

ELEC 6
STERNER

**Low Income Baseload Programs:
Design & Implementation**

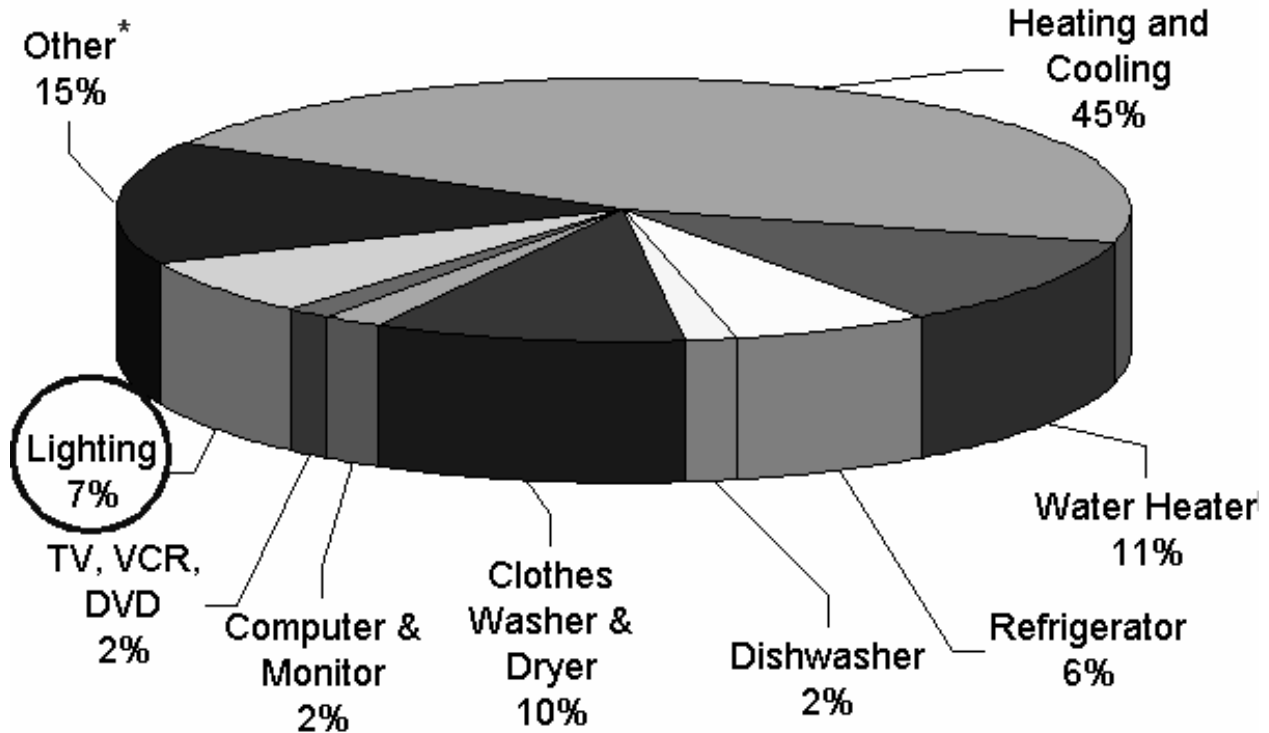
Lighting

ELEC 6
Thursday, May 25, 2006
3:30 pm – 5:10 pm

A. Tamasin Sterner
Pure Energy

Energy Use Breakdown

What does my energy bill pay for?



* "Other" represents an array of household products, including stoves, ovens, microwaves, and small appliances. Individually, these products account for no more than about 2% of a household's energy bills.

Source: http://www.energystar.gov/index.cfm?c=products.pr_pie&layout=print

Since about 7% of the total residential energy use is for lighting, or easily 15% of the average electric bill, lighting replacement is an important energy savings opportunity. The savings primarily comes from replacing incandescent light bulbs with compact fluorescent light bulbs. Fixtures can also be replaced with ENERGY STAR fluorescent fixtures, such as replacing halogen torchiere lamps with fluorescent torchiere lamps.

Compact fluorescent light bulbs typically use 1/4 to 1/3 the energy of an incandescent light bulb for the same amount of light. They last 6 to 10 times longer than incandescent bulbs.

Incandescent Bulb (Watts)	Typical Lumens (Measure of Light Output) and Typical Wattage of CFL
40	> 450 5-8 watts
60	> 800 14-15 watts
75	> 1,100 18-20 watts
100	> 1,600 20-27 watts
150	> 2,600 27 or more

Savings Achieved by Switching from Incandescent to Compact Fluorescent Light Bulbs (Replacing 75-watt Incandescent with 20-watt Integral CFL)					
Hours / Day Lights On	Savings after 1st year	Savings after 2nd year	Savings after 3rd year	Savings after 5th year	Savings after 10th year
2	(\$0.24)	\$4.53	\$9.30	\$18.83	\$42.65
4	\$4.53	\$14.06	\$23.59	\$42.65	\$84.55
8	\$14.06	\$33.12	\$52.18	\$84.55	\$174.85
12	\$23.59	\$52.18	\$75.77	\$127.20	\$259.40
Assumptions:					
		75-watt incandescent		20-watt compact fluorescent	
Lamp output (lumens)		1,200		1,200	
Lamp life (hours)		750		10,000	
Lamp cost		\$0.75		\$5.00	
Electricity cost per kWh:		\$0.10			
<i>Numbers in parentheses are negative.</i>					

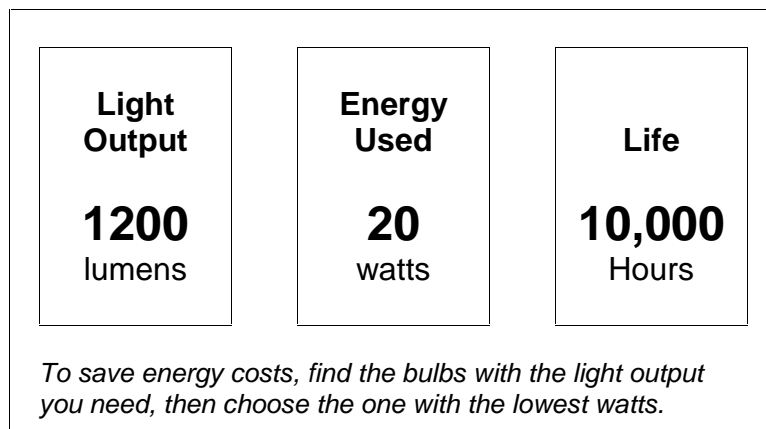
Adapted from: Alex Wilson, Jennifer Thorne, and John Morrill. 2003. "Consumer Guide to Home Energy Savings." 8th Ed. American Council for an Energy Efficient Economy. Washington, D.C.

Other Benefits

Incandescent bulbs are small heating units. 90% of the energy used by an incandescent bulb goes to create heat. A 60 watt incandescent bulb easily heats to 230 degrees. In the summer, this added heat increases the air conditioning load. Halogen light bulbs have been known to heat to 700 degrees. These bulbs can cause fires if they are close to combustible materials like curtains. Compact fluorescent bulbs are much cooler. A 15 watt CFL with the same lumens as a 60 watt incandescent only heats to about 70 degrees. In the summer, this cooler lighting helps reduce the air conditioning load.

Tips for Choosing the Best CFL

1. Pick a CFL that has the highest lumens for the lowest wattage. All light bulb manufacturers product labels include this important information:
 - The bulb's rated lumens
 - The bulb's watts
 - The bulb's lifetime in hours





2. Install CFL's in fixtures that are used, **on the average**, 1 or more hour per 24 hour period. If a light is used one half hour a day in the summer but 3 hours a day in the winter, it should be considered for replacement.
3. Choose ENERGY STAR approved bulbs with the highest lifetime hours as possible. For example, there are 8,760 hours in a year. If a 6,000 hour bulb is installed in a fixture that is used 24 hours a day, the bulb will burn out before one year has passed. An 8,000 hour bulb will last almost the entire year and a 10,000 bulb will last longer than the year.
4. Be sure to check the packaging and specification sheets to ensure that the CFL you want to buy will work in your fixture. CFL's are available for every application (except dimmable candle based bulbs), including:
 - Mini's or sub-compact bulbs that are the same length as an incandescent
 - 3-ways
 - Outdoors, including floods, bug lights and porch lights
 - Dimmables
 - Spot and reflector replacements, including light reflectors
 - Built-in photocells
 - Candle shape with regular size bases and mini bases
 - Replacements for 25, 40, 60, 75 and 100 watt incandescent bulbs
 - Halogen torchiere replacements
5. Some CFL's are wider or taller than the incandescent bulb it is replacing. These products help fit the CFL's to the lamp or fixture:
 - Tall lamp harps
 - Socket extenders
 - Harp base extenders

6. When reading a maximum wattage label in a lighting fixture, wattage means wattage, not lumens. For example, if the fixture label says “60 watt max.”, you can install a light bulb that uses 60 watts or less. This means, you can install a CFL that uses up to 60 watts. This would be a very bright bulb, but you could install a bulb with that wattage. It does not mean that you have to install a 15 watt CFL. You could install a 20 watt CFL with higher lumens than the incandescent you are replacing if that would suit the customer better. Don’t get lumens and wattage mixed up.
7. Be sure to read the CFL boxes to check that the CFL will work properly in the fixture. For example:
 - Install dimmable CFL’s in fixtures controlled by dimmer switches. The fixture and the switch can be damaged if the CFL is not a dimmable CFL.
 - Not all CFL’s work in fixtures that are controlled by photocells or motion detectors.
 - Some CFL’s are made for outdoor applications.
 - Some CFL’s can’t be used in enclosed fixtures.
8. CFL’s are available in a range of color temperatures. Warm, white light comes from a color temperature of 2,700 – 3,000 Kelvin. Cooler, white light comes from a color temperature of 4,500-6,000 Kelvin.
9. Common reasons for customer dissatisfaction with CFL’s and possible solutions are:
 - The light is not bright enough (higher lumens could be installed).
 - The light bulb sticks out from the fixture (a smaller CFL with the same lumens could be installed).
 - The bulb takes too long to get bright (many newer CFL models are very quick to warm up).
 - The bulb looks weird (CFL’s are now available to look like most incandescents, including candle shaped, round globes for bathroom mirror lights, flood and reflector types).

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Find ENERGY STAR Qualified CFLs: Advanced Search

Find ENERGY STAR qualified CFLs by searching by model number or using the other parameters below.

Model Number:

All similar model numbers will be found - enter only the first few digits for best results.

OTHER PARAMETERS

Manufacturer Name:

Brand:

Model Type:

Retail Product Number(s):


Wattage: watts


Bulb Life: hours

Features/Uses:

<input type="checkbox"/> 3-Way CFL	<input type="checkbox"/> Ceiling-Mounted Fixture Use
<input type="checkbox"/> Dimmable CFL	<input type="checkbox"/> Recessed Can Fixture Use
<input type="checkbox"/> Bug Light CFL	<input type="checkbox"/> Ceiling Fan Use
<input type="checkbox"/> Table Lamp Use	<input type="checkbox"/> Decorative/Vanity Fixture Use
<input type="checkbox"/> Torchiere Use	<input type="checkbox"/> Outdoor Flood Light Use
<input type="checkbox"/> Sconce Use	<input type="checkbox"/> Outdoor Enclosed Fixture Use (post lamp, porch fixture)
<input type="checkbox"/> Hanging Pendant Fixture Use	

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Source: http://www.energystar.gov/index.cfm?fuseaction=CFLS.advanced_cfl_search

Earth Light® Dimmable Compact Fluorescent Lamps

Electrical, Technical and Ordering Data (Subject to change without notice)

Product Number	Description	Nominal Volts	Nominal Watts	Base	Color Temp. (Kelvin)	Color Rendering Index (CRI)	Approx. Initial Lumens	Maximum Overall Length	Rated Avg. Life (Hours) ⁽¹⁾	Lamp Current (mAmps)	Power Factor	Min. Starting Temp. ⁽²⁾	Max. Ambient Temp.	Lumen Maintenance ⁽³⁾	Approx. Incand. Equip.
Dimmable — Boxed															
27115-5	Dimmable SLS/D 23	120	23	Med. (E26)	2700	82	1500	6.6 in./167 mm	10,000	265	.5 to .7	32°F/0°C	140°F/60°C	85%	90W
Dimmable — Blister Carded															
27157-7	Dimmable BC-SLS/D 23	120	23	Med. (E26)	2700	82	1500	6.6 in./167 mm	10,000	265	.5 to .7	32°F/0°C	140°F/60°C	85%	90W

Shipping Data

Product Number	SKU UPC (0 46677)	Outer Bar Code (5 00 46677)	Case Qty.	Case Weight (lbs.)	Case Cube (cu. ft.)	Pallet Qty.	SKU's Per Layer	Layers High	SKU Dimensions (W x D x H)	Case Dimensions (W x D x H)	Pallet Dimensions (W x D x H)
27115-5	27115-2	27115-7	6	2	.15	1800	300	6	2.19 x 2.19 x 6.81	7.06 x 4.81 x 7.69	35.31 x 48.13 x 46.13
27157-7	27157-2	27157-7	6	2	.63	450	90	5	5.88 x 9.00 x 2.14	15.75 x 7.19 x 9.56	35.95 x 47.25 x 47.80

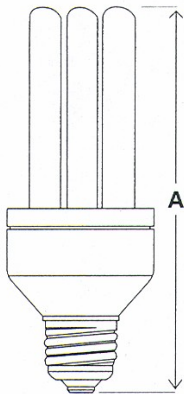
⁽¹⁾ Lamps operated in extreme environments will have reduced life (i.e. recessed or enclosed lighting fixtures with elevated line voltage). 7000 hour estimated average rated life in recessed downlight.
⁽²⁾ Suitable for indoor or outdoor use down to 32°F. UL listed for damp locations. Outdoor use requires an enclosed fixture.
⁽³⁾ Percentage of initial lumens at 40% of rated average life (4000 hours).

CAUTION: Risk of Electric Shock — Do Not Use Where Directly Exposed To Water.

This product complies with Part 18 of the FCC rules. These products may cause interference with radios, cordless telephones, and remote control devices. Interference may cease after a brief 90 second lamp warm-up period. If interference continues, relocate the lamp away from the device or plug into a different outlet.

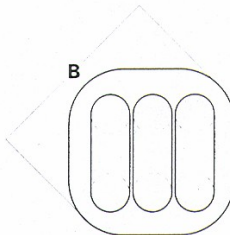
THIS PRODUCT IS DESIGNED FOR USE WITH DIMMERS, PHOTOCELLS, AND SWITCHING DEVICES MARKED "INCANDESCENT ONLY."

Lamp Dimensions

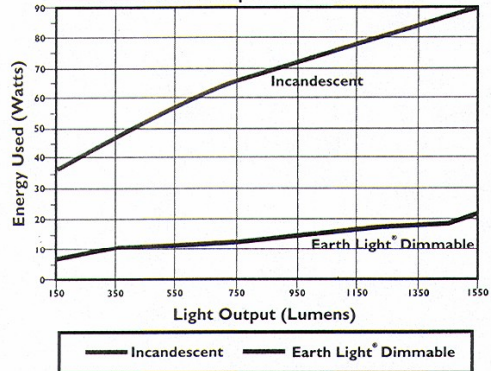


SLS/D 23

Dimensions		SLS/D 23
Max. Overall Length	A	6.6 in. / 167 mm
Max. Diameter	B	2.3 in. / 60 mm
Weight		4.5 oz / 130 g
Lamp Harp Fit		9 inch



Earth Light Dimmable uses about 70% less electricity than Incandescent Lamps at all dim levels



Gen IV™ Collection

Our most advanced electronic CFLs to-date, Gen IV lamps fit a variety of 120-volt lighting fixtures. All Gen IV lamps consume 75% less energy than comparable incandescent bulbs and feature a 10,000-hour rated life span. They are also ENERGY STAR® qualified, which means they offer superior lumen maintenance compared to many other CFLs.

- Low-profile pocket size
- Lights instantly, no flicker
- Approved for damp locations
- Medium screw-in base—E26/24 ANSI
- 84-88 CRI
- 2800K warm color, 5000K cool color
- Start temperature as low as -22°F
- Approved for totally enclosed fixtures (select models)



Suggested Applications:

Table Lamps, Floor Lamps, Wall Sconces, Outdoor Fixtures (waterproof), Surface Mounted Ceiling Fixtures, Recessed Ceiling Fixtures, Swag Ceiling Fixtures, Task Lighting, Post Mounts (waterproof), Store Merchandising Displays, Totally Enclosed Fixtures (select models only)

Suggested Harp Sizes:

7": EFA14, EFD14
8": EFA19, EFD19, EFD23
9": EFA23



FACT SHEET: Mercury in Compact Fluorescent Lamps (CFLs)

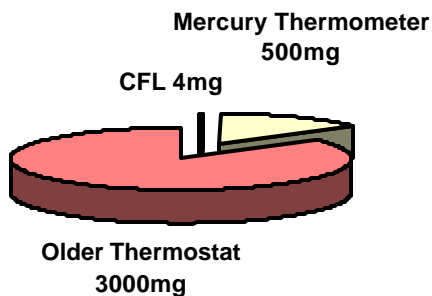
The US Environmental Protection Agency has prepared this fact sheet to respond to questions/concerns about mercury in energy-efficient lighting that uses compact fluorescent technology.

What are the Health Risks of Mercury and How do CFLs Fit In?

Mercury is an essential ingredient for most energy-efficient lamps. The amount of mercury in a CFL's glass tubing is small, about 4mg. However, every product containing mercury should be handled with care. Exposure to mercury, a toxic metal, can affect our brain, spinal cord, kidneys and liver, causing symptoms such as trembling hands, memory loss, and difficulty moving.

As energy-efficient lighting becomes more popular, it is important that we dispose of the products safely and responsibly. Mercury is released into our environment when products with mercury are broken, disposed of improperly, or incinerated. If you break a CFL, clean it up safely. And always dispose of it properly to keep CFLs working for the environment.

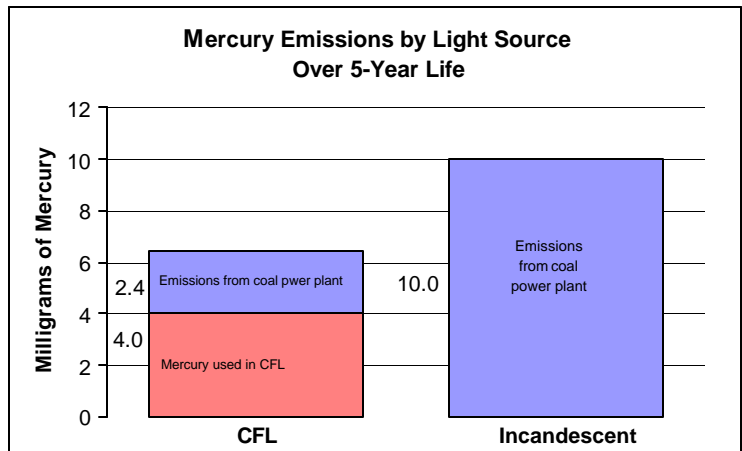
Household Mercury Amounts



Mercury is an ingredient in several household products. Recycling programs exist for mercury in older non-digital thermostats and mercury thermometers, but residential CFL recycling programs are just now appearing.

CFLs Responsible for Less Mercury than Incandescent Light Bulbs

Ironically, CFLs present an opportunity to *prevent* mercury from entering our air, where it most affects our health. The highest source of mercury in our air comes from burning fossil fuels such as coal, the most common fuel used in the U.S. to produce electricity. A CFL uses 75% less energy than an incandescent light bulb and lasts at least 6 times longer. A power plant will emit 10mg of mercury to produce the electricity to run an incandescent bulb compared to only 2.4mg of mercury to run a CFL for the same time.



Source: US EPA, June 2002

Always Dispose of Your CFL Properly

While CFLs for your home are not legally considered hazardous waste according to federal solid waste rules, it is still best for the environment to dispose of your CFL properly upon burnout. Only large commercial users of tubular fluorescent lamps are required to recycle. If recycling is not an option in your area (see below on how to find out), place the CFL in a sealed plastic bag and dispose the same way you would batteries, oil-based paint and motor oil at your local Household Hazardous Waste (HHW) Collection Site. If your local HHW Collection Site cannot accept CFLs (check Earth911.org to find out), seal the CFL in a plastic bag and place with your regular trash.

Safe cleanup precautions: If a CFL breaks in your home, open nearby windows to disperse any vapor that may escape, carefully sweep up the fragments (do *not* use your hands) and wipe the area with a disposable paper towel to remove all glass fragments. Do *not* use a vacuum. Place all fragments in a sealed plastic bag and follow disposal instructions above.

Resources for Recycling or Proper Disposal of CFLs

NOTE: Residential recycling programs are not yet available in most regions.

- 1. Earth911.org** (or call **1-800-CLEAN-UP** for an automated hotline): Online, enter your zip code, press "GO," click "Household Hazardous Waste", then "fluorescent light bulb disposal." The site will identify your nearest residential mercury recycling facility or mail disposal method. If you find no specific information on CFL disposal, go back and click on the link for "Mercury Containing Items."
- 2. Call your local government** if the Web site and Hotline number above does not have your local information. Look on the Internet or in the phone book for your local or municipal government entity responsible for waste collection or household hazardous waste.