

Teacher Background and Instructions

Vampire or **phantom loads** refer to the amount of electricity wasted when appliances such as computers, microwaves and phone chargers continue to draw current when turned off. This can equal up to 15% or more of total energy use. Businesses and homeowners can save a great deal of energy and money when phantom loads are identified and reduced or eliminated. A typical bedroom with a flat-screen TV, DVD player, and cable box will use about \$110 a year in phantom load energy – more than the double the cost to run an Energy Star refrigerator for a year!

Teenagers and young people are often the largest wasters of energy because they are plugged into everything from MP3 players, iPhones, video games and digital cameras. Cell phone chargers alone can cost more than \$10 a year in phantom load. Eliminating phantom loads will save money and contribute to a more sustainable model of energy consumption.

A **watt** is a measure of electrical energy consumed.

Voltage is a measure of electrical potential or pressure.

Amps are a measure of current, or the flow of electrons.

Amps x volts = watts

References

Motavalli, Jim. "Hey, Dude, Where's My Phantom Load? | Yahoo! Green." Web log post. *News, Blogs, and Tools for Living Green | Yahoo! Green*. YAHOO! Green. Web. 15 July 2010. <http://green.yahoo.com/blog/daily_green_driving/23/hey-dude-where-s-my-phantom-load.html>.

"Tree Hugger TV: Vampire Power : Video : Planet Green." *Planet Green : Sustainable Living, Energy Conservation, Earth Day*. Web. 15 July 2010. <<http://planetgreen.discovery.com/videos/tree-hugger-tv-vampire-power.html>>.

Activity #1: Finding the Vampires

1. Use the current interest in all things vampire to get a discussion started about phantom loads. Ask students if they know about the real “vampires” that lurk in their homes and at school. What kinds of things are associated with vampires? Why might this be related to energy usage?
2. Show students the video clip: “**Vampire Power**”
(or similar – there are many available on the Internet).

<http://planetgreen.discovery.com/videos/tree-hugger-tv-vampire-power.html>

3. Discuss the video with students and ask them to describe a phantom load. Why is it important to find and eliminate phantom loads?
4. Have students write a description of phantom loads in their own words on the student handout.
5. Complete **Activity #2: Measuring Phantom Loads Lab**.
6. Help students analyze and discuss the collected data using the questions and calculations on the student handout.
7. Show students the Smart Power video clip: “**Start Stripping**”

<http://www.youtube.com/watch?v=nj2WX3xXT7E>

8. **Activity #3: Making a Difference** - Discuss ways to **reduce or eliminate** energy wasted by phantom loads. Have students design a project focused on reducing phantom loads at school, such as:
 - Create and distribute educational posters, podcasts or video clips
 - Develop a presentation using the collected Phantom Load Data to encourage school administrators to support the purchase and effective installation of power strips in all classrooms.

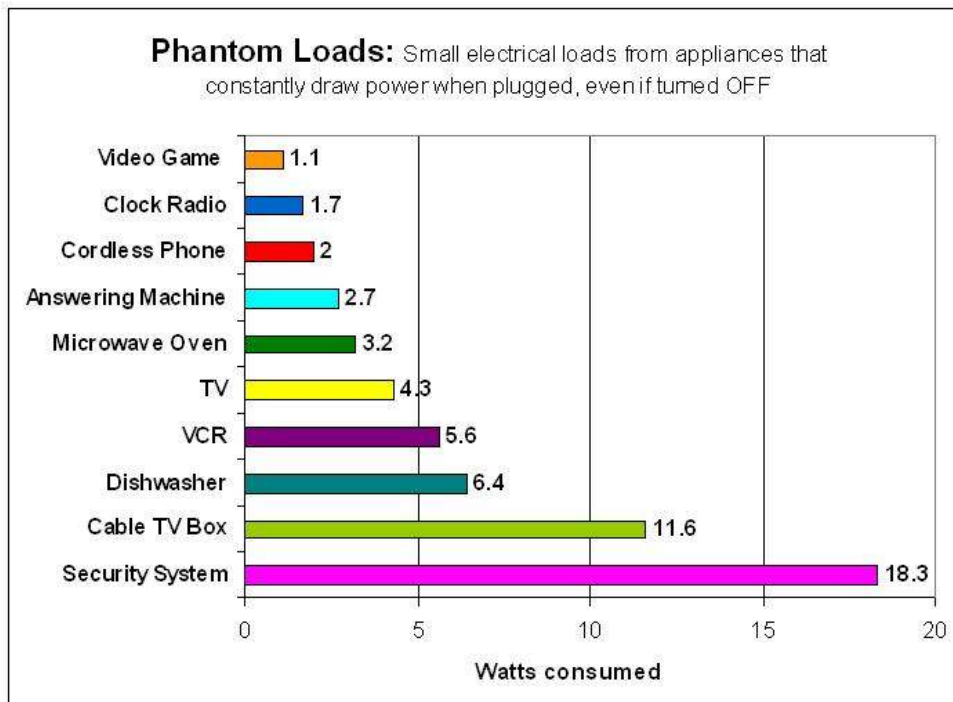
Activity #1: Finding the Vampires

Did you know vampires could be haunting every building on campus? Watch the video clip: "Vampire Power" to learn more about this mysterious phenomenon.

<http://planetgreen.discovery.com/videos/tree-hugger-tv-vampire-power.html>

1. Describe in your own words what a vampire or **phantom load** is:

Here are some examples of common phantom loads:



Graph courtesy of:

Cruz-Pol, Dr. Sandra L. "Phantom Loads." *Outreach Materials and Presentations*. UNIVERSITY OF PUERTO RICO at MAYAGÜEZ. Web. 19 July 2010. <<http://ece.uprm.edu/~pol/image/phantomLoads.jpg>>.

Activity #2: Measuring Phantom Loads Lab

Purpose

Measure the energy usage of appliances that are turned off, but still plugged in operating in standby mode.

Materials

Kill-A-Watt meter (1 per group)

Extension cord (3-prong 6ft appliance rated)

Finding Vampire Loads with the P3 Kill-A-Meter data chart

Desk Lamp

Room appliances, including TV, computer, printer, phone chargers, refrigerator

Procedure

1. Plug meter into extension cord.
2. Plug extension cord into wall outlet.
3. Plug lamp into meter.
4. Turn the lamp on.
5. Push voltage button and record value on data chart.
6. Repeat for the amp, watt and hertz buttons, recording the values each time.

NOTE:

If a "00 WATT" reading shows on the screen when the appliance is turned off, push the amp button to see if there is a reading of one or two hundredths amp.

If the meter reads "0.00 Amps", assume the appliance is truly off. If the meter reads a few hundredths amps, there is a small vampire load of less than 1 watt which can be indicated by entering "<1" in the vampire amps column.

7. Turn off the lamp and repeat for all 4 values.
8. Test and record information for all remaining appliances.
9. Total the number of vampire watts.

Analysis and Conclusions

1. What types of appliances do **not** use electricity when they are turned off?
2. Which appliances **do** use electricity when off, but plugged in or in standby mode?
3. Look at the Vampire Watts value for each of these appliances and compare it to the operating watts. How do you think this affects the amount of energy our school is using?
4. Go to the PG&E website to find the current cost of energy per kWh for your school, or use the average value of \$0.13 kWh to calculate how much these phantom loads are costing your school district per month. NOTE: Convert the watts to kilowatts by dividing by 1000.

Use the **Phantom Load Calculations** Excel file or the following equation to calculate total cost per month of each phantom load:

Total cost/month = (Vampire kW) x (cost per kWh) x (24 hrs) x (30 days)

Example: A single TV has a phantom load of 9 watts when in standby mode.

$$9 \text{ watts}/1000 = .009 \text{ kW}$$

Total cost/month = (Vampire kW) x (cost per kWh) x (24 hrs) x (30 days)

$$= (.009 \text{ kW}) \times (\$0.13/\text{kWh}) \times (720 \text{ hrs})$$

$$= \$0.84$$

