



Vampire Power - Guided

## Introduction:

You probably know that electrical energy is required to operate an electrical appliance when you are using it. But is electrical energy still consumed even when you are not using it?

Consider the following scenarios:

- Families that are away for a holiday for a few months, not using their household appliances for that time.
- People not using their devices in the office or at work overnight .
- Leaving your mobile, iPad, or laptop charging throughout the night.

You might think that the electricity meter doesn't record any power usage during these times. However, in many cases the meter will still register some value. But how? Is somebody stealing your electricity?

Let's investigate!



Many household appliances have features such as remote control, pre-set memory, clock display, instant on etc. Do these appliances still use electricity even when you are not using them?

Write an aim that outlines the main purpose of this investigation. It can include a testable hypothesis about how and when your appliances are using electricity:

**Aim:**

## Equipment:

- Power meter:

The power meter shown below is a Power Tech Plus Multifunction Energy Meter. This is an affordable power meter that can accurately measure instantaneous power. However, most brands of store bought plug in power meters will be suitable for this investigation.

**CAUTION:** Do not plug in appliance that draws more current than the meter is rated for. Can you make a risk assessment for this experiment?



- An assortment of electrical appliance, you must be able to plug them into a wall socket to use the power meter

## Method:

1. For each of the appliances you will be using in your investigation, estimate the number of hours that the appliance is in use and on standby for on an average day.

### Table 1: Operating Hours:

2. Use the power meter, as shown here, to measure the power used by your appliances

3. Record the power usage for the appliances while in use and in standby.






**Fun Fact:**



Even something as simple as household lighting has improved a lot over the past 100 years. Shown here are major steps in development. The first improvement over the humble candle was the standard incandescent bulb, which is 50 times more efficient. This was replaced with another type of incandescent globe called a halogen lamp, which is about 90 times more efficient than the candle. The compact fluorescent (CFL) is about 250 times more efficient than the candle. And finally the latest development is the LED bulb. Current LEDs have a similar efficiency to CFLs. However, they are much more environmentally friendly, and can theoretically be made up to 1000 times as efficient as the candle!

## Analysis:

The Watt or kW is the unit for measuring power, a kWatt is 1000 Watts. The meter measures;

$$Power = \frac{Electrical\ Energy}{Time}$$

When it come to your electricity bill the electricity company doesn't charge you based on the power you are consuming at any given second but rather the total amount of electrical energy you use. This is typically measured in kWh.

If we rearrange the previous formula, and use the power recorded in table 2 (remember to divide by 1000 to convert W to kW) and the time in use per day estimated in table 1, we can calculate the total energy used by the appliance over a year.

$$Energy = Power \times Time \times 365 (days)$$

Record your results in a similar table to the one used in the previous section. A typical cost for electricity is 25 cents per kWh.

**Table 3: Corresponding annual standby energy estimated for the measured electrical appliance**

Appliance	Operation Mode	Energy (___)	Cost (___)


Graph the results on the next page: Make sure you clearly demonstrate the cost of the power used by all of the appliances, both in use and standby.



## **Discussion:**

Here you can discuss the results of your experiment. Are there any general trends?

Are there any results that surprised you?

Do devices use power even when they are in standby?

What relationship do you see between in use power and standby power?

Are there any appliances that stand out from the others?

Was this a fair test?

## **Conclusion:**

Here you should answer the specific question you made in your aim. Address the hypothesis you created. Make any suggestions for future investigations or improvements to the validity of this investigation.

Image Credit

[1] Jiro Bevis: <http://www.bloomberg.com/news/articles/2012-03-08/smart-meters-help-brazil-zap-electricity-theft>

[2] <https://www.jaycar.com.au/mains-power-meter/p/MS6115>

[3] <http://pngimg.com/img/objects/candle>

[4] <https://solutions.borderstates.com/new-lighting-technology-new-understanding-of-lighting-measurements-its-more-than-wattage/>

[5] <https://www.spreadshirt.co.uk/mode+long+sleeve+shirts>