

**BIG** RESULTS



**BIGGER** POTENTIAL

**CFL Market Profile | March 2009**

U.S. Department of Energy



## TABLE OF CONTENTS

Executive Summary.....	1
Shipments and Market Share.....	2
Sales Channels.....	3
Market Competition and Variety.....	4
Media Attention.....	4
National Socket Saturation.....	5
National Household Saturation.....	6
Household Placement.....	7
Energy Savings.....	8
ENERGY STAR® Criteria.....	9
Consumer Perception.....	10
Energy Efficiency Program Sponsor Activities.....	10
CFL Promotions.....	12
Strategy for ENERGY STAR CFLs.....	13

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## EXECUTIVE SUMMARY

This document presents key market facts that ENERGY STAR partners will find helpful in developing CFL programs. A summary is presented below, with additional details contained within the body of this market profile.

**The market for CFLs\* has grown tremendously, with dramatic increases in shipments<sup>1</sup> and market share in the past three years.** CFL availability, number of varieties, and quality have continued to improve, while prices have continued to fall. With the new ENERGY STAR Criteria V4.0 that took effect December 2, 2008, and upcoming standards on lamp efficiency from the Energy Independence and Security Act of 2007 (EISA 2007), CFLs appear poised to capture even more of the lighting market.

**Despite recent market growth, CFL household saturation is still low throughout the United States, even in regions with successful and long-standing energy efficiency programs.** While the commercial and industrial sectors were early adopters of CFLs, vast potential remains in the residential sector. It contains 90 percent of CFL-appropriate sockets, but has only 11 percent CFL saturation. Thirty percent of households still own no CFLs, and 64 percent of households that own CFLs have five or fewer. Overall, there is still plenty of room for the CFL market to grow.

**CFLs remain by far the quickest, cheapest, and easiest technology that utilities can use to improve energy efficiency and generate energy savings.** Compared to other energy saving products, CFLs are inexpensive, and offer competitive energy savings and shorter payback periods, making them an easy way to achieve energy savings. Decreasing sales prices and increasing electricity rates have made CFLs more than eight times more cost effective than in 1990.

**CFLs are a significant, and often primary, source of Demand Side Management (DSM) program energy savings.** CFL programs have contributed more than 60 percent of energy savings of the most established energy efficiency program sponsors (EEPS), and 20–97 percent of savings for newer programs. Regional differences in CFL promotions are apparent, with the greatest spending in California and the Northeast. California leads the way, with \$88 million projected for 2008, accounting for over half of reported national CFL program spending.

**The success of the ENERGY STAR CFL program comes from the creativity and collaboration of ENERGY STAR manufacturer, retailer and energy efficiency program sponsor (EEPS) partners.** These entities have worked diligently to improve the quality of CFLs and consumer perception of the product. DOE will continue to work with these partners to continue to increase CFL market share and realize the remaining savings potential for CFLs.

\*This market profile is focused on the general market for medium screw-based CFLs, which DOE considers to provide a reasonable assessment of the market for ENERGY STAR qualified CFLs. The market for pin-based CFLs is not covered because comprehensive data for these types of CFLs are not readily available.

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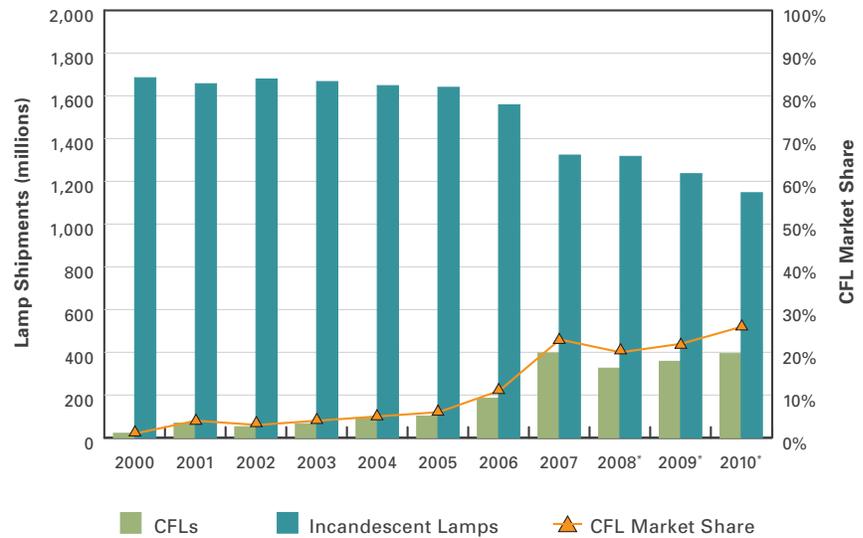
The market for CFLs has come a long way, with significant improvement in shipments, variety, and media attention in the past three years.

## SHIPMENTS AND MARKET SHARE

CFL shipments have grown tremendously in three years, from 21 million lamps in 2000 to 397 million lamps in 2007. This increase represents a compound annual growth rate of 52 percent.<sup>2</sup> CFLs have captured an increasing share of the market for medium screw-based lamps, growing from 1 percent to 23 percent between 2000 and 2007, or about 3 percentage points a year.<sup>3</sup> Despite increased interest in and demand for energy savings, current data indicates that CFL shipments fell in 2008, suggesting that additional support may be needed to help sustain the market.

The future market for incandescent lamps is also uncertain. Because each CFL effectively replaces at least five incandescent lamps over its lifetime, incandescent lamp sales have already begun to decline substantially and will continue to fall. In addition, EISA will increase efficiency standards for all lamps over the next six years. While incandescent lamps may improve in efficiency during this time, current ENERGY STAR qualified CFLs already meet the new energy efficiency standards, and the market will likely continue to shift to CFLs.

CFL and Incandescent Lamp Shipments by Year



Note: \*Projections

Source: D&R International, Ltd., 2009.

## SALES CHANNELS

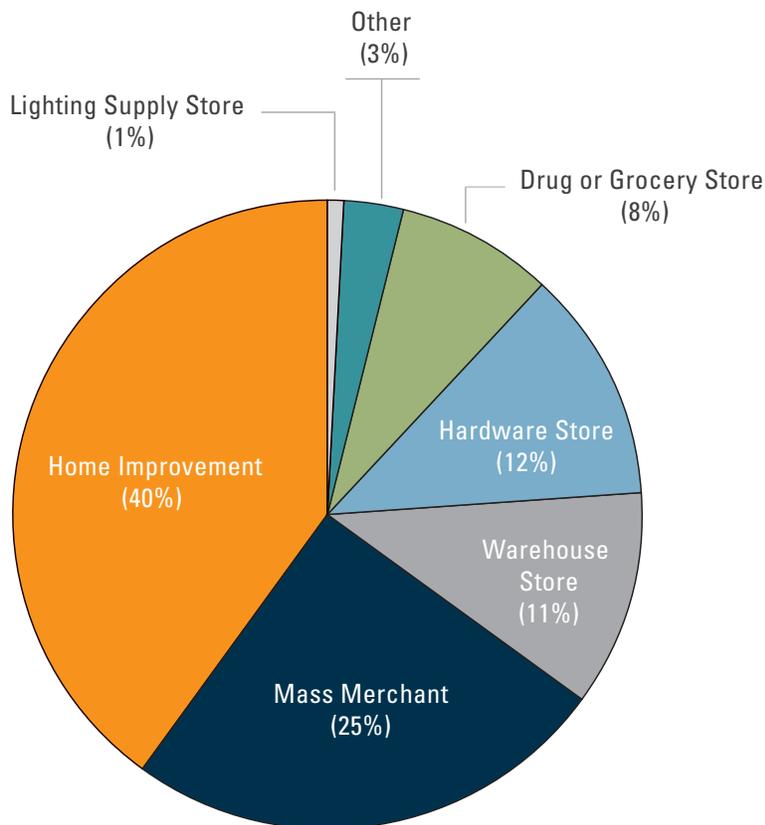
CFL sales have occurred primarily through home improvement stores, mass merchants, and warehouse stores, which accounted for three-quarters of all CFL sales in 2006. Grocery stores and drug stores, which are the traditional channels for incandescent lamp sales, sell only a small share of CFLs. The reason for the difference in distribution channels is not entirely clear, but generally, home improvement stores, mass merchants, and warehouse stores:

- Have greater available shelf space.
- Can purchase in large volumes.
- Are better able to leverage pricing with suppliers.
- Offer multi-packaging.
- Sell higher-priced goods, making CFLs relatively inexpensive compared to other stock products.

### Walmart Initiative

In 2006, as part of its sustainability strategy, Walmart announced it was committed to selling 100 million CFLs in 2007. To achieve this goal, Walmart worked with its suppliers to increase volume, while significantly lowering costs and price points. In addition, Walmart expanded shelf space and selection, and improved the clarity and effectiveness of packaging and signage. Most importantly, it made CFLs the easiest choice for consumers by placing them in the most visible, central, and accessible shelf positions. The high-profile campaign generated significant media attention and helped transform the way retailers view CFLs. Walmart far exceeded its goal, selling 162 million CFLs in 2007—41 percent of all CFL shipments. Learn more at <http://green.yahoo.com/18seconds/>

CFL Sales Channels in the Northwest 2006



Source: Northwest Energy Efficiency Alliance, "Consumer Products Market Progress Evaluation Report 3," 2007.

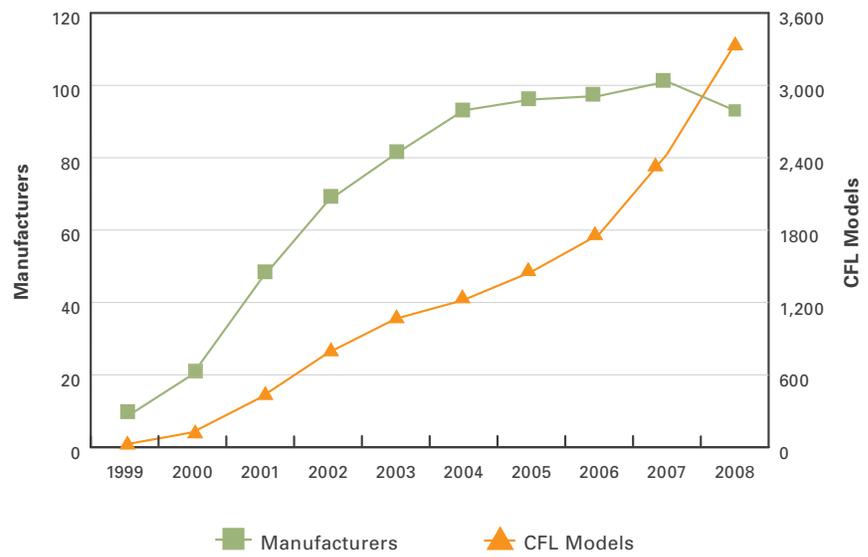
## MARKET COMPETITION AND VARIETY

The number of CFL manufacturers has increased five-fold since the ENERGY STAR CFL program began ten years ago. In 1999, five manufacturers offered 22 ENERGY STAR qualified CFL products; today, 93 manufacturers offer more than 3,340 ENERGY STAR qualified CFL products.<sup>4</sup> Due to manufacturer innovation ENERGY STAR qualified models have expanded beyond simple spirals to reflector, a-shaped, tubed, globe, outdoor, dimmable, three-way, and candelabra options.

## MEDIA ATTENTION

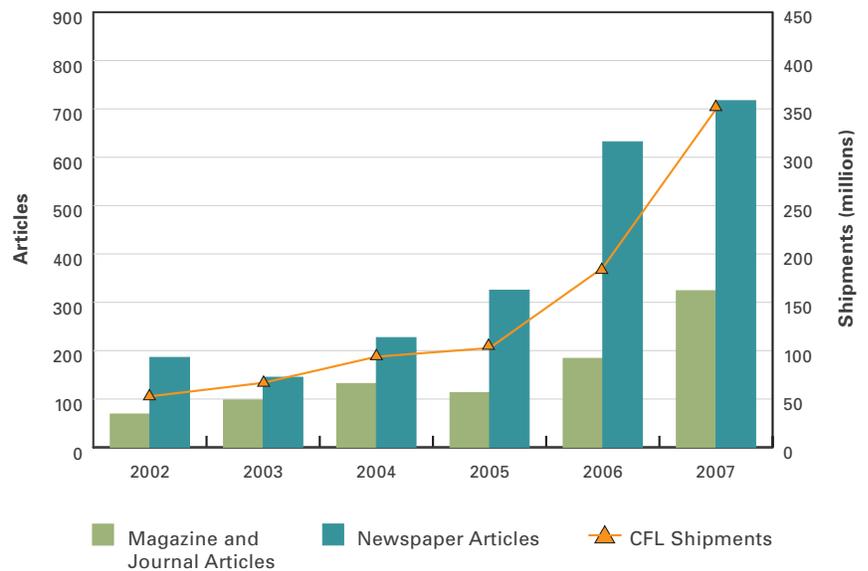
Improvements in product quality and growth in CFLs shipments have led to much greater press coverage. The number of magazine, journal and newspaper articles about CFLs has increased annually since 2002.

### CFL Manufacturers and Models by Year



Sources: D&R International, Ltd., 2009.

### Newspaper, Magazine and Journal Articles on CFLs, 2002-2007



Sources: Lexis Nexis, accessed September 9, 2008.

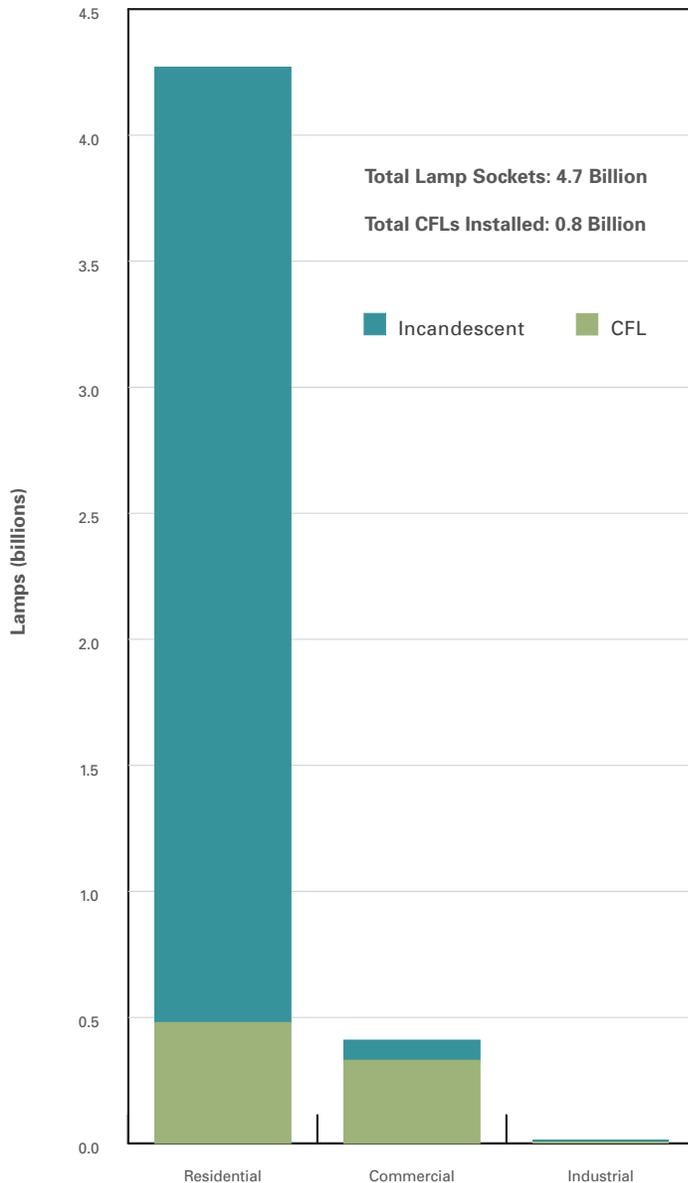
## NATIONAL SOCKET SATURATION

Current CFL socket saturation is 17 percent across all sectors, with most remaining potential in the residential sector. Commercial and industrial businesses were early adopters of CFLs and are nearly saturated. Almost all remaining potential is in the residential market, which contains 90 percent of all potential sockets, 11 percent of which contain a CFL.

### What Is Socket Saturation?

When measuring sector penetration, ENERGY STAR refers to socket saturation, which is the ratio of installed CFLs to potential sockets where a CFL could be placed. Potential sockets exclude pin-based sockets, candelabra sockets, tube fluorescent fixtures, and appliance sockets (stove, refrigerator, etc).

### CFL and Incandescent Lamps by Sector, 2008



Note: Installed medium screw-based lamps only.

Sources: D&R International, Ltd., 2009.

**Despite dramatic growth in the CFL market, plenty of potential remains, especially in the residential sector.**

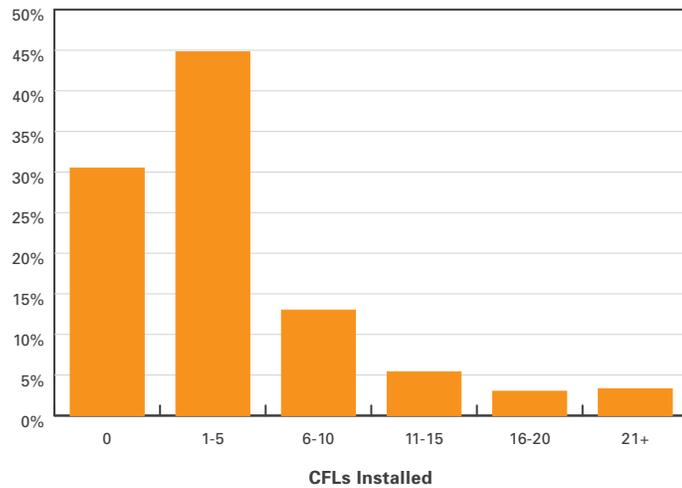
## NATIONAL HOUSEHOLD SATURATION

Despite growing sales volumes, CFL socket saturation in the residential sector remains low. As noted above, CFLs are currently installed in only about 11 percent of available sockets in homes, or 4.39 CFLs per household. In addition, 30 percent of households have not installed any CFLs, and two-thirds of those households with CFLs have installed five or fewer.<sup>5</sup>

CFL socket saturation is higher in states and regions that have invested most heavily in CFL promotions. These include California, the Pacific Northwest, Wisconsin, and New England.

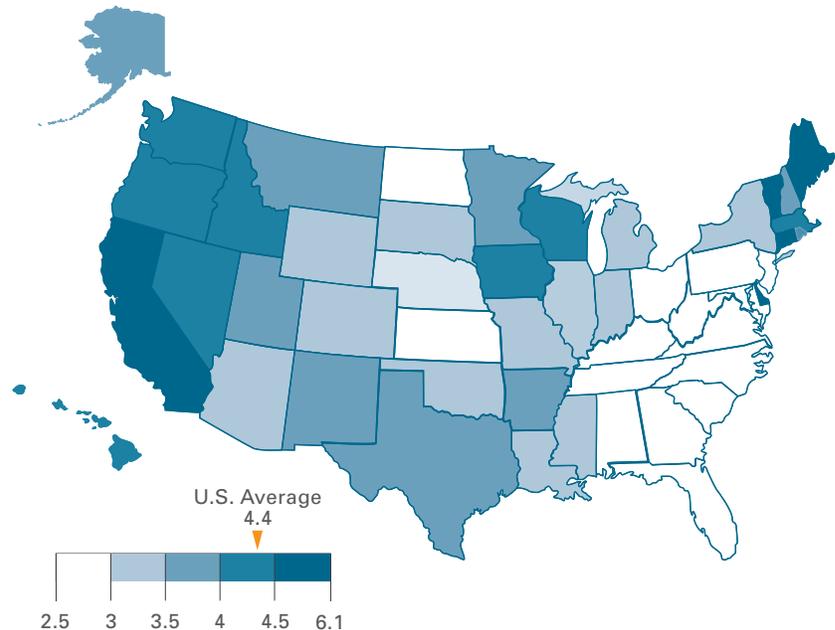
**Seventy-five percent of U.S. homes still have five or fewer CFLs installed.**

## Estimated National Distribution of Household CFL Ownership, 2008



Sources: D&R International, Ltd., 2009. Estimate based on initial baseline distribution from on-site audit data provided by RLW Analytics and gathered for the California Lighting and Appliance Saturation Study 2005, and on historic CFL import data from the U.S. Department of Commerce.

## CFL Residential Saturation by State



Source: Michael Reid, E Source, "Who's Buying CFLs? Who's Not Buying Them? Findings from a Large-Scale, Nationwide Survey," 2008 ACEEE Summer Study on Energy Efficiency in Buildings. Results based on self-reported survey data.

## HOUSEHOLD PLACEMENT

CFLs are most often installed in bedrooms, bathrooms, living rooms, kitchens and porches. The simplest explanation for this is that consumers are likely installing CFLs as incandescent lamps burn out, although messages from program sponsors, manufacturers, retailers, and ENERGY STAR to install CFLs in the most frequently used fixtures may also be influencing placement.

### Estimated CFL Household Saturation by Room

Room	California Audit Data 2005		DOE National Estimate 2008	
	Distribution of CFL Installations (%)*	Number of Potential Medium Screw Based Sockets	Number of CFLs Installed	CFL Saturation Rate (%)*
Bedroom	24	2.92	1.04	36
Bathroom	19	4.45	0.84	19
Kitchen	11	3.16	0.50	16
Living Room	13	4.61	0.57	12
Porch	5	1.69	0.20	12
Hall	8	4.34	0.36	8
Garage	3	1.79	0.12	7
Laundry Room	2	1.09	0.07	6
Family Room	6	4.58	0.24	5
Office	4	3.16	0.15	5
Closet	2	1.95	0.07	4
Dining Room	4	5.39	0.19	4
Other	1	4.20	0.04	1
<b>Whole House</b>	<b>100</b>	<b>37.50</b>	<b>4.39</b>	<b>12</b>

Source: Distribution and sockets: California Lighting and Appliance Saturation Study 2005. CFLs installed and Saturation: D&R International, Ltd., 2009.

\*Sum of distribution values exceeds 100% due to rounding.

### Where Should CFLs Be Used to Achieve the Greatest Energy Savings?

Room	Hours of Use Per Day
Kitchen	3.0
Dining Room	2.5
Living Room	2.5
Porch	2.1
Bathroom	1.8
Office/Family Room	1.8
Garage	1.5
Hall	1.5
Bedroom	1.1
<b>Weighted Average</b>	<b>1.9</b>

Source: U.S. Department of Energy, *U.S. Lighting Market Characterization, Volume I: National Lighting Inventory and Energy Consumption Estimate, 2002.*

## ENERGY SAVINGS

### CFLs Deliver Large Savings for a Small Price, and are an Attractive First Step for Consumers

**Considering Energy-Efficiency Measures.** With increasing energy prices, CFLs deliver impressive savings in both energy and dollars. Each CFL installed saves an average of 51 kilowatt hours, \$5.41, and 78 pounds of CO<sub>2</sub> emissions per year.<sup>6</sup> Compared to other energy efficiency improvements, CFLs require substantially less investment, have no installation costs, and pay for themselves much more quickly.

### CFLs Deliver Huge National Savings.

In 2007, 397 million CFLs were shipped to the United States. Once installed, these lamps will save 20 billion kilowatt hours, \$2 billion in energy costs, and 14 million metric tons of CO<sub>2</sub> a year nationally, compared to using incandescent lamps. Over their lifespan, these CFLs will save the U.S. 111 billion kilowatt hours, \$11 billion in energy costs, and 80 million metric tons of CO<sub>w</sub> emissions.

CFLs Represent a Potent Option for Addressing Climate Change. A recent independent study by McKinsey and Company on reducing greenhouse gas (GHG) emissions calculated that installing of efficient lighting products (with emphasis on CFLs) was one of the GHG reduction measures with the greatest potential, and the third most cost-effective of all measures. The study also estimated that adoption of CFLs and LEDs could deliver 8 percent of all potential GHG reductions.<sup>7</sup>

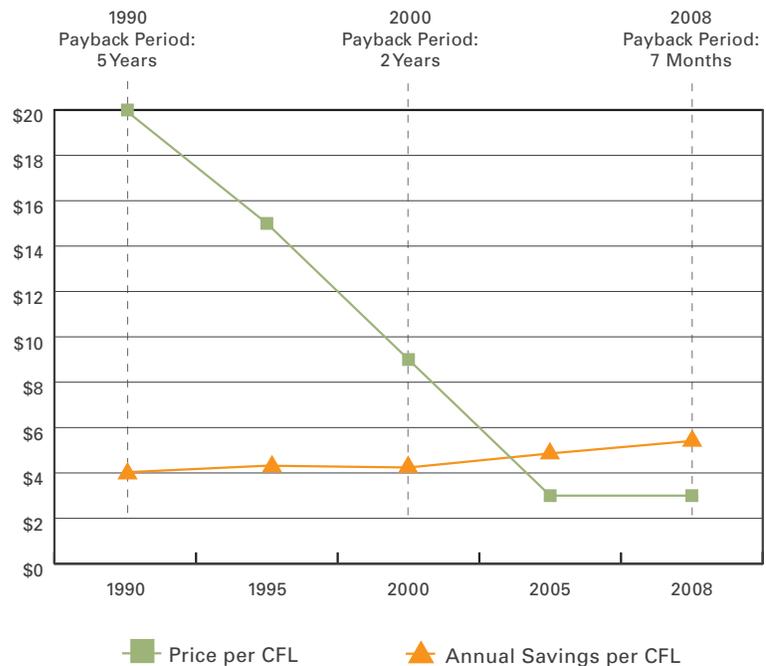
## Energy Cost Savings and Return-On-Investment for ENERGY STAR Products

Product	Price Premium for ENERGY STAR Qualified Unit (\$)*	Annual Energy Cost Savings (\$)	Payback Period (Years)	Lifetime (Years)	Return on Investment (%)
CFL	2.50	5.41	0.5	7	1,400
Clothes Washer	210.00	51.03	4.1	11	268
Dishwasher	12.00	8.63	1.4	10	714
Refrigerator	30.00	8.10	3.7	12	324
Room Air Conditioner	50.00	7.26	6.9	9	130

\*Note: The price premium for one CFL is compared to the price of one incandescent lamp.

Source: D&R International, Ltd., 2009. Based on ENERGY STAR Product Database, 2008; 2007 Energy Pricing from Energy Information Administration, "Current and historical monthly retail sales, revenues, and average retail price by state and by sector (Form EIA-826)."

## Trend in CFL Prices and Annual Energy Cost Savings



Sources: Price per CFL from: Bradley Steele, Energy Federation Incorporated, "Lighting Measures—Delivering on Predicted Savings and Benefits," 2007 ACEEE Symposium on Market Transformation.

Annual Savings based on 3 hours of use daily, replacing one 60W incandescent lamp with a 13W CFL, and electricity prices from Energy Information Administration, Annual Energy Review, 2007, Table 8.10, and Energy Information Administration, "Short Term Energy Outlook," January 2009, Table 2.

## ENERGY STAR CRITERIA

The primary objective of the ENERGY STAR CFL Program has been to increase market penetration. To this, the program had to overcome many of the early market challenges faced by CFLs, specifically issues of performance and quality that led to consumer dissatisfaction and low adoption rates. Therefore, unlike other ENERGY STAR criteria, the criteria for CFLs have focused heavily on addressing quality and performance in addition to energy efficiency. As a result, consumers can now purchase an ENERGY STAR qualified CFL with confidence that it will perform well.

### Chronology of ENERGY STAR Criteria for CFLs

#### Version 1.0 (1999)

- Set baseline performance requirements for CFLs, including minimum efficacy (efficiency) requirements, minimum lifetime requirements, and color and light quality requirements.
- Set minimum warranty of one year.

#### Version 2.0 (2001)

- Revised lumen depreciation requirements to assure products did not dim too quickly.
- Added interim life- and rapid-cycle testing requirements to assure products would not fail too early.
- Added packaging guidelines to assure no false claims for equivalency.

#### Version 3.0 (2003)

- Changed warranty requirements to two years for residential applications.
- Added packaging guidelines for lifetime claims.

#### Version 4.0 (2008)

- Revised efficacy levels, lumen depreciation, and color requirements to push for more consistency among products.
- Added high-heat testing for reflector products to account for the increasing prevalence of recessed downlights.
- Expanded program to include candelabra-base products.
- Limited mercury content and added mercury disclosure labeling requirement.
- Formalized independent quality assurance testing program.

### Potential Impacts of EISA

The Energy Independence and Security Act of 2007 (EISA) may significantly affect the future market for lamps. EISA does not ban incandescent lamps outright; specialty lamps, such as three-way and reflector lamps, are exempt from upcoming standards. However, most current incandescent lamp technology will not meet the efficiency requirements, which begin to phase in on January 1, 2012. Manufacturers have indicated that new incandescent lamps will be ready when the standards take effect, but it is unknown how the costs for new incandescent lamps will compare to CFLs. If prices for incandescent lamps remain sufficiently low, there may be a continued need for CFL promotions. If prices for incandescent lamps become level with CFL prices, no further CFL promotions may be needed.

## Consumer Satisfaction with CFLs in the Northwest, 2006

Rated Characteristic	Average Rating (on a scale of 1–5, 5 = Very Satisfied)
Overall*	4.0
Appearance	4.0
Brightness	4.0
Color	4.0
Lifetime	4.5

\*Originally rated on a scale of 1–10, adjusted to 1–5.

Source: Northwest Energy Efficiency Alliance, "ENERGY STAR Consumer Products Market Progress Evaluation Report 3", July 2007.

## CONSUMER PERCEPTION

For energy efficiency program sponsors, the ENERGY STAR label is as important for conveying product quality and building consumer confidence in CFLs as it is for conveying energy efficiency. By choosing ENERGY STAR qualified CFLs, consumers are assured a CFL will have fewer defects, fewer premature failures, extended life, and improved light quality.

Surveys from the Northwest show that consumer satisfaction with CFLs is growing, with average ratings for most lighting characteristics at around 4 on a scale of 1–5. A national survey conducted by ESource in 2007 indicates that more than three-quarters of consumers, regardless of age or gender, now perceive CFL light quality as equivalent to or better than that of incandescent lamps.

### Perception of CFL Light Quality, Compared to Incandescent Lamp Light Quality

Perceived CFL Light Quality Versus Incandescent Light Quality	Percentage of Respondents (%)				
	Age 18–34	Age 35–54	Age 55+	Men	Women
<b>Same or Better</b>	<b>82</b>	<b>79</b>	<b>76</b>	<b>79</b>	<b>82</b>
Better	38	31	27	31	38
Same	44	48	49	48	44
Worse	13	17	21	17	13
Unsure	5	4	3	4	5

Source: Michael Reid, E Source, "Who's Buying CFLs? Who's Not Buying Them? Findings from a Large-Scale, Nationwide Survey," 2008 ACEEE Summer Study on Energy Efficiency in Buildings (Analysis based on survey of 34,750 U.S. households).

## ENERGY EFFICIENCY PROGRAM SPONSOR ACTIVITIES

The success of the CFL market owes much to the sustained work of Energy Efficiency Program Sponsors (EEPS). Despite the tremendous potential for energy savings, CFLs might well have languished as niche specialty products, held back by a high price point and lack of consumer familiarity, if not for the investment and assistance of EEPS. These utilities, state agencies, and advocacy and non-profit have worked to promote CFLs as a cornerstone of energy efficiency. In many cases, CFL promotions by EEPS drove the market, allowing manufacturers and retailers to build consumer demand.

Rising concerns about energy supplies have led utilities to place more importance on energy efficiency as a resource, on par with coal, natural gas, or hydropower. With supply shocks, rising fuel costs, and difficulties in constructing new generation facilities, many utilities have begun aggressively pursuing demand side management as a quick, cost-effective alternative to increasing generation. Due to their relatively low purchase cost and high energy savings, CFL programs are a major component of most EEPS' efficiency programs.

## Contribution of CFLs to Measured DSM Program Savings

EEPS	% of Total DSM Savings from CFL Programs
Baltimore Gas and Electric	97
NYSERDA	84
Wisconsin Focus on Energy	64
Pacific Gas and Electric	62
Gainesville Regional Utilities	28
Duke Energy	20

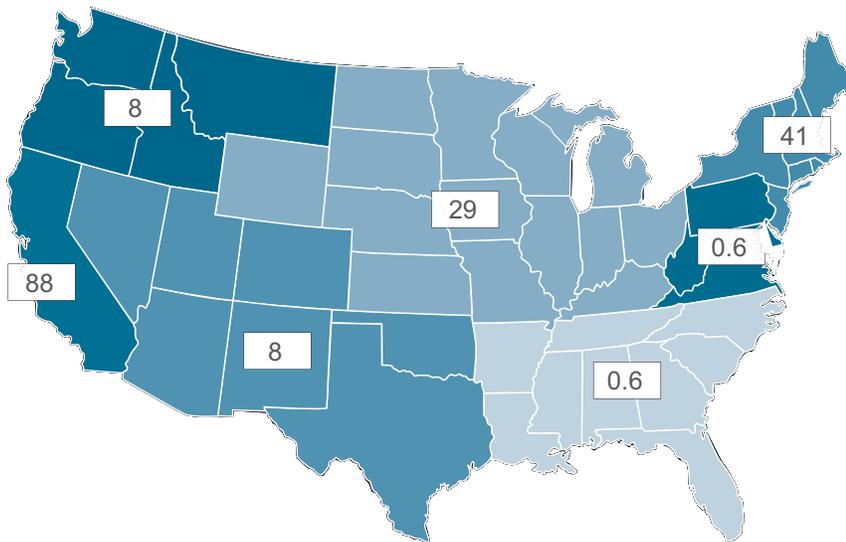
Source: D&R International, Ltd., 2008.

Nationwide, the number of CFL programs is increasing, as is the spending for them. California alone accounts for half of all disclosed national spending on CFL programs, with the remaining spending concentrated in the Northeast and the Midwest.

## CFL Program Spending

National Spending 2006-2008	2006	2007	2008
Total CFL Program Spending (\$ million)	50	120	175
Total CFL Programs	24	67	71

### Regional Spending 2008 (\$ million)



Note: Only reported spending is listed. Hawaii and Alaska did not report.

Source: D&R International, Ltd., 2009.

**ENERGY STAR**  
**Operation Change Out —**  
**The Military Challenge**

A joint effort of the U.S. Department of Energy (DOE) and the U.S. Department of Defense (DOD), is the first national energy efficiency campaign to encourage servicemen and–women to save energy and money by replacing their incandescent lamps with ENERGY STAR qualified CFLs. In 2008, more than 395,000 incandescent lamps have been replaced with ENERGY STAR qualified CFLs on 96 bases, saving 111 million kWh and \$12 million in energy costs over the lifetime of the lamps. Learn more at: [www.energystar.gov/OCO](http://www.energystar.gov/OCO)

## CFL PROMOTIONS

EEPS typically collaborate with manufacturers and retailers to promote CFLs to their customers. Many promotion programs are designed to offset some or all of the price premium for CFLs, allowing them to gain a foothold in the market. The four most common promotion programs are described in Table 5.

Common CFL Promotions	
Incentive Method	Description
Customer Coupons (mail-in or instant)	<p><b>How it Works:</b> Program sponsors provide coupons for customers to redeem when purchasing CFLs. The coupons may be instant (collected and redeemed by the retailer) or, less frequently, mail-in (collected by sponsor with rebates mailed back to the redeemer).</p> <p><b>Advantages:</b> Ensures purchasers are customers of the sponsoring utility. Offers EEPS an easy means for promoting the program. Ensures equal and fixed access for customers. Greater accuracy in tracking sales.</p> <p><b>Disadvantages:</b> High administrative costs from collecting and processing coupons and mailing individual payments.</p>
Manufacturer Buy-Down	<p><b>How it Works:</b> Program sponsors pay CFL manufacturers to reduce the wholesale product price. The price discount is subsequently passed on to consumers as a lower retail price.</p> <p><b>Advantages:</b> Very little administrative burden. Discounted CFLs can be distributed to multiple retailers, giving consumers multiple purchase location options.</p> <p><b>Disadvantages:</b> Difficult to track specific sales. Free-ridership by non-customers can occur in areas with overlapping utilities. Hard to ensure equal access among all customers. Can create a distorted perception of CFL prices.</p>
Retailer Mark-Down	<p><b>How it Works:</b> Program sponsors pay retailers to reduce retail price product. These programs are similar to Manufacturer Buy-Down programs, the difference being that the subsidized payment from the sponsor happens directly at the retail level.</p> <p><b>Advantages:</b> Very low administrative burden on the sponsor and retailer. Easier to track sales data.</p> <p><b>Disadvantages:</b> Similar disadvantages as those for Manufacturer Buy-Down programs. Program limited to participating retailers, to which customers may not have access. Some national retail chains may not allow individual stores to offer in-store signage.</p>
Direct Install	<p><b>How it Works:</b> Program sponsor uses field staff to install CFLs in homes, usually low-income homes, or other targeted populations.</p> <p><b>Advantages:</b> Guarantees installation and savings. More easily targeted to sponsor's preferences. Easy to track participation.</p> <p><b>Disadvantages:</b> Labor required for installations can be expensive. May mask the value of the CFLs because consumers did not purchase the lamps.</p>
Social Marketing Distribution	<p><b>How it Works:</b> Program sponsor works with a volunteer network to distribute lamps to consumer homes. (e.g. One Change–Project Porchlight)</p> <p><b>Advantages:</b> High levels of installation. Low implementation costs. Motivates consumers to take additional energy efficiency actions.</p> <p><b>Disadvantages:</b> Typically requires a partner experienced in community-based social marketing to set up and coordinate volunteer activities. Requires a large pool of volunteers to achieve high levels of distribution.</p>

## STRATEGY FOR ENERGY STAR CFLS

DOE will continue to support the ENERGY STAR program for CFLs to capture the enormous remaining potential for CFLs in homes. To this end, DOE will work with ENERGY STAR partners to:

- Increase ENERGY STAR qualified CFL market share to 30 percent by providing partners with useful marketing materials and tools for CFL promotion, with specific attention to specialty lamps.
- Strengthen consumer commitment to replacing incandescent lamps with CFLs by increasing consumer education efforts.
- Help partners use CFL promotions as a springboard to, or a foundation for, energy efficiency initiatives.
- Ensure a successful transition to version 4.0 of the ENERGY STAR CFL criteria.
- Launch the Third-Party Testing Program, and assist partners in adopting new test procedures, especially heat testing of reflector lamps.
- Streamline the qualification process to minimize delays, decrease administrative burdens, and strengthen partner relationships.

### Endnotes

- <sup>1</sup> As comprehensive sales data for CFLs is not available, DOE uses import shipment data from the U.S. Department of Commerce for CFLs as an approximate substitute.
- <sup>2</sup> U.S. Department of Commerce.
- <sup>3</sup> D&R International, Ltd., 2009.
- <sup>4</sup> D&R International, Ltd., 2009.
- <sup>5</sup> D&R International, Ltd., 2009. National estimate model based on initial baseline distribution from on-site audit data provided by RLW Analytics and gathered for the *California Lighting and Appliance Saturation Study 2005*, and historic CFL import data from the U.S. Department of Commerce. Studies conducted in California in 2005 and in the Seattle/Puget Sound in 2007 found that 43 percent of all homes in California and 29 percent of all homes in Washington still had not installed CFLs. (RLW Analytics, *California Lighting and Appliance Saturation Study 2005*; EMI, *Puget Sound Area Residential Compact Fluorescent Lighting Market Saturation Study*, November 20, 2007.)
- <sup>6</sup> Estimate based on average daily use of 3 hours, electricity price of \$0.106/kWh, and 1.54 pounds of carbon dioxide emissions per kWh. Electricity price from Energy Information Administration, "Current and Historical Monthly Retail Sales, Revenues, and Average Retail Price by State and by Sector (Form EIA-826)"; Carbon emissions from U.S. Environmental Protection Agency, *Climate Change Action Plan 2008*.
- <sup>7</sup> McKinsey & Company, "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?" December 2007. Percentages are based on a mid-range case.



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