

# *Dunbarton Town Offices High Performance Lighting Project*

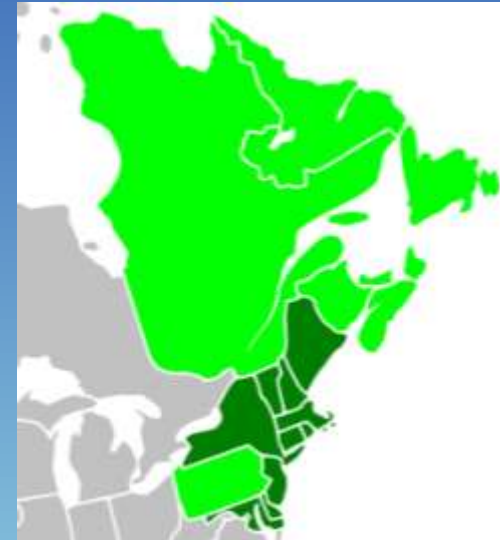


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# *Regional Greenhouse Gas Initiative (RGGI)*

- This energy-efficiency project was made possible, in part, through RGGI. Lowering bills. Conserving energy. Creating jobs.
- RGGI is a cooperative effort by ten Northeast and Mid-Atlantic states to reduce greenhouse gas emissions from the electric power sector through individual CO2 Budget Trading Programs in each of the ten participating states.
- Learn more at [www.rggi.org/home](http://www.rggi.org/home)



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# *Why Energy Efficiency?*

- Keeps the cost of electricity down by reducing system wide peak demand for electricity.
- Energy efficiency is our cheapest source of electrical energy @ \$0.03 per kilo-watt hour (kWh).
- Spur economic growth through investment in our own state's economy of monies currently spent on energy imports.
- It's an uninterruptable power source.

(excerpt from the New Hampshire Climate Action Plan, March 2009)

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# *Why Focus on Lighting? An End-User Perspective*

- Improved lighting quality and productivity
  - Improved lighting enhances visual comfort, reduces eye fatigue, and improves performance on visual tasks.

Source: [www.ENERGY STAR.gov](http://www.ENERGY STAR.gov)

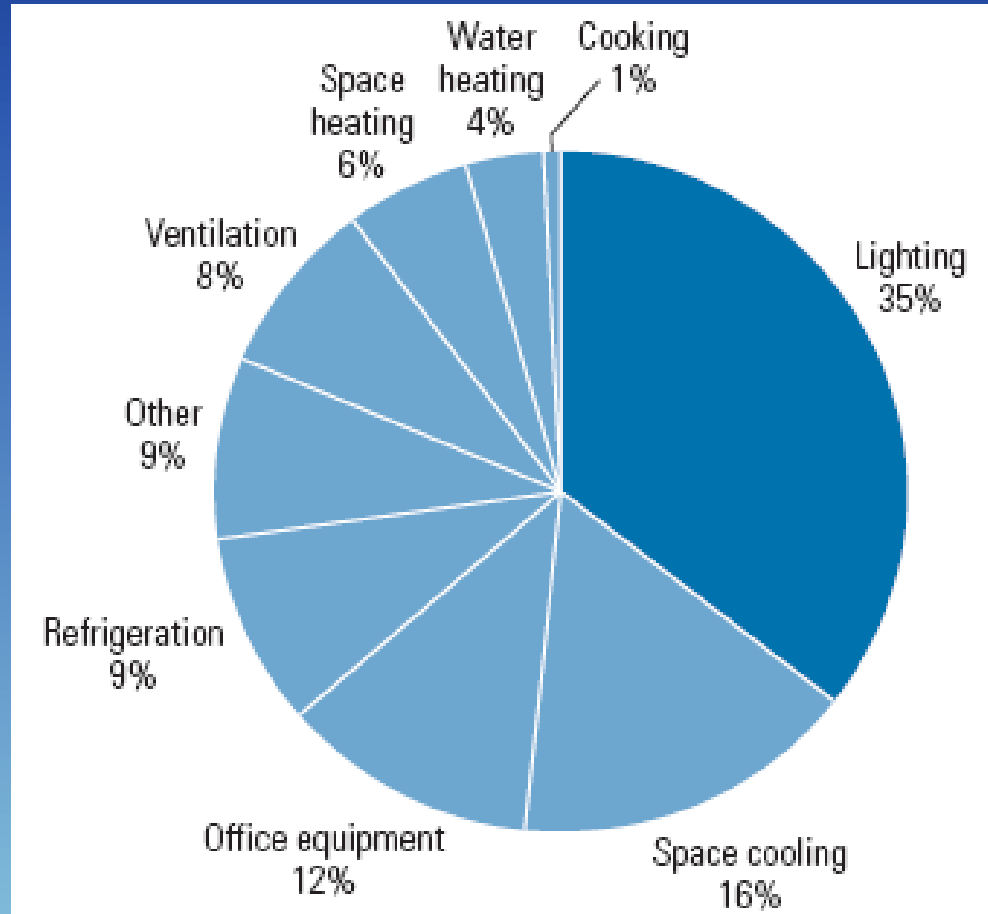


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# *Why Focus on Lighting: An Energy Perspective*

Lighting Share of  
Commercial Building  
Electricity Use



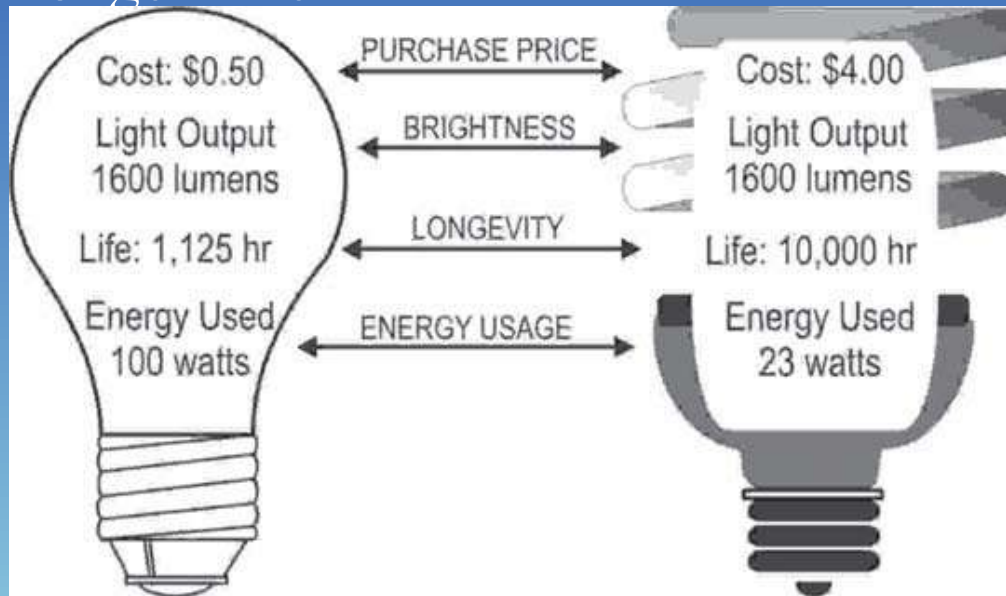
Source: ENERGY STAR Building Manual, 2006. Adapted from E source; data from 2005 Buildings Energy Data Book

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# *Why Focus on Lighting? An Energy Perspective*

- Save Money
  - Using Less Energy for equal or more light
  - Longer Life

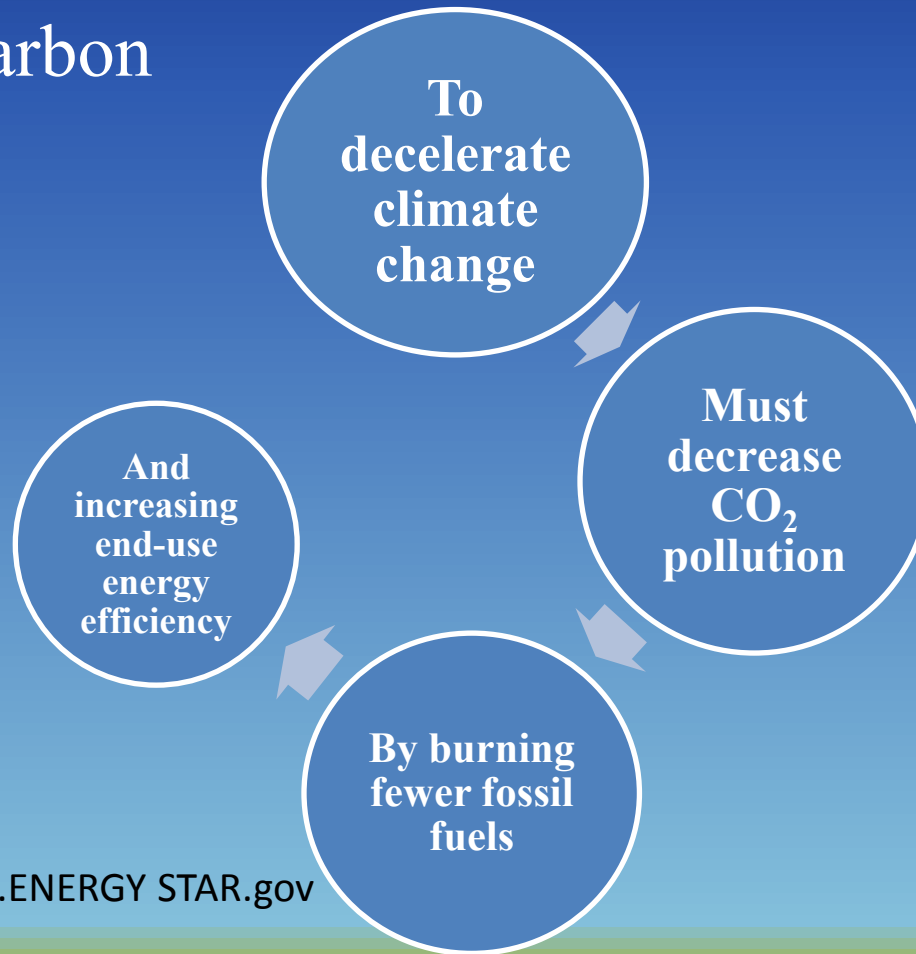


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# *Why Focus on Lighting An Environmental Perspective*

- Reduce Carbon Emissions



Source: adapted from [www.ENERGY STAR.gov](http://www.ENERGY STAR.gov)

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# *Town of Dunbarton Project Goals*

- Reduce electricity costs
- Improve lighting quality
- Allow work areas to be lighted only when in use
- Take action to reduce the Towns carbon footprint



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# *Project Scope*

- LighTec, Inc. engineered and installed a high efficiency lighting and lighting controls project to replaced the 1970s vintage T-12 fluorescent in 4 and 8 foot fixtures and incandescent lamps. This involved significant additional wiring to bring those areas retrofitted, up to code.

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# *Lighting Project Savings Summary*

Annual Cost Savings*:	\$937.00
Annual kWh Savings:	6,246
Avg. Monthly kW Savings:	3
CO <sub>2</sub> Equivalent:	3 metric tons

Carbon sequestered by **77** tree seedlings grown for 10 years and removing emissions from consumption of 337 gallons of gasoline

\* Based on 15 cents per kWh

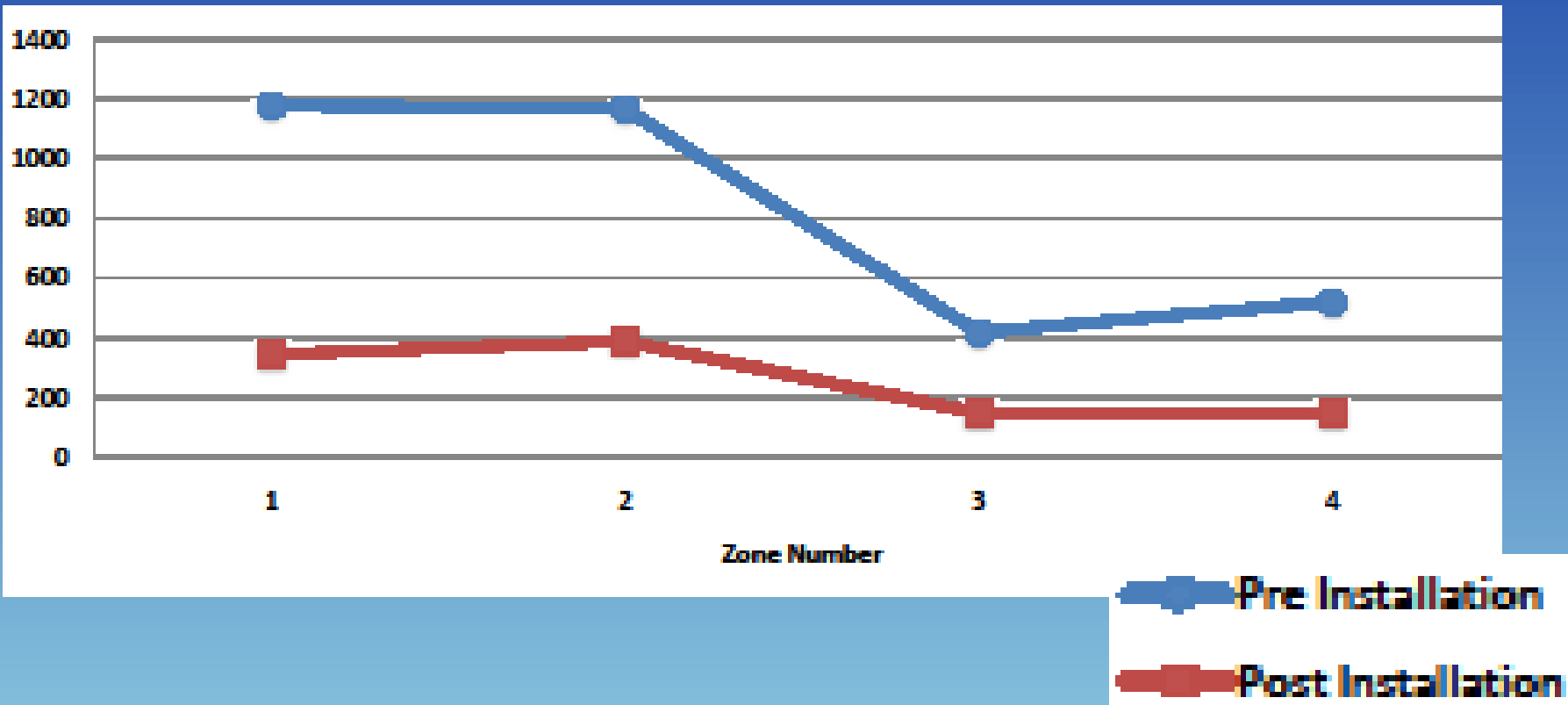


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# *Lighting Electric Savings Measured Results*

Dunbarton Town Offices



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# *Installed Energy-Efficient Lighting Technologies*

- High Performance T8 (HPT8) is the state of the art in T8 technology.
- Performance Characteristics:
  - 32W, 30W, 28W, 25W
  - Longer life (24,000 hrs (at three hours per start.))
  - Color Rendering Index  $\geq 80$
  - Mean System Efficacy  $\geq 90$  MLPW
  - Lumen Maintenance 94%



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# *Lighting Technologies Installed*

- New fixtures are used when the existing fixtures are in disrepair, inefficient or a new lighting layout is required.
- When fixtures are in good shape it is usually most cost effective to simply replace the old lamps and ballasts.



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# *Lighting Technologies Installed cont.*



- Screw-in Compact Fluorescent Lamps (CFL) are a great option when historic lighting fixtures or newer incandescent fixtures are in place. They are also used in areas of low use such as the attic or basement.

- Hardwired CFL fixtures are a good choice when the existing fixture is in disrepair . Using hardwired fixtures will ensure the savings are maintained over time.

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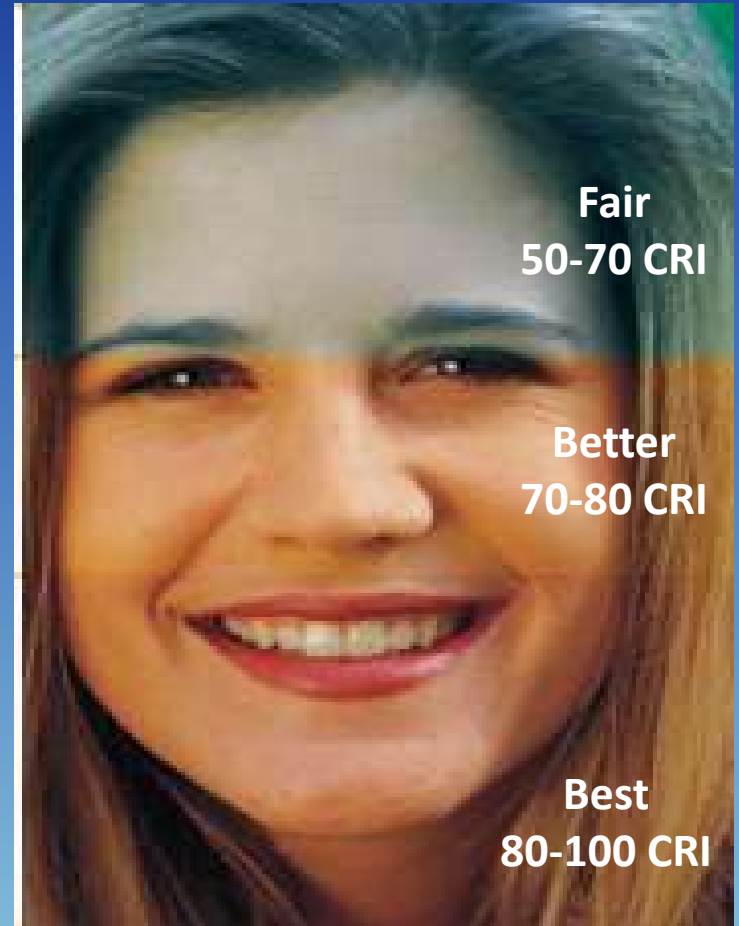
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# *Lighting Terminology*



# *Lighting Terminology*

- Color Rendering Index (CRI)
  - Measured on a scale of 0 to 100, describes the ability of a light source to render a sample of eight colors relative to an incandescent source.
  - Light sources with a CRI of 80 or higher are considered to provide excellent color rendering
  - CRI is an average value so it will not describe how a light source renders a specific color.



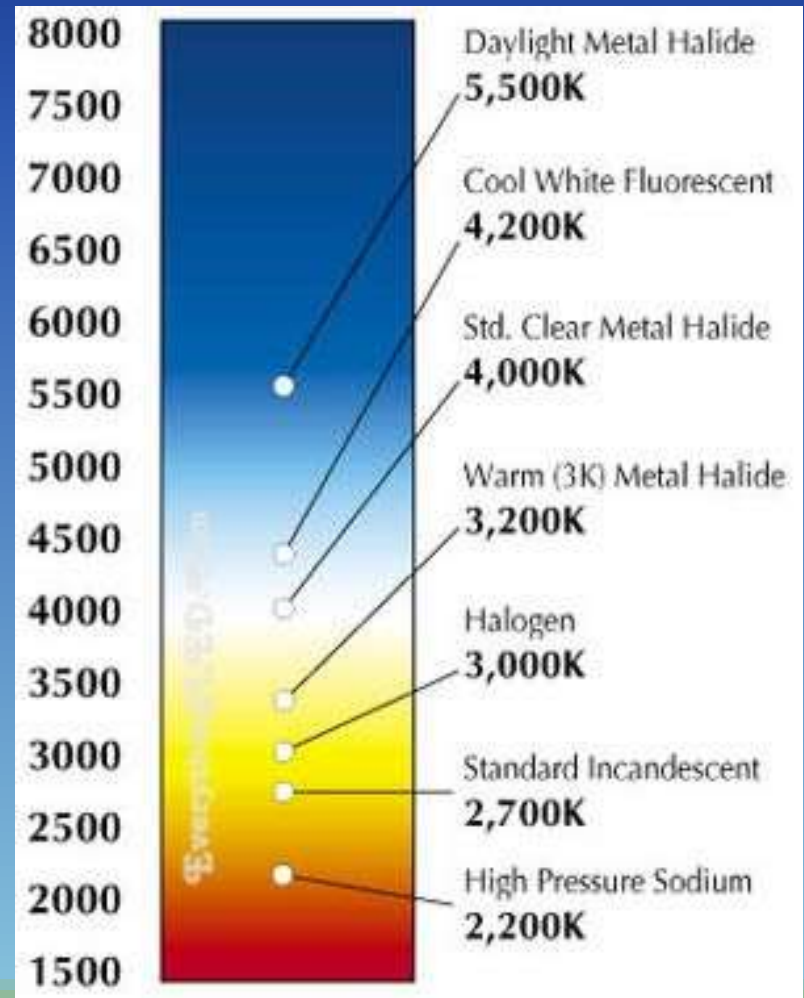
Source: [http://www.energystar.gov/index.cfm?c=fixture\\_guide.pr\\_fixtures\\_guide\\_lightquality](http://www.energystar.gov/index.cfm?c=fixture_guide.pr_fixtures_guide_lightquality)

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# Lighting Terminology

- Color Temperature
  - The color appearance of the light.
  - The standard is based upon the color given off by a tungsten filament heated to a specific temperature in degrees Kelvin (K).
  - Above 5000K CCT is used
  - Blue sky 12,000-20,000K



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# *Lighting Terminology*

- **Lamp (Bulb):** A generic term for a source created to produce optical radiation. Three broad categories of electric lamps are:
  - **incandescent** - A filament, usually of coiled tungsten wire, is heated to incandescence by the flow of current.
  - **fluorescent** - Low pressure mercury is ionized inside the lamp, producing primarily ultraviolet radiant energy which causes phosphors to fluoresce.
  - **high intensity discharge** - Pressurized gases inside an arc tube are ionized by current flow between electrodes, emitting light.
- **Ballast:** A device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current and waveform) for starting and operating.

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# *Lighting Terminology*

- **Luminaire/Fixture:** A complete lighting unit consisting of a lamp (or lamps), ballast (or ballasts) as required together with the parts designed to distribute the light, position and protect the lamps and connect them to the power supply. A luminaire is often referred to as a fixture.
- **Light Emitting Diode (LED):** A solid state semiconductor that directly converts electrical impulses into light.

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# *Lighting Terminology*

- **Watt (W):** A unit of electrical power. Lamps are rated in watts to indicate the rate at which they consume energy.
- **Demand/Kilowatt (kW):** The measure of electrical power equal to 1000 watts.
- **Usage/Kilowatt hour (kWh):** The standard measure of electrical energy and the typical billing unit used by electrical utilities for electricity use.
  - A 100-watt lamp operated for 10 hours consumes 1000 watt-hours (100 x 10) or one kilowatt-hour. If the utility charges \$.10/kWh, then the electricity cost for the 10 hours of operation would be 10 cents (1 x \$.10)

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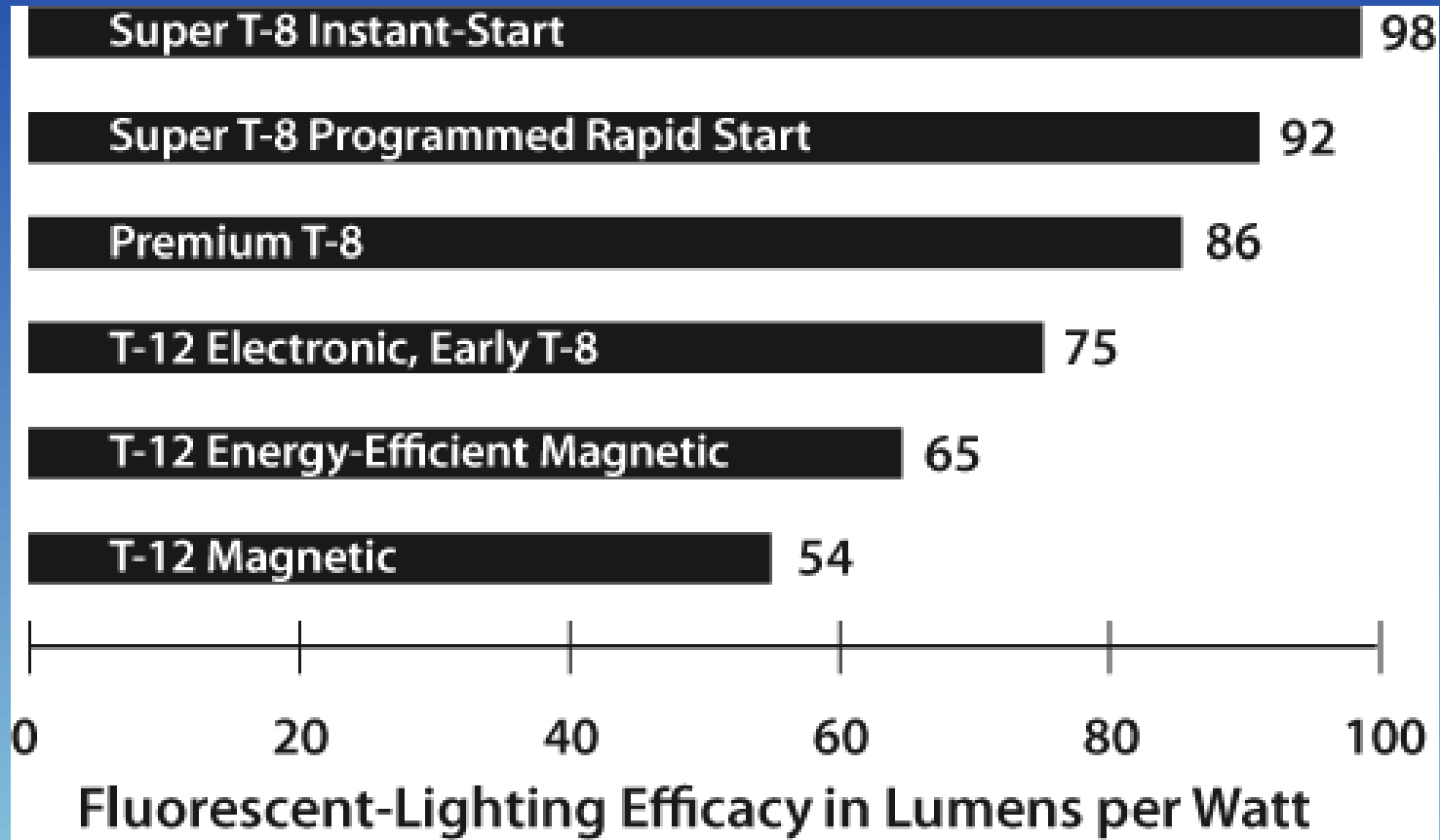
# *Lighting Terminology*

- **Lumens:** A measure of the quantity of light emitted by a source. For example, a dinner candle provides about 12 lumens. A 60-watt incandescent lamp and a 13-watt compact fluorescent lamp produces about 840 lumens.
- **Efficiency:** The fraction of electrical energy converted to light. For example, a 100 watt incandescent lamp converts 7% of the electrical energy into light; discharge lamps convert 25% to 40% into light.
- **Efficacy:** Lumens/Watt. Efficacy is the measure of lighting efficiency and is calculated by dividing the light output (measured in lumens) by the electricity used (measured in watts).

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# *Efficacy in Lumens/Watt Fluorescent Systems*



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# *Tips for Saving Energy at Home*



Note: Many of the slides contained within are adapted from presentations located on the ENERGY STAR Web site at [www.energystar.gov](http://www.energystar.gov)

# *Change a Light*

- Replace your five most frequently used light fixtures or the bulbs in them with ENERGY STAR qualified lights, and save more than \$65 a year in energy costs.



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# Where to Use CFLs?



## Which Rooms?

- Family and living room
- Kitchen
- Dining room
- Porch

## Which Fixtures?

- Table lamps
- Floor lamps
- Wall sconces
- Pendants
- Open ceiling fixtures

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# *Use a Programmable Thermostat*

- The average household spends nearly \$2,000 a year on energy bills – nearly half on heating and cooling. A programmable thermostat, set and used properly, can save about \$180 each year.



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# *Choose Energy Efficiency*

- Appliances that have earned the ENERGY STAR can save \$80 a year in energy costs.
- Look for the ENERGY STAR when buying home appliances, electronics, and heating and cooling systems.



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# *No Cost Energy Savers*



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# *No Cost Energy Savers*

- Unplug cell phone battery chargers or power adapters
- Turn off lights when leaving a room
- Keep air registers and vents clear to allow air to flow freely throughout the room
- Keep condenser surfaces of refrigerators and AC units clean
- Always set back heating and set forward cooling set points on your thermostat
- Lower water tank temperatures
- Think about paint color choices
- Think about where you plant vegetation

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# *The Facts about CFLs and Mercury*

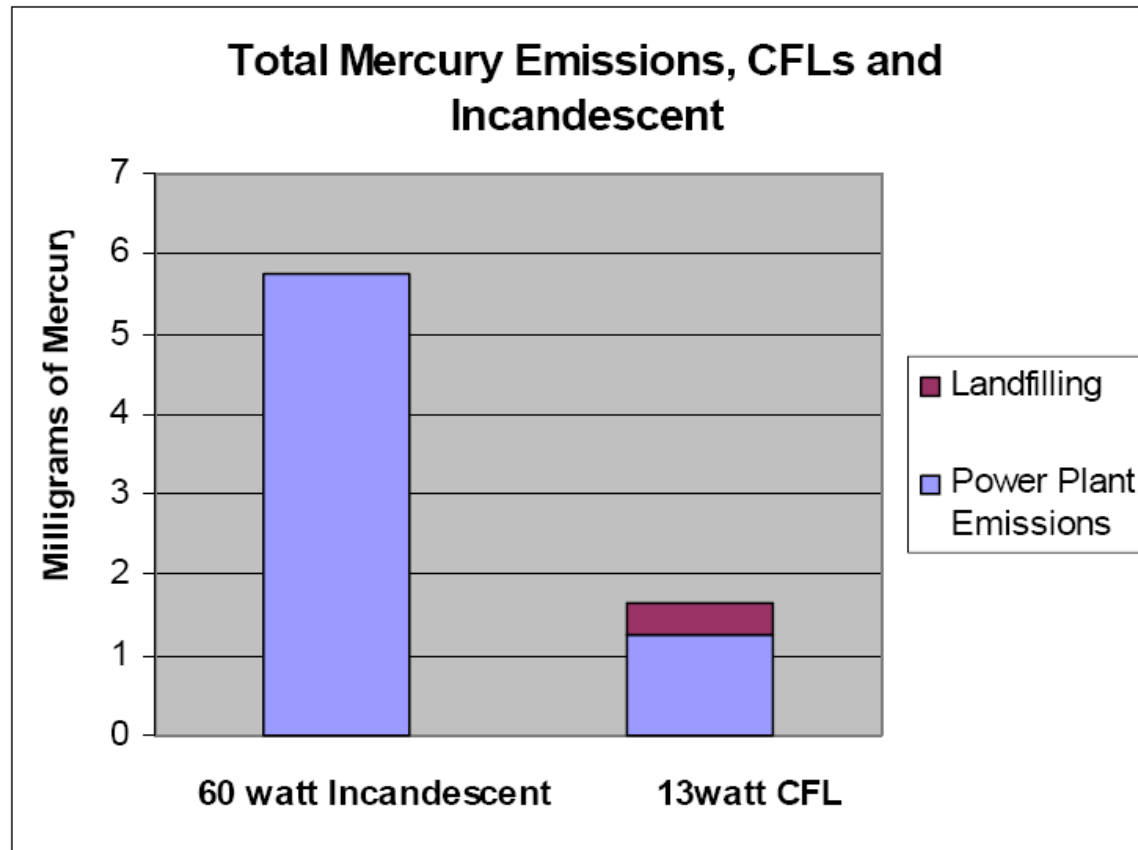
- Because CFLs use less electricity than traditional light bulbs, they reduce demand for electricity; that reduction means less mercury is emitted from power plants.
- CFLs contain a very small amount of mercury — an average of 4 milligrams in each bulb.
- No mercury is released when the bulbs are intact or in use.

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# Concerns about Mercury

Figure 1



Source: [http://www.energystar.gov/ia/partners/promotions/change\\_light/downloads/Fact\\_Sheet\\_Mercury.pdf](http://www.energystar.gov/ia/partners/promotions/change_light/downloads/Fact_Sheet_Mercury.pdf)

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# *CFL Disposal in New Hampshire*

- Do not dispose CFL bulbs in regular household trash.
- Recycle lamps at Town Recycling Centers or participating True Value and Ace Hardware Stores.
- For additional information on properly disposing broken CFLs go to:

<http://des.nh.gov/organization/commissioner/pip/factsheets/co/documents/co-19.pdf> or

<http://www.epa.gov/mercury/spills/index.htm#fluorescent>

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# *Learn More*

- To find out more ways you can save energy at home visit:
  - [www.myenergyplan.net](http://www.myenergyplan.net)
  - [www.nhsaves.com](http://www.nhsaves.com)
  - [www.energystar.gov](http://www.energystar.gov)
- To learn about state, local, utility and federal incentives that promote renewable energy and energy efficiency visit:
  - [www.dsireusa.org](http://www.dsireusa.org)

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