamp types, in different geographic regions, and through various retail channels, Including a national comparison area provides a context in which to evaluate the success of California's lighting initiatives.

The remainder of this report provides an overview of the key findings (Section 2), discusses the POS data used for the analysis and details how the lamp data are classified (Section 3), presents the analysis of residential-use lamps by retail market channel and by lamp type (Section 4), and provides a detailed analysis of medium screw-based lamp (MSLB) sales. The MSLB analysis includes a presentation of units sales over time, market shares by lamp type, sales by retail market channel, sales by equivalent wattages, and the impact of lamp-life on MSBL shares (Section 5). This section also includes new analysis that summarizes retail prices. The final section summarizes ongoing efforts to develop a national lamp tracking project.

## **2. Summary of Key Findings**

Since the inception of this research, the share of compact fluorescent lamps (CFLs) as a percent of all medium screw-based lamps (MSBLs) sold in California has increased significantly – from less than 1% in 1998 to 8.7% in mid-2001. Shares have varied since, and in 2005 CFLs reached their highest level ever at 11.3% of all MSBL sales in the state. The CFL share of MSBLs sold nationwide did not exhibit the spike observed in California in 2001, but have steadily increased from less than 1% in 1998 to 4.5% in 2005. Other key findings are summarized below.

- Incandescent lamps continue to dominate the unit sales of lamps for residential use, accounting for three-fourths of the U.S. market. Other lamp types with significant market shares of unit sales include specialty (13%), fluorescent (7%), and halogen (4%) lamps. Lamp sales in California are distributed approximately the same way, although with slightly lower market share for incandescent lamps (70%) and slightly higher market share for fluorescent lamps (11%).

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<sup>3</sup> Each line item contains detailed information such as the manufacturer, UPC, watts, package size, price, and quantity sold.

<sup>4</sup> The California data are further subdivided into the California electric IOU service territories: Pacific Gas & Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E).

- The CFL market share of MSBL sales in the rest of the U.S. has slowly been approaching California's CFL market share over the last few years. At the end of 2001, CFLs had more than four times the market share of MSBLs in California (5.8%) than they did nationwide (1.3%). In 2005, California's CFL market share saw higher gains than the rest of the U.S., increasing the gap.
- Growth in CFL unit sales has not been uniform across all wattages; it has been strongly concentrated in 14-18 watt and 19-24 watt bulbs (equivalent to a 60-watt and 75-watt incandescent bulbs).
- In 2005, the CFL share of unit sales was approximately 7.0% in California. However, when taking into account that the life of each CFL is much longer than that of an incandescent lamp, the estimated market share is approximately 46%.
- Mass merchandisers are beginning to sell more CFLs. In the rest of the U.S. they sold nearly half of all CFLs sold. In 2000, mass merchandisers sold only 6% of the total CFLs sold in California, whereas in 2004, they sold almost 22% of the total CFLs sold in California. The percentage of CFLs sold in drug and food stores increased greatly in California in 2004 and 2005, but since the increase may be related to very high sales of certain low-priced multi-packs, it remains to be seen if the trend will continue.
- CFL prices have fallen dramatically for all retail channels in California and the U.S. since 1999, with the greatest decrease occurring after 2001. In 2005 the average price of a CFL reached its lowest level ever at \$0.53 in California and \$1.43 in the U.S.

### **3. Lamp Point-of-Sale Data**

#### ***Point-of-Sale Data Sources***

Most large retail stores today employ bar code scanners and computers to maintain product inventory, pricing, and sales data. These data are sampled and aggregated by specialized market research firms and are available for a wide range of consumer products. Itron identified the numerous research firms that supply POS data and evaluated their data for use in this study. Ultimately, POS data were purchased for the retail channels through which residential lamps are typically sold: food stores, drug stores, mass merchandisers, and home/hardware stores.<sup>5</sup> Most lamps for residential use are sold through these channels, and the data analyzed in this report do not include sales through other relatively smaller channels, such as club warehouse stores, the Internet, small independent stores, and direct sales from the manufacturer to the consumer.<sup>6</sup>

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<sup>5</sup> Ecos Consulting. *Lighting the Way to Energy Savings*, Volume 2. Prepared for the Natural Resources Defense Council. December 1999.

<sup>6</sup> Discussions with industry professionals estimate lamp sales outside the major retail channels at 10% to 20%.

The POS lamp data are received in an unprocessed spreadsheet format and then converted into a structured electronic database categorized by various levels of product efficiency and performance. These data include Universal Product Code (UPC), lamp-type indicator, location sold, retail sales channel, and monthly counts of units sold for nearly 15,000 different lamp types. For the 2005 analysis, Itron included historic pricing data for all lamp types. An analysis of the pricing data was included in the 2005 report for the first time. Itron's historical lamp sales database is updated every time a new set of POS data is received for analysis.

**POS Data from Food Stores, Drug Stores, and Mass Merchandisers**

Consumer sales data for food, drug, and mass merchandisers are obtained from ACNielsen.<sup>7</sup> These data are collected from a sample of food stores with annual revenue over \$2 million, drug stores with annual revenue over \$1 million, and mass merchandisers with annual revenue over \$1 million from major metropolitan areas across the U.S. Data from grocery stores are collected in 52 regions and data from drug stores and mass merchandisers are collected from 11 regions.

ACNielsen uses a stratified sample design to measure consumer sales across different geographic regions and retailers and projects sample data from individual stores to represent sales data across a given region. This projection is based on a "ratio estimation" procedure, which uses a combination of total store counts and dollar sales volume to weight store-level data up to a regional level. ACNielsen uses this same process to project regional data to national data. The sample selection process also accounts for socioeconomic differences (i.e., urban/rural areas, ethnicity, and income). This sampling strategy provides a complete picture of these retail channels, taking into account variances by retailer, geography, and other factors.

A couple of caveats with respect to these data should be noted. First, sales data for food stores, mass merchandisers, and drug stores cover only specific major metropolitan and regional areas. As such, Itron used U.S. Census Bureau<sup>8</sup> population data to scale these regional and metropolitan sales to the California state level and to individual IOU service territories. Specifically, sales data from California metropolitan areas were expanded to represent sales data for the entire state using population as the weighting factor. Total California sales were then proportioned to each of the IOU service territories and areas not covered by the IOUs by using a combination of utility service area maps and population data. This approach required certain assumptions about the demographic similarities of parts of California relative to the entire state, and is likely not as accurate as the results that could

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<sup>7</sup> ACNielsen Company, Schaumburg, IL. [www2.acnielsen.com](http://www2.acnielsen.com).

<sup>8</sup> U.S. Census Bureau data obtained from [www.census.gov](http://www.census.gov) for July 1998, July 1999, and July 2000.



have been obtained by developing a customized (and costly) sample in all parts of the state. This scaling process is likely to be reasonably accurate for grocery stores, where original sample sizes were substantial, but less precise for mass merchandisers and drug stores, due to of the relatively small sample size.<sup>9</sup>

Second, these data only cover stores above a certain sales volume threshold that use computerized inventory control. As such, it does not include smaller “mom and pop” shops, which might collectively account for 10 to 20% of lighting sales in food and drug stores.<sup>10</sup>

Third, a large mass merchandiser discontinued supplying detailed data to ACNielsen. Detailed data are still available for the other large mass merchandiser stores in both California and the rest of the U.S., but ACNielsen’s estimates no longer include the chain that dropped out of the sample. While this chain does not provide skew level detail, it has agreed to provide ACNielsen with total U.S. lamp sales, by manufacturer. Therefore, since 2002, Itron has used store counts and sales volumes, combined with a ratio of the missing retailer’s portion of the mass market, to weight up the data to estimate total sales through the entire mass market channel in California.

### **Hardware and Home Improvement Center Stores**

Consumer sales data for national and independent hardware and home improvement center stores are obtained from Activant.<sup>11</sup> Activant collects hardware and home improvement center (H&H) data from stores across four distinct regions: Northeast, Midwest, South, and West. The four main characteristics behind the stratified sample selection process are retailer, geographic region, store type, and store size. Sample stores have been chosen to represent all stores across these four characteristics. Activant scales the sample data to the regional or national level by comparing individual store sales volumes and number of stores to overall sales for a given region.<sup>12</sup> Itron and Activant also worked to develop a similar system to develop projections for California and for each electric IOU service area.

Unfortunately, as of December 2002 national chain home centers no longer provide point-of-sale (POS) data for lamps. Beginning in the second quarter of 2001, sales data for H&H

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<sup>9</sup> Using population weighted expansion factors is a reasonable approach. However, the project team recognizes that it does assume that lamp sales per household through these channels in areas outside the regions covered by the data are the same. To the extent promotional and product offering differ by mass merchandisers across regions, this assumption could lead to over or under reporting sales of certain lamp types.

<sup>10</sup> From conversations with lighting industry professionals.

<sup>11</sup> Activant, formerly CCI/Triad Vista ([www.aktivant.com](http://www.aktivant.com)).

<sup>12</sup> It should be noted that one strength of the Activant data is that it contains a census of store outlets for a number of the home improvement and hardware chains. As such, no weighting is required for these elements of the data.

were available separately which made it possible to estimate 2004 sales for home centers using trends observed over the last five years. Therefore, throughout this report, dashed lines are used to indicate sales/shares that include the estimated home improvement center results.

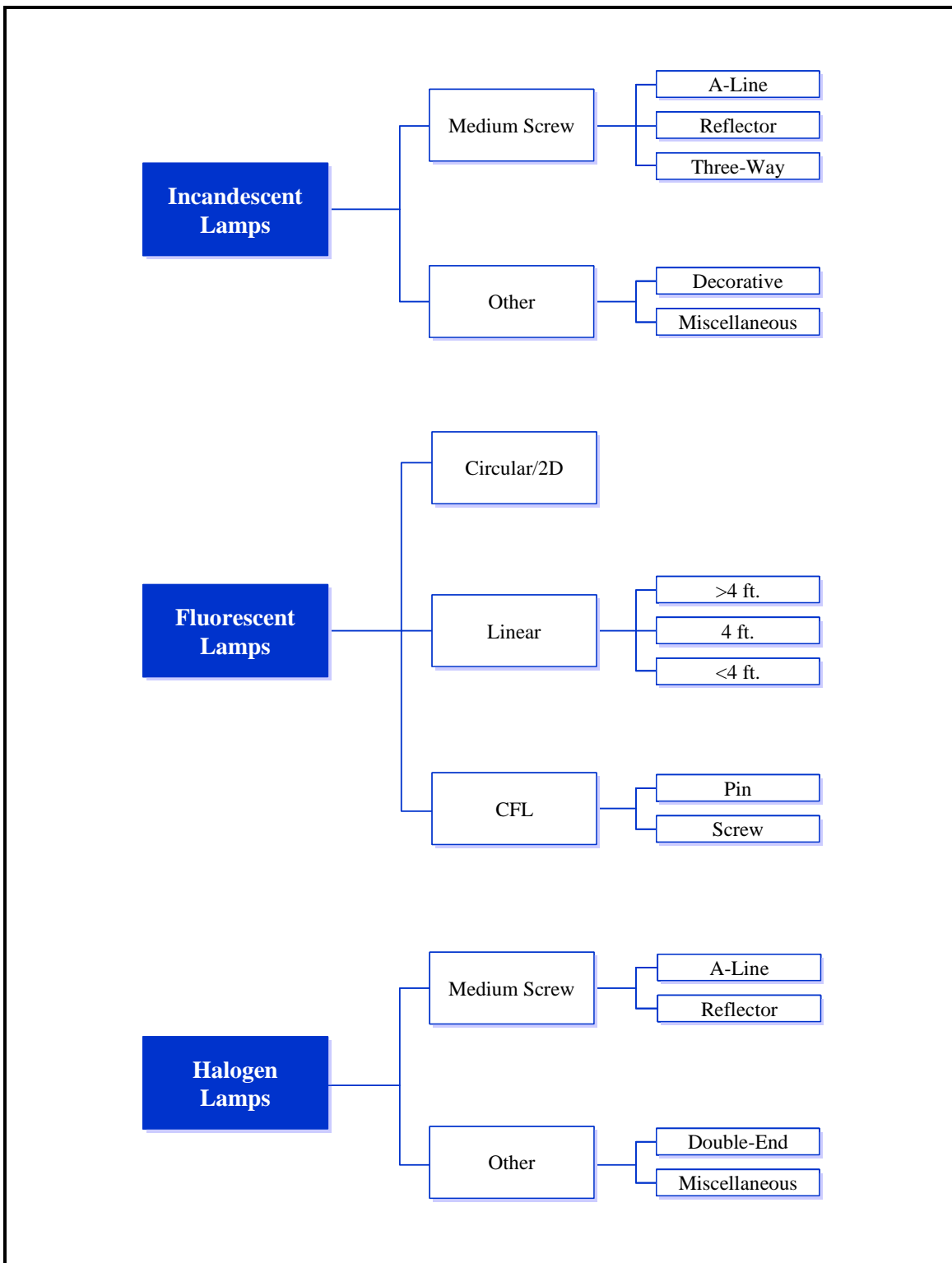
### ***Classification of Lamp Types***

Each line item in the POS data is mapped to one of four major lamp types: fluorescent, halogen, incandescent, and special.<sup>13</sup> Fluorescents, halogens, and incandescent lamps are further broken down into subcategories based on lamp configuration and application, as shown in Figure 1. Specifically, lamps are first broken out by base type. MSBLs are separated from all other base types since most can be replaced by a CFL screw-based lamp. “Other” based lamps include small (typically candle and flame-tipped lamps for decorative purposes) and large screw-based and pin-based lamps.

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<sup>13</sup> Special lamps are those not used for general household lighting and include bug lamps, Christmas lights, nightlights, and heat lamps among others.

Figure 1: Lamp Classifications



The POS data from ACNielsen and Activant are similar, but require different algorithms to classify the units sold by lamp type. Each data set contains at least one descriptor field that is key to identifying lamp type. Using a series of database queries, Itron identifies many of the lamps and classifies the remainder manually using manufacturer websites and catalogs.

The data representing sales through the food, drug, and mass merchandiser market channels include only one descriptor field. This field includes keywords and abbreviations that provided details about the lamp. The descriptor field uses consistent terminology and a key was provided for these abbreviations. Using this key, Itron runs a series of queries every time a new data set is received in order to search for keywords to classify the lamps.

The data including sales through the hardware and home improvement center market channels set includes five descriptor fields. The first four fields indicate categories for the lamps that are used to identify lamp types of the units sold. For many line items, however, the information in these fields did not provide the level of detail required to classify the lamps as needed by the project team. Itron classifies these units by using data contained in the fifth descriptor field. These descriptors are combined with information from lighting experts, lighting manufacturers' websites and catalogs, and publications in order to correctly classify the remaining lamps.

For both data sets, the descriptor fields sometimes contain ambiguous terms that could cause improper classification of lamps (i.e., a descriptor with keywords that could classify the line item into multiple lamp categories). To ensure data quality, Itron continually reviews the data manually and corrects the data where necessary.

#### **4. Residential Lamp Sales**

This section examines sales of all lamp sales identified for residential use, including sales by retail market channel and sales by various lamp types. Itron performs analysis on the overall residential lighting market with an emphasis on interchangeable lamps. The findings are presented so that comparisons can be made based on different variables including time, sales channel, wattage, and other variables of interest. This analysis provides insight into the residential lighting market nationally (including California), in California, and in each IOU service territory.

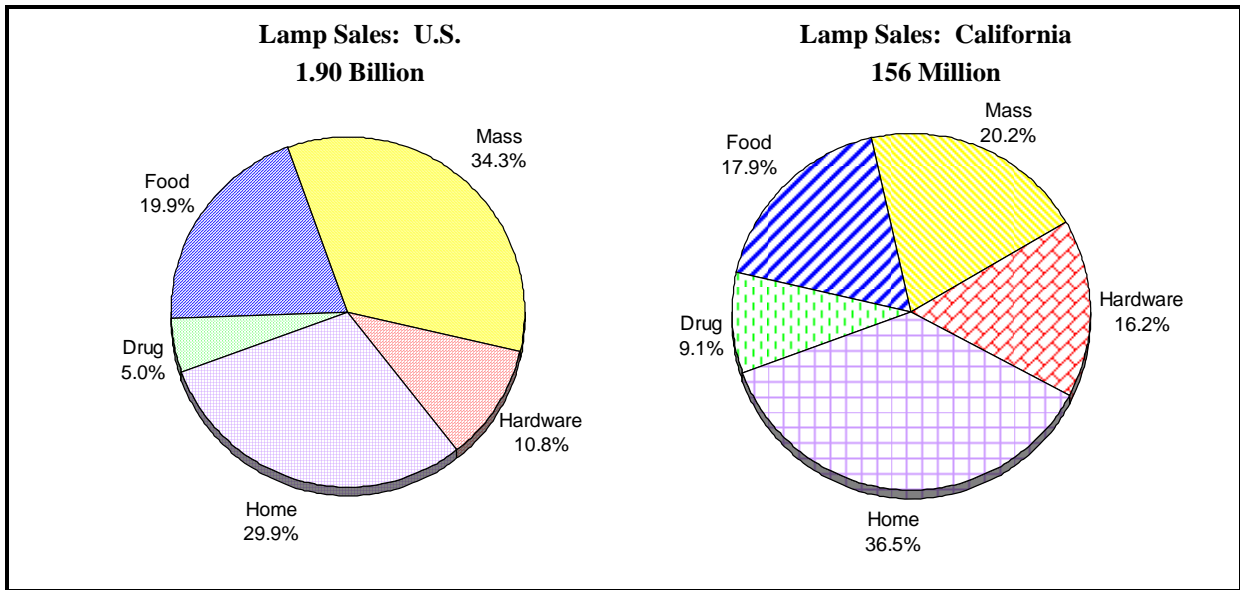
As explained above, the POS data from the five market channels were sorted into the following four categories: incandescent, fluorescent, halogen, and special. Lamps sold through these channels are not necessarily used solely in the residential sector. For example, hardware stores and home improvement centers sell to contractors, who in turn use the lamps

in commercial jobs.<sup>14</sup> Using information from previous studies and lighting industry professionals, fluorescent and incandescent lamps found in packages greater than 12 and halogen lamps found in packages greater than eight are assumed to be for non-residential use and removed from the analysis. Purchasing fluorescent lamps in such bulk is rare for residential consumers and is far more common for contractors. Additionally, Itron determined that the majority of high-intensity discharge (HID) lamps and fluorescent tubes greater than four feet are used in the commercial/industrial sector and were excluded from the analysis.

### Lamp Sales by Market Channel

Figure 2 presents lamp sales by major retail market channel in California and the U.S., revealing a slight shift in purchasing preferences. The figure shows that hardware stores and home improvement centers account for a larger percentage of lamp sales in California than in the overall U.S.<sup>15</sup> Correspondingly, sales through mass merchandisers account for a smaller percentage of lamp sales in California than they do nationally.

Figure 2: Lamp Sales – by Market Channel – 2005



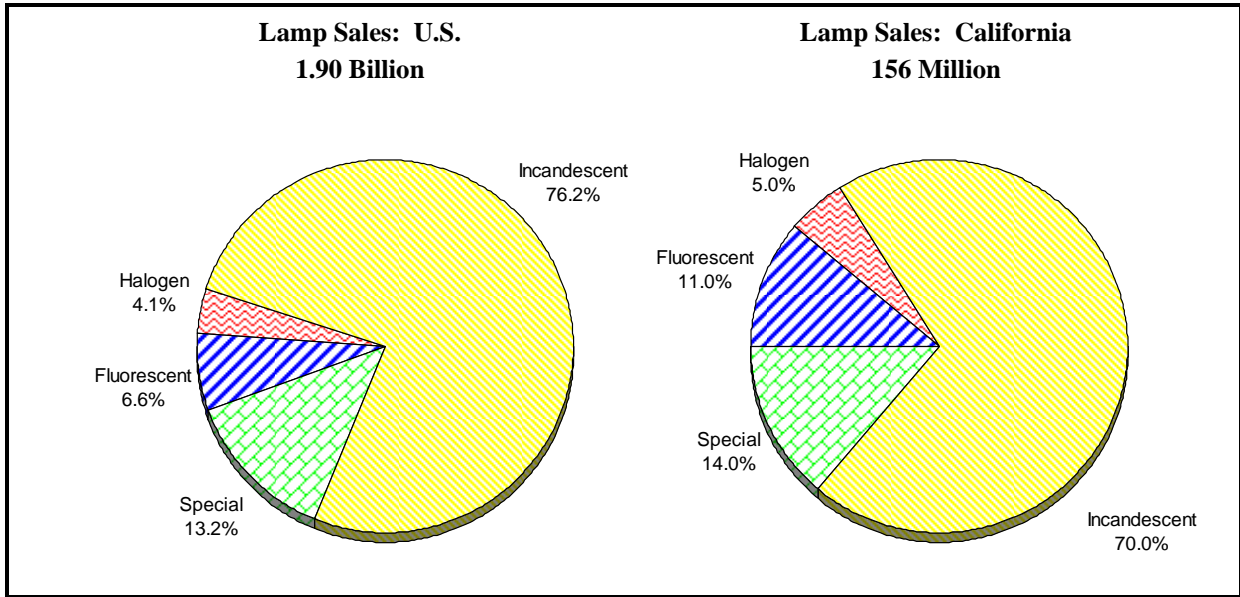
<sup>14</sup> Ecos Consulting. *Lighting the Way to Energy Savings, Volume 2*. Prepared for the Natural Resources Defense Council. December 1999.

<sup>15</sup> Note that as explained in Section 3, as of December 2002 national chain home centers no longer provide point-of-sale (POS) data for lamps. However, 2003 sales for home centers throughout this report were estimated using trends observed over the last five years.

### Lamp Sales by Type

Figure 3 illustrates the share of lamps for residential use by major lamp type (using the classification of Figure 1), in California and the U.S. As shown, the share of fluorescent lamps in California is higher (11.0%) than the total U.S. (6.6%) and the shares of incandescent lamps are lower in California. Shares of the halogen and special lamp types are very similar between the two regions.

**Figure 3: Lamp Sales – by Type – 2005**

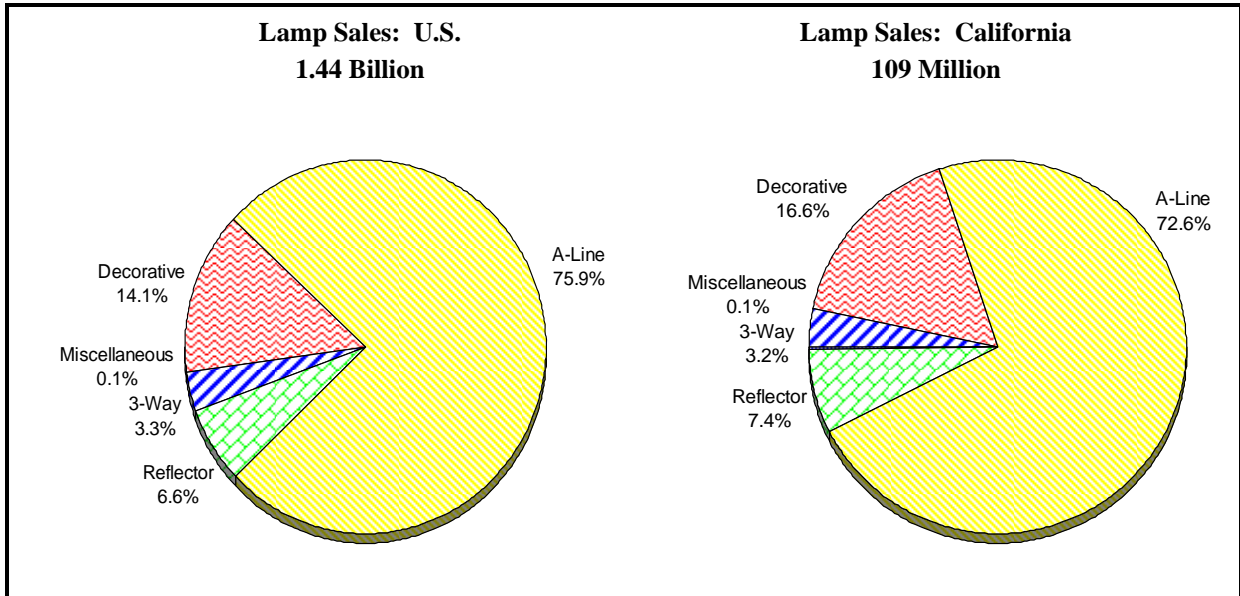


Analysis of each subcategory within incandescent, fluorescent, and halogen are presented below.

### Incandescent Lamp Sales

Figure 4 presents sales of incandescent lamps by type for the U.S. and California and shows that A-line MSBLs dominate incandescent lamp sales. In both the U.S. and California, these lamps account for approximately three-fourths of all incandescent unit sales.

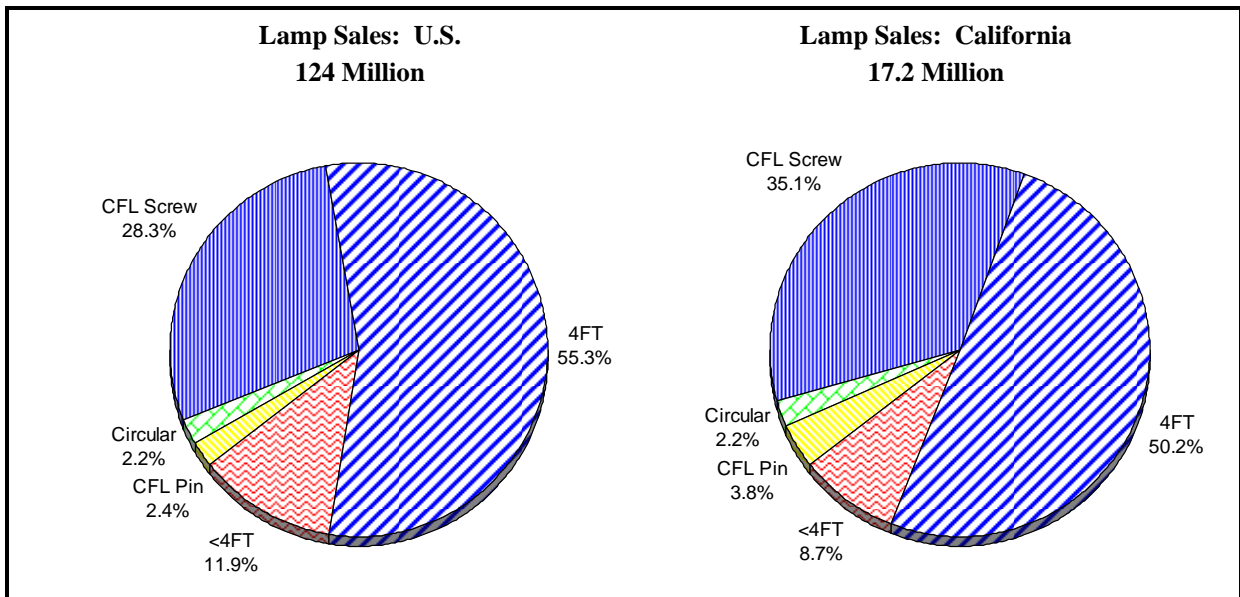
**Figure 4: Incandescent Lamp Sales – by Type – 2005**



**Fluorescent Lamp Sales**

Figure 5 presents fluorescent lamp sales by type for the U.S. and California. As shown, 4-foot lamps comprise the largest share, followed by CFL screw-ins. CFL screw-ins and CFL plug-ins contribute a larger percentage of overall fluorescent lamp sales in California than in the U.S.

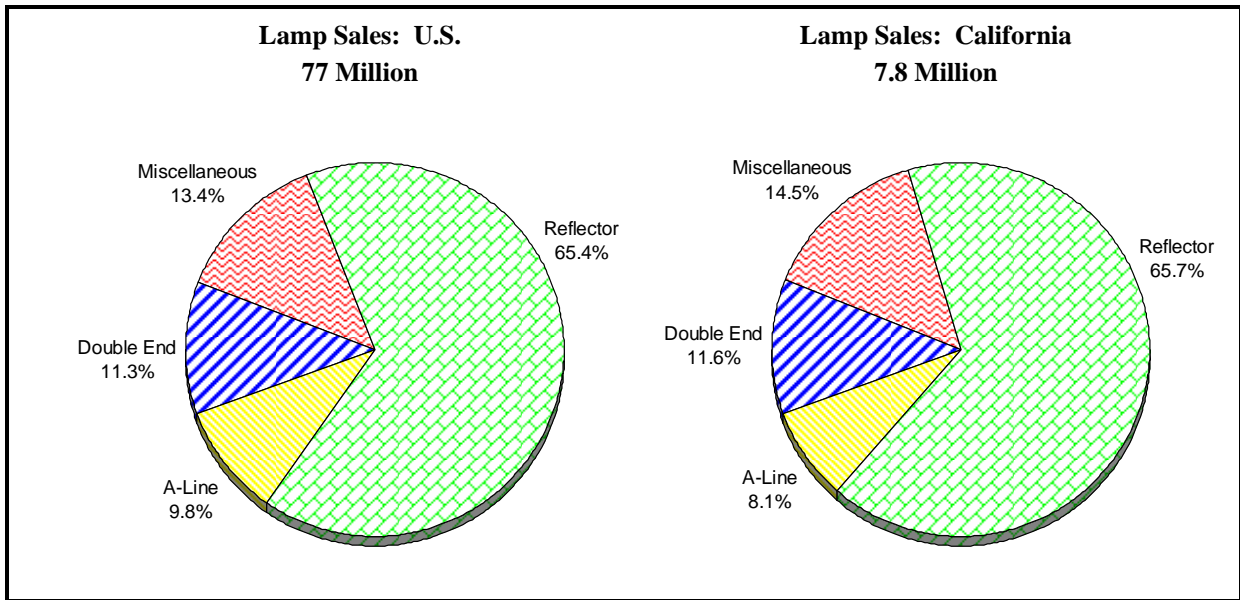
**Figure 5: Fluorescent Lamp Sales – by Type – 2005**



**Halogen Lamp Sales**

Figure 6 presents residential halogen lamp sales by type for the U.S. and California. Of the three major residential lamp types, halogens contribute the smallest share to overall lamp sales. As shown in Figure 6, reflectors dominate halogen lamp sales. Only subtle differences continue to exist between the distribution in U.S. halogen sales and California halogen sales.

**Figure 6: Halogen Lamp Sales – by Type – 2005**



**5. Medium Screw-Based Lamp Sales**

An important element of this research is to determine the market share of energy efficient CFLs. This requires detailed analysis of CFLs and all possible substitutes (i.e., all MSBLs). Table 1 provides a snapshot of total unit sales of residential medium screw-based lamps for calendar years 1998 through 2005.<sup>16</sup> This table provides some perspective on the number of lamps sold annually across the U.S., in California, and within each of California’s electric IOU service areas.

As shown, sales of MSBLs in California account for approximately 7.5% of overall U.S. sales during 2005. Sales of MSBLs decreased in both California and the U.S. between 2000 and 2001. Specifically, sales of medium screw-based incandescent lamps decreased by approximately 22 million (19%) in California and 53 million (4%) in the U.S. During this same period, CFL sales increased by nearly 15.3 million in the U.S. and 4.6 million in

<sup>16</sup> Total sales for 1998 only include the third and fourth quarters of the year.



California. After experiencing a drop in 2002, CFL sales in California continued to increase through 2005.

**Table 1: Annual Medium Screw-Based Lamp Sales (in thousands)**

	CFLs							
Region	1998*	1999	2000	2001	2002	2003	2004	2005
U.S.	1,928	5,063	6,796	22,078	27,079	31,943	29,299	35,144
CA	259	713	1,161	5,744	4,463	4,589	5,135	6,028
SCE	64	169	328	1,679	1,214	1,324	1,454	1,800
SDG&E	26	70	157	506	356	420	545	708
PG&E	112	318	416	2,540	2,141	2,009	2,207	2,511
Other	57	155	261	1,019	752	549	639	724
	Incandescent Lamps							
Region	1998*	1999	2000	2001	2002	2003	2004	2005
U.S.	633,672	1,322,715	1,355,233	1,301,845	1,278,327	1,234,269	1,183,569	1,096,000
CA	54,014	112,636	114,717	92,916	95,430	91,548	87,765	79,240
SCE	16,634	34,174	35,460	29,712	30,551	30,375	28,776	26,304
SDG&E	4,309	9,042	9,059	7,357	7,390	7,237	6,920	6,329
PG&E	22,670	47,861	47,881	37,562	38,477	35,386	34,132	30,457
Other	10,402	21,560	22,316	18,285	19,012	12,930	12,169	10,550

\*Third and fourth quarters only.

### ***Medium Screw-Based Lamp Sales over Time***

Figure 7 illustrates the sales of medium screw-based incandescent lamps for both California and the rest of the U.S., quarterly from 1998 through 2005.<sup>17</sup> As shown, incandescent lamp sales peak during periods of less daylight (autumn and winter) and decline during periods of more daylight (spring and summer). Aside from this seasonality, sales remained relatively constant until the second quarter of 2001 when they decreased by 21% compared to the second quarter of 2000 for California. Several possible reasons for this decrease include the following:

- A tremendous increase in sales of CFLs during the same period. A combination of the increase in sales of these lamps and their longer life is one reason that the

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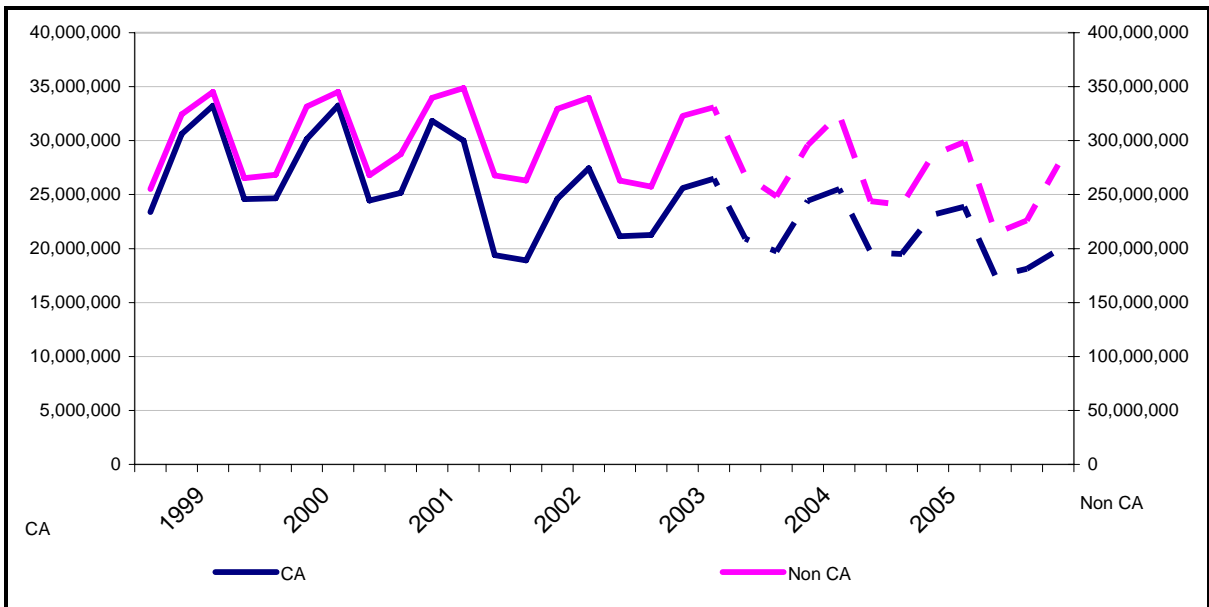
<sup>17</sup> "The rest of the U.S." includes all areas of the United States except California.

replacement market for medium screw-based incandescent lamps has become smaller.<sup>18</sup>

- CFLs tend to be sold in packs of one or two and consumers tend not to purchase extra replacements. On the other hand, consumers tend to purchase incandescent bulbs in packs of four, six, or eight. As such, the increase in CFL sales could cause a disproportionate decrease in incandescent sales. Interviews with industry experts suggest that a ratio of four to one would be reasonable.
- During 2001, there was a massive media campaign to inform Californians on ways to conserve energy during the “energy crisis.” Some of the recommended measures may have had an effect on the number of lamps demanded in the market.

After the decrease in 2001, incandescent sales in California remained fairly stable during 2002. During 2003, sales in mass merchandiser and hardware stores remained the same but sales in food and drug stores dropped slightly. Food store lamp sales decreased in 2004 by 10%, which may possibly be related a Southern California grocery store strikes. After estimating sales in home improvement centers, total sales in California are estimated to have decreased approximately 10%.<sup>19</sup> For the rest of the nation, sales of incandescent lamps fell in 2005 by approximately 7%.

**Figure 7: Incandescent Medium Screw-Based Lamp Sales, by Quarter**



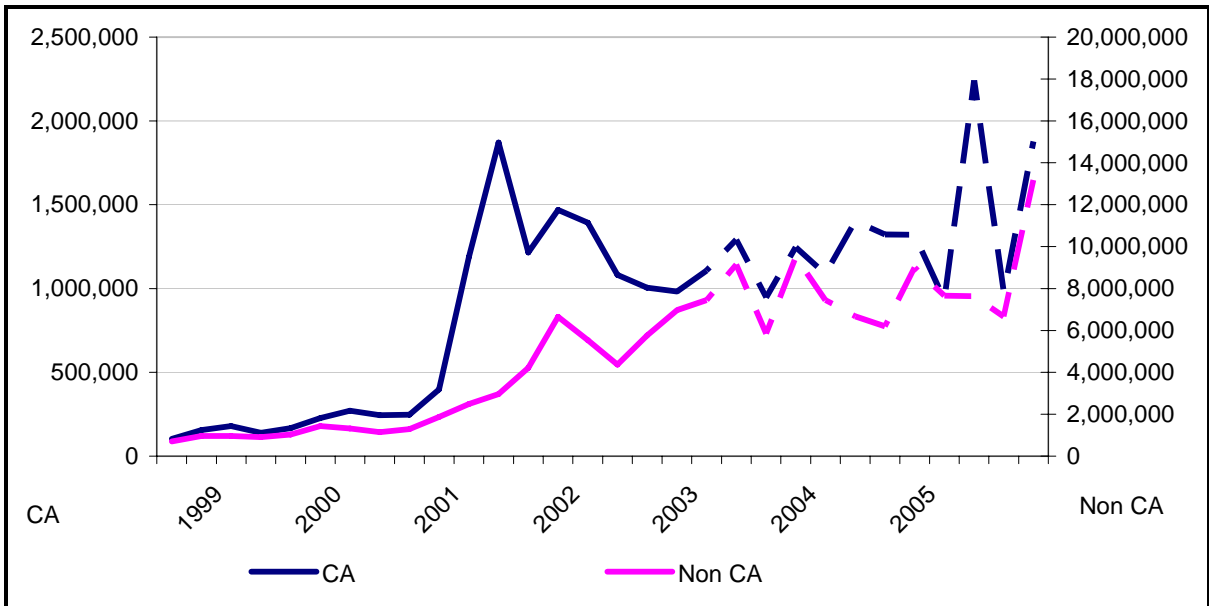
\* Dashed lines represent estimated sales.

<sup>18</sup> See the section Impact of Lamp Life on Medium Screw-Based Lamp Sales on page 33.

<sup>19</sup> Note that the dotted lines in Figure 7 represent the sum of the actual results for drug, food, mass merchandise, and hardware stores and estimated results for home centers.

Figure 8 illustrates quarterly sales of medium screw-based CFLs for California and the rest of the U.S. from 1998 through 2005.<sup>20</sup> CFL shares in California spiked during the second quarter of 2001, corresponding with California’s energy crisis. CFL sales in the state declined throughout 2002, while sales in the rest of the U.S. continued to climb. During the first half of 2003, California’s CFL sales increased for the first time since mid-2001, an increase that can be primarily attributed to sales through mass merchandise stores. CFL sales in California continued to increase over the next several years, and in 2005 reached their highest level ever, peaking at 2.2 million. During this time, there were several very inexpensive multi-packs available in food and drug stores, resulting in huge sales of these particular lamps. Sales in the rest of the U.S. also reached their highest level ever in 2005, with over 13 million unit sold in the last quarter

**Figure 8: CFL Medium Screw-Based Lamp Sales by, Quarter**

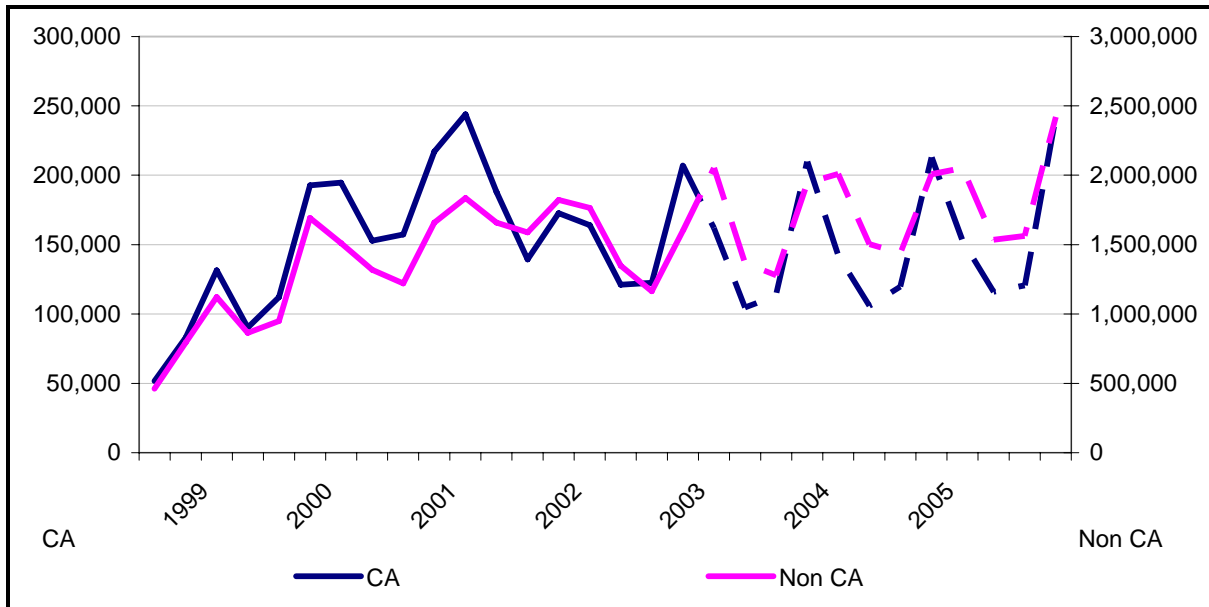


\* Dashed lines represent estimated shares.

Figure 9 illustrates quarterly sales of medium screw-based, A-line, halogen lamps in California and the rest of the U.S. from 1998 through 2004. While unit sales increased significantly from 1998 through 2001, sales of halogen lamps over the last four years have exhibited seasonal fluctuations, though total annual sales has remained fairly constant.

<sup>20</sup> “The rest of the U.S.” includes all areas of the United States except California.

**Figure 9: Halogen Medium Screw-Based Lamp Sales by Quarter**



\* Dashed lines represent estimated sales.

**Sales by Lamp Type as a Percentage of Medium Screw-Based Lamp Sales**

This section focuses on the analysis of interchangeable MSBLs sold for residential use and presents the shares of each medium screw-based lamp type as a percentage of all medium screw-based A-line lamps.

**CFL Shares of MSBL Sales**

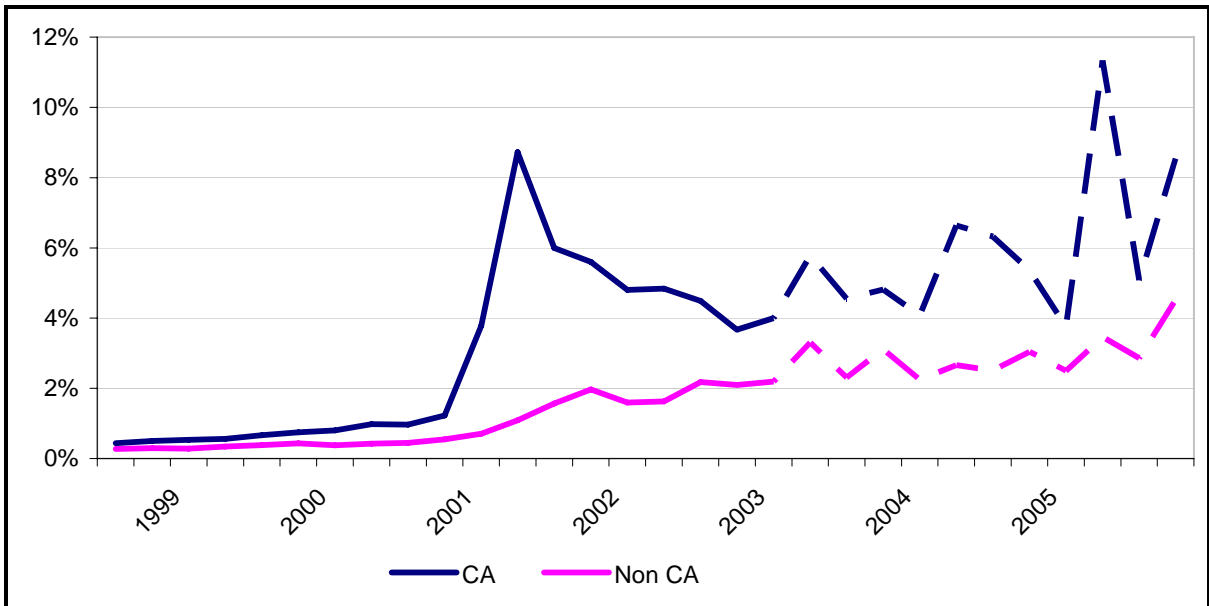
An important element of the RMST study is to determine the market share of CFL lamps in the residential sector. For purposes of this analysis, the market share of CFLs is the share of CFLs among lamps of similar type and application. Given this definition, the most logical comparisons are between the medium screw incandescents, medium screw halogens, and medium screw CFLs. It should be noted that although pin-based CFLs could be a replacement for incandescents, these CFLs require a special socket ballast or dedicated fixture to operate. Thus, for the comparisons presented in the following analysis, only screw-based CFLs were included because these can directly replace a medium screw-based incandescent or halogen lamp without changing or modifying the fixture. In addition, efforts in California to promote CFLs are focused on ENERGY STAR compliant lamps, which are screw-based.

Figure 10 illustrates the share of medium screw-based CFLs as a percentage of all MSBLs sold by quarter for California and the rest of the U.S.<sup>21</sup> As shown, the market share of CFLs in California more than tripled from the fourth quarter of 2000 to the first quarter of 2001

<sup>21</sup> “The rest of the U.S.” includes all areas of the United States except California.

(1.2% to 3.8%) and during the second quarter of 2001, the market share of CFLs rose to approximately 8.7%. As previously mentioned, that peak in share coincides with California’s energy crisis. The market share of CFLs in California decreased in 2002, but increased in 2003, reaching 6% in the second quarter of 2003 and then hovering just below 5% during the last two quarters. The market share of CFLs in California continued to increase in 2004 to nearly 7%. This coincides with the high sales numbers of some inexpensively priced CFL multi-packs. In the second quarter of 2005, the share of CFLs in California reached its highest level ever, with over 11%. This dramatic increase also coincides with the availability of very low priced multi-packs. The CFL market share in the rest of the U.S. has steadily increased each year from just under a half of a percent in 2000 to 4.5% in 2005.

**Figure 10: CFL Share of Medium Screw-Based Lamps**

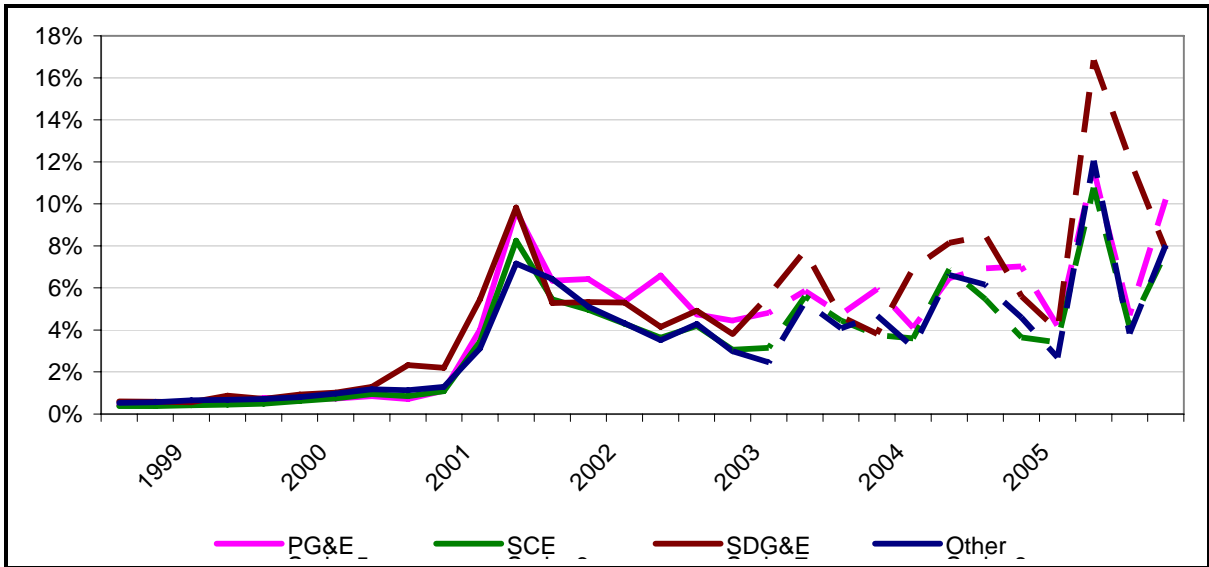


\* Dashed lines represent estimated shares.

Figure 11 presents the sales of medium screw-based CFLs as a percentage of all MSBLs sold in each of the California IOU service territories and for the remaining non-IOU areas in California. CFL lamp share trends are similar across utility service areas prior to 2000. Noticeable differences, however, are first observed in third quarter of 2000 when the share in SDG&E territory spiked to over 2% and coinciding with customers’ high energy bills. The next noticeable difference occurred in mid 2002 when the share in PG&E’s service area increased to 6.5%, while shares in the other IOU regions declined. By early 2003, shares in all regions had dropped considerably since the peak in 2001. Then in mid-2003, CFL shares in SDG&E’s territory skyrocketed to 8.6%, nearly reaching its all-time high during the 2001 energy crisis. This short-lived increase was due to increased CFL sales in food stores during the first and second quarters of 2003 that were not seen in the rest of the state. The highest

increase in CFL shares in 2004 occurred in SDG&E’s territory, reaching nearly 9%. This increase was driven by the low-cost CFL multi-packs sold by particular drug and grocery store chains with a higher per-capita concentration of stores in SDG&E territory than in the rest of California. In 2005, after a decrease in the first quarter, second quarter sales reached their highest levels ever for all utilities. PG&E and SCE reached 12% and 11%, respectively, and shares in the SDG&E service area reached nearly 17%. These new highs were also due to very low-cost CFL multi-packs.

**Figure 11: CFL Share of Medium Screw-Based Lamps – California Electric IOUs**



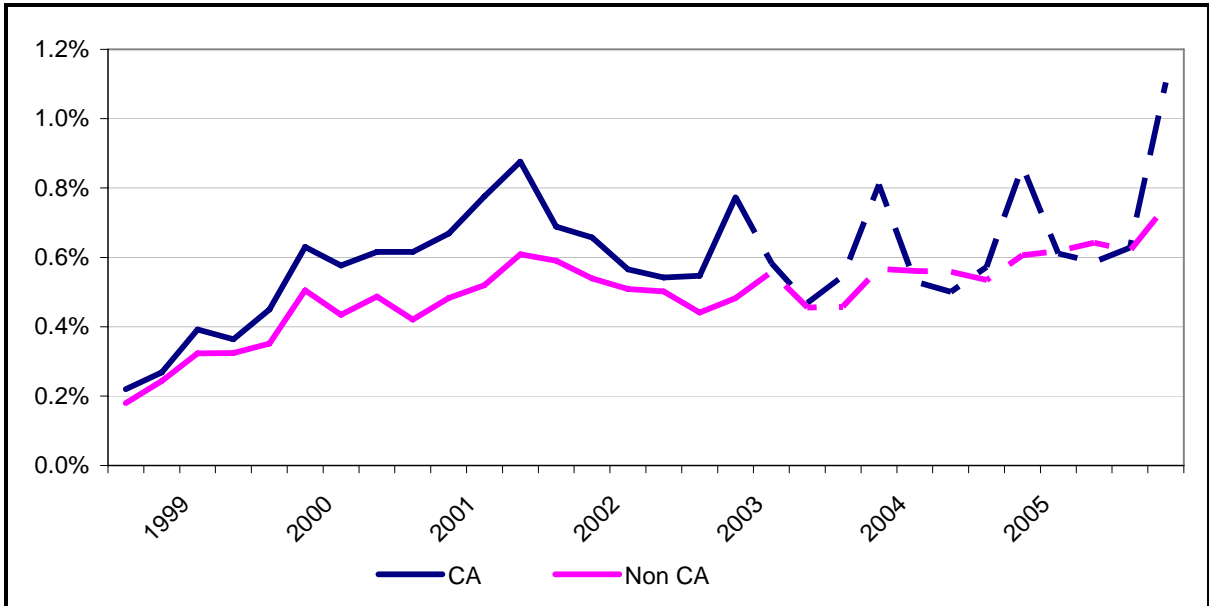
\* Dashed lines represent estimated shares.

\*\* “Other” includes regions in California not served by the three electric IOUs.

**Halogen Share of MSBL Sales**

Figure 12 illustrates the share of medium screw-based halogens as a percentage of screw-based lamps sold by quarter in California and the rest of the U.S. As shown, halogen shares in California increased from 0.2% in 1998 to 0.9% in 2001, and leveled off until the last quarter of 2005, when they increased to 1.1%. Sales in the rest of the U.S. have level off since 2001.

**Figure 12: Halogen Share of Medium Screw-Based Lamps**

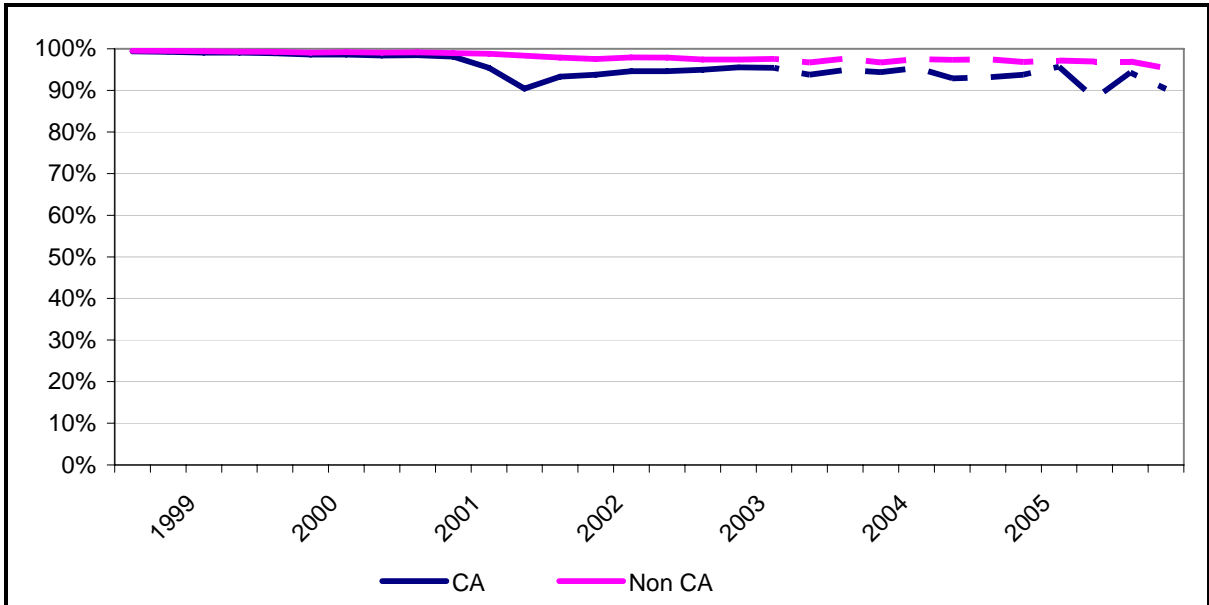


\*Dashed lines represent estimated shares

**Incandescent Share of MSBL Sales**

Figure 13 illustrates the share of incandescent lamp sales from 1998 to 2005. As shown, incandescent lamps account for the majority of MSBL sales both in California and the rest of the U.S. Shares of incandescent lamps, while still accounting for an overwhelming majority of MSBL sales, dropped almost 10% in California during the first two quarters of 2001. Figure 13 clearly illustrates that incandescent shares in California have decreased more over time than in the rest of the U.S. The gap slightly widened slightly in 2004, which coincides with the increase in CFL shares California, and in 2005 the share of incandescent lamps fell to less than 89% in the second quarter, rose slightly in the third and ended the year at 90%. Sales in the rest of the U.S. have steadily decreased, and in 2005 fell to 95%, their lowest level ever.

**Figure 13: Incandescent Share of Medium Screw-Based Lamps**



\* Dashed lines represent estimated shares.

### **Medium Screw-Based Lamp Sales per Household**

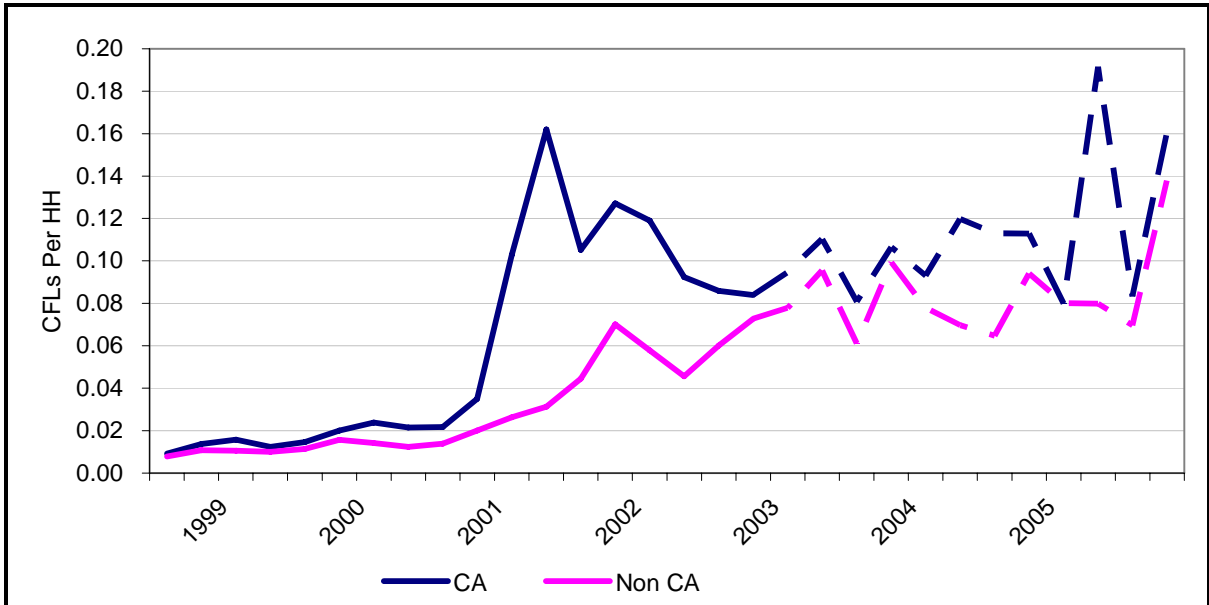
Per capita sales of MSBLs can account for the variation in the number of households over time and normalizes the sales figures to reflect these changes. The results provide an estimate of how many CFLs, halogens, and incandescents are typically purchased per household.<sup>22</sup> Figure 14 and Figure 15 plot medium screw-based CFLs and incandescent lamp sales per household, respectively.

As Figure 14 demonstrates, CFL sales per household in California follow the general trend of overall sales, increasing greatly in 2001 to 0.16 bulbs per household in the second quarter of 2001. This increase placed California well above the rest of the nation in CFL market penetration. CFL sales per household in the rest of the U.S. approached California's CFL sales per household in the fourth quarter of 2003, but then dropped through most of 2004, at the same time that sales per household in California increased. Sales per household in California reached their highest level in 2005, at 0.19 bulbs. Sales in the rest of the U.S. reached 0.14 bulbs per household, the highest level ever for the rest of the nation. The increases in the 2004 and 2005 are most likely related to the availability of low cost CFL multi-packs.

<sup>22</sup> U.S. Census Bureau data obtained from [www.census.gov](http://www.census.gov) for July 1998, July 1999, and July 2000 were used to determine the approximate number of households in California and the U.S.



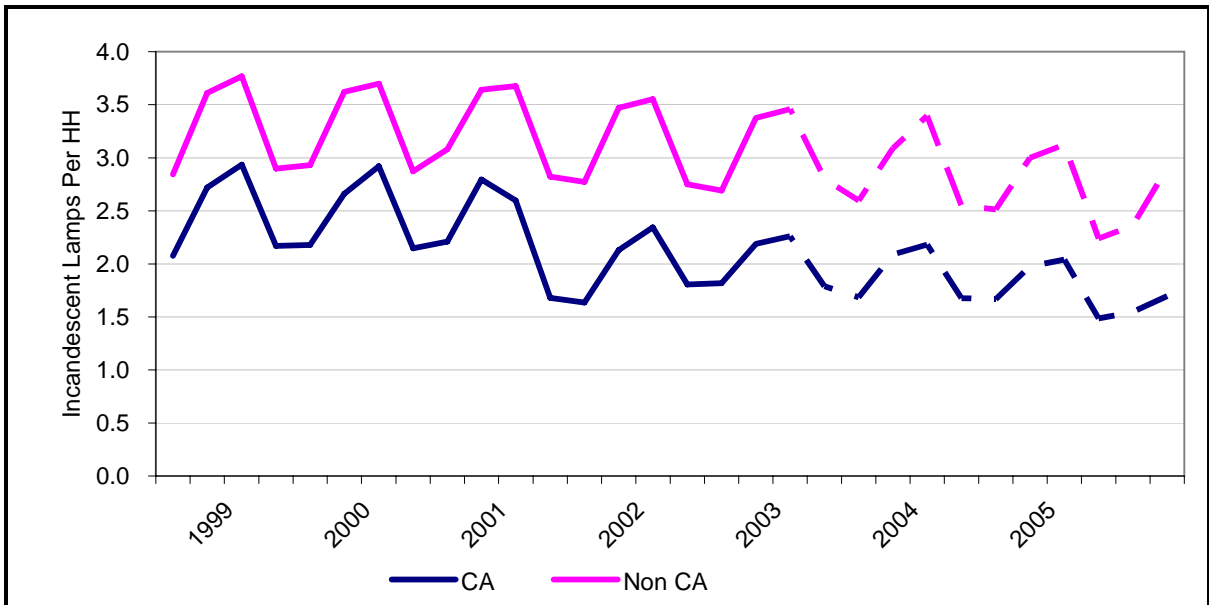
**Figure 14: Medium Screw-Based CFL Sales Per Household**



\* Dashed lines represent estimated sales.

Figure 15 indicates that unlike CFL sales, sales of incandescent medium screw-based bulbs are seasonal. As shown, more lamps are purchased per household during periods of less daylight—the fourth and first quarters.

**Figure 15: Medium Screw-Based Incandescents per Household**



\* Dashed lines represent estimated sales.

Because of this seasonality, comparisons are made on an annual basis. Table 2 summarizes annual MSBL sales per household from 2000 to 2005. The data reveal that CFL sales per household are increasing in the U.S, while incandescent sales per household are decreasing. California’s results, again, show a larger percent increase in CFL sales between 2000 and 2001 than in the rest of the U.S. In 2003, there was a large increase in the number of CFLs sold per household for the U.S., while California data showed minimal change from 2002 to 2003. In 2004, CFL sales per household decreased in the rest of the U.S., but increased in California. Sales in per household in both California and the rest of the country increased to their highest levels in 2005, with sales in the rest of the U.S. increasing the most, by 20%. California CFL sales per household increased 17%, and now are over 0.5 bulbs per household. In other words, more than half of all households in California bought a CFL during 2005.

**Table 2: Annual Medium Screw-Based Lamps Sold per Household**

	2000	2001	2002	2003	2004	2005
<b>U.S. (non-California)</b>						
CFL	0.060	0.172	0.236	0.286	0.253	0.304
Halogen	0.061	0.073	0.061	0.063	0.067	0.073
Incandescent	13.291	12.742	12.365	11.945	11.455	10.629
<b>California</b>						
CFL	0.102	0.497	0.381	0.392	0.439	0.515
Halogen	0.063	0.064	0.053	0.050	0.050	0.054
Incandescent	10.072	8.043	8.153	7.821	7.498	6.770

***Sales of Medium Screw-Based Lamps by Market Channel***

This section presents medium screw-based lamp sales by type and market channel. This analysis provides insight on the types of establishments where consumers typically purchase lamps.

***CFL Sales by Market Channel***

Figure 16 illustrates sales of medium screw-based CFLs by market channel in 2005 and Figure 17 provides quarterly CFL unit sales, by market channel from 2000 through 2005. Figure 16 shows that, in the rest of the U.S., hardware/home improvement stores dominate CFL sales, however in California, food stores dominated CFL sales. Mass merchandisers play a more significant role in overall U.S. lamp sales than in California.

**Figure 16: Medium Screw-Based CFL Sales by Market Channel – 2005**

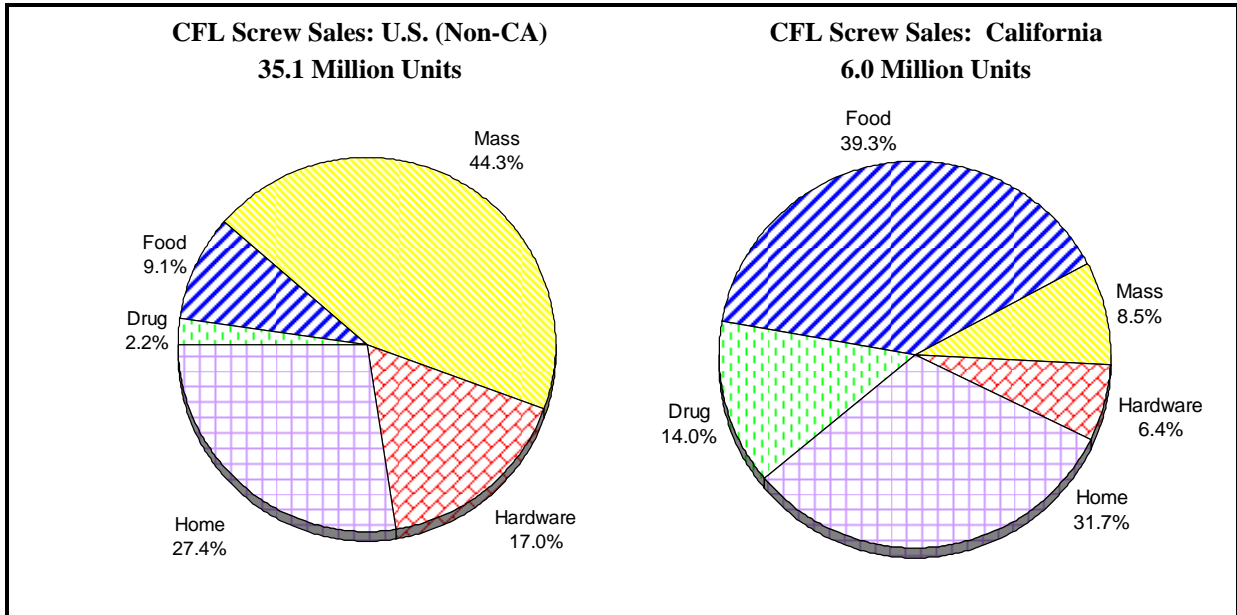
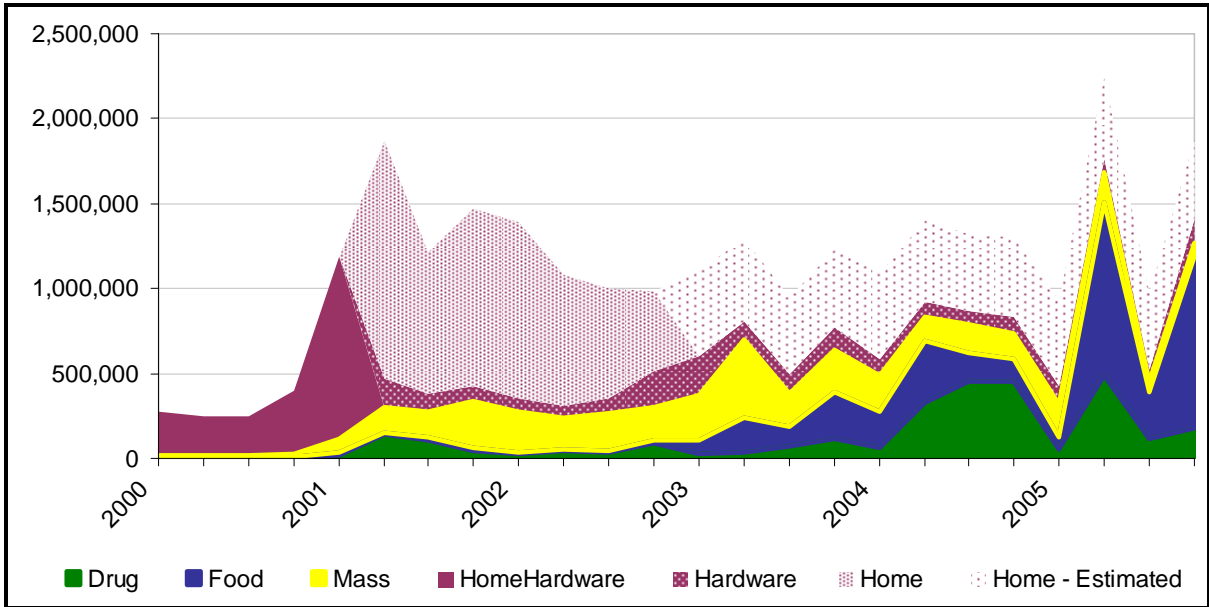


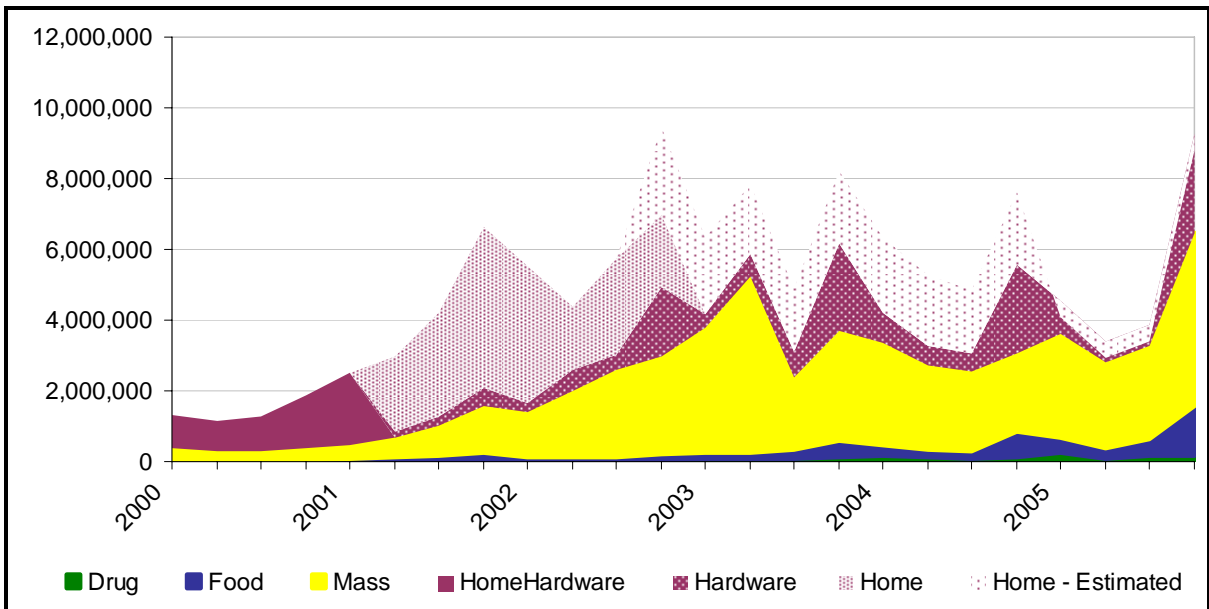
Figure 17 shows that while home improvement centers account for the largest share of CFL sales in California since early 2000, sales by mass merchandisers are slowly increasing. In particular, in 2000 mass merchandisers sold approximately 6% of the CFLs sold in California but by 2003, 25% of CFLs were sold through this market channel. However, in 2004 and 2005, sales in drug and food stores increased tremendously, while sales in the other channels remained fairly constant. Food stores sales in particular spiked in the second and fourth quarters of 2005. This is again due to the very low-priced CFL multi-packs that were available primarily in drug and food stores.

Figure 18 reveals that the increase in sales at mass merchandisers started earlier and is even more dramatic in the rest of the U.S., where they sold 23% of the CFLs in 2000 and 44% in 2005. The rest of the U.S. also experienced an increase in CFL sales in food stores, however, it was more gradual and less dramatic than sales in California.

**Figure 17: Medium Screw-Based CFL Sales by Retail Channel – California**



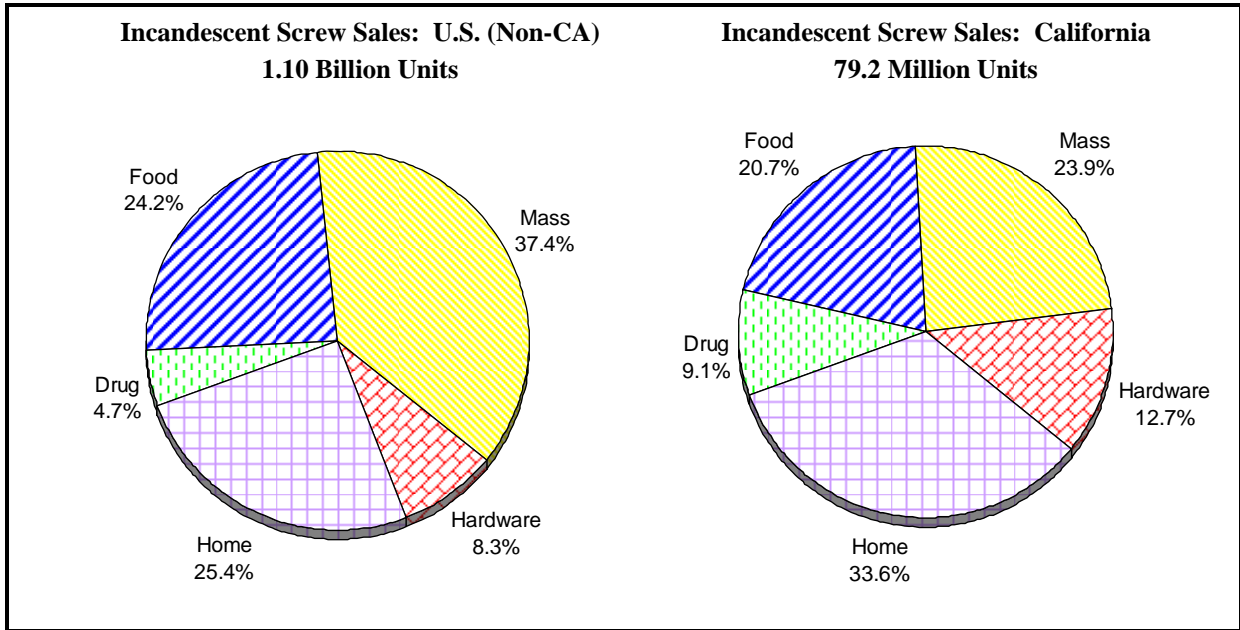
**Figure 18: Medium Screw-Based CFL Sales by Retail Channel – U.S. (non-CA)**



**Incandescent Lamp Sales by Market Channel**

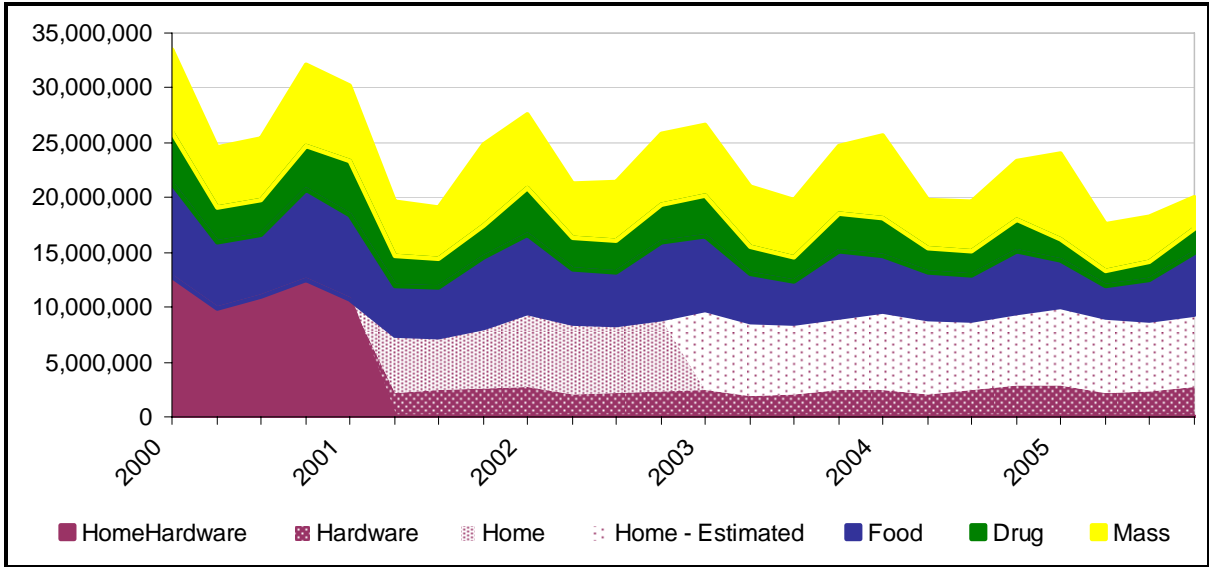
Figure 19 shows incandescent lamp sales by market channel in the U.S and California. As shown, incandescent lamp sales have been distributed more evenly across retail channels than CFLs. However, similar to CFLs, the percentage of lamps sold through home improvement stores is greater in California than in the rest of the U.S.

**Figure 19: Medium Screw-Based Incandescent Sales by Retail Channel – 2005**

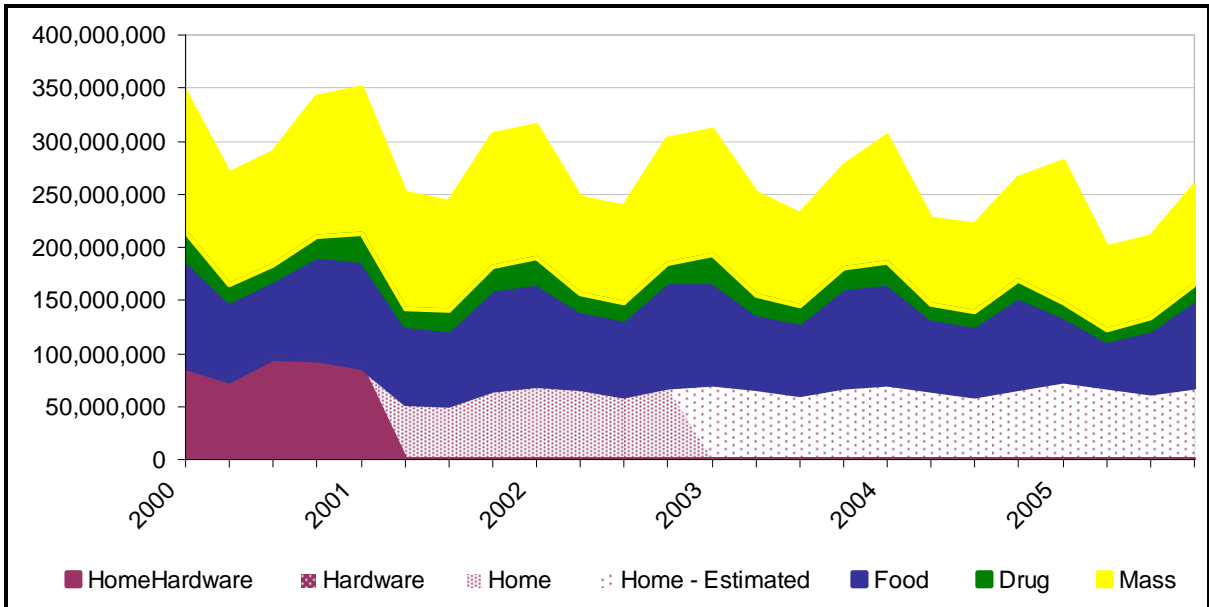


Figures 20 and 21 illustrate quarterly incandescent MSBL sales by market channel. The relative distribution of medium screw-based A-line incandescent lamp sales have remained approximately the same over the last four years. While sales in home improvement centers and hardware stores had a small decrease in sales in California, Figure 20 shows that the distribution of sales among channels has remained fairly constant. In addition, Figure 21 shows that mass merchandisers in the rest of the U.S. have sold a large share of medium screw-based A-line incandescent lamps consistently since 2000 (35%).

**Figure 20: Medium Screw-Based Incandescent Sales by Retail Channel – California**



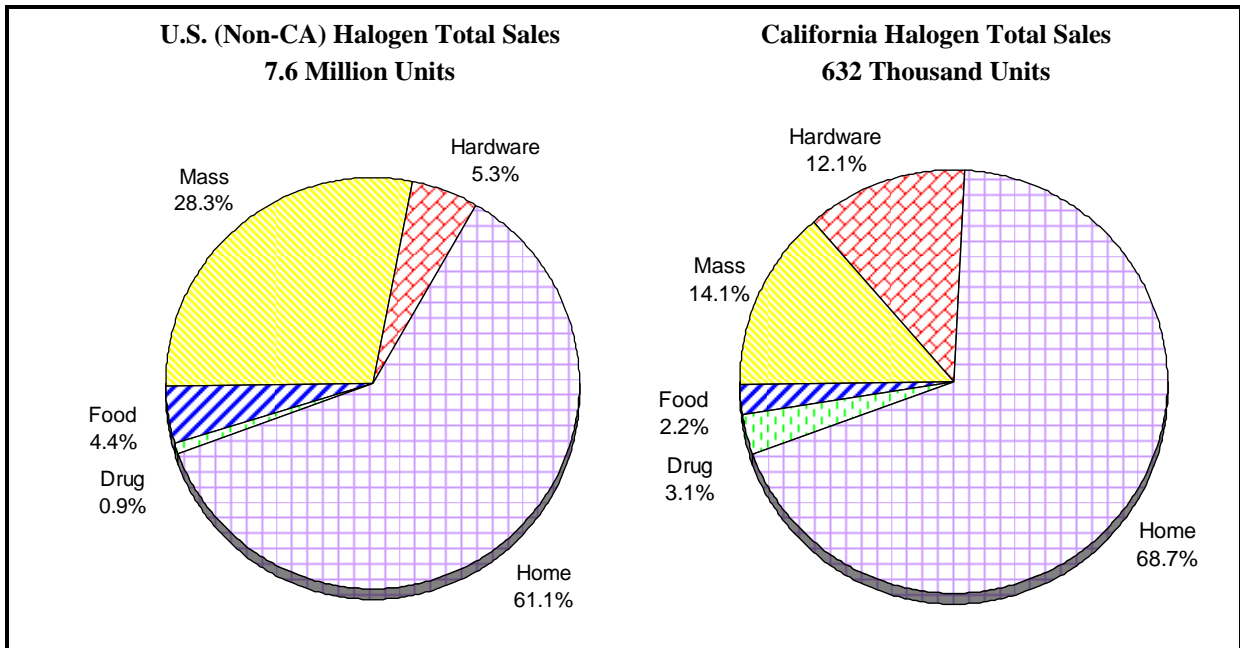
**Figure 21: Medium Screw-Based Incandescent Sales by Retail Channel – U.S. (non-CA)**



**Halogen Lamp Sales by Market Channel**

Figure 22 presents sales of medium screw-based halogens by market channel in the U.S. and California. As shown, sales of medium screw-based halogens are sold primarily through home improvement stores.

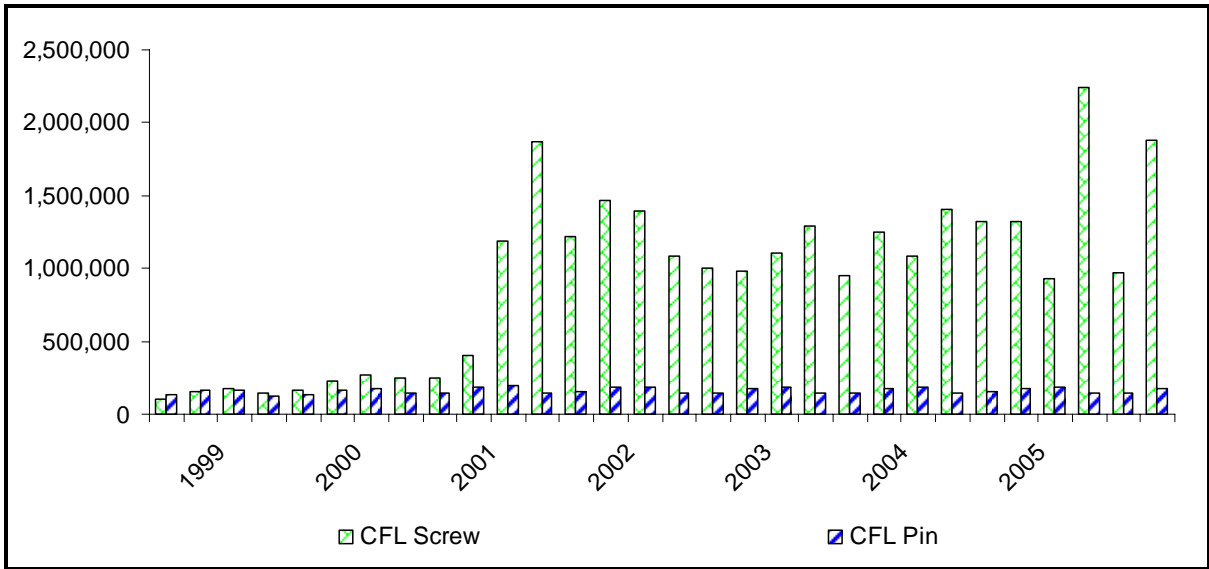
**Figure 22: Medium Screw-Based Halogen Sales by Retail Channel – 2005**



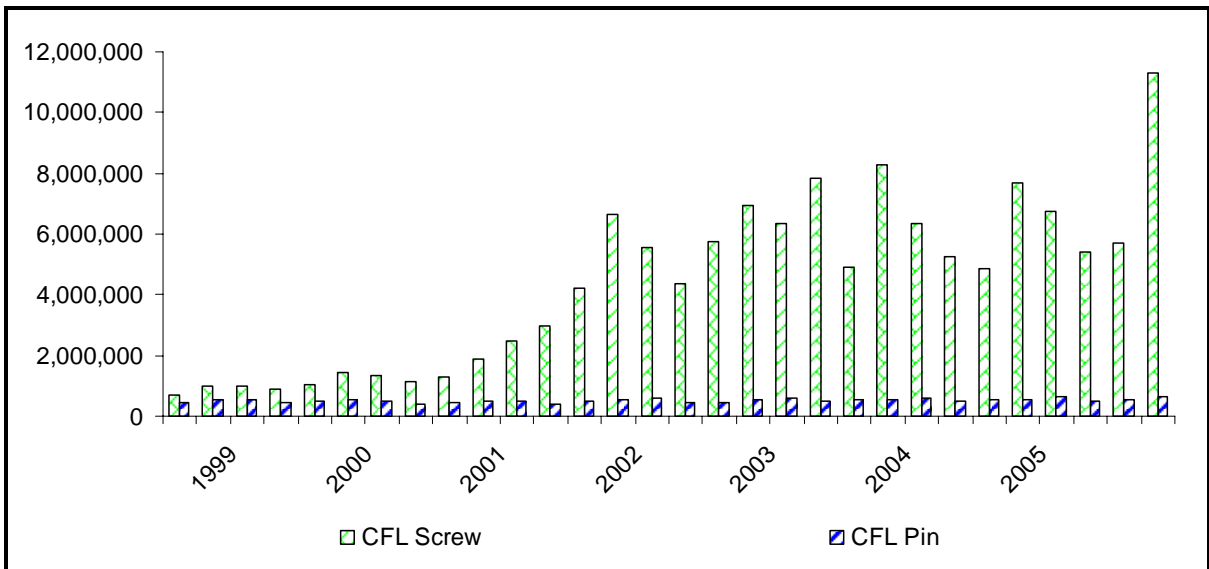
**Comparison of Medium Screw-Based and Pin-Based CFL Sales**

Figure 23 and Figure 24 compare sales of screw-based CFLs and pin-based CFLs by quarter in California and the U.S., respectively. These graphs show that, while medium screw-based CFL sales increased significantly starting in 2001 and have varied widely from quarter to quarter, pin-based CFL sales have remained relatively constant in California and the U.S. over the last six years.

**Figure 23: Medium Screw-Based CFL Sales and Pin-Based CFL Sales – California**



**Figure 24: Medium Screw-Based CFL Sales and Pin-Based CFL Sales – U.S. (non-California)**





**Sales of Medium Screw-Based Lamps by Equivalent Wattages**

When replacing medium screw-based incandescent lamps with CFLs, it is important to maintain a comparable light level. Lumen output measures the amount of light produced by a lamp and is closely approximated by lamp wattage. Using information from lamp manufacturers and the Lighting Research Center,<sup>23</sup> lamps sold were sorted by equivalent lumen output, as shown in Table 3.<sup>24</sup>

**Table 3: Comparison of Equivalent Lamp Wattages**

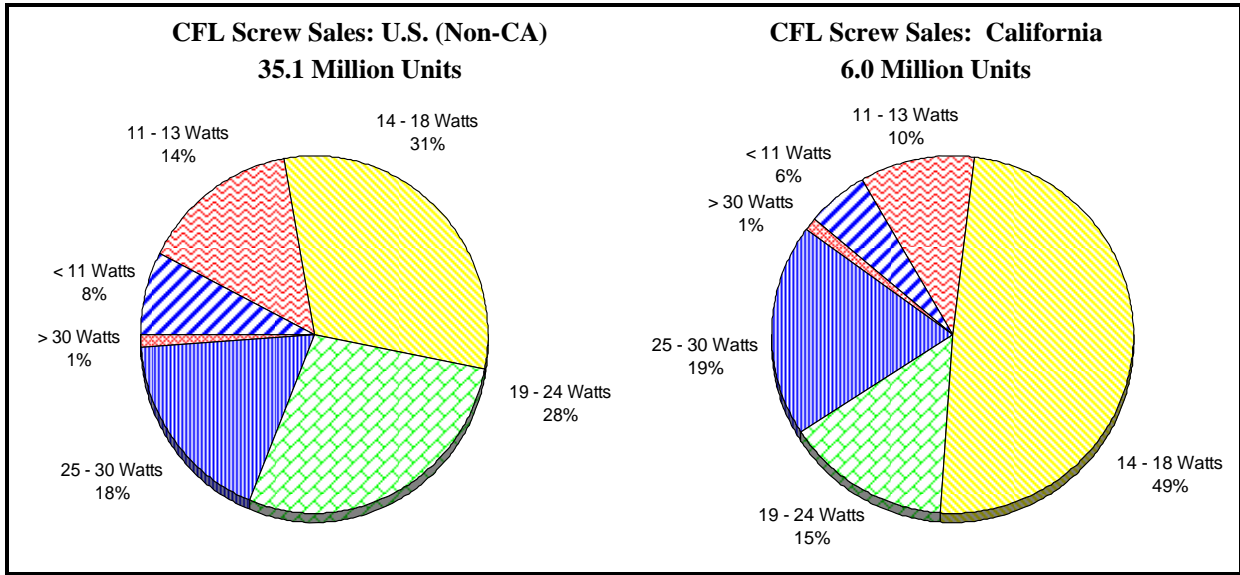
CFL Wattage Range	Incandescent/Halogen Wattage Range	Typical Incandescent Wattage	Typical Lumen Output
11-13	35-45	40	450
14-18	46-64	60	800
19-24	65-85	75	1,150
25-30	86-125	100	1,550
30+	125+	150	2,500

Figure 25, Figure 26, and Figure 27 present sales of medium screw-based CFLs, incandescent, and halogens by wattage in California and the rest of the U.S., respectively. Comparing Figure 25 through Figure 27 reveals that the most commonly purchased incandescent and halogen lamps are in the 46-64 watt range, typically 60-watt lamps. Correspondingly, CFLs that provide the equivalent light levels of the 60-watt incandescent are the most commonly sold lamps, followed closely by CFLs that provide the equivalent light levels of the 75-watt incandescent. In California, the majority of CFLs sold fell in the 14-18 watt range, which corresponds to the wattage of the high-selling, low-priced lamps that drove the increase in CFL sales in 2004 and 2005. For the other lamp types, the distribution of wattage in California is similar to the rest of the U.S.

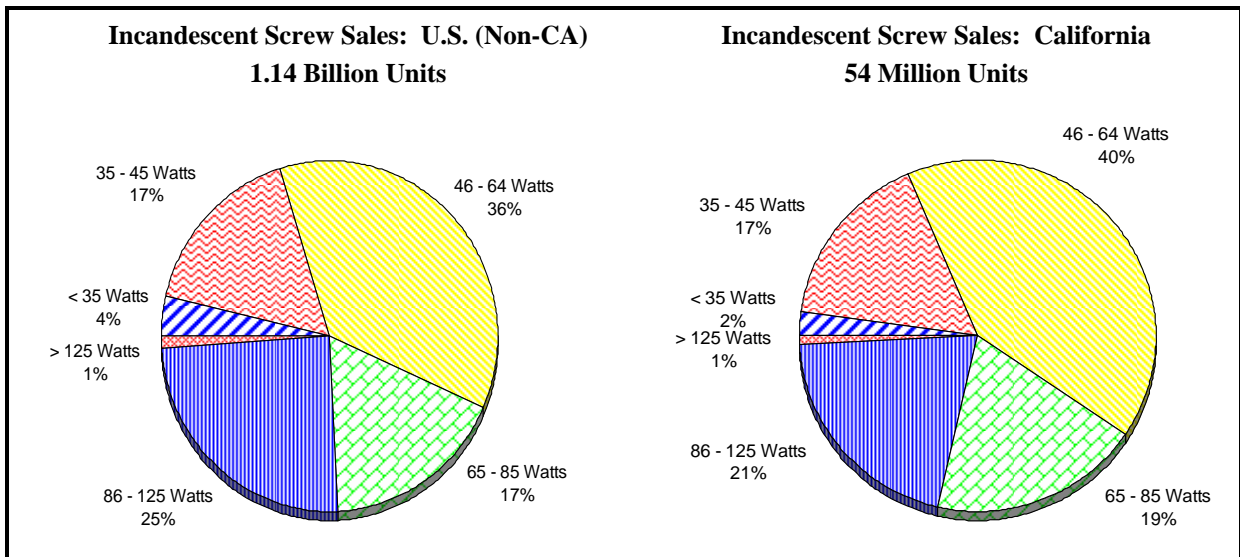
<sup>23</sup> Lighting Research Center. *Specifier Reports: Screwbase Compact Fluorescent Lamp Products, Volume 7, Number 1*. June 1999.

<sup>24</sup> Typical Incandescent Wattage is the most common incandescent lamp found for that wattage range, based on data from lamp manufacturers.

**Figure 25: Medium Screw-Based CFL Sales by Wattage – 2005**



**Figure 26: Medium Screw-Based Incandescent Sales by Wattage – 2005**



**Figure 27: Medium Screw-Based Halogen Sales by Wattage – 2005**

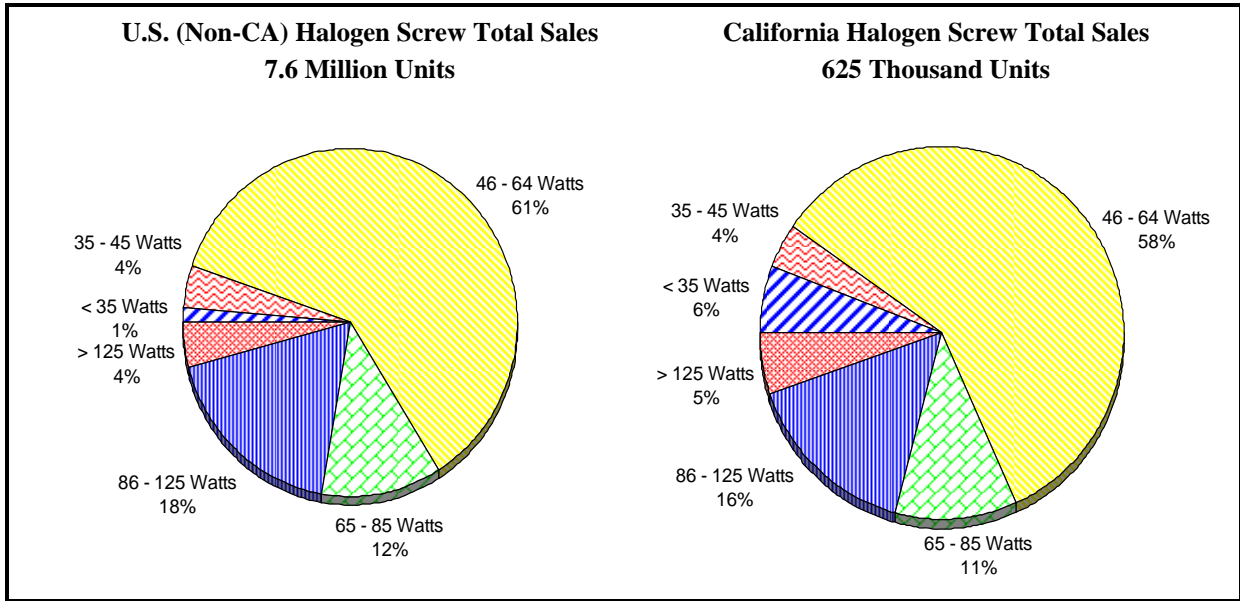
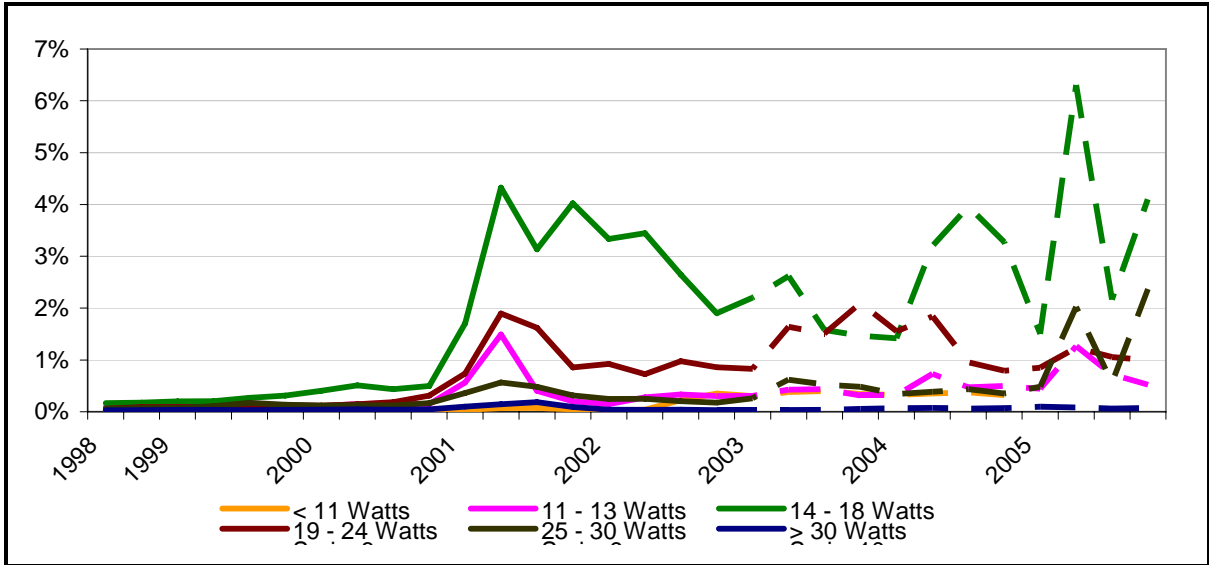


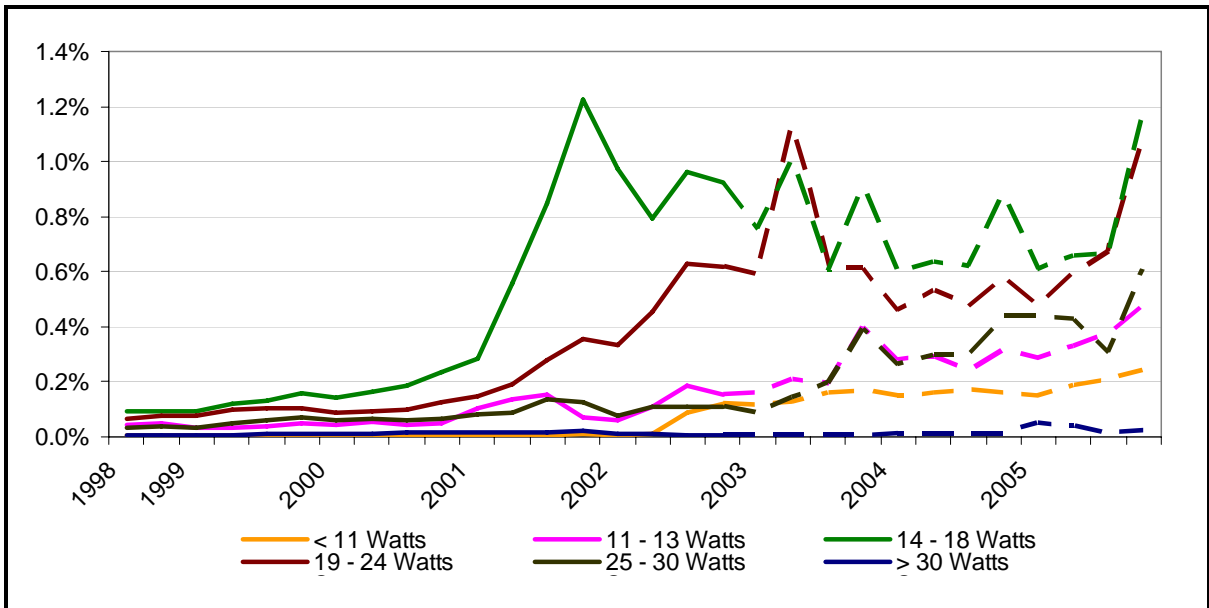
Figure 28 and Figure 29 illustrate medium screw-based CFL sales as a percentage of total medium-based lamp sales by wattage over time for California and the rest of the U.S., respectively. These figures reveal that CFLs in the 14-18 watt range (60-watt equivalent) account for a large portion of the total increase in CFL MSBLs in 2001 and 2002 for both the U.S. and California particularly. In 2003, CFLs in the 19-24 watt ranges increased and temporarily overtook CFLs in the 14-18 watt range. However, in 2004 CFLs in the 14-18 watt range increased substantially in the latter part of the year, while the percentage of CFLs in the 19-24 watt range fell. In 2005 CFL sales in both wattage groups increased to nearly identical levels in the rest of the U.S., while in California the 14-18 watt range increased the most.

**Figure 28: Medium Screw-Based CFL Sales as a Percentage of Total Medium Screw-Based Sales, by Wattage – California**



\* Dashed lines represent estimated shares.

**Figure 29: Medium Screw-Based CFL Sales as a Percentage of Total Medium Screw-Based Lamp Sales, by Wattage – U.S. (non-California)**



\* Dashed lines represent estimated shares

### Impact of Lamp Life on Medium Screw-Based Lamp Sales

The percentage of medium screw-based CFL and halogen sales as a percentage of total MSBLs sold does not entirely capture their impact in the market. The sale of one CFL is not equivalent to the sale of one incandescent, because, a typical CFL will last six to ten times longer than an incandescent lamp.<sup>25,26</sup> Therefore, the sale of one CFL is equal to selling many incandescent lamps. Likewise, the sale of one medium screw-based halogen lamp is the equivalent of selling three incandescent lamps. The technologies of CFLs and halogens require far fewer replacements and fewer subsequent purchases by the consumer.

To better estimate of the impact of CFL and halogen sales, the relative life of each lamp type was calculated by using the average lamp life, in hours. Then, by using the share of sales for each lamp type in 2005, a lamp life normalized market share was estimated. As shown Table 4, by weighting the lamp counts by relative lamp life, the impact of CFLs and halogens in the marketplace is higher than when simply looking at their shares of sales. In 2005, the CFL share of unit sales was approximately 7.0% in California. However, when taking into account that the life of each CFL is much longer than that of an incandescent lamp, the estimated market share is approximately 46%. Similarly, the lamp life normalized market share for halogen lamps is higher than its share of sales—1.7% compared to 0.7% in California and the rest of the U.S.

**Table 4: Medium Screw-Based Lamp Shares Based on Normalized Lamp Life – 2005**

Lamp Type	Average Lamp Life (hours)	Relative Life of Lamp	Raw Sales		Lamp Life Normalized	
			U.S. Share	CA Share	U.S. Share	CA Share
Incandescent	875	1.00	96.6%	92.2%	80.5%	65.9%
Compact Fluorescent	8,000	9.14	2.8%	7.0%	21.1%	45.8%
Halogen	2,750	3.14	0.7%	0.7%	1.7%	1.7%

\* Relative Life of Lamp is Average Lamp Life divided by Average Incandescent Lamp Life.

### Pricing Data over Time

For the 2005 report, Itron completed an analysis of historic pricing data for compact fluorescent bulbs in California and the U.S. The point-of-sale data received included the average price by UPC, by region, and by channel. The historical pricing data includes all

<sup>25</sup> Lamp life estimates are based on average data from lamp manufacturer websites.

<sup>26</sup> Note that the CFL life used in this report (8,000 hours) is less than in previous reports (10,000 hours). This is due to recent testing of CFLs which has shown that the new generation (twisters, dimmable, 3-way, etc.) of CFLs do not last as long as the previous generation (triples, quads, circlines, etc.).

regions and channels except for home centers after 2002, national food and drug store data before mid-2000 and the mass market retail channel. The following section presents the results of this new analysis by IOU, market channel, and wattage.

Figure 30 presents the average retail sales price of a medium screw-base CFL from mid-1998 to 2005 in California by IOU. The average price of a CFL has fallen dramatically over the years, from \$14 per lamp in the third quarter of 1998 in the PG&E service territory to a low of \$0.56 per lamp in SDG&E during the second quarter of 2005. Because the pricing data is point-of-sales data, it includes any instant rebates or manufacturer buy-downs. The low prices seen below appear to be highly related to the periods of high sales that were shown in Figure 11.

**Figure 30: Medium Screw-Based CFL Average Sale Prices per Lamp by IOU**

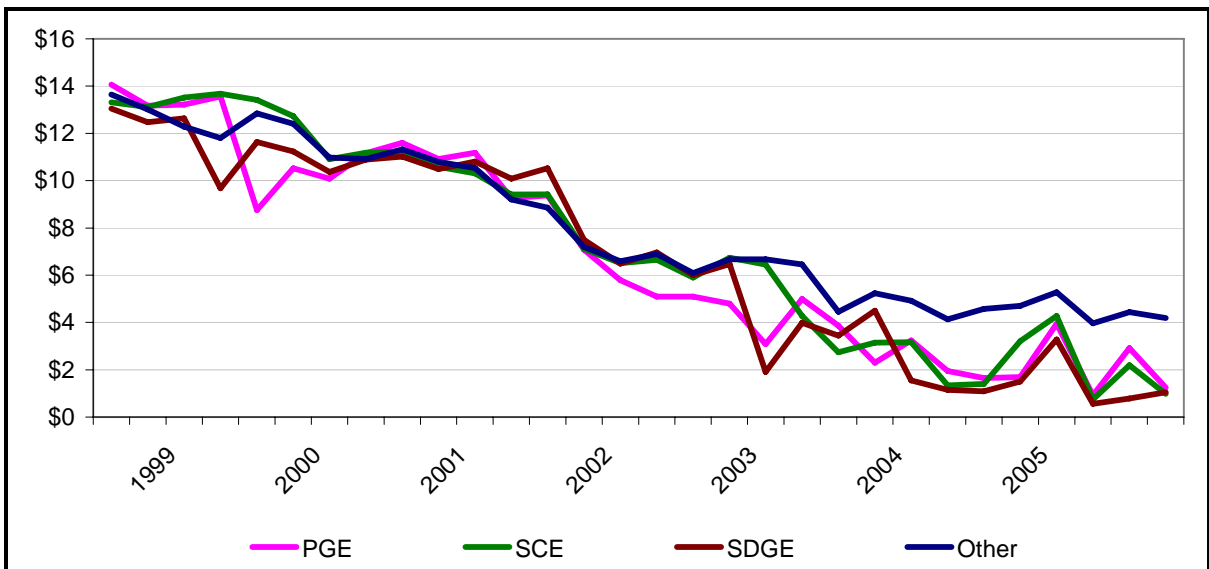
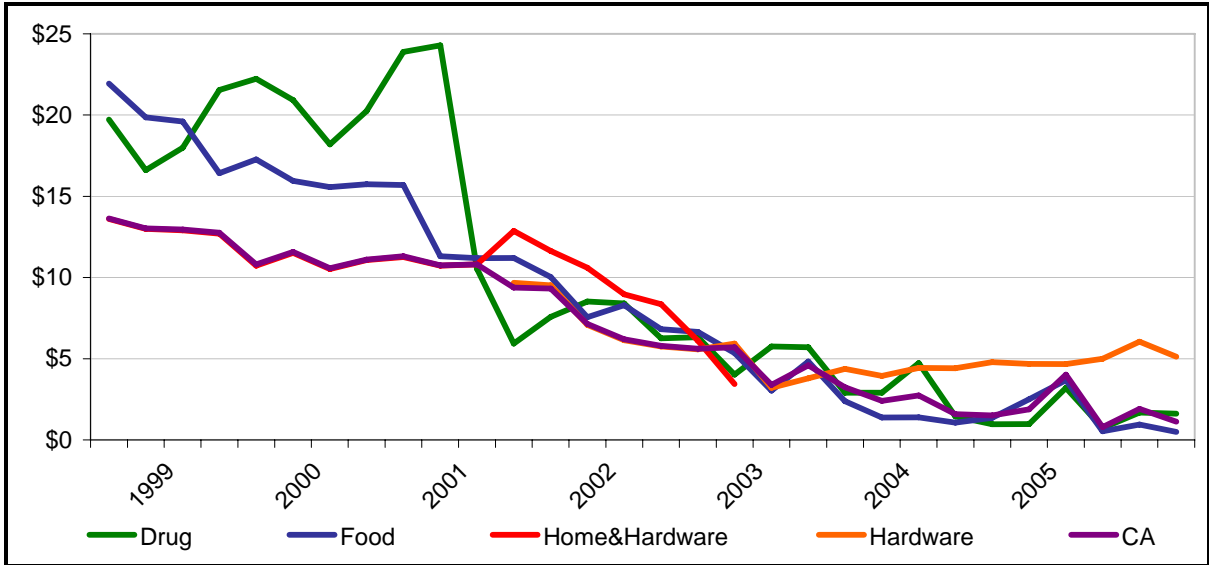


Figure 31 and Figure 32 presents the average retail sales price of a medium screw-base CFL by market channel in California and the U.S., respectively. As shown, the average price of CFLs fell most dramatically since 2001 for all retail channels, and in 2005 reached its lowest level to date at \$0.53 per bulb in food stores and \$0.72 in drug stores. Sales prices in the U.S. have also fallen, however, they have not reached the same dramatic lows observed in California. The lowest prices reached in the U.S. in 2005 were \$1.43 for drug stores and \$1.55 in food stores. Unfortunately, due to the absence of pricing data from a large retail chain, Itron was unable to estimate the average retail price for mass merchandisers. Also, drug and food store data were not available nationally before mid-2000.

**Figure 31: Medium Screw-Based CFL Average Sale Prices per Lamp by Retail Channel – California**



**Figure 32: Medium Screw-Based CFL Average Sale Prices per Lamp by Retail Channel – U.S.**

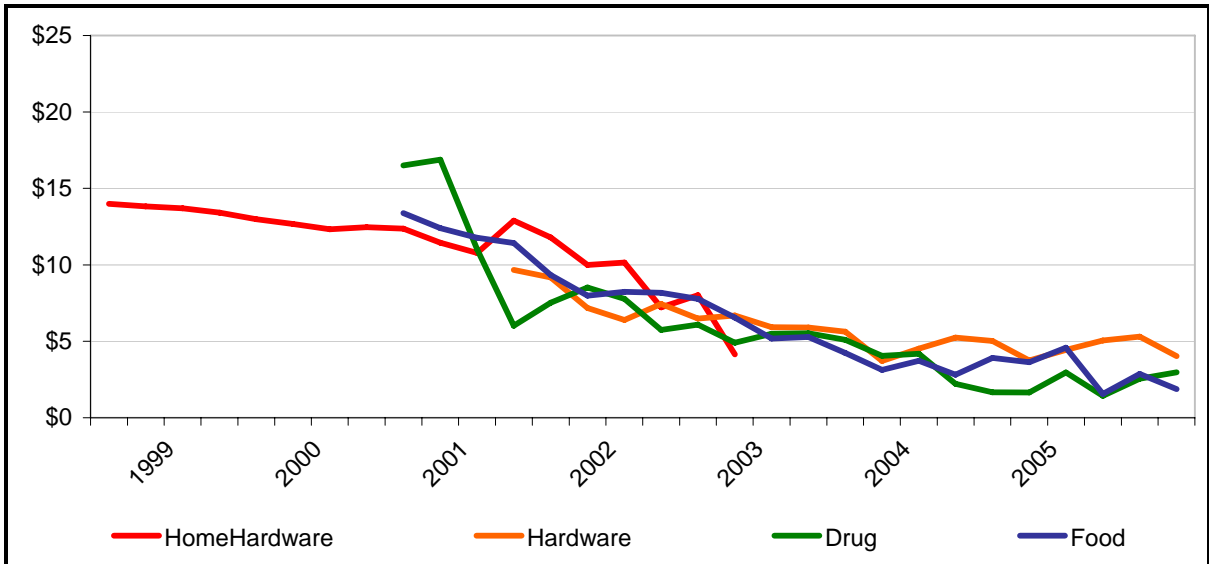
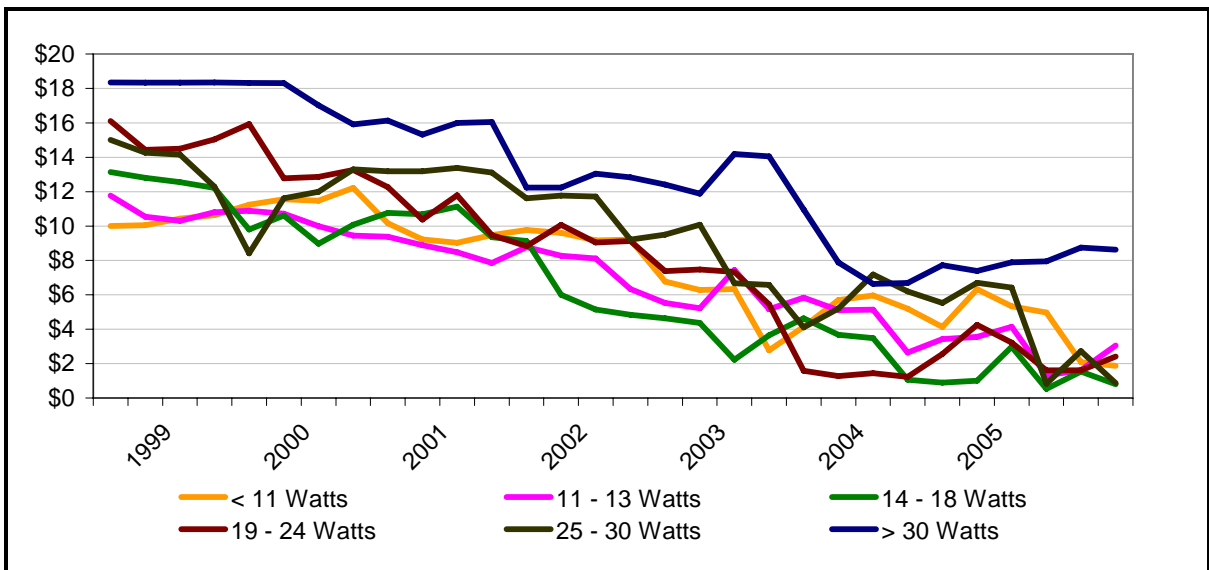


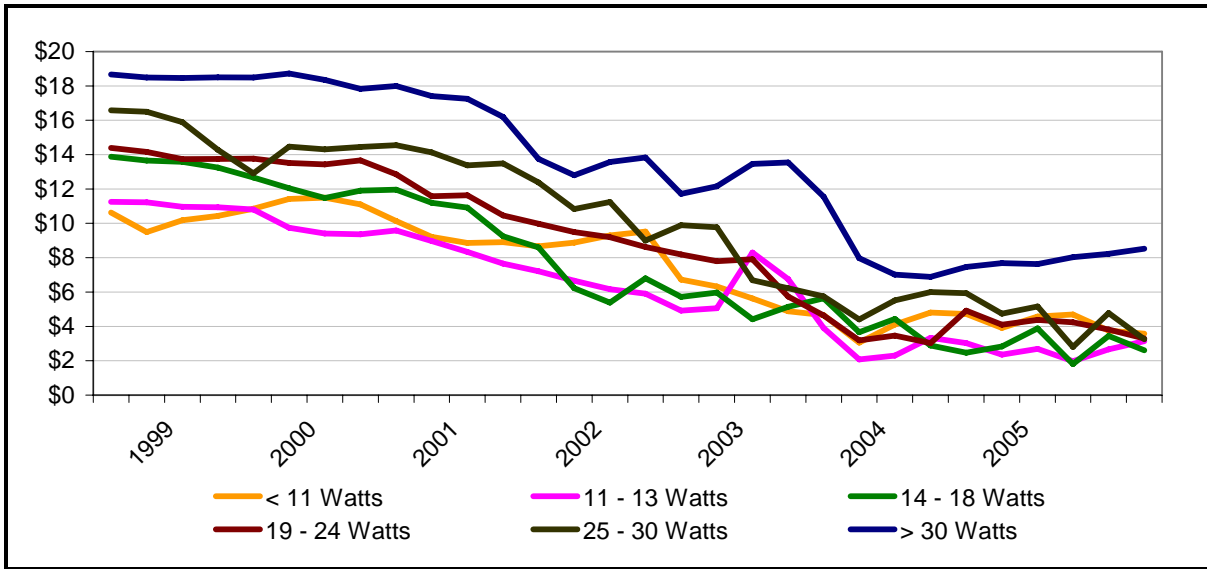
Figure 33 and Figure 34 presents the average sales price of a medium screw-based CFL in California and the U.S. by wattage group. Prices for all wattage groups have fallen, and the lowest prices can be seen in the 14-18 watt (\$0.53) and 25-30 watt groups (\$0.82). After reaching an all time low of \$1.24 in 2004, the average price of a bulb in the 19-24 watt group increased sharply, before falling back below \$2 a lamp. Prices in the highest watt group, those over 30 watts, reached their lowest point in 2004 with \$6.64 per lamp, and have been steadily climbing since. National prices have shown some of the same trends as California, though the average national price is usually higher than California's average price. The national average sales price is more consistent quarter to quarter, leading to individual quarters where the national average price is lower than that in California. The only time that the national average price to fell below the \$2 level occurred in the second quarter of 2005, in the 11-13 watt group with \$1.97 and the 14-18 watt group at \$1.81.

**Figure 33: Medium Screw-Based CFL Average Sale Prices by Wattage – California**





**Figure 34: Medium Screw-Based CFL Average Sale Prices by Wattage – U.S.**



## 6. Efforts to Expand Tracking of Residential Lamp Sales

The data analyzed in this report, prior to 2003, include lamps sold through channels that sell approximately 80% to 90% of residential lamps. (The other 10% to 20% of residential lamps are sold through other smaller channels, such as the Internet, small independent food stores, club warehouse stores, and direct sales from the manufacturer to the consumer.) However, since home centers stopped providing data in 2003, the data available from the market research firms no longer include efficiency sales from this important source.

This loss of home center data, coupled with a growing interest in market penetration tracking by energy efficiency organizations outside of California, has facilitated efforts to expand POS data sources. In particular, efforts are currently underway to develop a partnership with the ENERGY STAR program to track the national market penetration of CFLs.<sup>27</sup> Central to this new endeavor are the efforts of the ENERGY STAR implementation contractor to collect POS data from retail partners not currently represented in the data obtained from market research firms, including home centers and club warehouse stores. If these efforts are successful, the additional data will be invaluable in evaluating the progress of the national ENERGY STAR program and improving estimates of market shares for California.

<sup>27</sup> Itron, Inc. *National Lighting Tracking Feasibility Study*. Prepared for the U.S. Department of Energy. February 9, 2005.