# POST-VISIT ACTIVITY: STANDARD VERSION

**TEP BRIGHT STUDENTS:** THE CONSERVATION GENERATION

Tucson Electric Power

**Part A. Energy Savings Kit**

Go through the contents of the Energy Savings Kit with students. Make sure that all students know **where** to install each device. Make sure students also remember the basic benefits of each device (e.g. the low-flow showerhead saves energy and water and, therefore, money). Consider a brief role-play in which students practice explaining the function and location of the devices in the Energy Savings Kits. Remind students that the aerator has an instruction card.

**Part B. Home Efficiency Measures**

Lead a classroom discussion with students about what different energy efficiency measures they can undertake at home, either alone or with the help of parents. See "Home Efficiency Measures" handout. Optional: Have students pledge to do at least 5 energy efficiency measures. Ask students to write down their 5 (or more) choices and pledge together as a class to become more energy efficient.

**Part C. Home Energy Savings**

Students will do an inventory of the light bulbs in their house, broken down by incandescent, CFL, and LED bulbs. Students will do multiplication and basic unit calculation to determine how much energy the different light bulbs in their homes use. Students will continue to use multiplication to answer various questions about the benefits of upgrading light bulbs to both CFLs and LEDs.

There is also an optional activity available as a separate download that has students perform a basic return on investment (ROI) analysis. It is very challenging and only recommended for students who are capable of independently working on relatively complex math and word problems.

**Part D. On-Line Extensions**

Explore some of the energy efficiency tips and strategies available at www.tep.com/tips. Consider promoting the following with your students:

- The Carbon Footprint Calculator (https://www.tep.com/efficiency/tools/carbon/)
- The Kilowatt Counters Charts (https://www.tep.com/efficiency/tools/kilowatt/)
- Other Energy Games and Tools (https://www.tep.com/efficiency/tools/world/)
- The TEP Home Energy Report – a comprehensive and interactive tool that TEP customers can use once they have logged into their accounts online. Available at (https://tep.opower.com/ei/app/dashboard)

# Home Efficiency Measures

Home Energy Efficiency Measures can be thought of in two ways:

1. Using efficient devices that will automatically save anytime they are being used (e.g. CFL and LED light bulbs).
2. Changing behavior to become more efficient.

The lists below are differentiated by the two different ways to be efficient listed above. They are also ranked in terms of cost. That is, the items at the top of the list are the lowest cost while the items at the bottom of the list are highest cost. Use these lists as a tool when brainstorming ways to become more efficient with your students.

*Note: These lists are comprehensive though by no means absolute. Feel free to add to them with your students!*

## Efficient Devices

- CFL light bulbs
- Weather stripping
- Pipe insulation
- Air filter whistle
- Metallic duct tape to seal ducts
- Faucet aerator
- Low-flow showerhead
- Caulk to seal gaps near windows
- Refrigerator and freezer thermometers or temperature cards
- LED night lights
- LED light bulbs
- Plant trees on the south and/or west side of your house
- Use smart power strips
- Note: The following devices are much higher cost and, obviously, fall to the discretion of parents. The benefits, however, are significant:
  - EnergyStar certified pool pump
  - EnergyStar certified refrigerator
  - EnergyStar certified dishwasher
  - EnergyStar certified clothes washer
  - EnergyStar certified clothes dryer
  - EnergyStar certified HVAC unit

## Efficient Behavior

- Use ceiling fans
- Turn off lights when leaving the room
- Adjust hot water heater temperature to 120 degrees F
- Adjust air conditioner to 78 degrees F or higher in the summer
- Adjust heater to 68 degrees or lower in the winter
- Run the dishwasher only when full
- Run the washing machine only when full and only in cold water
- Clean the lint filter on the dryer before every use
- Hang dry clothes on a clothes line or clothes rack instead of using the dryer
- Clean refrigerator coils
- Use a home energy monitor
- Get a home energy audit from an energy professional

# Student Worksheet: Home Energy Savings

Name: _____ Class: _____ Date: _____

## A. Incandescent Light Bulbs

1. A typical incandescent light bulb for your home is 60W. Convert 60W to kW.
   (Hint: 1,000W = 1kW or .001kW = 1W)

_____W X _____ = _____kW

2. If a 60W incandescent light bulb is on for 3 hours a day, calculate the number of kWh per day.

_____kW X _____hours/day = _____kWh/day

3. Calculate the number of kWh per year.

_____kWh/day X _____days/year = _____kWh/year

4. Each kWh costs about $.11. Calculate the cost to operate one incandescent light bulb for a year.

_____kWh/year X $_____/kWh = $_____/year

## B. Compact Fluorescent Light Bulbs (CFLs)

1. A typical CFL for your home is 13W. Convert 13W to kW.
   (Hint: 1,000W = 1kW or .001kW = 1W)

_____W X _____ = _____kW

2. If a 13W CFL is on for 3 hours a day, calculate the number of kWh per day.

_____kW X _____hours/day = _____kWh/day

3. Calculate the number of kWh per year.

_____kWh/day X _____days/year = _____kWh/year

# Student Worksheet: Home Energy Savings *(Continued)*

4. Each kWh costs about $.11. Calculate the cost to operate one CFL for a year.

_____kWh/year X $_____/kWh = $_____/year

**C. Light Emitting Diodes (LEDs)**

1. A typical LED for your home is 10W. Convert 10W to kW.
   (Hint: 1,000W = 1kW or .001kW = 1W)

_____W X _____ = _____kW

2. If a 10W LED is on for 3 hours a day, calculate the number of kWh per day.

_____kW X _____hours/day = _____kWh/day

3. Calculate the number of kWh per year.

_____kWh/day X _____days/year = _____kWh/year

4. Each kWh costs about $.11. Calculate the cost to operate one LED for a year.

_____kWh/year X $_____/kWh = $_____/year

**D. Conclusions**

5. Using your data from Parts A, B and C, explain which light bulb is more efficient and use your calculations to prove your point:

# Student Worksheet: Home Energy Savings *(Continued)*

6. Complete the table below as you walk through each room of your home and take an inventory of the light bulbs you observe.

| LOCATION | # INCANDESCENT | #CFL | #LED |
|---|---|---|---|
| Kitchen | | | |
| Dining Room | | | |
| Living Room | | | |
| Family Room | | | |
| Bedrooms | | | |
| Bathrooms | | | |
| Office | | | |
| Hallways | | | |
| Closets | | | |
| Garage | | | |
| Outdoors | | | |
| Other | | | |
| TOTAL | | | |

7. Calculate the total cost per year of operating your home incandescent light bulbs.

$_____/year X _____incandescent bulbs = $_____year
*(one incandescent bulb)* *(total # in home)* *(Total cost)*

# Student Worksheet: Home Energy Savings *(Continued)*

8. Calculate the total cost per year of operating your home CFL light bulbs.

$_____/year X _____CFL bulbs = $_____year
*(one CFL bulb)* *(total # in home)* *(Total cost)*

9. Calculate the total cost per year of operating your home LED light bulbs.

$_____/year X _____LED bulbs = $_____year
*(one LED bulb)* *(total # in home)* *(Total cost)*

10a. If you switched 5 incandescent light bulbs to CFLs, how much money could your family save in a year? (If your family has already switched to CFLs – GREAT! – calculate how much money you are already saving per year.) Show your work below.

10b. If you switched all of your incandescent light bulbs to CFLs, how much money could your family save in a year? Show your work below.

# Student Worksheet: Home Energy Savings *(Continued)*

11a. If you switched 5 incandescent light bulbs to LEDs, how much money could your family save in a year? (If your family has already switched to LEDs – GREAT! – calculate how much money you are already saving per year.) Show your work below.

11b. If you switched all of your incandescent light bulbs to LEDs, how much money could your family save in a year? Show your work below.

# Student Worksheet: Home Energy Savings – Answer Key

Name: _____ Class: _____ Date: _____

## A. Incandescent Light Bulbs

1. A typical incandescent light bulb for your home is 60W. Convert 60W to kW.
   (Hint: 1,000W = 1kW or .001kW = 1W)

60 W X .001 = .06 kW

2. If a 60W incandescent light bulb is on for 3 hours a day, calculate the number of kWh per day.

.06 kW X 3 hours/day = .18 kWh/day

3. Calculate the number of kWh per year.

.18 kWh/day X 365 days/year = 65.7 kWh/year

4. Each kWh costs about $.11. Calculate the cost to operate one incandescent light bulb for a year.

65.7 kWh/year X $.11 /kWh = $7.23 /year

## B. Compact Fluorescent Light Bulbs (CFLs)

1. A typical CFL for your home is 13W. Convert 13W to kW.
   (Hint: 1,000W = 1kW or .001kW = 1W)

13 W X .001 = .013 kW

2. If a 13W CFL is on for 3 hours a day, calculate the number of kWh per day.

.013 kW X 3 hours/day = .039 kWh/day

3. Calculate the number of kWh per year.

.039 kWh/day X 365 days/year = 14.235 kWh/year

# Student Worksheet: Home Energy Savings – Answer Key *(Continued)*

4. Each kWh costs about $.11. Calculate the cost to operate one CFL for a year.

14.235 kWh/year X $ .11 /kWh = $ 1.57 /year

**C. Light Emitting Diodes (LEDs)**

1. A typical LED for your home is 10W. Convert 10W to kW.
   (Hint: 1,000W = 1kW or .001kW = 1W)

10 W X .001 = .01 kW

2. If a 10W LED is on for 3 hours a day, calculate the number of kWh per day.

.01 kW X 3 hours/day = .03 kWh/day

3. Calculate the number of kWh per year.

.03 kWh/day X 365 days/year = 10.95 kWh/year

4. Each kWh costs about $.11. Calculate the cost to operate one LED for a year.

10.95 kWh/year X $ .11 /kWh = $ 1.21 /year