



memo

California Compact Fluorescent Lamp (CFL) Market Overview

This memorandum was prepared by CPUC lighting consultants Jennifer Canseco (KEMA, Inc.), Karl Johnson, (California Institute for Energy and Environment); and Michael Siminovitch (California Lighting Technology Center). It is intended to provide a brief overview of the market for compact fluorescent lamps (CFLs) in California. The memo provides an overview of key market indicators such as consumer awareness and purchase rates, CFL price, availability and diversity of CFLs, and consumer satisfaction with CFLs. The memo also provides data on the IOUs’ residential CFL program sales volumes as an indicator of statewide sales.¹

Since the early 1990s, California’s investor-owned utilities (IOUs) have operated energy-efficiency programs designed to increase penetration of higher-efficiency lighting technologies. Table 1 shows the barriers that the IOUs face as well as indicators of progress toward overcoming those barriers.

**Table 1
Market Barriers and Market Transformation Progress Indicators**

Barrier	Progress Indicator
Consumer awareness	Rate of awareness
Consumer purchase	Rate of purchase
CFL quality	Consumer satisfaction
CFL price	Average sales price
CFL availability / diversity	Number of models/brands/styles stocked by retailers and produced by manufacturers

Awareness and Purchase Rates

Awareness and purchase rates are key indicators of market transformation progress. Figure 1 below shows the change in the percentage of households in the California IOU service territories that are aware of CFLs and the percentage that have purchased them over time. The primary source of these data is surveys of residential customers conducted as part of the evaluations of the IOUs’ residential programs (through 2003) and mass markets programs (after 2004). Included in the data are a small number of respondents who purchased CFLs for their businesses.

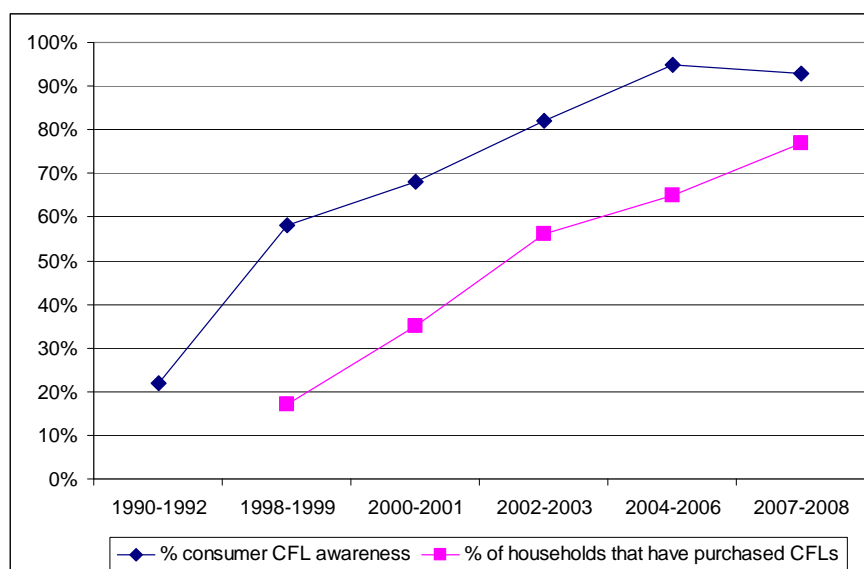
- **1990-1992:** During the California IOUs’ initial CFL program phase, the CFL awareness rate was very low: 22 percent of 1992 SDG&E CFL program participants had used CFLs (note that data in the table through 2003 is for SDG&E program participants only).

¹ A full list of sources is provided at the end of the memorandum.



- **1998-1999:** Just prior to the launching of the California IOUs' residential lighting market transformation program in 1998, 58 percent of California IOU customers were aware of CFLs, and 17 percent had purchased a CFL within the past year and a half.
- **2000-2001:** In 2001, during the energy crisis and the final year of the California IOUs' residential market transformation programs, 68 percent of California IOU customers were aware of CFLs, and 35 percent had purchased one or more CFLs.
- **2002-2003:** After two years of sustained California IOU upstream incentives, the rate of awareness among customers increased to 82 percent in 2003, and the purchase rate increased to 56 percent.
- **2004-2006:** After another three years of even larger-scale California IOU upstream incentive programs, awareness reached 95 percent in 2006. During 2004 and 2005, 65% of Californians bought CFLs.
- **2007-2008:** By 2008, 93 percent of Californians are reportedly aware of CFLs, and 77 percent have bought CFLs.

Figure 1
CFL Awareness and Purchase Rates Among California Consumers², 1990-2008



Sources:
1990-1992: Boutwell, B. et al., 1993 (SDG&E data only);
1998-1999 and 2000-2001: XENERGY Inc., 2002;
2002-2003 and 2004-2005: Itron and KEMA, 2006;
2007-2008:KEMA, Inc., 2008.

Notes: the 1990-1992 estimate is for SDG&E service territory only, and is of program participants; the 1998-1999 purchase rate estimate is only for purchases from mid-1997 through end of 1998; the 2004-2006 purchase rate estimate is only for purchases between 2004 and 2005.

² These awareness and purchase rates reflect those of consumers within the three CA electric IOU service territories.

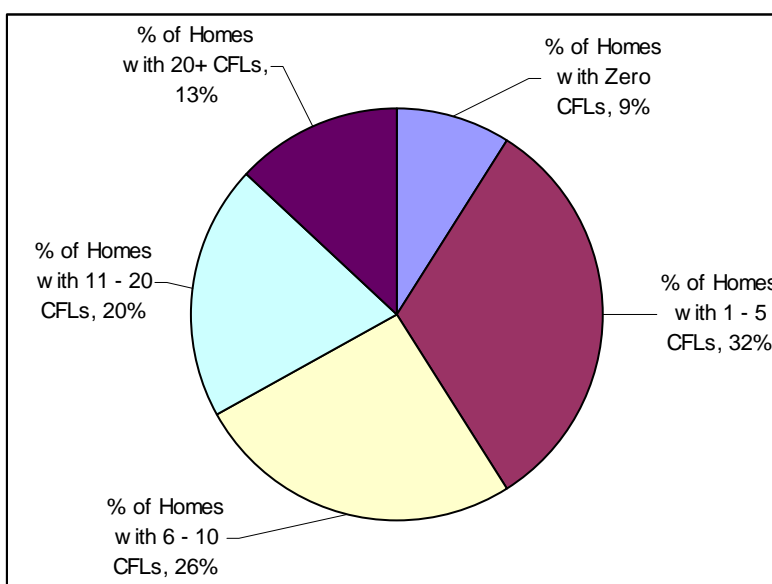


Socket Penetration and Saturation

CFL socket penetration – the percentage of sockets containing a CFL – has increased substantially in California. Currently 21 percent of sockets in California contain CFLs³, compared to 1 percent in 2000⁴ and 5 percent in 2005⁵.

CFL saturation – the percentage of homes with CFLs – has also increased dramatically. In 2000, approximately 12 percent of homes had at least one CFL⁶. This increased to 57 percent in 2005⁷, and current estimates suggest that between 81 and 91 percent of homes in California have at least one CFL⁸. Figure 2 shows the current breakdown of saturation levels in California, based on the higher estimate of saturation (91%).

Figure 2
California Households by CFL Saturation Level, 2008



Source: KEMA, Inc., 2009. Note that this figure is based on preliminary data.

Consumer Satisfaction with CFLs

Consumer satisfaction with CFL has increased in California as lamp quality has improved, likely in response to updates to ENERGY STAR product specifications and continuous manufacturer improvements. In 2006, we asked consumers to rate their general satisfaction with CFLs purchased through 2005 on a 10-point scale where 1 means “not at all satisfied” and 10 means “extremely satisfied.” Figure 3 shows consumer satisfaction is higher for CFLs purchased more recently in comparison to CFLs purchased prior to 2004.

³ KEMA, Inc., 2009.

⁴ RLW, 2005.

⁵ RLW, 2000.

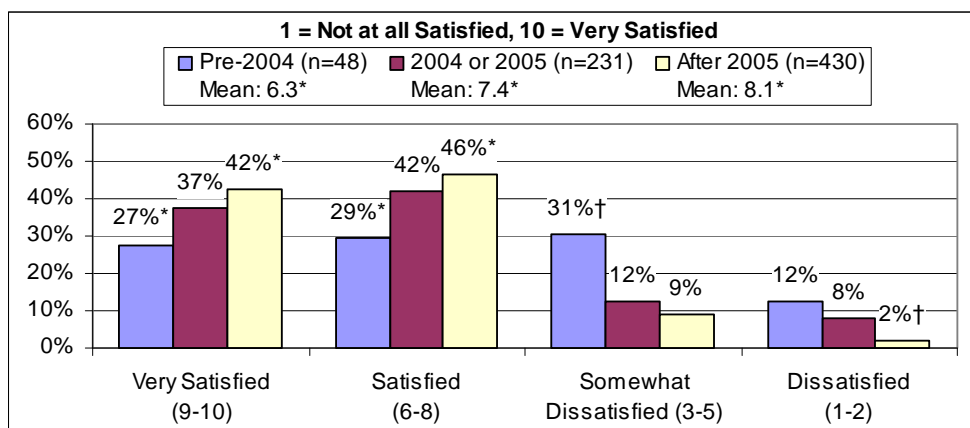
⁶ Ibid.

⁷ RLW, 2005.

⁸ KEMA, Inc., 2009.



Figure 3
California Consumers' Satisfaction with CFLs by Date of Most Recent CFL Purchase, 2006



Source: Itron and KEMA, 2006.

* Differences between purchaser groups within satisfaction category are statistically significant at the 90 percent level of confidence.

† Difference from other Purchaser Groups within satisfaction category is statistically significant at the 90 percent level of confidence.

Satisfaction with various CFL attributes has improved over time and is, at present, fairly high among CFL purchasers. In a recent survey of PG&E and SCE residential customers, interviewers asked respondents to rate their satisfaction with seven different CFL attributes on a scale of one to ten with 1 meaning, "not at all satisfied" and 10 meaning "very satisfied." Among the attributes tested (see Table 2), satisfaction was highest with length of life and lowest with the way CFLs look in fixtures. It is worth noting, however, that ratings across all seven attributes were toward the high end of the 10-point scale (above 7, on average).

Table 2
Satisfaction with CFL Attributes Among PG&E and SCE Residential Customers Who Have Purchased CFLs, 2009

CFL Attribute	Satisfaction					
	PG&E		SCE		Overall	
	Mean Rating	n	Mean Rating	n	Mean Rating	n
Overall satisfaction with CFLs	7.8	465	8.0	470	7.9	935
Length of life	8.7	406	8.7	409	8.7	815
Brightness	7.8	461	8.1**	469	7.9	930
Color of light	7.7	455	8.0**	464	7.8	919
Amount of time to light up	7.7	449	7.8	462	7.8	911
The way they fit into fixtures	7.9	457	7.8	472	7.8	929
The way they look in fixtures	7.0	443	7.1	462	7.1	905

Source: KEMA, 2009. Preliminary Data from Process Evaluation of 2006-2008 Mass Markets Programs for PG&E and SCE.

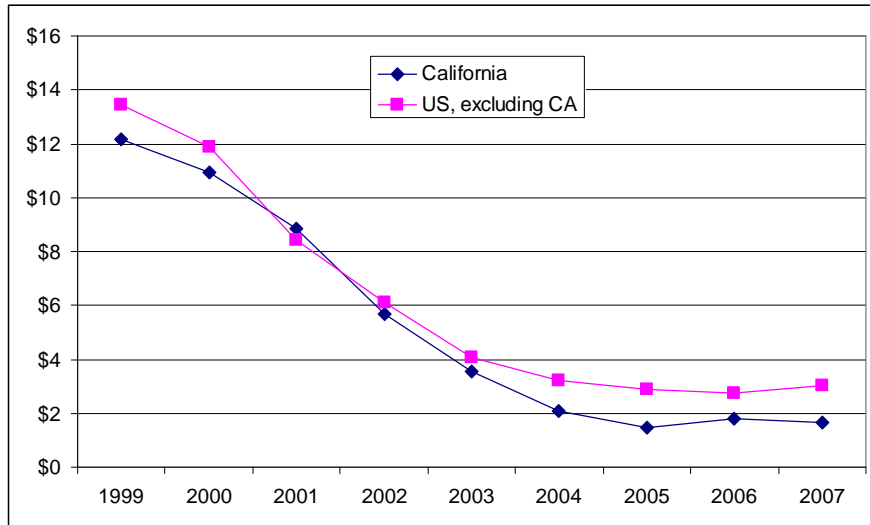
** Difference between IOUs is statistically significant at 95 percent level of confidence.



CFL Average Retail Price

Over the last decade, the average CFL retail price has declined steadily, in both California and the rest of the nation. Figure 4 presents historic pricing data based on point-of-sale data. Through 2001, the data include most mass merchandisers, and, through 2002, the data include the large home improvement store channel. Even though the data shown in Figure 4 do not completely represent all channels where consumers buy CFLs, they are valuable in showing price trends for a subset of retail sales channels. As shown, the retail sales price for CFLs in California in 2007 was less than \$2 per lamp, which is roughly one dollar cheaper, on average, than prices across the rest of the U.S.

Figure 4
CFL Average Retail Price – California and the Rest of the Nation, 1999-2007



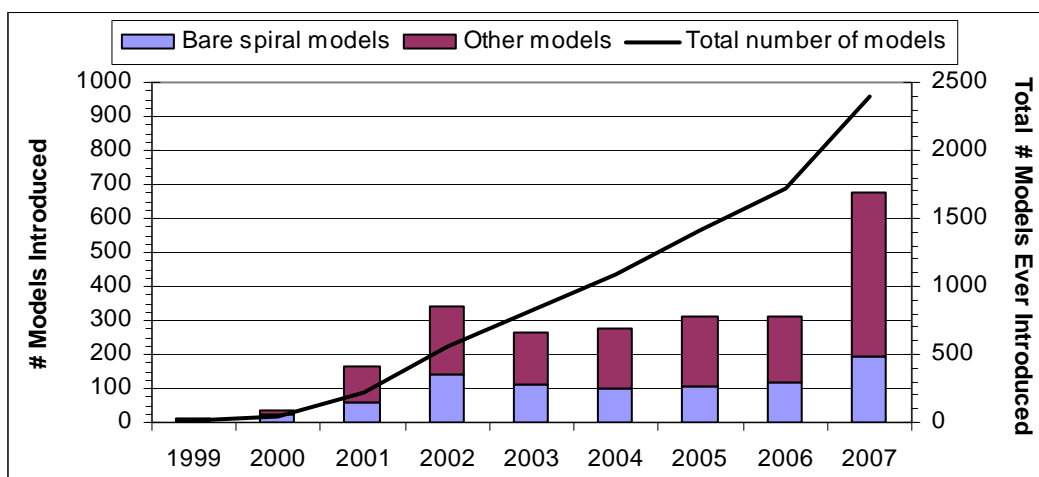
Source: Itron, 2008.
Note: Warehouse/membership clubs and discount stores are excluded during the entire study period.
A large mass merchandiser is excluded as of 2002, as is the home improvement channel as of 2003.

CFL Availability and Diversity

The ENERGY STAR website listed a total of 2,405 ENERGY STAR-qualified CFL models produced during 2007 by 117 manufacturers around the world. This represents a dramatic increase over prior years. Also during 2007, the number of specialty CFL models (i.e., non- bare spiral lamps) more than doubled over 2006 estimates. Figure 5 illustrates the number of ENERGY STAR-qualified CFL models on the U.S. market since 1999, by style.



Figure 5
Number of ENERGY STAR CFL Models by Style Category, 1999-2007



Source: U.S. EPA, 2008.

Note: Models retired from company product lines are included in this figure.

Bulb Styles

There are a wide variety of ENERGY STAR CFL models on the market. Table 3 lists the styles of qualified CFL models produced in 2006 and 2007 in order from most to least commonly produced in 2007. As shown, bare spiral and mini-spiral CFL models are the most common styles of ENERGY STAR-qualified CFLs, representing nearly two-thirds of total models produced in 2007. The number of non-spiral reflector models increased by more than 40 percent between 2006 and 2007, and the number of a-lamp and globe style CFLs each increased by more than 20 percent between the two years. The number of other model types has remained constant from 2006 to 2007.

Table 3
Number of ENERGY STAR CFL Models Produced by Style, 2006 and 2007

CFL Style	2006		2007		Change From 2006 to 2007	
	# Models Produced	% of Total Models Produced	# Models Produced	% of Total Models Produced	# Models Produced	% Change in # Models
Bare- mini-spiral	476	26%	882	37%	406	85%
Bare spiral	655	36%	671	28%	16	2%
Covered reflector	236	13%	336	14%	100	42%
Covered A-line	135	7%	165	7%	30	22%
Covered globe	114	6%	141	6%	27	24%
Other*	212	11%	210	9%	-2	-1%
Total	1,818	100%	2,405	100%	587	4%

* "Other" model types include bare triple-tube, covered bullet, bare quadruple-tube, covered candle, bare twin-tube, bare circuline, and covered post (each of which represents less than 5% of ENERGY STAR CFL models produced in 2007).

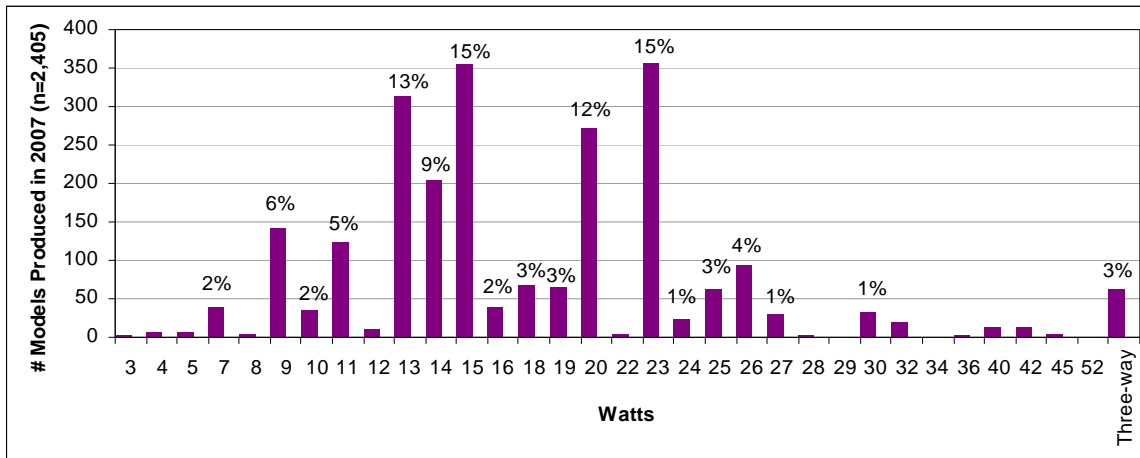
Source: U.S. EPA, 2008.



Bulb Wattage

ENERGY STAR CFL wattages range from 3 to 52 Watts. Figure 6 provides the numbers of separate CFL models manufactured within each wattage category as of the end of 2007. Seventy-one percent of the ENERGY STAR models produced in 2007 were between 13 and 23 Watts, while 15 Watt and 23 Watt CFLs each represented 15% of the total models produced. Three-way CFLs represented 3% of the ENERGY STAR CFL models produced in 2007.

Figure 6
Number of ENERGY STAR CFL Models and Percent of Total Models by Bulb Wattage, 2007



Source: U.S. EPA, 2008.

Bulb Manufacturers

Table 4 shows the 10 manufacturers that produced the largest number of CFL models in 2007. Combined, these companies produced 43 percent of the total ENERGY STAR CFL models available. Less than 14 percent of the CFL models manufactured in 2007 were produced by the three largest multi-product lighting manufacturers (Osram Sylvania, GE, and Philips). Several of the top CFL producers are active only (or primarily) in the energy-efficient lighting market.



Table 4
Top 10 ENERGY STAR CFL Manufacturers by Number of Models Produced, 2007

Company	# Models Produced in 2007	% Models Produced in 2007
1. Osram Sylvania Inc.	201	8%
2. Technical Consumer Products, Inc.	140	6%
3. Globe Electric, Inc.	126	5%
4. Feit Electric	123	5%
5. GE Consumer & Industrial	79	3%
6. The Home Depot	79	3%
7. Xiamen Topstar Lighting Co., Ltd.	78	3%
8. Greenlite Lighting Corporation	73	3%
9. Fujian Joinluck Electronic Enterprise Co., Ltd.	67	3%
10. Westinghouse Lighting Corporation	57	2%
Total	1,023	43%

Source: U.S. EPA, 2008.

CFL Sales

There is no single source of CFL sales data at the state level for California that represents all retail channels. Because the California IOUs' energy-efficiency programs have provided incentives for a great number of CFLs, these program sales can be used as an indicator of statewide sales. Sales of CFLs through the California IOU programs have increased dramatically since 1999. Table 5 shows that program CFL sales have increased approximately 930% in one decade, from 600,000 during the 1998-1999 programs to 57 million during the 2006-2007 program periods.

Table 5
California Program-Level CFL Sales Estimates

Program Year(s)	Program Sales of CFLs
1998-1999	600,000
2000	100,000
2001	8 million
2002-2003	7 million ⁹
2004-2005	20 million
2006-2007	56 million

Sources:
 1998-1999, 2000, 2001: XENERGY, Inc., 2002.
 2002-2003: XENERGY, Inc., 2003.
 2004-2005: Itron and KEMA, 2006.
 2006-2007: IOU Program Tracking Databases.

⁹ We assumed that the unit accomplishment for Program Year 2003 were equivalent to Program Year 2002, since the program was not evaluated in 2003



Conclusions

Time-series data on consumer awareness and purchase rates, consumer satisfaction, CFL price, availability, and diversity of available CFL models all suggest the CFL market has changed significantly since the 1990s. Market barriers have been reduced due to a number of forces acting on the market, including the IOUs' energy-efficiency programs as well as cultural and economic changes in California.

Both the level of consumer awareness and the percent of households that have purchased CFLs have quadrupled since 1990. Socket penetration has increased from 1 percent to 21 percent during that period, and CFL saturation levels have increased nearly seven-fold by since 2000. Consumer satisfaction has risen considerably over time, and the number of ENERGY STAR models continues to rise, especially in recent years. Since 1999, the average retail price has dropped by more than \$10 per CFL and sales have skyrocketed. All of these indicators suggest a significantly different CFL market in California today than in the past, with many of the market barriers addressed to some degree.



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