Lighting and Appliances

Funding

Funding for this class was provided by the Alaska Housing Finance Corporation (AHFC).

This course is designed to empower homeowners with the knowledge to live in and maintain a safe, energy efficient home.

Disclaimer

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No Continuing Education Units (CEUs) will be offered by Alaska Housing Finance Corporation for this class. Refer to the presenting organization for CEU opportunity.

All photos are property of AHFC unless otherwise noted.

Topics for today:

- AHFC programs
- Energy use in AK
- Phantom loads
- Lighting options
- Appliances

AHFC Energy Efficiency Programs:

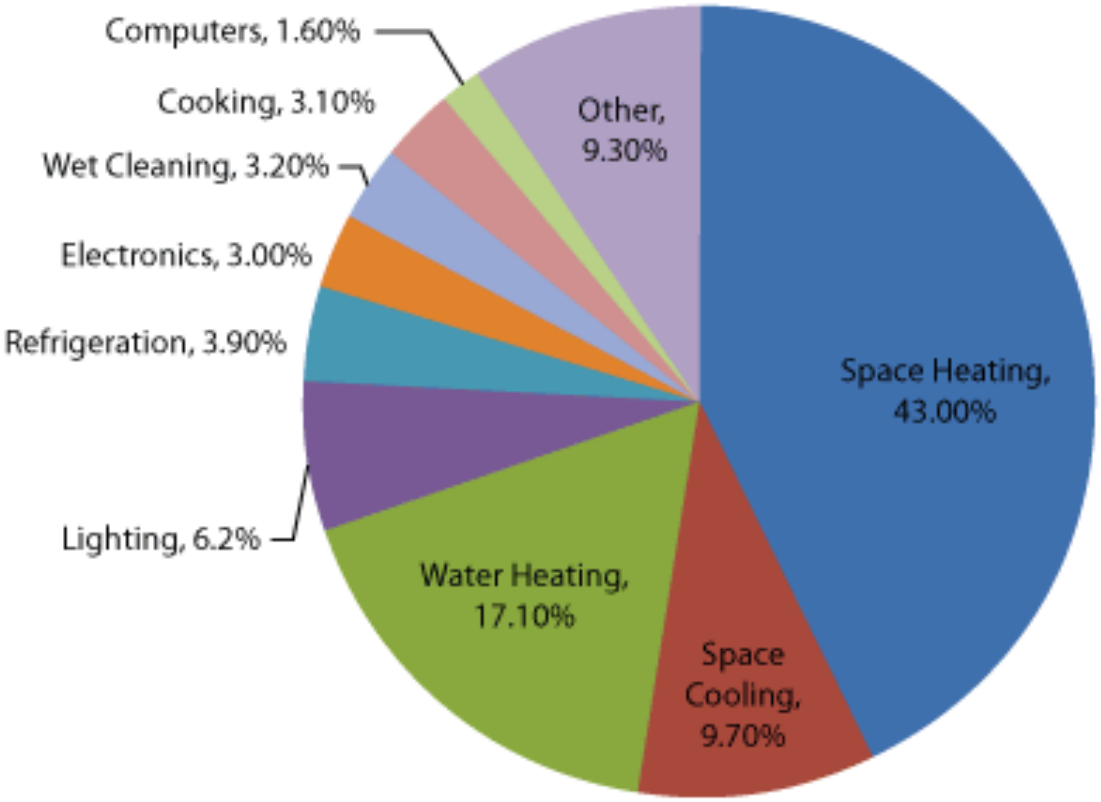
- Home Energy Rebate Program
- Weatherization Assistance Program
- New Home Rebate
- Second Mortgage for Energy Conservation
- Energy Efficiency Rate Reduction Mortgage
- www.ahfc.us

Energy Use – Lighting and Appliances

- 10 – 50% of home energy use (US Average)
- 12 – 17% (AK)

- Depends on
  - Efficiency of building shell
  - Utility rates
  - Behavior
  - Climate
  - Design

How We Use Energy in Our Homes (% of Energy Consumption)



Source: 2010 Buildings Energy Data Book, Table 2.1.6 www.energy.gov

Measuring Use

WHERE DOES YOUR MONEY GO?

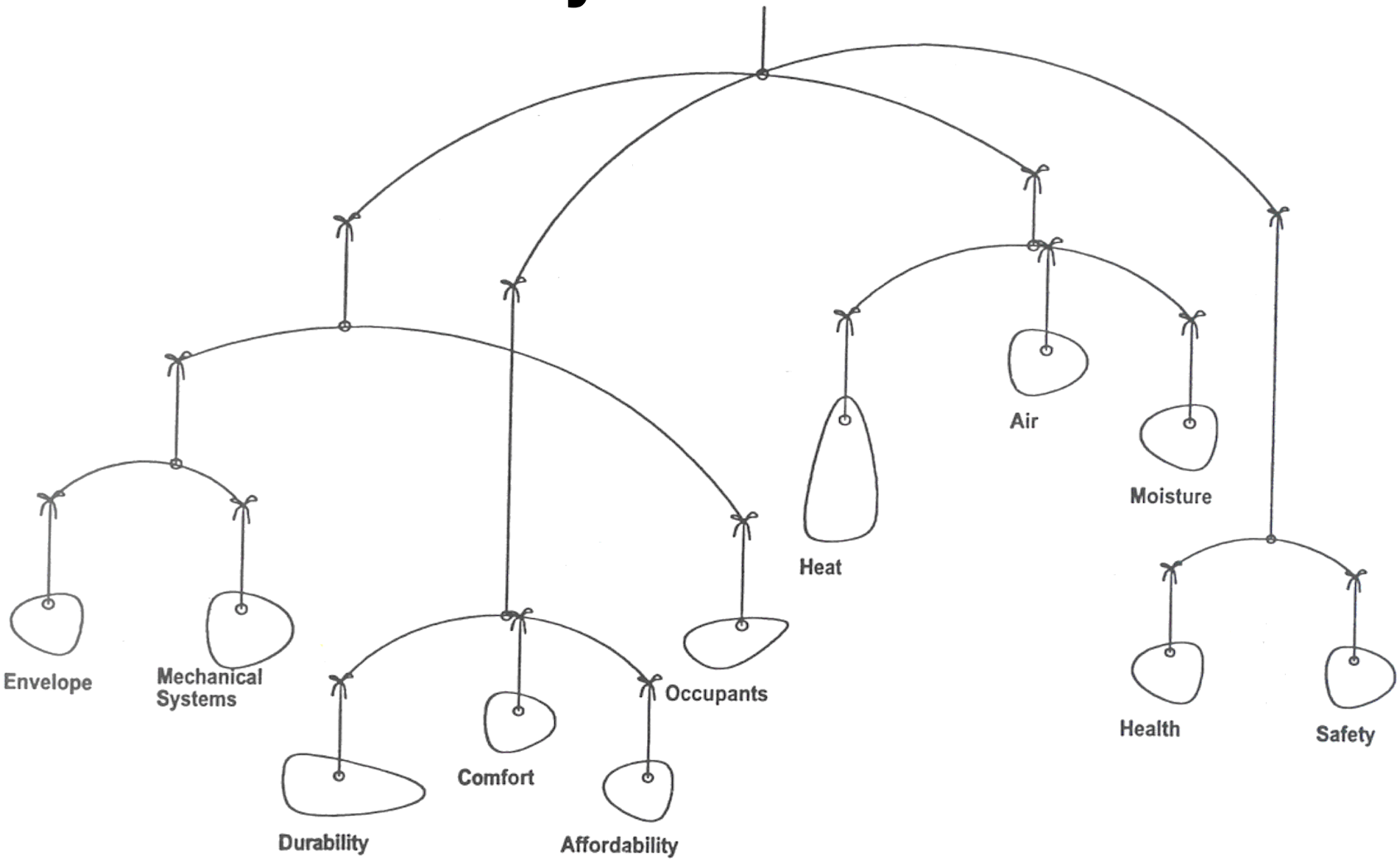
Energy bills don't come itemized showing you which appliances and systems use the most energy.

ALASKA HOUSEHOLD ENERGY COSTS %

Southeast		Interior	
Space Heating	69%	Space Heating	77%
Water Heating	14%	Water Heating	11%
Appliances	17%	Appliances	12%
South Central		**Western**	
Space Heating	73%	Space Heating	73%
Water Heating	14%	Water Heating	10%
Appliances	13%	Appliances	17%

*Statistics used on this page are from Alaska Housing Finance Corporation's 2013 Housing Needs Assessment

The house is a system



Energy and Power

- Energy
  - Measurable amount of work, heat, light
  - Converted from 1 form to another
  - Btu (heat), kilowatt-hour (electricity)

- Power
  - Energy divided by time
  - Btu/hour (heating), kilowatt (electricity)

For Lighting and Appliances

- Mostly interested in electricity
  - Energy
    - Kilowatt-hours
  - Power
    - Kilowatts

Electrical Rates (in Kwh)

- Bethel ~ $0.45
- Kotzebue ~ $0.48
- Nome ~ $0.36
- Unalaska ~ $0.39
- Anchorage ~ $0.13
- Fairbanks ~ $0.20
- Ketchikan ~ $0.10

Measuring Use

- Meters
  - Individual appliances
  - Energy, Power
- Utility Bills
  - Household
  - Energy

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Electric Bill

Previous Read Date	Current Read Date	Days of Service	Bill Date	Read Type
12-10-2013	01-10-2014	31	01-14-2014	Actual Read
Previous Read	**Current Read**	**Total kWh Usage**	**Due Date**	**Amount Due**
9347	9628	281	02-10-2014	$47.36

Description of Charges

Previous Balance		59.58
Payment 01/06/2014 - Thank You		-59.58
Balance Forward		0.00
Customer Charge		8.00
Energy	218 x 0.08472	18.90
Energy	63 x 0.09432	5.51
Fuel	281 x 0.03807	10.70
Regulatory Cost Charge	281 x 0.000578	0.17
FIW Renewable Energy Adj.*	281 x 0.00239	0.67
Purchased Power	281 x 0.00881	2.48
2% Underground Charge		0.93
Total New Electric Charges:		47.36
Total Balance		**47.36**

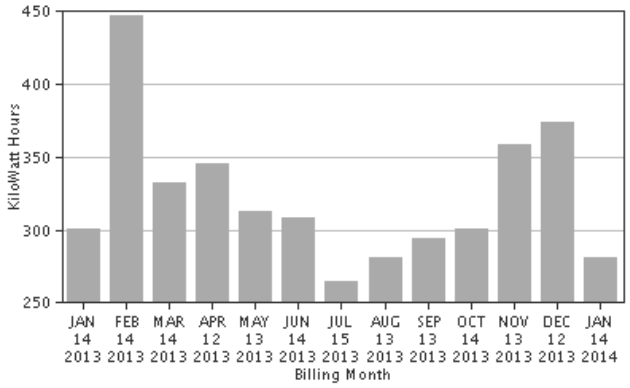
Member Corner

* Represents the cost difference of Fire Island renewable wind power compared to other generation. For more information visit www.chugachelectric.com.

Trying to find ways to lower your electric bill? MyPower can help. Join the thousands that have already started to save. Go to www.chugachelectric.com for more info.

The Regulatory Commission approved Demand and Energy rate increases in January. New Fuel, Purch. Power and FIW Renewable Energy Adj. rates also went into effect in Jan.

Your Usage



Chugach Electric

Are your appliances really OFF?

- Phantom loads
  - Some electronic appliances use energy when they are turned off
  - Can be significant, especially if long-term and consistent

This appliance was “OFF”

Energy Use Watts:

- Coffee maker = 900–1200
- Clothes washer = 350–500
- Clothes dryer = 1800–5000
- Dishwasher = 1200–2400 (using the drying feature greatly increases energy consumption)
- Ceiling Fan = 65-175
- Furnace Fan = 750
- Hair Dryer = 1200-1875
- Heater (*portable*) = 750–1500
- Clothes iron = 1000–1800
- Microwave oven = 750–1100
- CPU + Monitor – awake = 270
  asleep = 60 or less Laptop = 50
- Refrigerator (*frost-free, 16 cf*) = 725
- TV (*color*) 53" - 61"
  - Projection = 170
  - Flat screen = 120
- Toaster = 800–1400
- Water heater (*40 gallon*) = 4500–5500
- Water pump (*deep well*) = 250–1100

Lighting

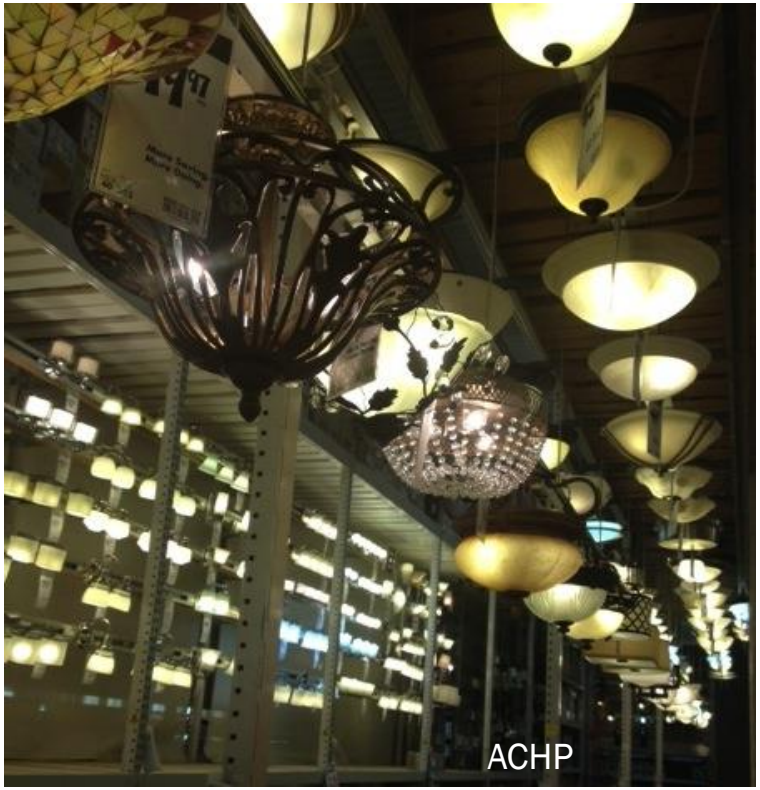
DOE

Replacing your 5 most frequently used bulbs or fixtures with Energy Star-rated bulbs can save $75/year

www.energystar.gov

Average home has 30 light fixtures. Changing to Energy Star-rated bulbs can save $400/year

www.energystar.gov



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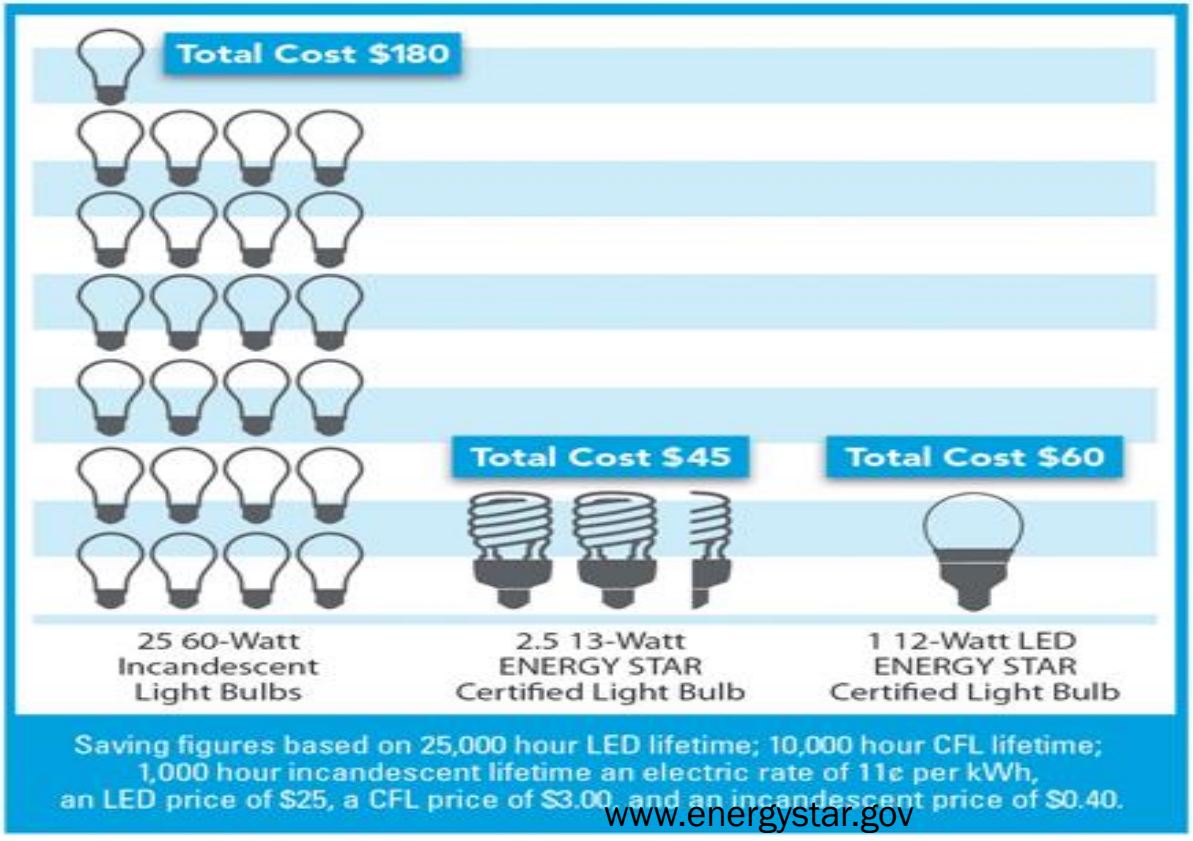
Lifetime Savings

ENERGY STAR® certified bulbs use 75% less energy than incandescent bulbs, last 10 to 25 times longer, and save you $40 to $135 in energy bills over their lifetime.



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Save $8 Billion!!

13W ENERGY STAR certified CFL

Brightness	Estimated Energy Cost
800 lumens	$1.57 Per year

12.5W ENERGY STAR certified LED bulb

Brightness	Estimated Energy Cost
800 lumens	$1.50 Per year

43W Incandescent halogen

Brightness	Estimated Energy Cost
800 lumens	$5.18 Per year

60W Incandescent

Brightness	Estimated Energy Cost
800 lumens	$7.32 Per year

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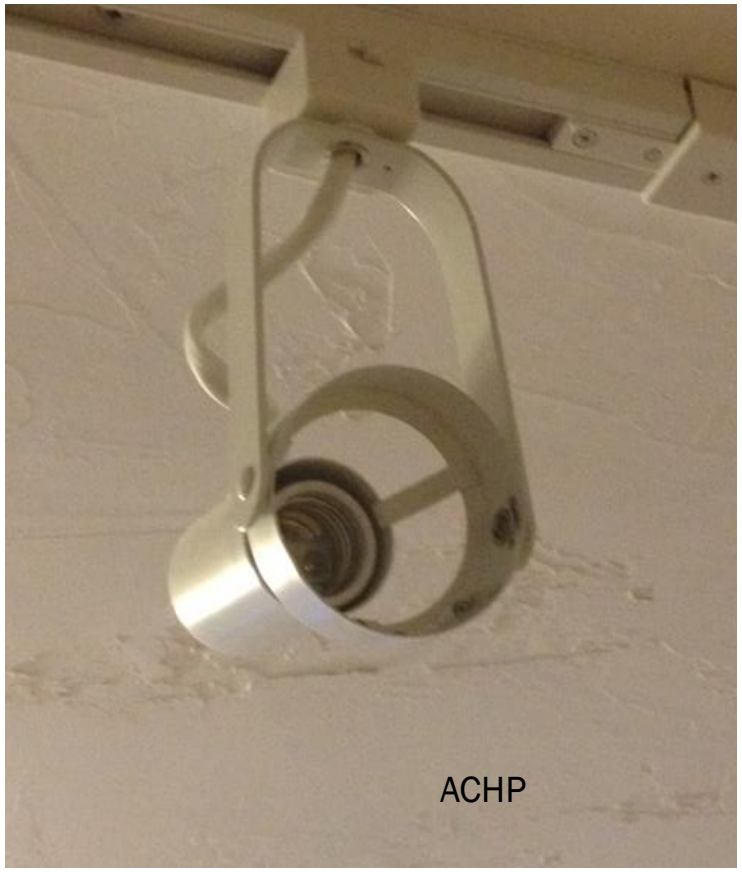
Energy Star-qualified bulbs are 75% more efficient than traditional bulbs

Lighting Terminology - Hardware

Fixture



Lamp

Lighting Terminology - Function

- Power
- Output
- Illumination
- Efficacy (Efficiency)
- Color Rendering
- Light Color/Color Temperature
- Light Quality

Lighting – Power and Energy

- Power – In watts or kilowatts
  - Ex. 100W bulb

- Energy – In watt-hours or kilowatt-hours
  - Ex. 100W bulb operating for 1 hour = 100Whr

Output and Illumination

- Output - Lumen
  - Ex. 100W incandescent ~ 1750 lumens

- Illumination
  - Foot-candle (FC)
    - 1 lumen spread over 1 sq foot surface

Output and Illumination – How much?

- Safety
  - 5 – 20 FC
- Office work
  - 30 – 50 FC
- Difficult tasks
  - 200 – 500 FC

Measuring Output and Illumination

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Efficacy (Efficiency, really)

- Lumens/watt
  - Incandescent ~ 10 - 23
  - Florescent (CFL) ~ 50 – 70
  - Florescent (straight tube) ~ 30 - 110
  - LED ~ 30 - 90

Color Rendering Index (CRI)

- Ability of light to let us see “true” color
  - CRI = 0 - 100

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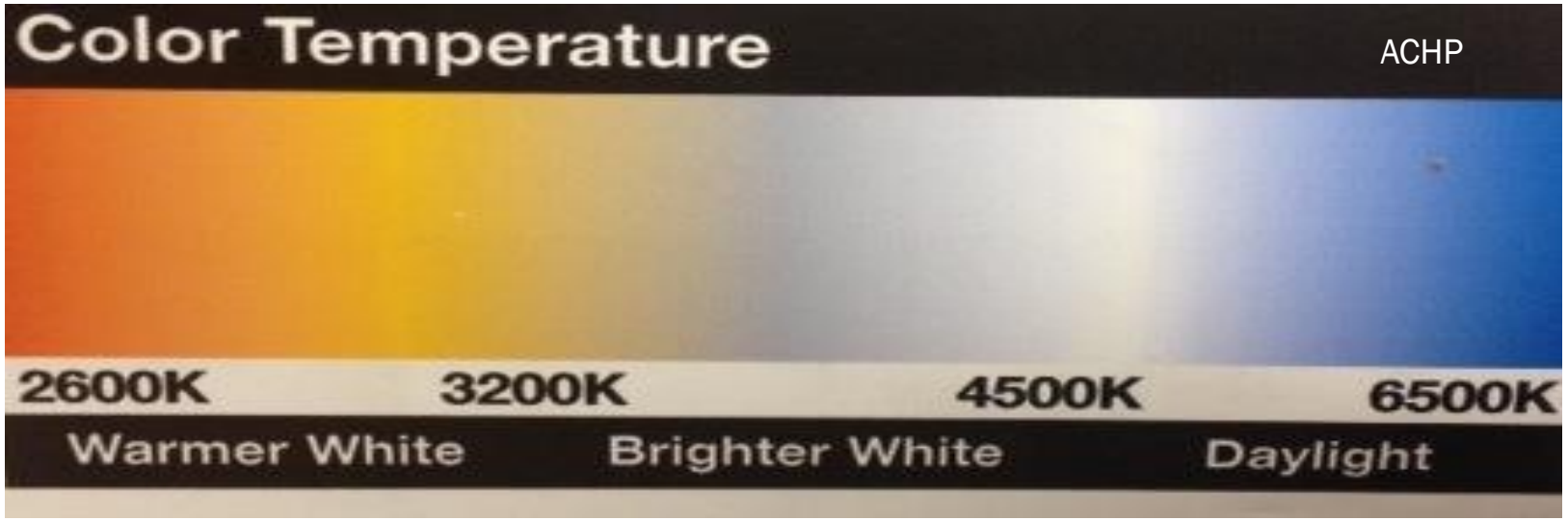
Color Rendering Index (CRI)

Lighting Type	CRI
Incandescent	95-100
Standard Fluorescent	52-62
CFL/T-8 Fluorescent	81-90
LED	75-85

Light Color/Color Temperature

- Measured in Kelvins (K)
  - Lower K = yellow (like incandescent light)
  - Higher K = white/blue



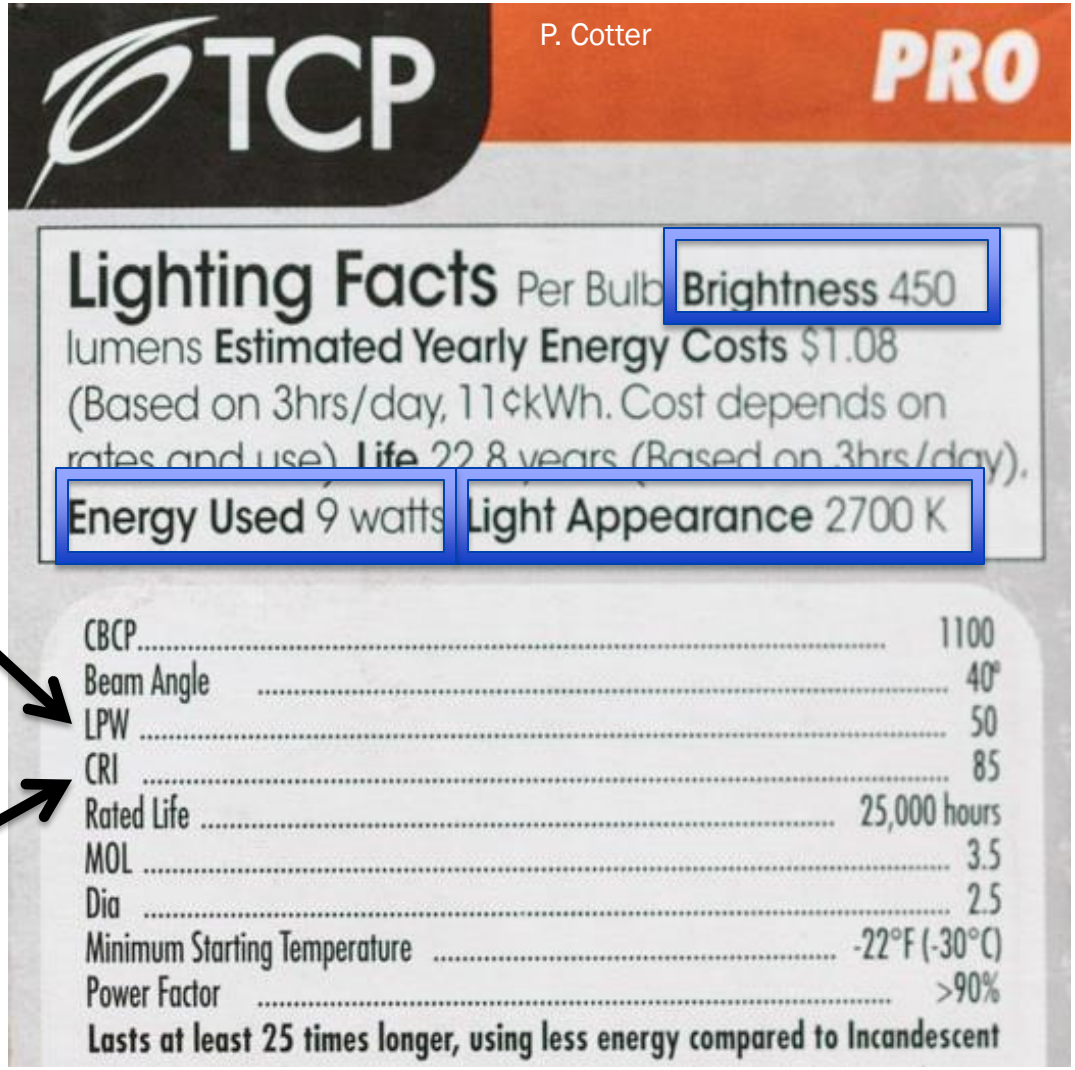
Light Color/Color Temperature

Energy Star

Bulb Data

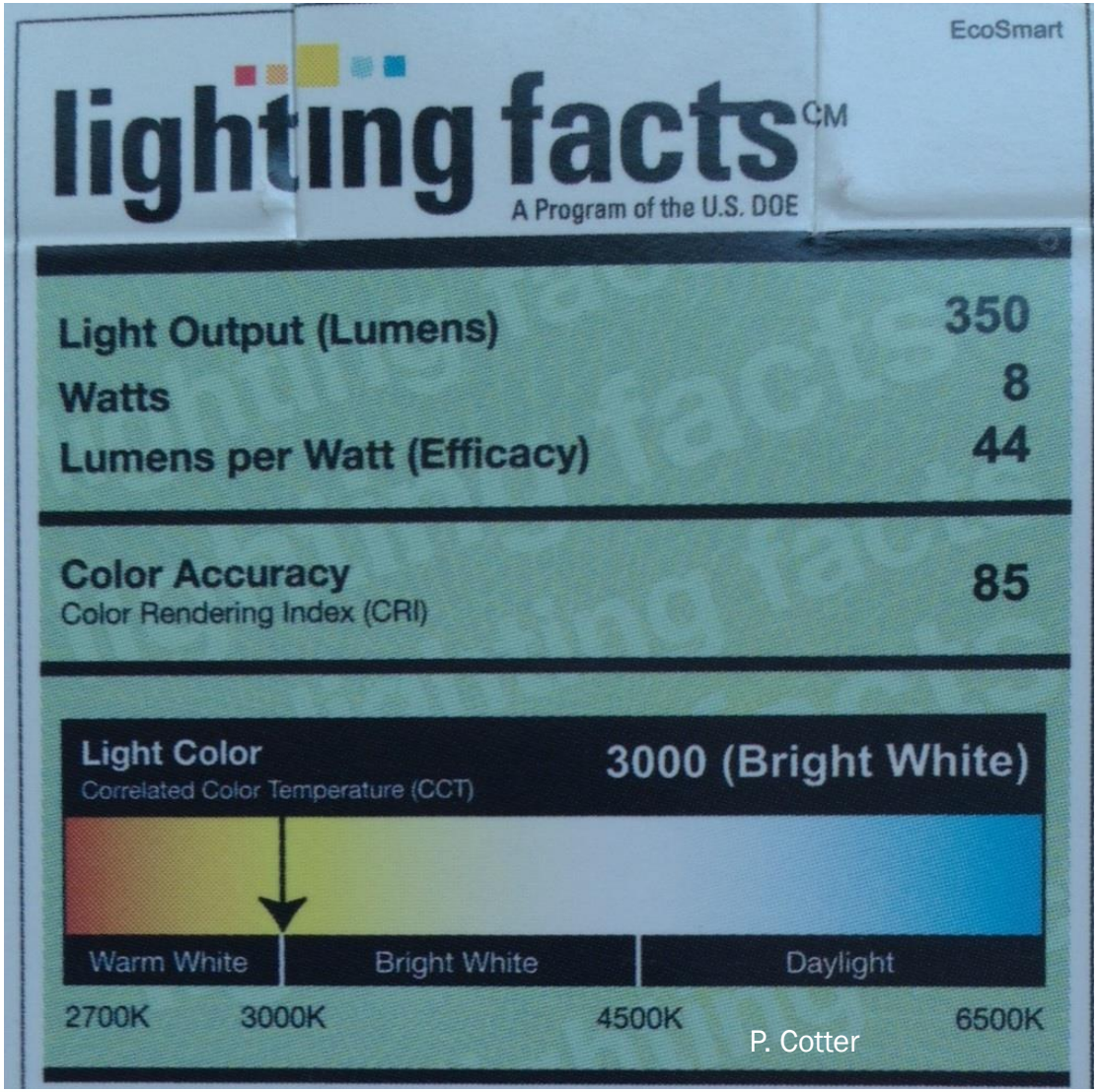
Efficacy (lumens/watt)

Color rendering index



Bulb Data

This format is more common for retail sales to consumers



Lighting Uses

- Ambient Lighting
  - Safety and security
- Task Lighting
  - For the work area, not beyond
- Accent Lighting
  - Visual comfort
  - Illuminate walls – less contrast with ceilings/windows

Lighting – Bulb Types

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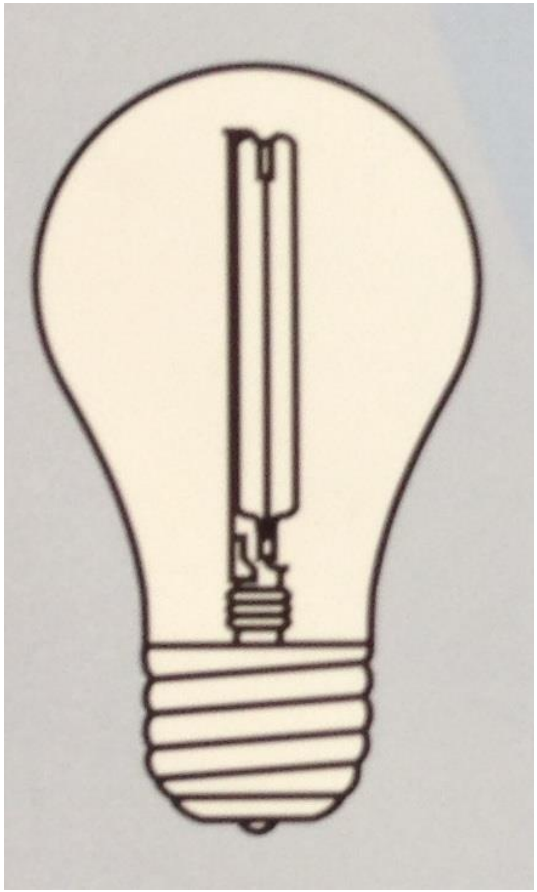
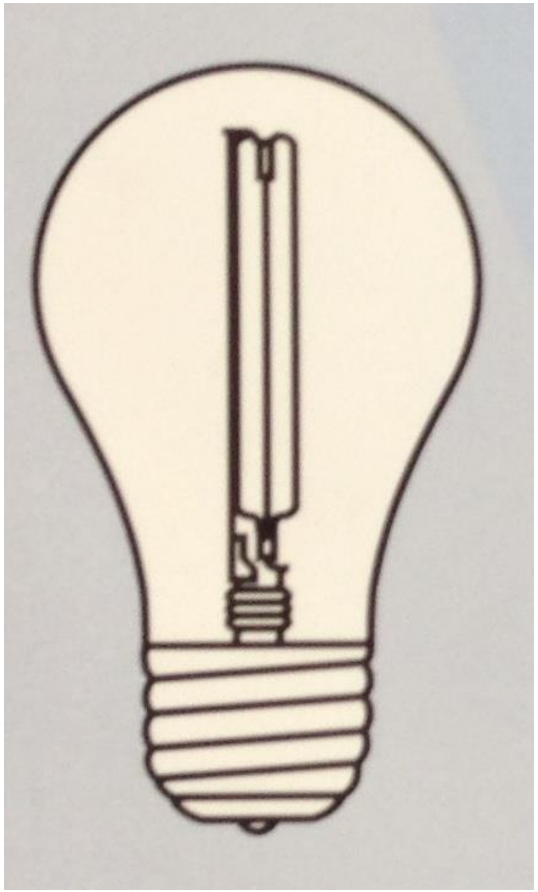
Incandescent - Filament

- Advantages
  - Cheap to purchase
  - Easy
  - Known light quality
  - Known light color



Incandescent - Filament



- Disadvantages
  - Inefficient
  - Low durability
  - Short lifespan

Fluorescent – Excitable Electrons

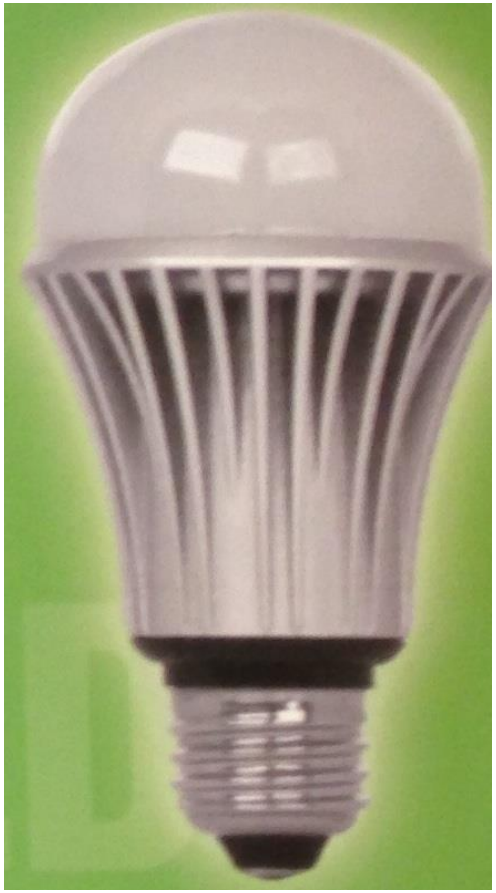
- Advantages
  - Long life
  - Efficient
  - Known light quality
  - Availability

Fluorescent – Excitable Electrons

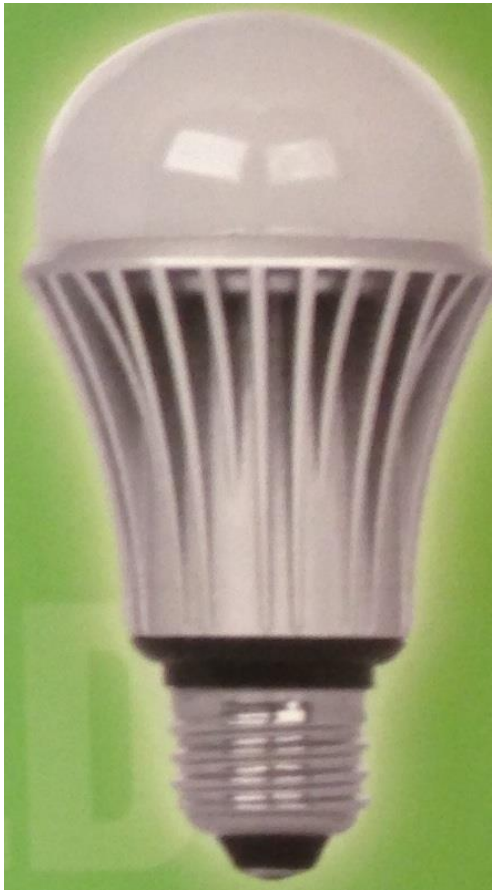
- Disadvantages
  - Light quality
  - Disposal
  - Higher initial cost
  - Poor cold start

Light Emitting Diode - LED

- Advantages
  - Long life
  - Efficient
  - Color options
  - Low temperature performance

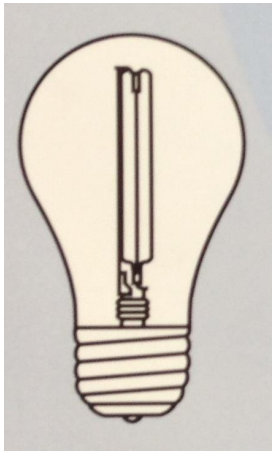


Light Emitting Diode - LED

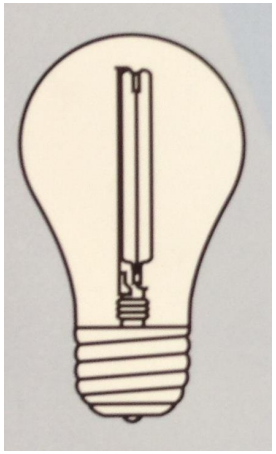


- Disadvantages
  - Higher initial price
  - Requires education
  - Availability
  - Light quality variability

Important lighting equation 1

1  = 10 

Important lighting equation 2

1  = 25 

Controls

- On/Off
- Timers
- Dimmers – match with bulb type
- Occupancy/Vacancy sensors
- Motion Sensors
- Photosensors

Lighting – Controls

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Manual Timers

Programmable Timers

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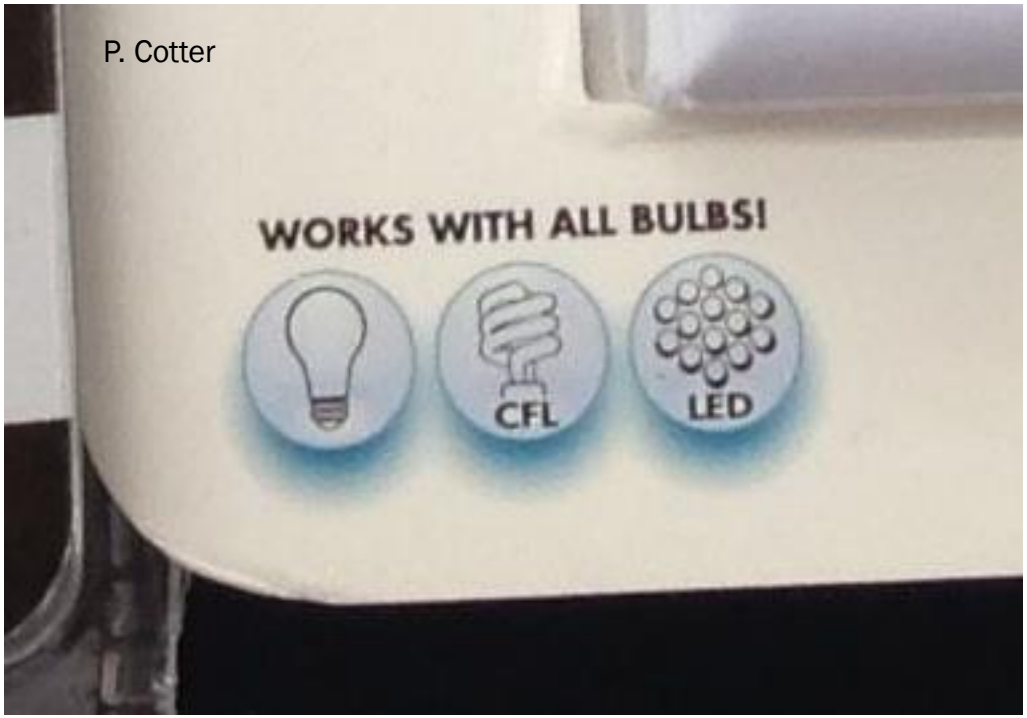
Not all controls work with all bulbs



Look for this or similar icon.

Or buy a control specifically made for your bulb type

Appliances


Appliance
LIFE'S GOOD
LOWE'S
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Most newer appliances are more efficient

- More insulation
- Pump/compressor efficiency
- Fan efficiency
- “Sleep” modes

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Energy Star-rated appliances

- Save Energy
- Save Money
- Are easy to find
  - Look for the sticker

Energy Star-rated appliances

- Ventilation Fans
- Dishwashers
- Clothes washers
- Freezers
- Refrigerators
- Computers
- Electronics
- Others

Look for the Sticker!

Refrigerator/Freezer Maintenance

- Vacuum the coils
  - Pull away from wall/remove bottom panel
  - Use hose to vacuum around coils
  - Repeat every six months

Freezer maintenance

- Defrost
- Keep it full
- Locate in cool area

Furnace

- Professional Service
- Change filters

Water heater

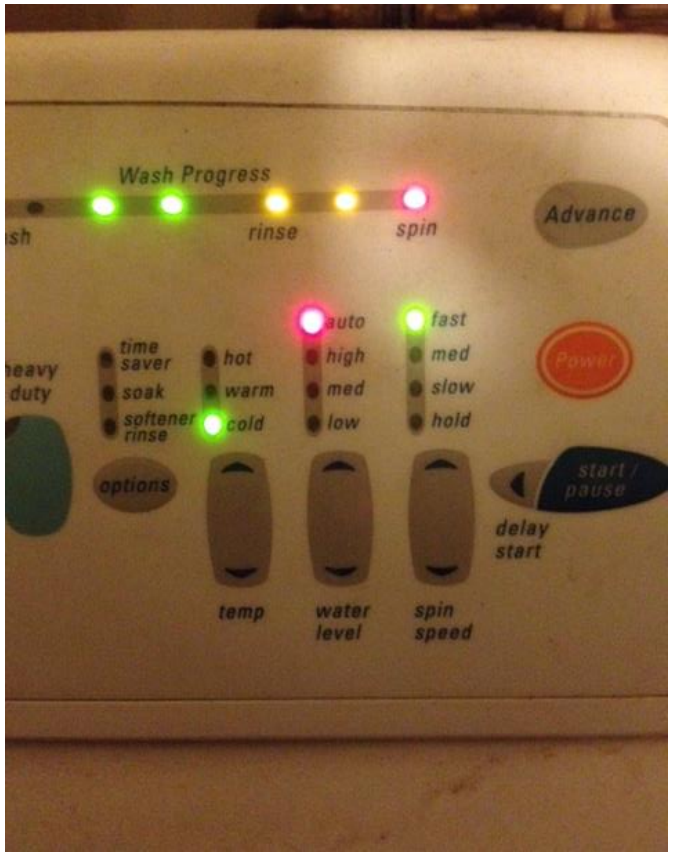
- Install blanket
- Turn down

Dryer

- Empty lint screen

Washing Machine

- Cold water
- Cold water detergent



Dishwasher

- “Eco” setting
- No heat dry

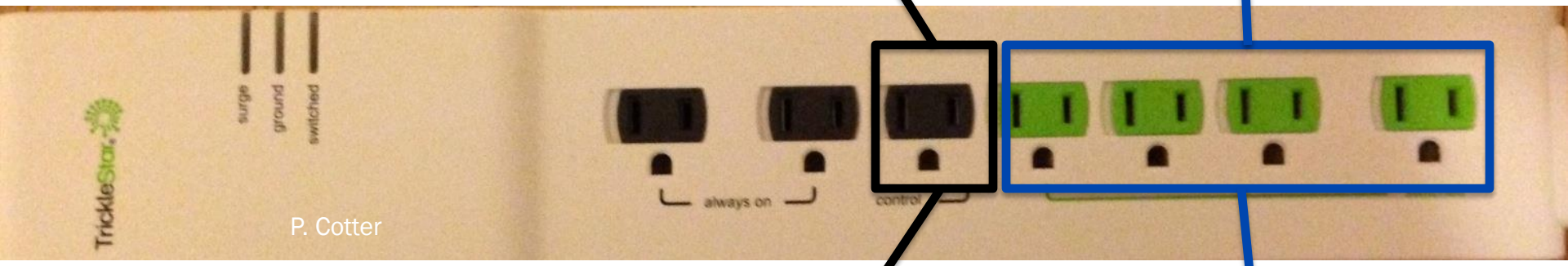
www.energystar.gov

For products, information, energy calculators, energy-saving tips….

Advanced Power Strips

- As smart as your phone?
- "Control/Switched" or "Master/Slave" principal minimizes phantom loads
  - When Control/Master is "ON", then Switched/Slave outlets turn "ON"
  - When Control/Master is "OFF", then Switched/Slave outlets turn "OFF"

Advanced Power Strips - Example



Master/Control

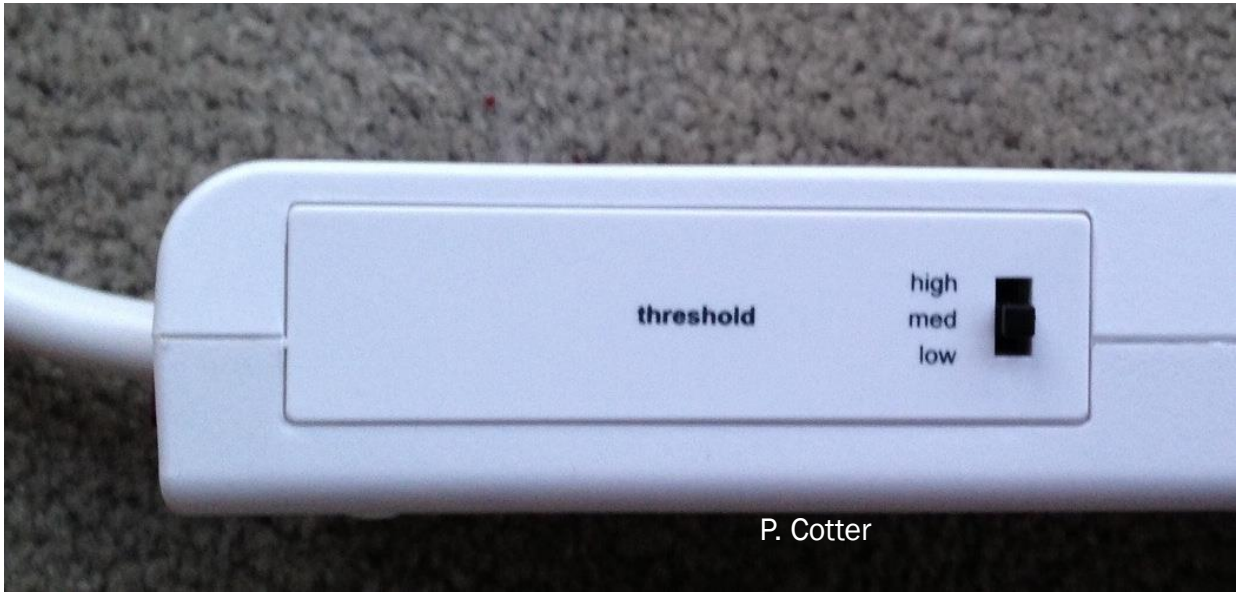
Slave/Switched

Computer

Monitor, speakers, etc.

Threshold setting

- Senses if the appliance is “on” or “off”
- Senses current in Control/Master outlet



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Does it really matter?

A couple calculations

Payback and Rate of Return

Payback =

Initial Cost ($) ÷ Annual Savings ($)

Rate of Return =

Annual Savings($) ÷ Initial Cost($) X 100

- Here's the formula to figure the cost of running a device:
- wattage x hours used ÷ 1000 x price per kWh = cost of electricity

wattage x hours used ÷ 1000 x price per kWh = cost of electricity

Payback:
LED (60W equivalent) = $15.00, uses 9W. Vs. incandescent using 60W
4 hours/day, 365 days/yr:

LED = 9*(4*365) / 1000 * .14 (ANC) =
9*1460=13140/1000=13.14*.14=$1.84

INC = 60*(4*365) / 1000 * .14 (ANC) =
60*1460=87600/1000=87.6*.14=$12.26

Annual Savings = 12.26-1.84= $10.42

Payback = 15/10.42= **1.44 years**

Rate of Return = $10.42 / $15 * 100= **69.46%**

Resources

- AHFC - Research Information Center
- Alaska Residential Building Manual
  www.ahfc.us
- Cold Climate Housing Research Center
  www.cchrc.org
- One stop shop for AK Energy Efficiency information
  www.akenergyefficiency.org