

Activity: Home Energy Audit



Purpose

We use energy in our lives everyday. Every activity that we perform requires energy in some form. Even simple functions like walking to the store or to school require energy. Our homes are filled with appliances that use electrical energy to work for us. Toasters, microwave ovens, televisions, and computers are some examples of the appliances we use everyday. We compare electrical energy use in units called watt-hours or kilowatt-hours. Some typical electrical energy usages are included in the table below.

<i>Average U.S. Household Electric Consumption for Major Electrical Appliances</i>	
Appliance	Annual kWh Consumption per Household
Central Air Conditioning	2,667
Water Heater	2,671
Freezer	1,204
Refrigerator	1,155
Water Bed Heater	960
Clothes Dryer	875
Room Air Conditioning	738
Range / Oven	458
Dishwasher	299
Clothes Washer	99

Adapted From:

<http://www.uwsp.edu/cnr/wcee/keep/Mod1/Whatis/energyresourcetables.htm#Wattages%20of%20Small-%20and%20Medium>

But that is not all... your appliances might be “leaking” electricity. Many appliances never stop using electricity, even when they are turned off. For example, if your TV has a remote, then part of the TV is always on “standby mode” so it’s ready to receive the signal from the remote to turn on. If there is a clock on the stove, this is always drawing electricity even though the stove is turned off. If you leave your cell phone charger plugged into the wall, it is using electricity even when you don’t have your cell phone plugged into the charger.

Experts call this usage “standby consumption” or “leaking electricity.” Although a single appliance usually only leaks a small amount of electricity, the total amount of leaking electricity consumption in a household can be significant.

The purpose of this activity is to learn more about the amount of electrical energy used by different activities at home. We do this by calculating the energy consumption of various appliances around your home.

Procedure

1. Use the “Tips for Energy Audit” to help you get started.
2. Chose one room in your house for your audit – the room should have at least 5 electricity consuming appliances/lights.
3. Determine the wattage for each of the power consuming appliances or lights in your room, enter into the table using one row for each light bulb or appliance.
4. Record the time that each of the power consuming appliances is on for each day of 1 week

5. Identify which of the appliances consume energy even in the hours they are off. If possible, estimate the watts consumed in stand by mode through the use of a power meter, appliance manual, or an internet search. (or use the tables provided).
6. Fill out the energy use tables – either the excel spreadsheet version or paper copy data sheet. There is one table for appliances when they are on and another for leaking electricity.
7. Calculate the energy used and cost of energy used
energy (kWh)= power(W)/1000 X time(h)
8. Answer the discussion questions

Discussion Questions – Energy Audit

1. What three appliances consume the most electrical energy at your house?
2. Does an appliance or device that has a high wattage always use the most energy over the week or month? Explain.
3. What do you think you could do to reduce the amount of energy used in your house?
4. Electrical Energy is one of the critical energy resources in our daily lives. Describe how you might replace the work of three of the appliances / devices if you did not have electricity.
5. How does your electricity usage compare with the New York State Averages? (hint – see graphing activity that we did in class)
6. How does the amount of leaking electricity consumption compare with the total amount of electricity used in your household? Can you think of ways to reduce the leaking (stand-by) electricity use?

Wattages of Small- and Medium-Sized Electrical Appliances and Equipment Found in Homes and Schools

Home Appliance	Wattage (Watts)
Heating/Cooling	
Dehumidifier	645
Fans	
Ceiling	100
20-24" Window	200
Oscillating	88
Portable Humidifier	88
Portable Space Heater	1,500
Water Bed Heater	350
Home Office and Entertainment	
Fish Aquarium	
Filter	10
Heater	100
Pump	10
Home Computer (Standard)	150
Printer	
Ink Jet	19
Laser	175-275
Movie or Slide Projector	150
Sewing Machine	75
Solid-State Radio	15
Stereo	110
Television	
Color	200-350
Black & White	40-160
Typewriter	60
VCR	40
Kitchen	
Blender	400
Broiler	1,500
Can Opener	120
Coffee Maker	1,400
Corn Popper	
Hot-Air Type	1,200
Oil-Type	575
Food Chopper	360
Food Processor	360
Frying Pan/Skillet	1,300
Hot Plate	1,100
Kettle	1,500
Microwave Oven	750
Mixer	
Hand	120
Heavy-Duty	210
Toaster	1,000
Toaster Over	1,350
Waffle Maker	1,200
Laundry/Utility	
Iron	1,000
Vacuum Cleaner	650

Home Appliance	Wattage (Watts)
Personal Care	
Blanket	200
Curling Iron	40
Hair Dryer	
Blower	1,200
Blower/Styler	600
Hood-Type	1,200
Soft Bonnet	400
Heating Pad	50
Shaver	14
Toothbrush (Electric)	7
School Equipment	
Aquarium Pump	4
Aquarium Heater	100
Computer (Standard)	150
Photocopier	Up to 2,500
Ditto Machine	65
Electric Typewriter	Less than 50
Film Projector	350
Opaque Projector	1,000
Overhead Projector	500-850
Printer	
Ink Jet	19
Laser	175-275
Record Player	30-100
Slide Projector	500
Tape Recorder	6-100
Television	
Black & White	40-160
Color	200-350
VCR	40

Adapted From:

<http://www.uwsp.edu/cnr/wcee/keep/Mod1/Whatis/energyresources.htm#Wattages%20of%20Small-%20and%20Medium>

Some Tips for the Energy Audit

1. Before you start, walk around your house with your printout to make sure you haven't overlooked any major appliance. Don't forget things like clocks and aquariums that run 24 hours a day. Pay particular attention to your own room – after all, that's where you can make the most difference!
2. Because you can't be everywhere at once, get your family to help! Give others a copy of the printout and ask them to be responsible for different things in the house, for example make one person responsible to track TV use, another washing machine use, and so on.
3. Try to make day 1 a typical work or school day:
 - a. Make note of the first major electrical uses of the day – lights, kitchen area, blow dryers...
 - b. If someone stays at home while you are at school, ask that person to track use for the day
 - c. When you come home from school, make sure you track your own use of computer, TV, stereo, etc.
 - d. Peak energy hours for most families during the week are in the evening, when cooking, watching TV, homework, and hobbies are all happening at once. You may need help tracking all of these!
 - e. When day 1 is over, add up all of the hours of use for each appliance and plug the total into your personal energy meter worksheet – on paper or on the computer.
4. If possible, determine the power consumed by appliances when they are "off." Many appliances consume power at all times in "stand by mode," which enables them to turn on quickly.
5. Days 2 through 5 should follow pretty much the same pattern, just be aware of special changes to the routine that may affect energy use.
6. If days 6 and 7 fall on the weekend, expect very different energy usage patterns. You'll probably notice that appliances are used all day long, but not all at the same time. It takes good detective work to keep up with it all!
7. At the end of day 7, put your final usage figures into the table and check out the grand total, in kWh and dollars.

Personal Energy Meter

*Energy cost based on total kWh (kilowatt-hours) X cost per kWh. Use default electric cost of \$0.15/kWh or enter another value:

0.15

Column: A	B	C	D	E	F	G	H	I	J	K	L	M
Energy Tracker (Hours/Day)								Cost Calculator				
Appliance	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Hours	Wattage	Total Wh	Total kWh	Energy Cost*
Television (19")	1.50	2.50	2.00	1.00	2.50	2.50	3.00	15.00	100		1.50	\$0.23
Space heater	4.00	3.50	5.00	6.00	5.50	4.50	5.00	33.50	1500		50.25	\$7.54
Personal computer	2.00	1.00	1.50	0.00	1.00	2.00	2.50	10.00	200		2.00	\$0.30
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
								0.00			0.00	\$0.00
Total for Week:											53.75	\$8.06

Personal Energy Meter - Leaking Electricity

*Energy cost based on total kWh (kilowatt-hours) X cost per kWh. Use default electric cost of \$0.15/kWh or enter another value:

0.15

Are your appliances leaking electricity? Use the Watt Meter or the information provided to determine which appliances in your household are using electricity when in standby mode. Enter the information in the table below.

Column: A	B	C	D	E	F	G	H	I	J	K	L	M	
	Energy Tracker (Hours/Day appliance is OFF)							Cost Calculator					Comments
Appliance	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Hours	Leaking Watts	Total Wh Leaked	Total kWh	Energy Cost*	
Television (19")	22.50	20.50	22.00	23.00	21.50	21.50	21.00	152.00	4		0.61	\$0.09	example
Space heater	20.00	21.50	19.00	18.00	18.50	19.50	19.00	135.50	5		0.68	\$0.10	example
Personal computer	22.00	23.00	22.50	24.00	23.00	22.00	21.50	158.00	10		1.58	\$0.24	example
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
								0.00			0.00	\$0.00	
Total for Week:											2.87	\$0.43	

Part 2 –What If...

The spreadsheet based home energy audit provides a convenient way for you to explore how changes in your energy efficiency or conservation could be used to save electric energy. Some examples of possible areas you can explore include:

Efficiency measures	Conservation measures
<ul style="list-style-type: none">○ Replace appliance with an Energy Star appliance (see www.energystar.gov)○ Replace light bulbs with CFLs○ Replace Plasma TV with LED TV	<ul style="list-style-type: none">○ Watch TV less○ Turn off lights○ Turn off your computer at night○ Don't use your hair dryer (or other optional appliance)○ Unplug appliances that have high stand by power requirements when not in use

You will need an excel spreadsheet version of your home energy audit to do this part of the activity.

1. Open your spreadsheet file and save it under a new name.
2. Review your week's worth of energy statistics, note the one or two rows that seem especially prominent to define the "energy hogs" in your household. It could be the appliance that's used for the longest time, or the one that uses the most wattage.
3. On your "What If" sheet, try experimenting with your energy hogs:
 - a. Change the wattage or usage (time) values and note if your changes make a difference in your overall electric energy consumed.
 - b. Make a new column that explains the changes you made to each row and why.
 - c. Estimate the total savings you can achieve by comparing your actual home energy audit results with your What If spreadsheet.
4. As a class, create a table of each students' actual energy use and projected "What If" energy use. Estimate the total energy and dollars your class can save if you implement these changes

Discussion Questions

1. What changes can you realistically make that can have a significant impact on your energy consumption and family's energy cost? Would these changes create any "hardship" for you or your family (cost or lifestyle)? Discuss the trade offs between these costs and the benefits of saving energy.
2. Using the results of this activity, propose three ideas that you can use for your final project.

Using the number of families in your community as your basis, extrapolate the results of your class' savings to the whole community. How much money could your community save on home electricity alone? Discuss how you might communicate these findings to your community. (This could make a great final project too!)