Light Bulb Efficiency Battle: Dollars and "Sense"

Part 1: Energy and Cost in $ and CO_2

Look around your home for an incandescent and LED light bulb in their packaging or use these images: **Incandescent** and **LED**. Fill in the table below.

How many Watts of electricity does each light bulb draw? (column B)

1. **Calculate Energy usage**
   a. Calculate the kilowatts for each of your light bulbs (C), estimate the average amount of time a person uses a light in your household (D and/ or E). Convert minutes (D) to hours (E) if needed.
   b. Calculate the electrical energy use in kilowatt hours (kWh) by multiplying the bulb's kilowatts by the hours used (F).
2. **Calculate the Cost in $**
   a. Calculate (column G) the cost in $ for the daily use of your bulb if 1 kWh = $0.17 (on average).
3. **Calculate the "Cost" in CO_2 Emissions**
   a. For each .07 kWh of electrical usage, there is enough CO_2 released to fill a 12" diameter party balloon. Calculate the number of balloons worth of emissions released per light bulb's use daily (column H). (.07kWh = 1 balloon)

Helpful Conversions:
1 kilowatt = 1000 watts
60 minutes = 1 hour
(kilowatt) x (hour) = kilowatt hours (kWh)
1 kWh = $0.17 on average
1 kWh = 14 balloons CO_2 or .07 kWh = 1 balloon CO_2

Data Table 1: Energy and Daily Cost in $ and CO_2

A Appliance	B Watts	C Kilowatts	D Daily Time (Minutes)	E Daily Time (Hours)	F Kilowatt hours (C x E)	G Electricity Cost per Day (F x $0.17)	H # Balloons of CO_2/day (F x 14) or (F divided by 0.07)
Incandescent bulb							
LED bulb							
EXAMPLE:							
CFL bulb	*14w*	*.014 kW*	*360 mins*	*6 hrs*	*0.084 kWh*	*$0.01*	*0.16*

**For a visual of this data, check out this slide in present mode.*

Part 2: A Better Deal

1. The cost you calculated shows how much you'd be spending and how much CO_2 (approximately) is released per DAY, but **there's more to the cost than just the electricity. You have to buy the bulbs, and some last longer than others!** Let's figure out which bulb is a better deal including those factors.

    b. Do some fast online "shopping" to find an average cost of an Incandescent and then an LED bulb that releases about 1000-1100 lumens (lumens are a measure of light output).

    c. Use this price to complete the table below.

Data Table 2: Long-term Cost Using Data from Part 1

Type of Bulb	I Average Purchase Price	J Expected Lifetime (hrs) -Look on Box	K # of years bulb should last if used each day for the number of hours you chose? (J / E) / 365 days)	L Purchase price per year of operation (I /K)	M Yearly Cost of Electricity per Bulb (Gx365 days)	N Total cost per year, for purchase and operation (L+M)	O # of Balloons of CO_2 per year (Hx365 days)
Incandescent							
LED							
EXAMPLE:							
CFL Bulb (used 6hrs/day)	*$2*	*8,000 hrs*	*3.65 years*	*$0.55*	*$3.65*	*$4.20*	*58.4*

Part 3: Payback Period and Return on Investment

1. **PAYBACK PERIOD**

What is the difference in price between the incandescent and the LED? Can you make up for that in electricity savings? If so, how many days would you have to operate the LED to make up the difference? This is called the "payback period."

- What is the price difference between the two bulbs?
- Use column G from the Part One Data Table to help calculate the payback period.

  Difference in purchase price / Difference in price per day of operation (G1-G2= $_____) = ____ day payback period

What is your payback period for purchasing an LED bulb in days?

2. **RETURN ON INVESTMENT (ROI)**

Your "return on investment," or "ROI" is how much you've made (or saved) compared to how much extra you spent on your initial purchase, after a certain period of time. Earnings (or savings)/ the extra initial cost = ROI.

- Use the **Difference in purchase price** you calculated in for the Payback period
- Use Column N from the Part Two Data Table to calculate savings.

  Difference in total cost per year (N1-N2= $_____ total savings) / (Difference in purchase price)= _____ROI

What is your ROI? In other words, how many times would you make back your initial investment, in a year, if you choose an LED instead of an incandescent bulb? _____
(To calculate your ROI as a percentage, multiply ROI x 100= _____ % ROI)

3. **YOUR PERSONAL SAVINGS**

Count up the number of lights in your house that are incandescent vs. LED.
Based on your ROI and Payback calculations, how much could you save per year if you switched to the more efficient lights in your house?

Formula: (Savings per year of using 1 more efficient lightbulb_____) x (# of inefficient lights in your house)= Total household cost savings expected from switching out light bulbs.

Optional extension:

Battle of the Bulbs

Watch this video to see another example of the differences between Incandescent and LED bulbs. We attached each bulb type to a bicycle generator, and had two volunteers pedal to light up the bulbs. Watch to see the difference in how much energy each volunteer had to use.

Part 4: Take Action

What would you recommend to your family to reduce the environmental impacts of lighting use in your home? What is most cost effective (both in $ and CO_2)? What is your reasoning for these recommendations?

Extend Your Reach

- Share your lighting recommendations on our social media!
    - facebook.com/NHenergyed or facebook.com/VTEnergyEducation
    - instagram.com/vtenergyed or instagram.com/nhenergyed

- In NH, check out our NHSaves Education Challenge: a literacy challenge where you can create and submit individual or group projects with a written component answering questions about energy and energy efficiency. Prizes for winners!
    - www.nheep.org/nhsaves-education-challenge

For next steps and ideas on how to take action to reduce emissions from electricity in your school, community, or state, check out our website.
Vermont: https://veep.org/poster-2020
New Hampshire: https://nheep.org/poster-2020-21

For more information on how to reduce electricity use and costs in your home, check out Efficiency Vermont or NHSaves.