

# *New England College High Performance Lighting Project*

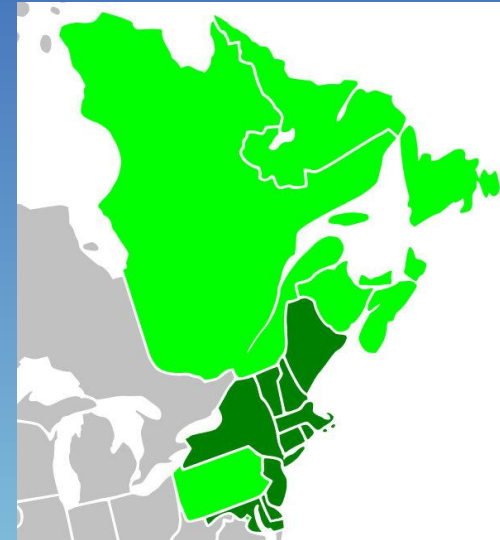


***LighTec, Inc.***

*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)



***LighTec, Inc.***

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

# *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)

***LighTec, Inc.***

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

# *New England College Project Goals*

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



***LighTec, Inc.***

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

# *Project Scope*

- In 2009, New England College (Henniker Campus) received \$17,302.00 from the Regional Greenhouse Gas Initiative (RGGI).
- 876 fixtures were replaced in Larter Hall, East Hall, The Charter House and Connor Hall, to reduce energy consumption and their total energy bill by ~\$14,000.00.
- Replaced existing fixtures with HP T8 lamps and HP performance T8 normal or low ballast factor ballasts.
- A mix of incandescent fixtures were replaced with either new, more efficient 27 watt CFL fixtures or 30 watt High Performance T8 industrial strip fixtures with white reflectors and High Performance normal ballast factor ballasts.
- Occupancy Sensors were installed where necessary.

***LighTec, Inc.***

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

# *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 (average efficiency)  
 $\geq 90$  MLPW
  - Lumen Maintenance 94%
    - (Over the life of the project only 6% of the lighting will need to be replaced or fixed.)



***LighTec, Inc.***

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

# *High Intensity T8 & T5 HO*



Source: Renova, Brownlee Lighting, TCP, Lithonia

***LighTec, Inc.***

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

# *Lighting Technologies Installed*



<http://www.asihome.com/images/sn-cm9r.jpg>

***LighTec, Inc.***

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

# Lighting Project Savings Summary: New England College

Annual Cost Savings: **\$13,538**

Annual kWh Savings: **90,256**

CO<sub>2</sub> Avoided: **44.5 metric tons**. Equivalent to:

- Carbon absorbed by **1,141** tree seedlings grown for 10 years
- Removing emissions from **8** cars and **4,988** gallons of gasoline consumed
- Removing **15** tons of trash from the landfill



# *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)

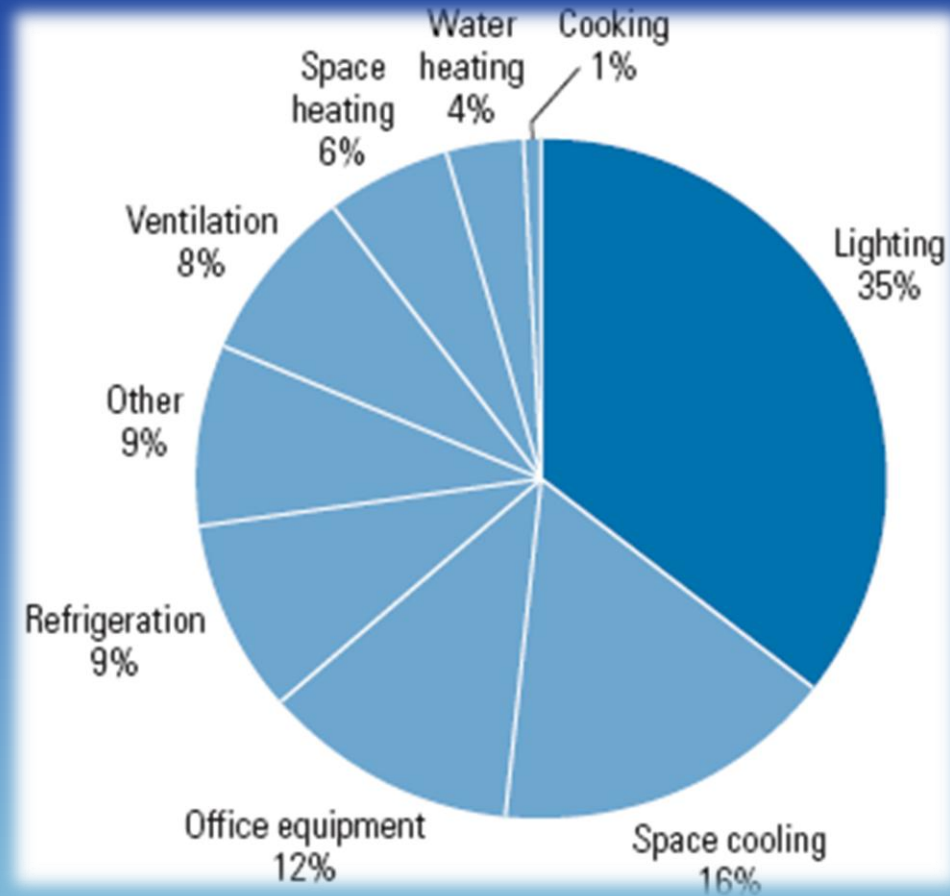


***LighTec, Inc.***

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

# *Why Focus on Lighting: An Energy Perspective*

Lighting Share of  
Commercial Building  
Electricity Use



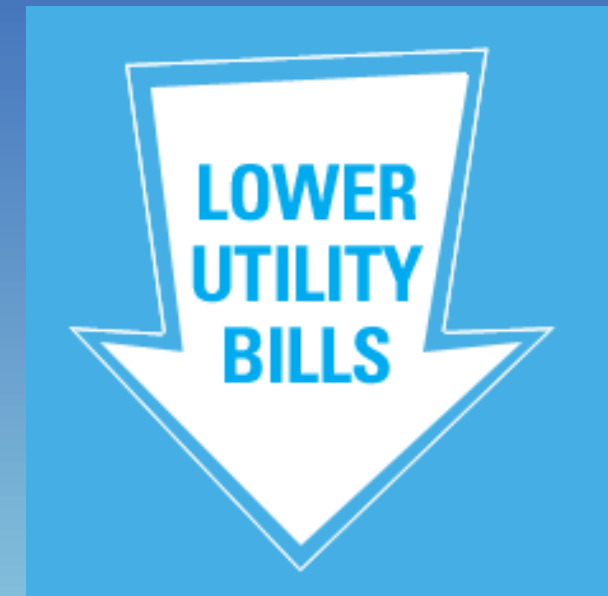
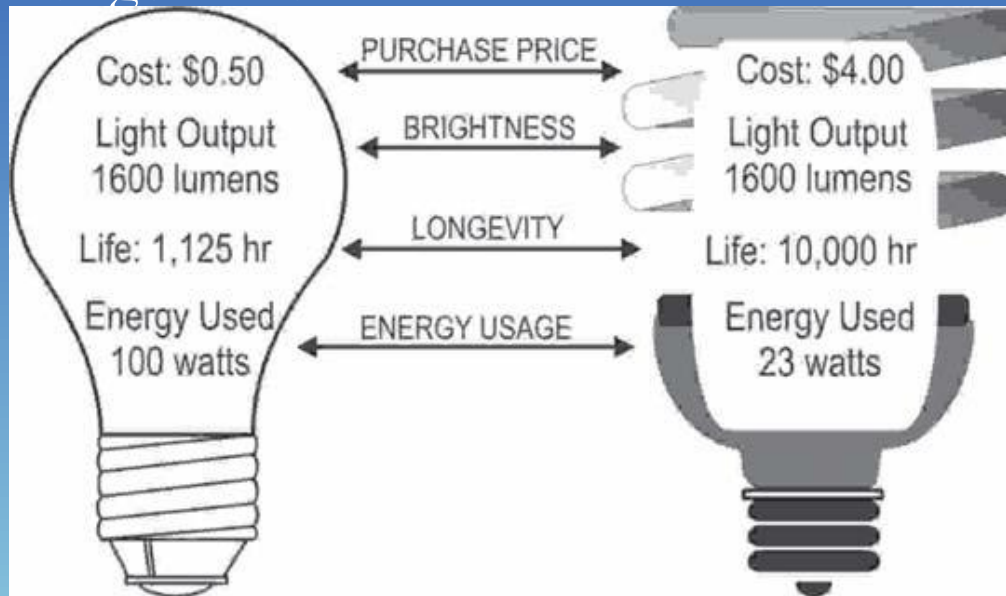
Source: ENERGY STAR Building Manual, 2006. Adapted from E source; data from 2005 Buildings Energy Data Book

***LighTec, Inc.***

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

# *Why Focus on Lighting? An Energy Perspective*

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

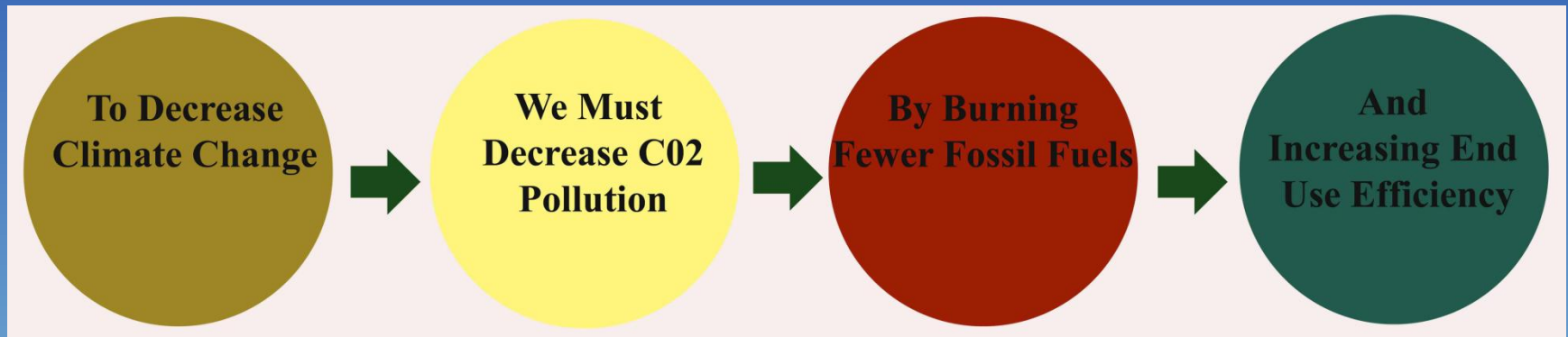


***LighTec, Inc.***

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

# *Why Focus on Lighting An Environmental Perspective*

- Reduce Carbon Emissions



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

***LighTec, Inc.***

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

# *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)= a measure of the visible output of light relative to the energy output.

***LighTec, Inc.***

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

# *What is Light*

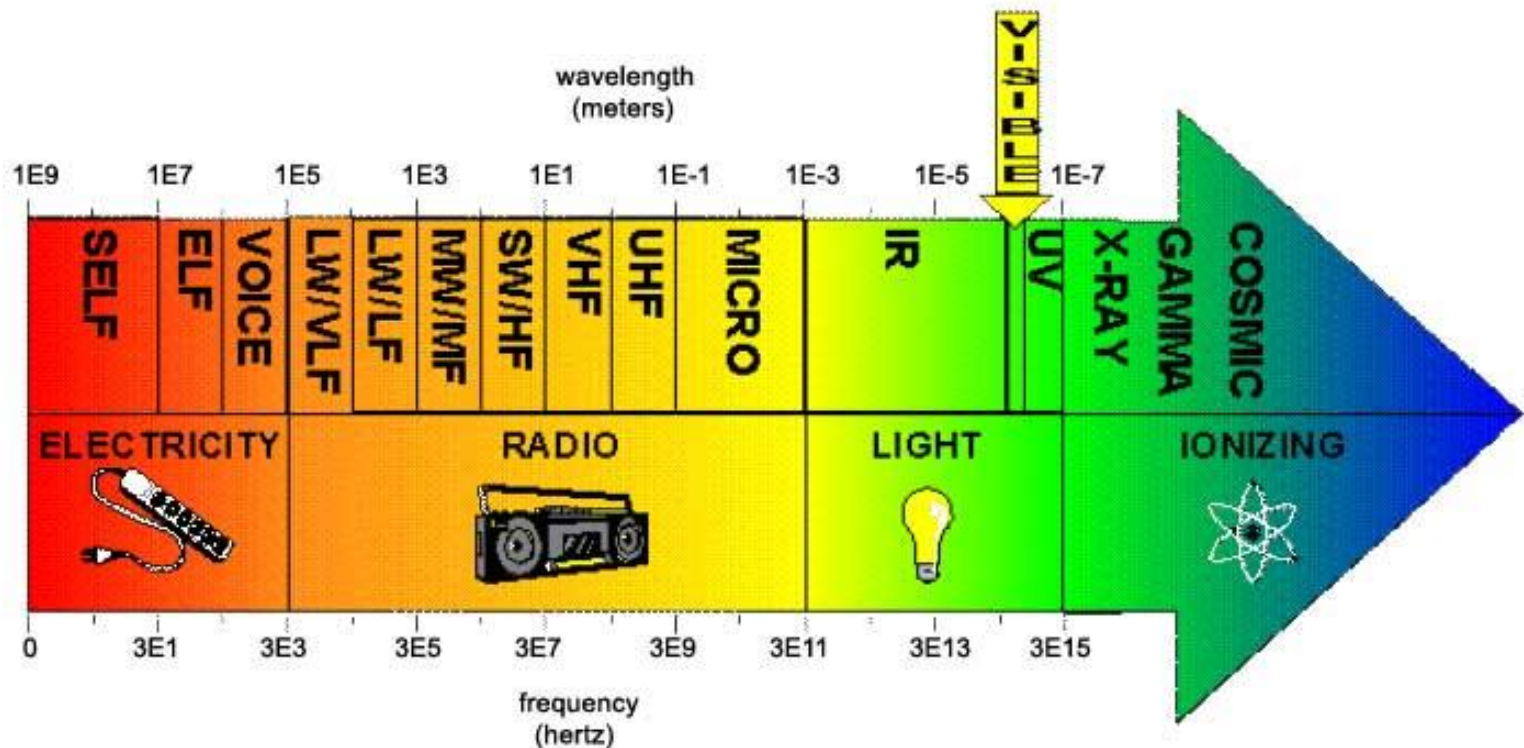
- Light is part of the electromagnetic spectrum.
- Humans “see” light in the visible range of the electromagnetic spectrum. The center of the visible spectrum consists of light waves with a wavelength of 500nm.
- A nano-meter is 1 millionth of a meter.
- Above the visible is ultra-violet (UV).
- Below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

***LighTec, Inc.***

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

# *Electromagnetic Spectrum*

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



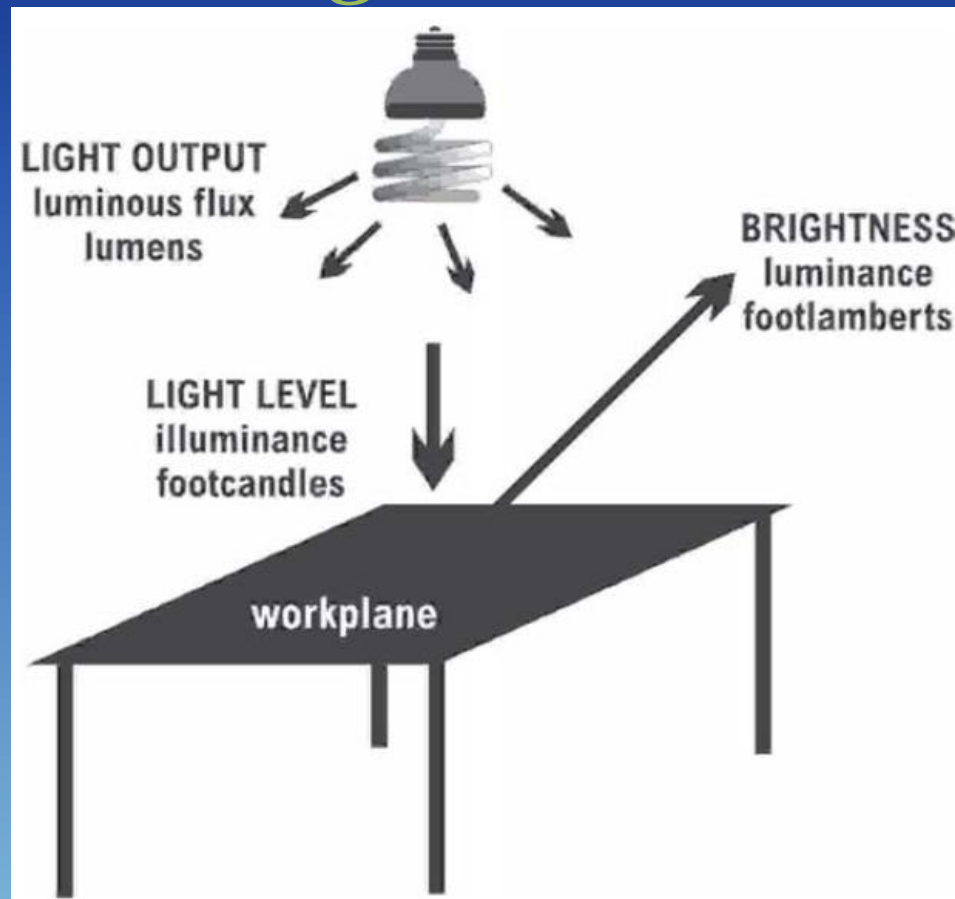
# *Color and Light*

- 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.

***LighTec, Inc.***

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

# *How Light is Measured*



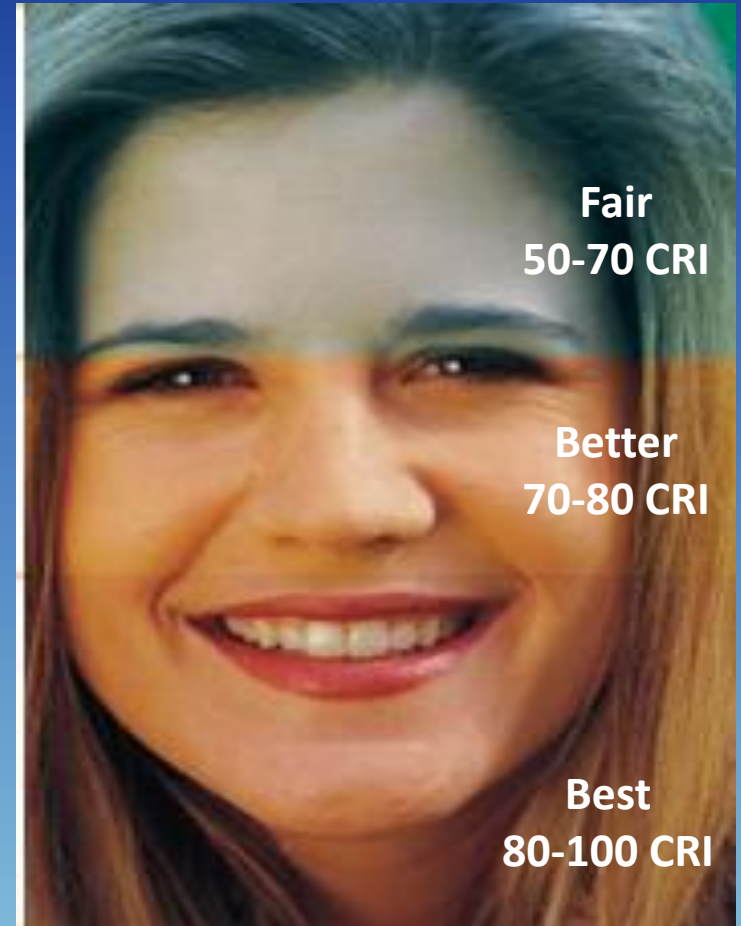
Source: The NEED Project, *Saving Energy School Energy Survey Student Guide*, p.16, 2008-2009.

***LighTec, Inc.***

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

# *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.



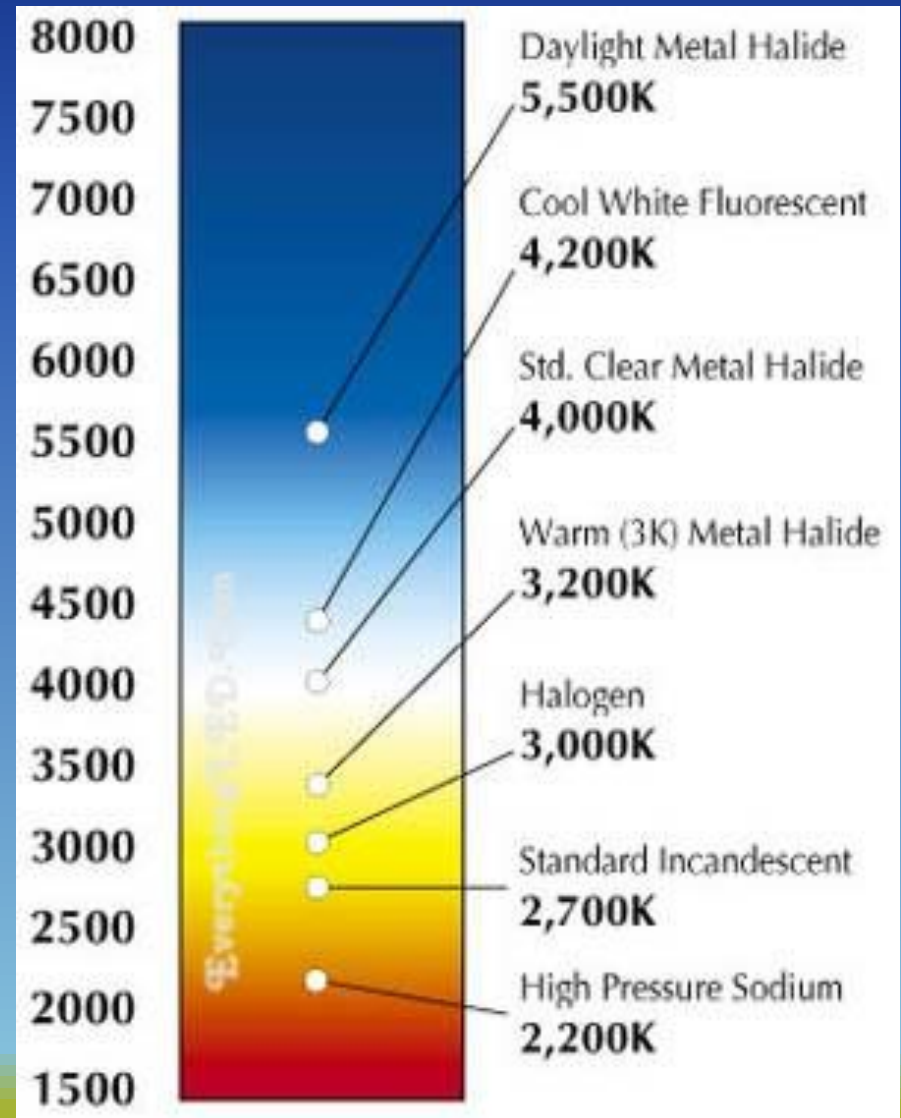
Source: [http://www.energystar.gov/index.cfm?c=fixture\\_guide.pr\\_fixtures\\_guide\\_lightquality](http://www.energystar.gov/index.cfm?c=fixture_guide.pr_fixtures_guide_lightquality)

***LighTec, Inc.***

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

# 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

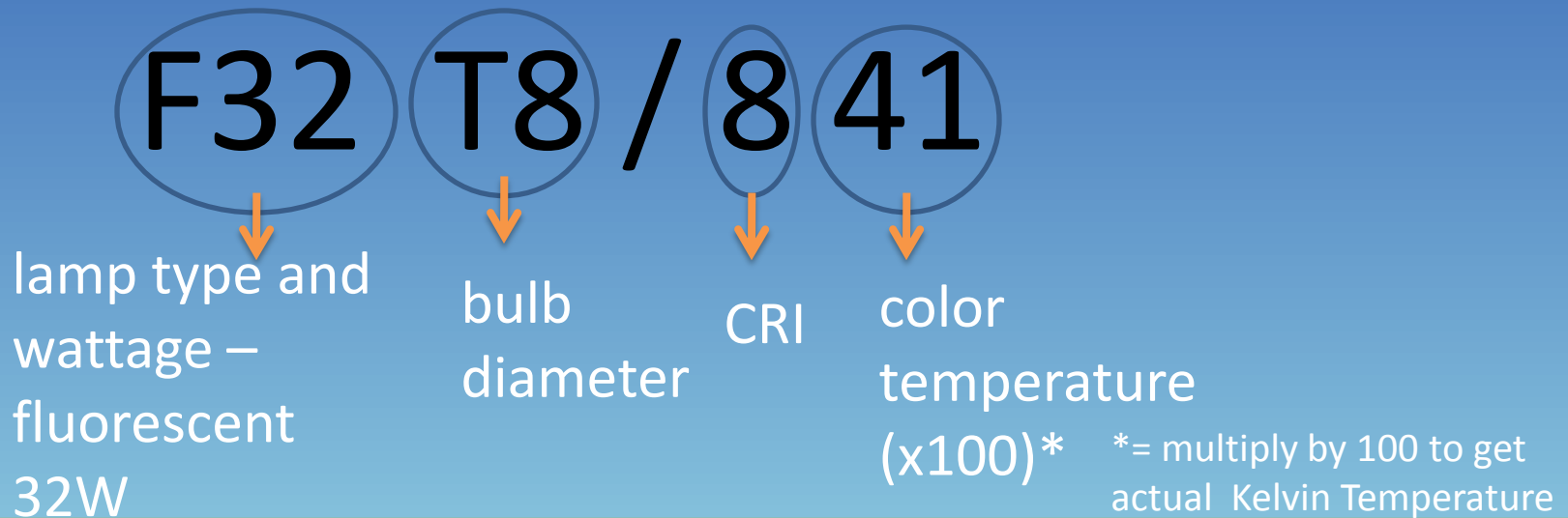


***LighTec, Inc.***

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

# Lamp 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.



**LighTec, Inc.**

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

# *The Facts about CFLs and Mercury*

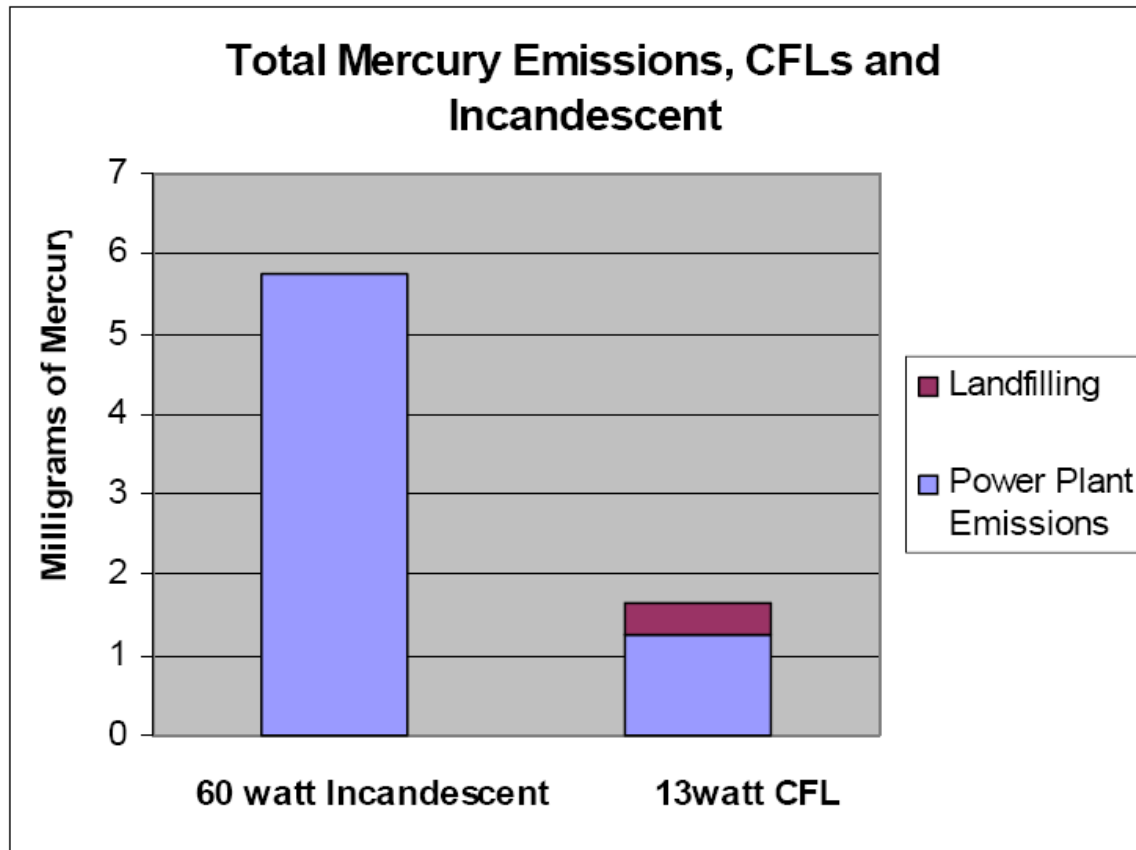
- Because CFLs use less electricity than traditional light bulbs, they reduce demand for electricity; that reduction means less mercury is emitted from power plants.
- CFLs contain a very small amount of mercury — an average of 4 milligrams in each bulb.
- No mercury is released when the bulbs are intact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

***LighTec, Inc.***

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

# 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)

***LighTec, Inc.***

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

# *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>

***LighTec, Inc.***

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

# *Saving Energy Helps Protect the Environment*



## **FACT:**

If every American home replaced just one light bulb with an ENERGY STAR bulb, we would save enough energy to light more than 3 million homes for a year, more than \$600 million in annual energy costs, and prevent greenhouse gases equivalent to the emissions from more than 800,000 vehicles.

***LighTec, Inc.***

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

# *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)

***LighTec, Inc.***

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