

# *Town of Wolfeboro*

## *High Performance Lighting Project*

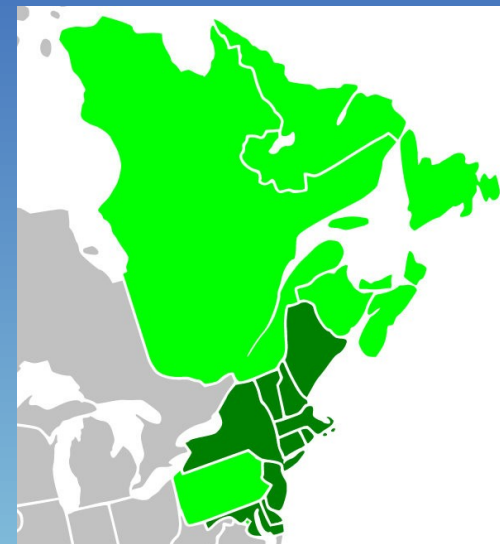


***LighTec, Inc.***

*Designers and builders of energy efficiency retrofit projects for commercial, industrial, school and municipal buildings.*

# *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)



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

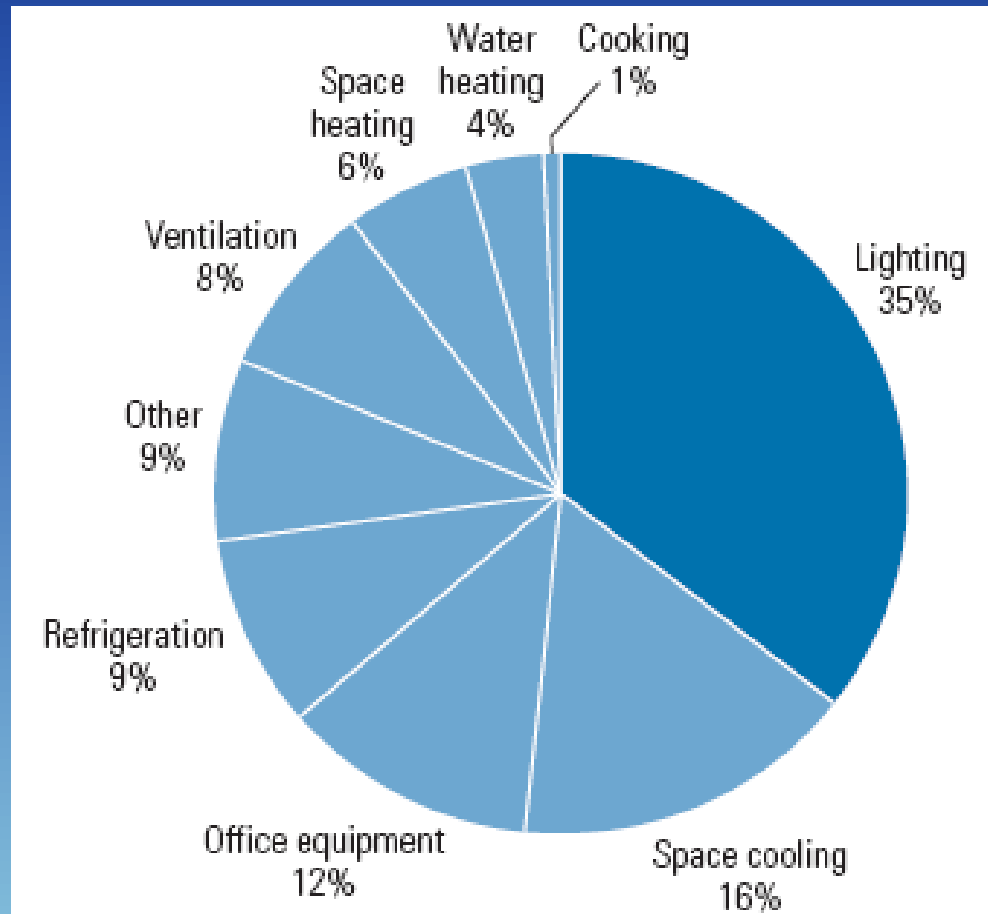
- Improved lighting quality and productivity
  - Improved lighting enhances visual comfort, reduces eye fatigue, and improves performance on visual tasks.

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



# *Why Focus on Lighting: An Energy Perspective*

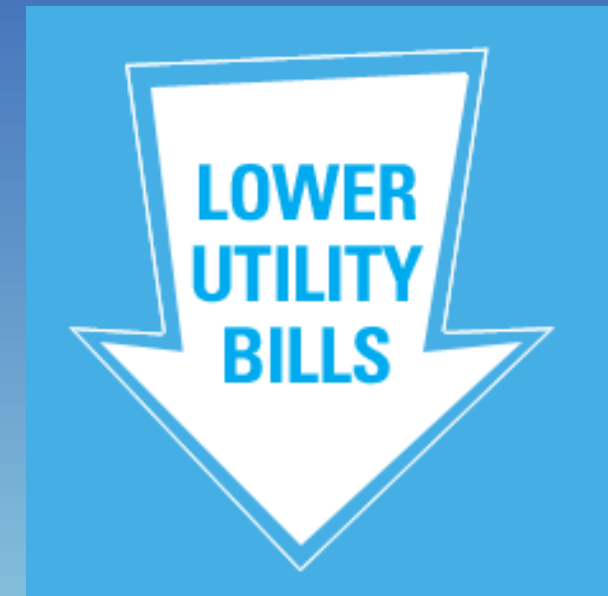
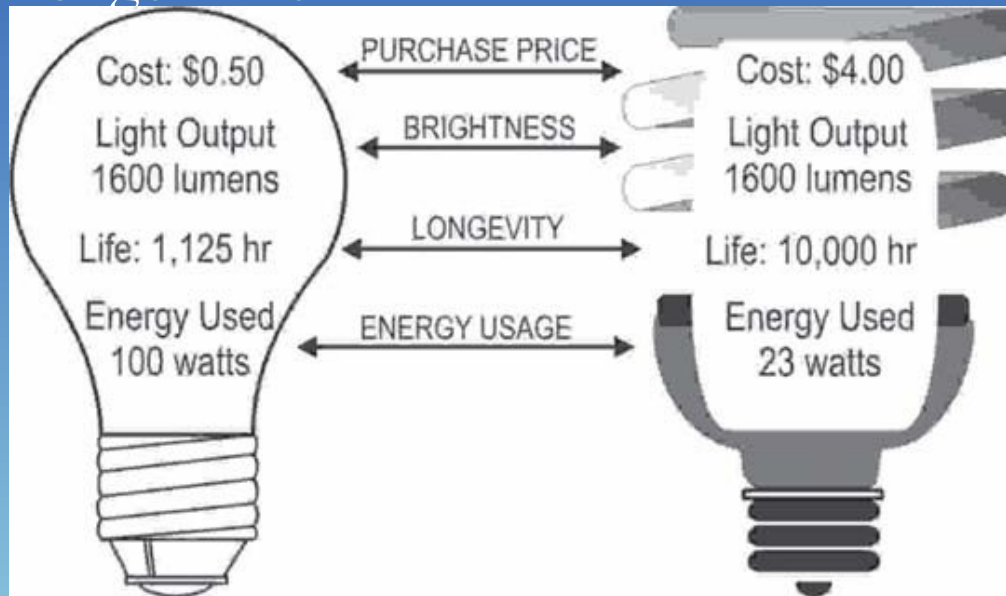
Lighting Share of  
Commercial Building  
Electricity Use



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

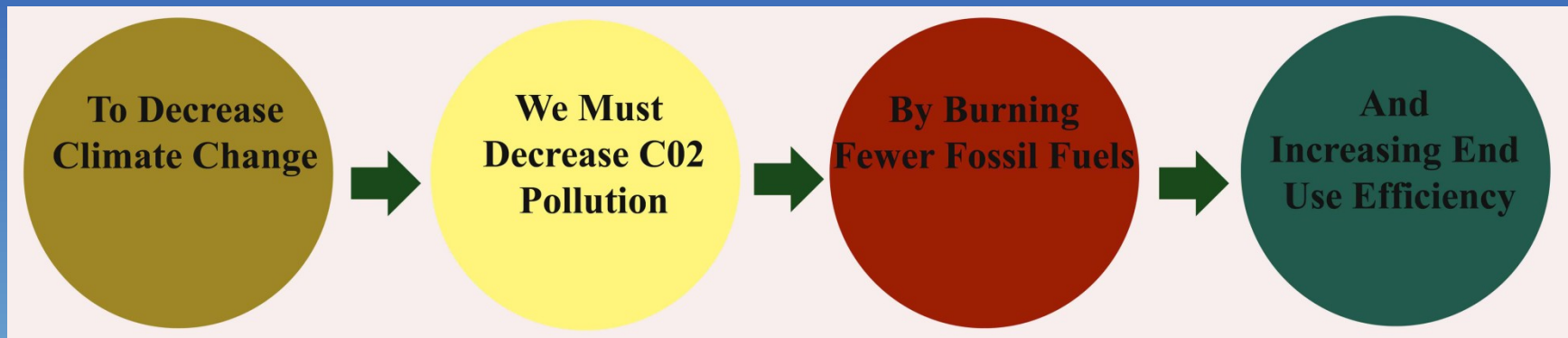
# *Why Focus on Lighting? An Energy Perspective*

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



# *Why Focus on Lighting An Environmental Perspective*

- Reduce Carbon Emissions



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

# *Town of Wolfeboro Project Goals*

- Reduce electricity costs
- Improve lighting quality
- Take action to reduce the Towns carbon footprint



# *Installed Energy-Efficient Lighting Technologies*

<b>Town of Wolfeboro, NH</b>	<b>Library</b>	<b>Public Safety Building</b>	<b>Public Works Garages</b>	<b>Pop Whalen Ice Arena</b>	<b>Water Treatment Plant</b>	<b>Waste Water Treatment Plant</b>
New T5 Fixtures		✘	✘			
HPT8 Retrofits	✘	✘	✘	✘	✘	✘
New HPT8 Fixtures	✘	✘	✘	✘	✘	✘
CFL Screw-In		✘	✘			✘
New LED Exit Signs			✘			
New CFL Fixtures		✘	✘	✘		
Occupancy Sensors	✘	✘	✘	✘	✘	✘
Timer for Hot Water Heater	✘	✘	✘		✘	

# *Lighting Project Savings Summary*

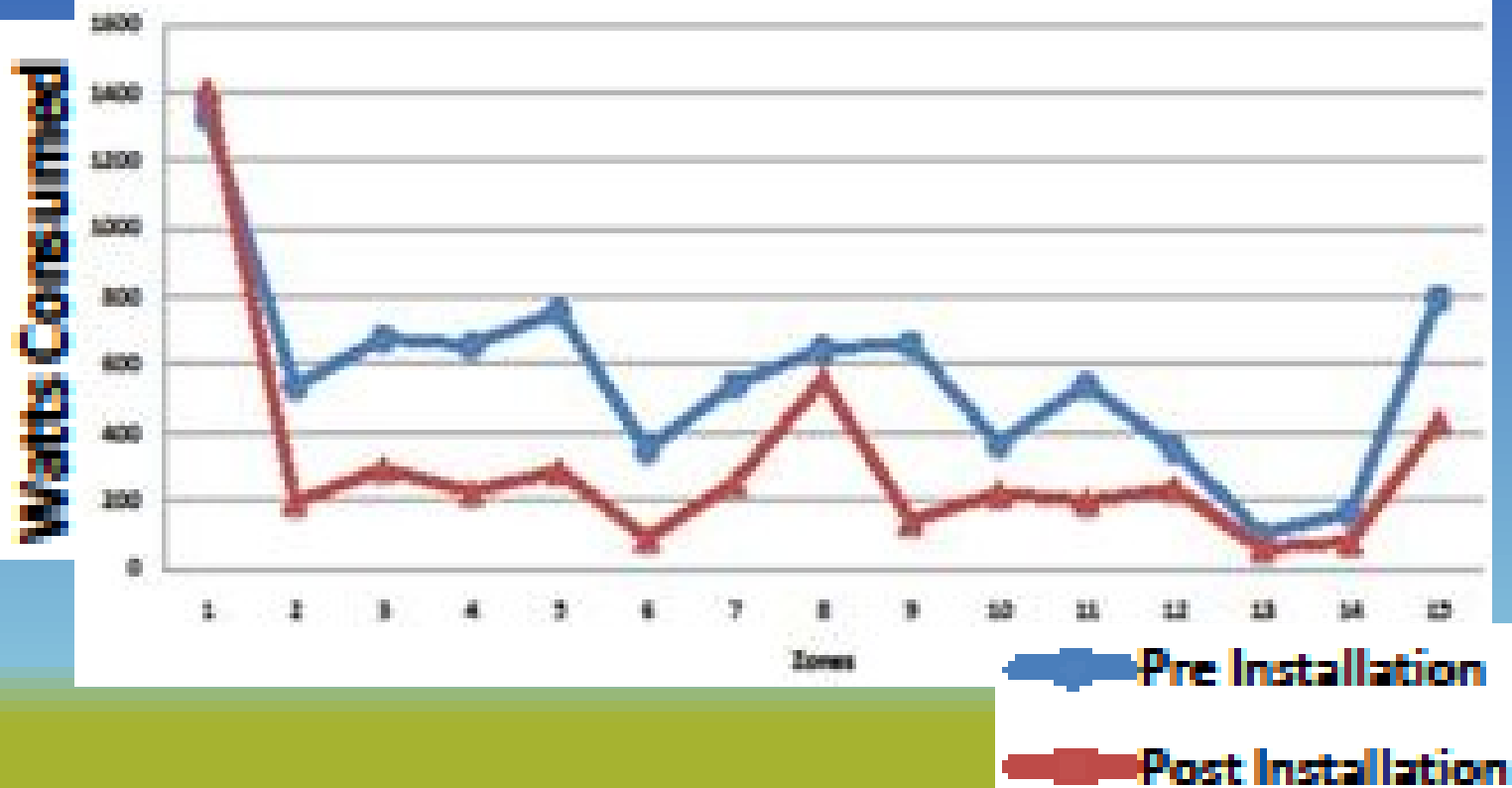
Annual Cost Savings:	\$12,657
Annual kWh Savings:	76,682
Avg. Monthly kW Savings:	30
CO <sub>2</sub> Equivalent:	38 metric tons

Carbon sequestered by **881** tree seedlings grown for 10 years.



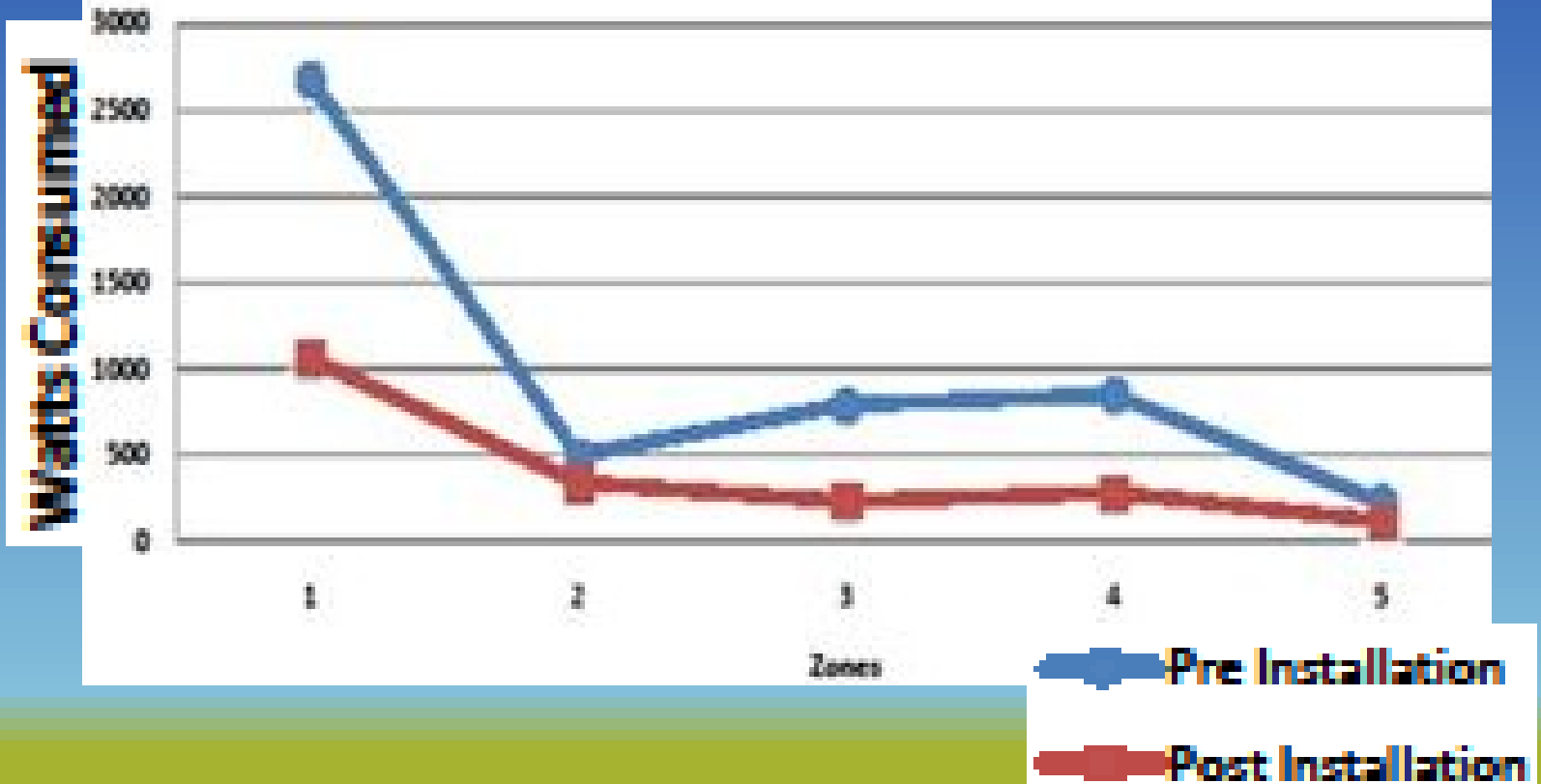
# *Lighting Electric Savings Measured Results*

**Phase I: Public Safety buildings, Library, Public Works  
Garage, Pop Warner Ice Arena**



# *Lighting Electric Savings Measured Results*

## **Phase II: Wolfeboro Water and Waste Water Treatment Plants**



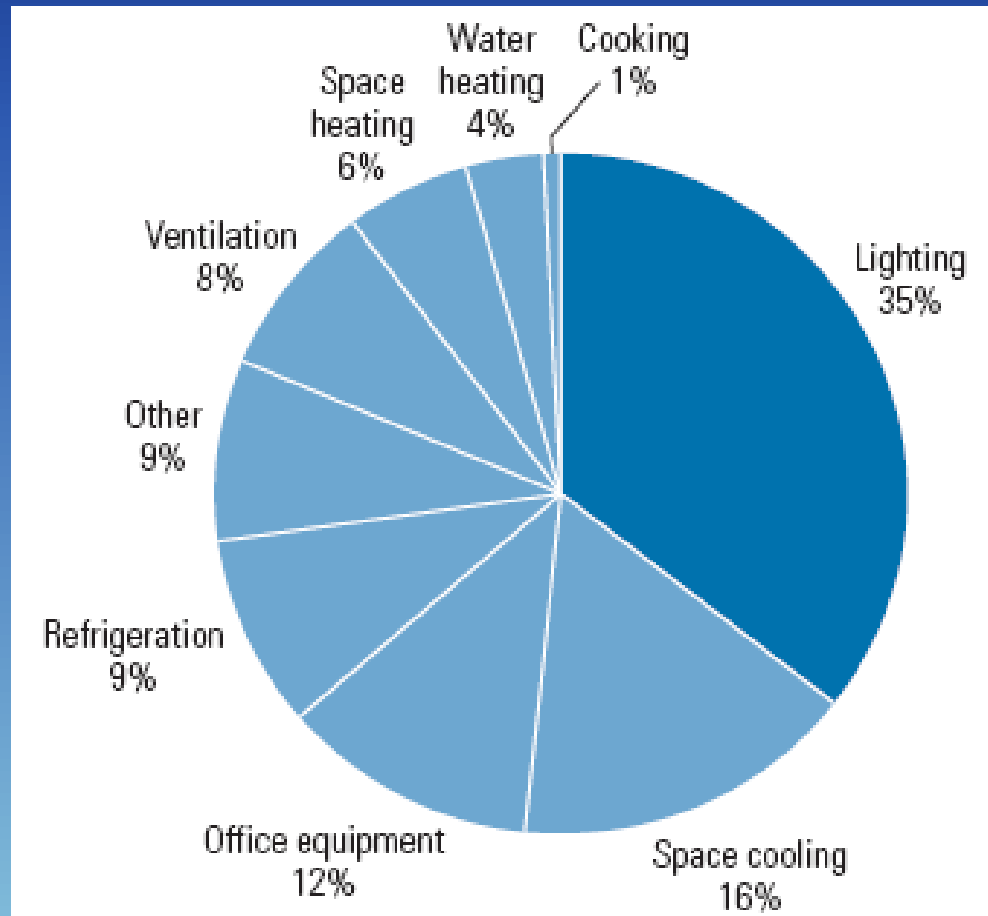
# *Why Focus on Lighting? An End-User Perspective*

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



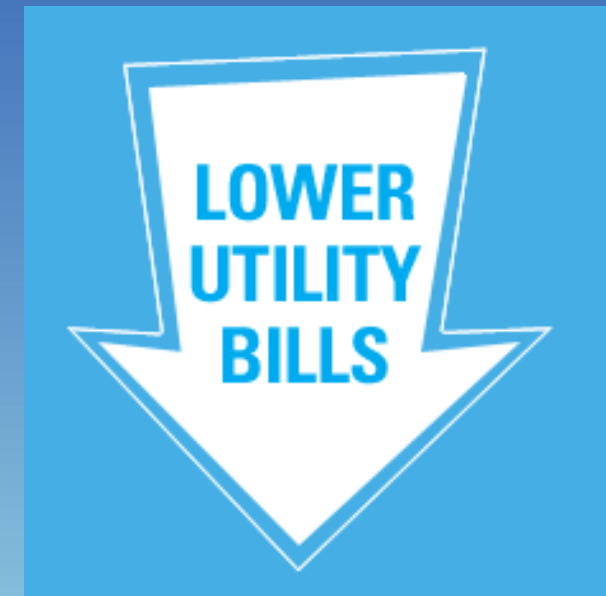
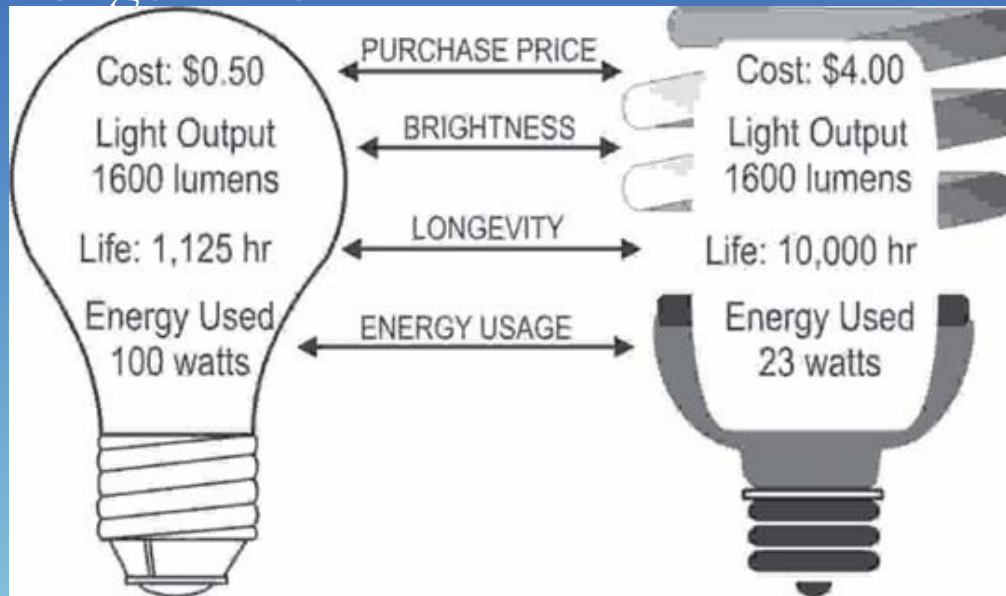
# *Why Focus on Lighting: An Energy Perspective*

Lighting Share of  
Commercial Building  
Electricity Use



# *Why Focus on Lighting? An Energy Perspective*

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



# *Basic Lighting Terminology*

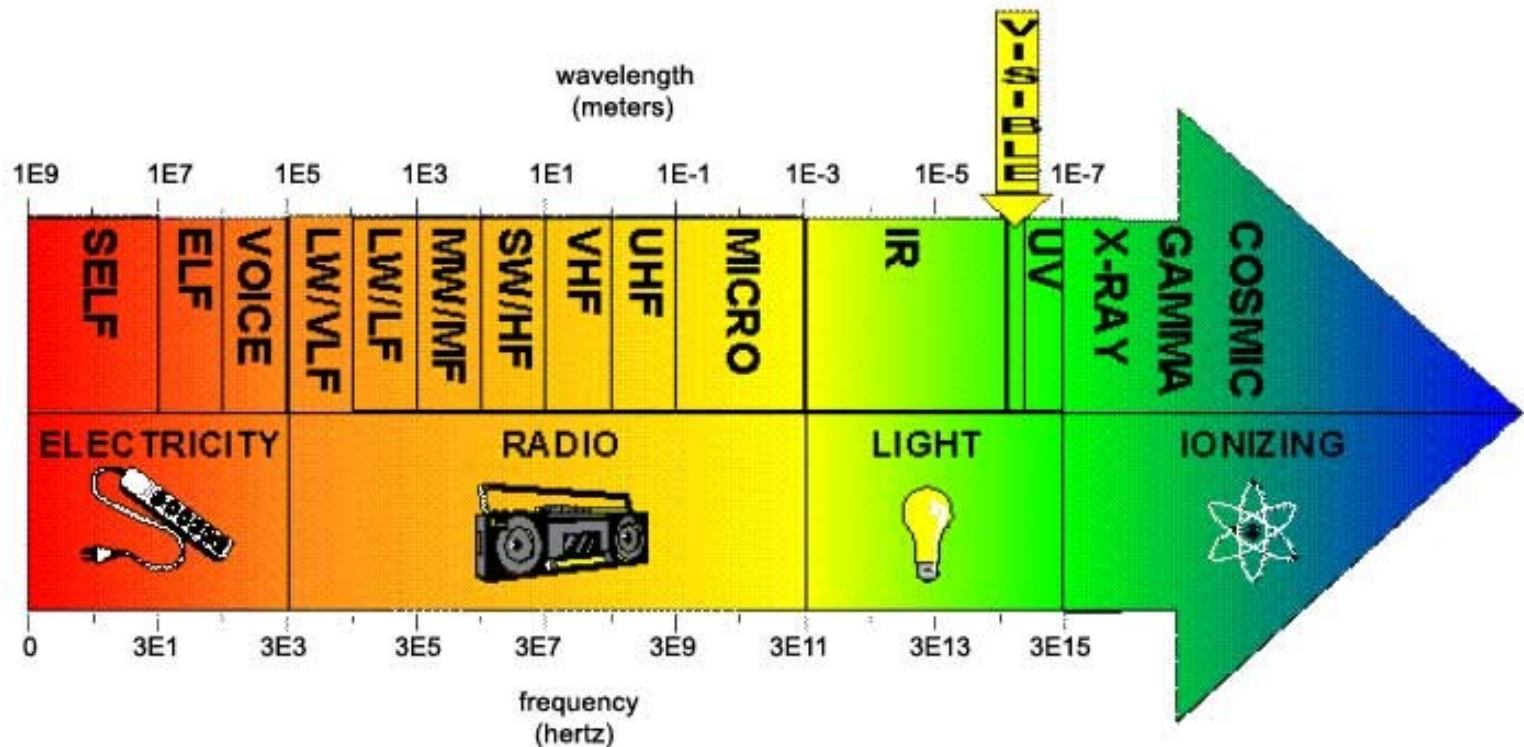
- Lamp = Bulb
- Ballast = Transformer
- Luminaire = Fixture
- Light Emitting Diode (LED)
- Watt (W) – A unit of electrical power
- Demand=Kilowatt (kW) = 1000 watts
- Usage=Kilowatt hour (kWh) =kW\*time
- Efficacy= lumens/watt

# *What is Light*

- Light is part of the electromagnetic spectrum.
- Humans “see” light in the visible range of the electromagnetic spectrum. The center of the visible spectrum consists of light waves with a wavelength of 500nm.
- A nano-meter is 1 millionth of a meter.
- Above the visible is ultra-violet (UV).
- Below that is Infra-red (IR).

# *Electromagnetic Spectrum*

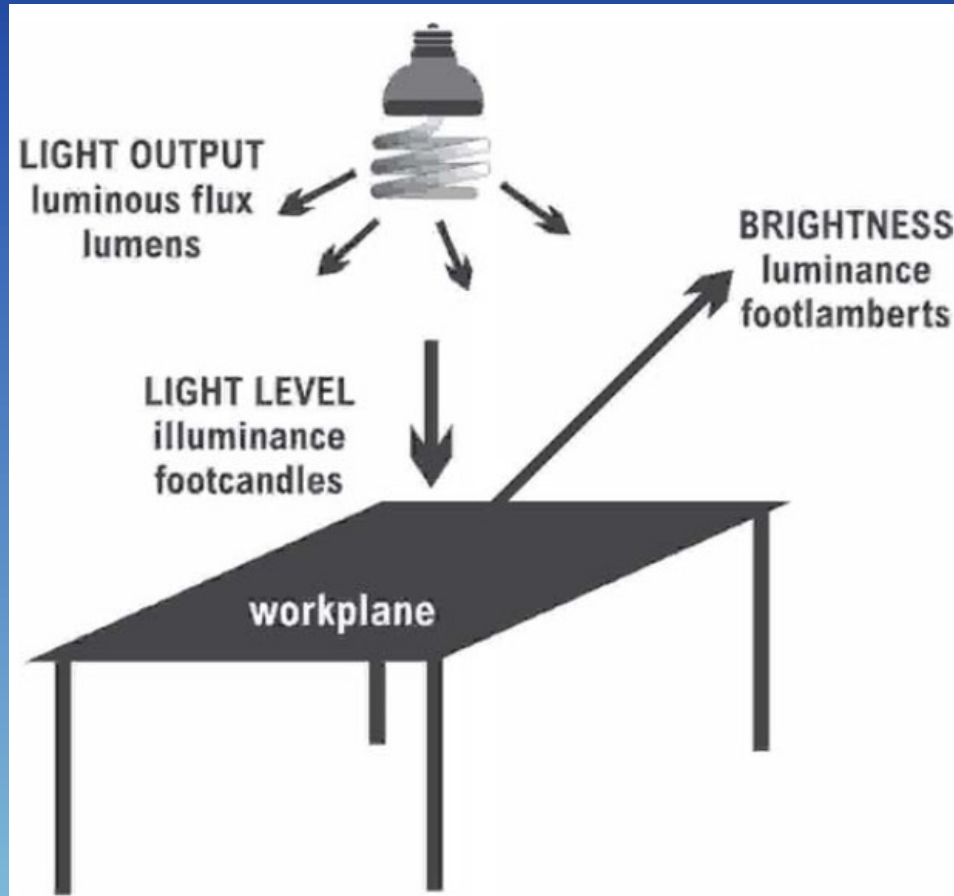
- Visible light consists of a range of wavelength between IR and UV.
- UV and shorter wavelengths are very bad for your health.



# *Color and Light*

- Color cannot be perceived if it is not in the source.
- Light happens naturally when things get hot.
- Our star is the hottest body in our solar system, and therefore our best source of light.
- Surfaces either absorb or reflect light.
- Every color will reflect a unique wavelength of light.
- If that wavelength is not in the source, it can't be reflected.

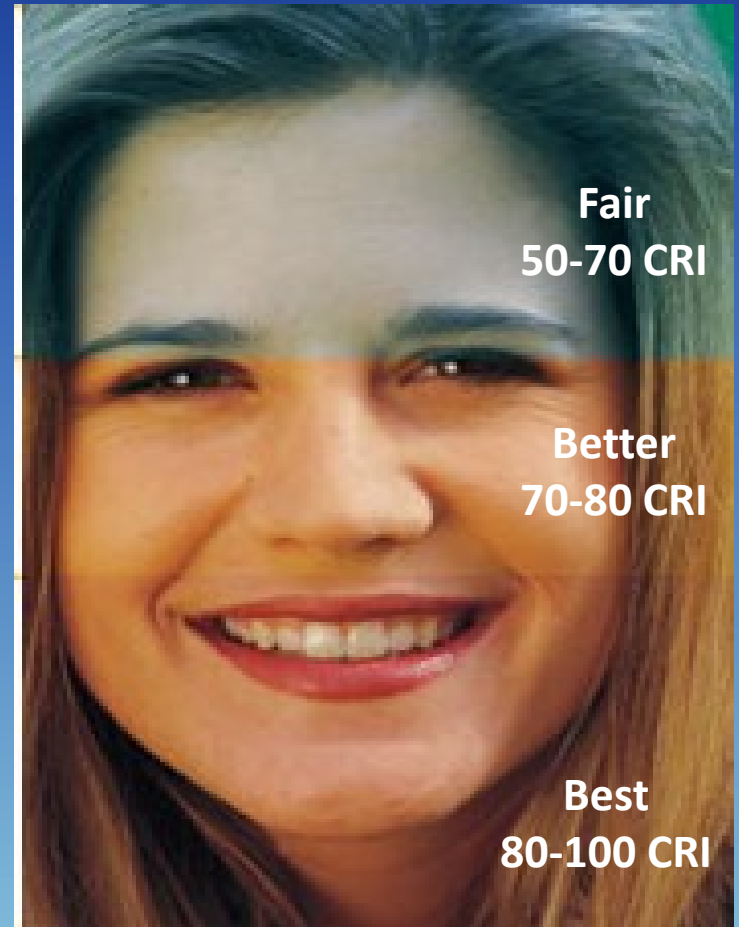
# *How Light is Measured*



Source: The NEED Project, *Saving Energy School Energy Survey Student Guide*, p.16, 2008-2009.

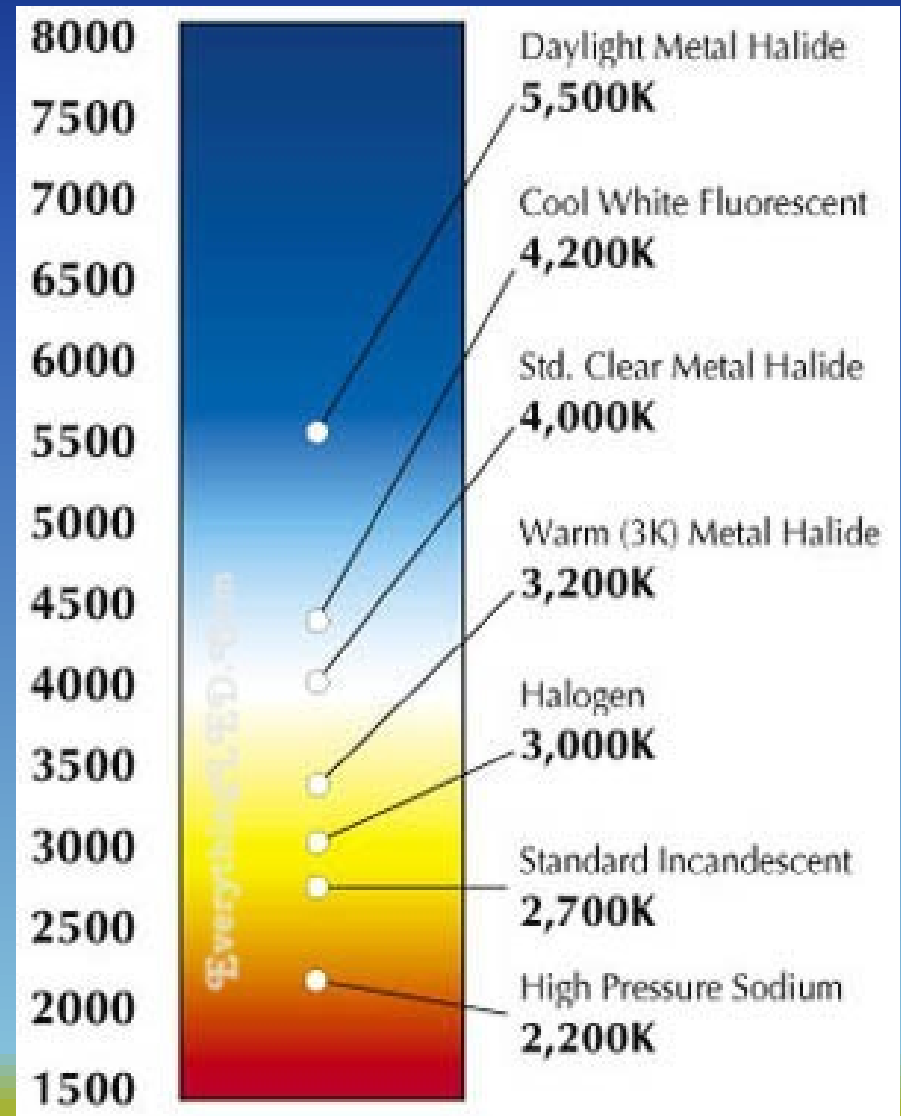
# *Color Rendering Index (CRI)*

- 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.



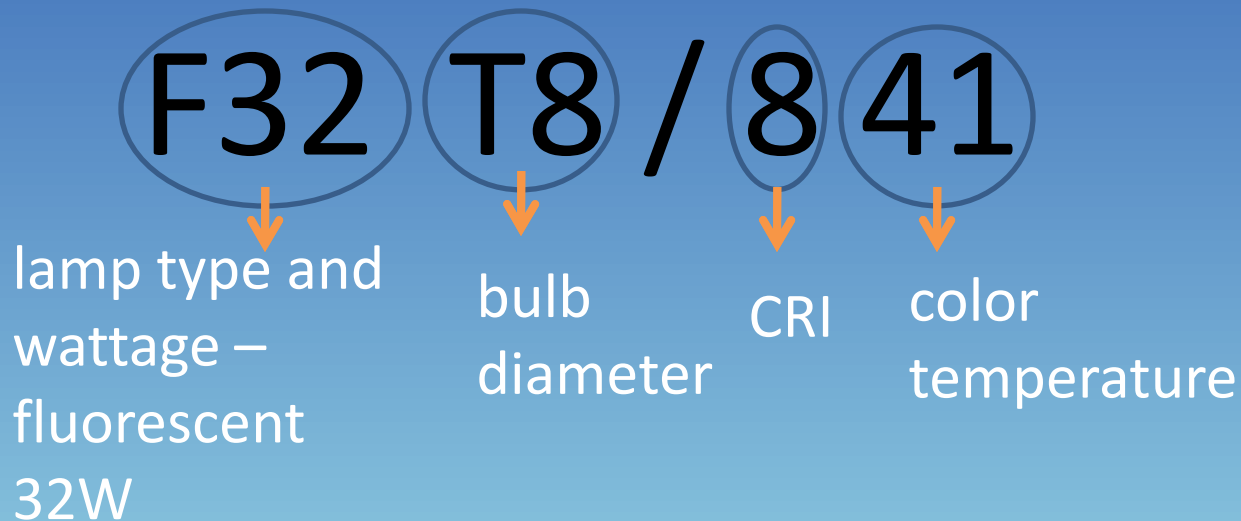
# Color Temperature

- 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



# *Bulbs Shapes and Sizes*

- Codes are a series of letters and numbers.
- Letter indicates the shape or type of the lamp.
- Numbers indicates the wattage, diameter (in eighths of an inch), CRI and color temperature.



# *Lighting Technologies Installed*

- 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%



# *High Intensity T8 & T5 HO*

- Replaces HID.
- Options:
  - High BF T8 6 lamp 234W.
  - T5 HO 4 lamp 234W.
  - T5 HO 6 lamp 351W.
  - T5 is preferred because of ramped start ballast & compatibility with controls.



# *Lighting Technologies Installed*

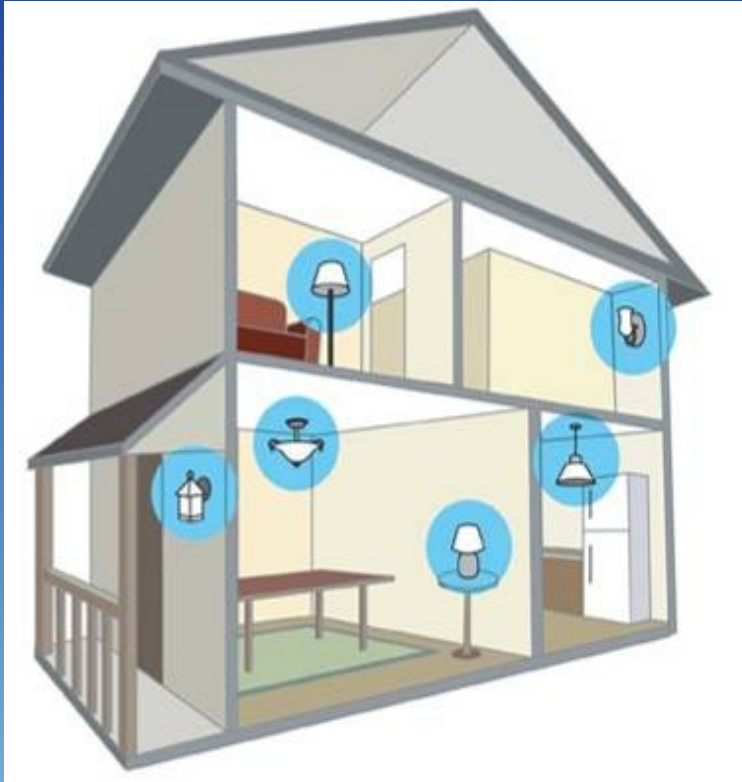


# *Change a Light*

- 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.



# *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

# *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.



# *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.



# *No Cost Energy Savers*



# *No Cost Energy Savers*

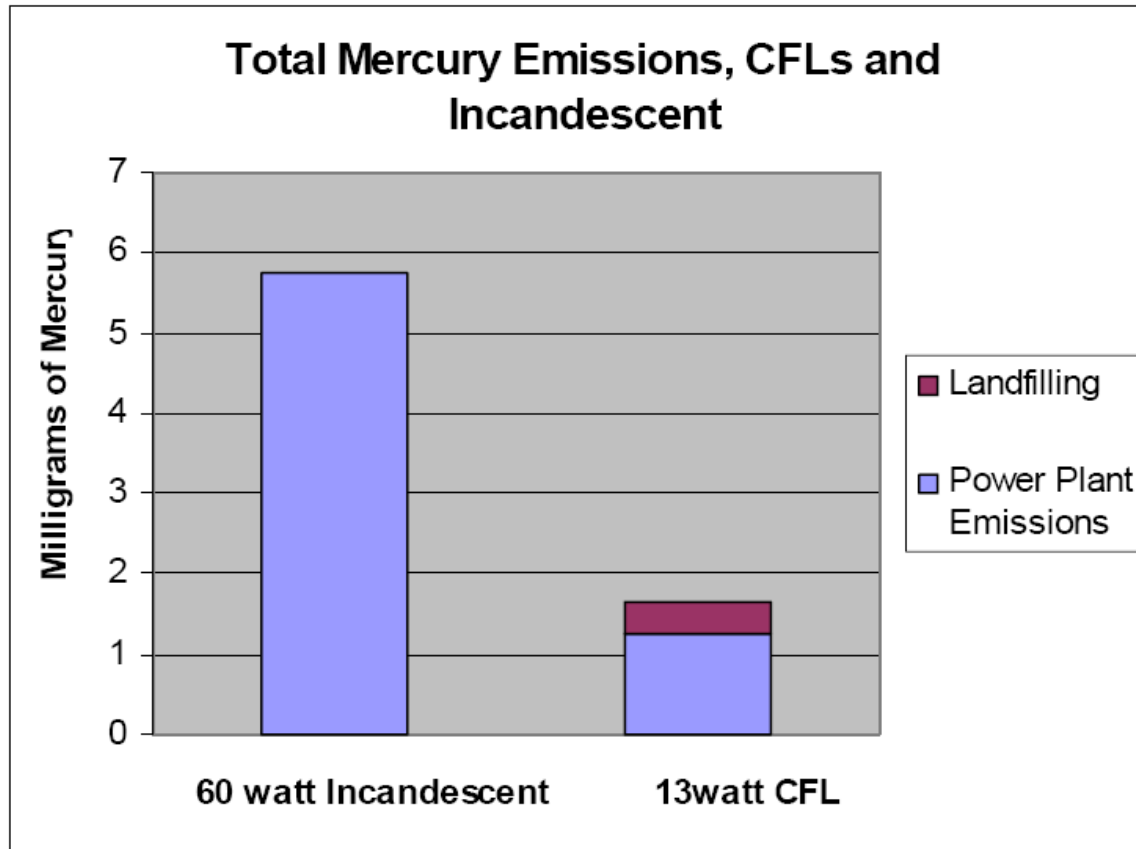
- Unplug cell phone battery chargers or power adapters
- Turn off lights when leaving a room
- Keep air registers and vents clear to allow air to flow freely throughout the room
- Keep condenser surfaces of refrigerators and AC units clean
- Always set back heating and set forward cooling set points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

# *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.

# Concerns about Mercury

Figure 1



# *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>

# *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)