

Advanced Plug Load



Plug Load Inventory Worksheet

Name:

Date:

How much energy does it take each year to power the plug loads in your school?

In **Part I**, Use a Watt meter to get power use and phantom load watts. Use the typical plug load chart to get Operating Hours per Year or make your own estimate. Calculate costs and carbon emissions.

In **Part II**, come up with a recommendation for each plug load, which could be related to conservation (e.g., eliminate the phantom load by unplugging when not in use, or reducing the hours each year the plug load is used) or related technological efficiency (e.g., replace old TV with an ENERGY STAR TV).

In **Part III**, calculate the energy consumption of your recommendations.

In **Part IV**, determine the total energy and cost savings based on your recommendations.

Typical Plug Load Watts and Avg. Hours Used Per Month Chart		
Plug Load	Watts	Average Hours used per month
Toaster	1000	3
Coffee Maker	1200	12
Clothes dryer - electric	4600	20
Dishwasher - Air Dry	200	25
Dishwasher - Heat Dry	1200	25
Microwave oven	1000	15
Electric oven	2660	15
Electric range	2000	15
Refrigerator/Freezer (ENERGY STAR)	800	117
Refrigerator/Freezer (Pre-1992)	600	215
Television	300	120
Flat Screen TV	120	120
DVD Player/VCR	22	45
Stereo - Component	200	120
Fish tank (20 gallon)	86	730
Iron	1000	5
Electric Water heater	4500	75
Lamp (75 W bulb)	75	150
Halogen Torchiere	300	150
Freezer	300	170
Laptop	20	20
Desktop computer	80	20
Computer monitor	80	20

Part II

Describe a recommendation to reduce energy consumption for three plug loads.

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Recommendation for Plug Load 1:

Recommendation for Plug Load 2:

Recommendation for Plug Load 3:

Part III

Calculate the yearly energy consumption and cost for the three recommendations.

If your recommendation is to eliminate the phantom load (by unplugging or putting the plug load on a power strip that can be shut off), enter zero for the Phantom Load Watts. The device will still have the same power use. If you recommend replacing the appliance with a more efficient model, use the chart to the right.

Appliance & Equipment	Average Power Use of Efficient Models When On (Watts)
Coffee Maker	900
Microwave	750
Refrigerator	48
Space Heater	750
Toaster	800
Vending Machine	205
TV	83
Computer	46

Table 2: Recommended Plug Load Table

Plug Load Name	Phantom Load Watts	Power Use	Operating Hours/yr	Phantom Load hrs/yr	Recommended Energy Consumption			Energy Costs	
					Operating Load kWh/yr	Phantom Load kWh/yr	Total kWh/yr	Energy Cost/yr (\$)	CO2 Emissions/yr (lbs)
	A	B	C	D	E	F	G	H	I
Example: Toaster	0	990	104	8,656	103	0	103	\$12.36	67.98
Total:									
Total Savings:									
% Saved:									

Part IV

Calculate the Total Savings.



Total Savings: Once you have calculated the energy costs per year for all recommended appliances, subtract the recommended total (Table 2; Column H) from the current total (Table 1; Column H) on the previous page to determine the total potential savings.

Percentage Saved: Divide the Total Savings by the Current Energy Costs x 100.

Appliance	Current Energy Costs	Recommended Energy Costs	Total Savings	% Saved
Total:				

Advanced Plug Load Activity Guide

1. Engage:

Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions: 10-15 minutes

- **Teacher will lead with a discussion.** A sample discussion could look like this: Electrical appliances are a major source of our school's energy use. What might be the consequences of wasting or misusing these resources? *Answers may vary: Costs money, Greenhouse gases, negative impact on environment.* Today we will do an energy audit by collecting data on how much energy we use in the classroom and discuss ways we might be able to reduce waste.
- **Electricity is measured in units of power called watts.** The amount of electricity we use in a period of time is measured in kilowatt-hours (kWh), or the **energy** of 1,000 watts for one hour. For example, if you use a 100 watt light bulb for 10 hours, you have used 1,000 watt hours of energy, or 1 kWh. **In SMUD's service territory, each kWh costs about 12 cents, and emits roughly .66 lbs of carbon.**

2. Explore:

Lesson Description – Materials Needed / Probing or Clarifying Questions: 25 minutes

- Pass out Audit worksheet and have students complete Part I of their worksheet. Students will now perform an energy audit around the room unplugging appliances and taking measurements.
- **Driving question:** How can we improve the energy efficiency of this room?
- *Note: Find a location where there are a lot of appliances and space for students to move. If the classroom is not large enough to accommodate groups of moving students an alternative location could be a library, office, teachers lounge or computer room.*

3. Explain:

Concepts Explained and Vocabulary Defined: 30 minutes or remainder of time

- After completing the Audit worksheet Part I, teacher will lead with a discussion. A sample discussion could look like this: Would anyone like to report his or her group's findings? Did anyone spot potential energy waste or ways we could be more energy efficient? Try to steer the conversation toward plug-in appliances that are not in use (phantom/vampire loads). Have students look at Part I: Table 1, under column A.
- Has anyone heard of vampire load? Does anyone know what a phantom load is? Here is a video describing what a vampire load/phantom load is:
<https://www.youtube.com/watch?v=mNcHUrg9EQY>
How can we better save energy and money?
- Instructor can steer students to 3 strategies for controlling plug-loads:

Changing behavior:

- Unplug appliances with phantom loads when not in use.
 - Cell phone chargers, home entertainment systems, etc.
- Minimize or get rid of equipment you don't need.

Upgrade appliances to energy efficient models (ENERGY STAR).

- CRT computer monitor, refrigerators, clothes dryers.

Using Controls, such as plug timers, which automatically turns off outlets when not in use, or smart power strips.

- Students can now complete Part II, Part III, and Part IV on their worksheets. Unfinished work should be completed at home.



Plug Timer

4. Additional Resources

- **Slay the vampire video:**
<https://www.youtube.com/watch?v=mNcHUrg9EQY>
- **National Energy Education Development Project – Plug Load Audit workbook:**
<http://www.need.org/files/curriculum/guides/PlugLoads.pdf> or www.need.org for other great energy related material.