Kill-A-Watt Monitor Instructions

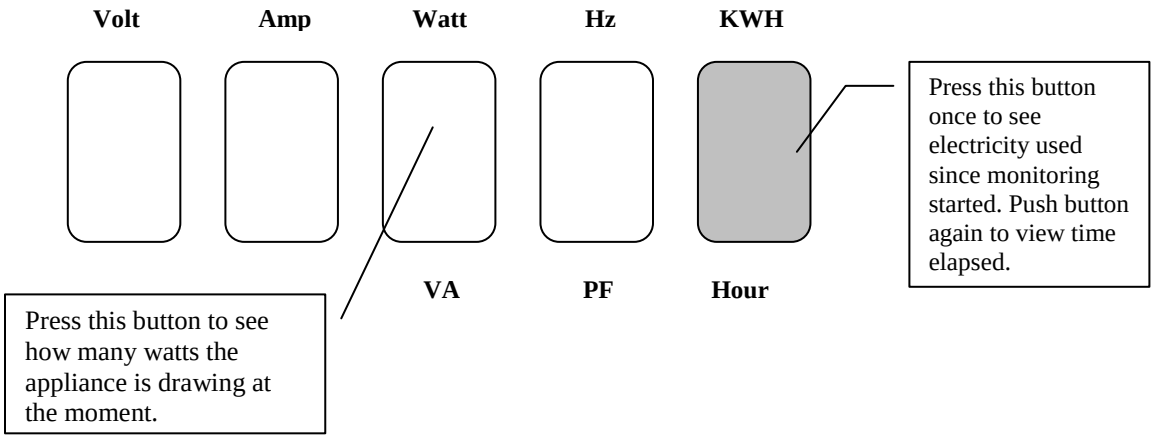
Definition: a kilowatthour (kwh) is the amount of electricity used when a 1,000 watt load (appliance or piece of equipment) is operated for one hour (1,000 watts for 1 hour = 1 kwh). There are an infinite number of ways that a kwh is consumed; the general formula for calculation is [(load, in watts) * (time, hours) = kwh's] The average Vermont residential daily consumption is almost 20 kwh/day.

This Kill-A-Watt Monitor measures several aspects of how much electricity any 120 volt equipment uses. These instructions help you use that information to:

- Determine the cost of running any appliance or piece of equipment
- Compare existing equipment with new efficient ENERGY STAR models, to determine whether replacement is suitable for you
- Determine if and how much energy any equipment uses when it is not in active use (eg, "sleep" mode)
- Determine what portion of overall household electric use any single piece of equipment represents

For assistance in evaluating Kill-A-Watt meter data, and making good economic decisions, please contact the Co-op.

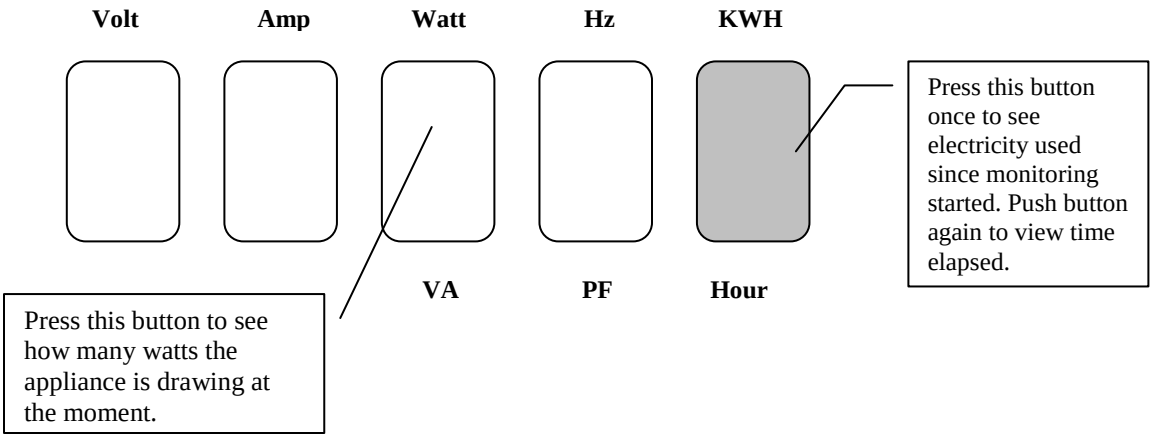
The Kill-A-Watt device measures several aspects of electric activity; the most important of these for decision-making are (1) the kilowatthours (kwh) accumulated electric usage, and (2) the watts being consumed instantaneously. These functions are achieved by selecting the purple button (on right), and the third (gray) button. See illustration below:



How to operate the monitor to measure an appliance's electric usage:

1. Plug the Kill-A-Watt monitor into a standard 3-prong outlet. (Suggestion: when monitoring a refrigerator, or freezer, use an extension cord to position the monitor in a location convenient for reading the meter; plug the monitor into the extension cord, and the refrigerator into the meter.)
2. Plug the equipment you want to evaluate into the Kill-A-Watt monitor.
3. Turn on the equipment.

4. To see how much electricity the equipment is drawing, push the Watt/VA button to toggle back and forth between the Watts of electricity the equipment is using at that moment and the Vrms Arms (apparent power). The important aspect is "watts"
5. We recommend that a 120 volt load be monitored for several days to gather sufficient data to make good decisions. Equally important while the Kill-A-Watt device is in use is to read and record the house main electric billing meter. The reason to read and record BOTH the individual load, AND the whole house usage is to be able to know the absolute amount of energy being used, as well as the proportion of the total use. Use the log sheet provided to gather both sets of data.
6. The accumulated kwh data will be "lost" when the meter is disconnected at the end of the monitoring period. Push the purple KWH/Hour button as needed to toggle back and forth between the number of Hours over which the equipment was monitored and the Kilowatt Hours of electricity used over that period. Record the numbers for both Hours and KWH before disconnecting the Kill-A-Watt monitor. The monitor resets each time it is unplugged and when electrical power is cut, e.g., during a power outage. If you unplug the monitor or if there is a power outage before recording the KWH used and the time elapsed since you began measuring, your data will be lost.



The monitor displays Kilowatt Hours from 0.01 KWH to 9999 KWH. Time will initially be displayed as Hours:Minutes (from 00:00 up to 99:59) and will then switch to Hours only up to 9999.

Pressing other buttons will show you:
Volts (Should read something close to 120.0, the standard voltage in US electrical outlets),
Amps (Measures the flow rate of electric current)
HZ/PF: 60 hertz (cycles per second) is the standard for alternating current in US electrical outlets. (**PF** stands for Power Factor.) The Volt, Amp, and Hz buttons are of lesser relevance to testing appliances for electrical efficiency.

Determining the Cost of Running a Piece of Equipment
To determine the costs of running a piece of equipment, you need to extrapolate how much energy the equipment uses over the period you want to evaluate, based on the time you monitored the equipment. So if you monitored the equipment for 5 days, and it used 15 kwh during that period and you want to know how much it costs to run it for one year, first divide the energy used over the number of days (15/5) and calculate the average daily consumption (~ 3 kwh/day). Then multiply the number of kWhs times $.16 (the average cost of electricity in Vermont varies, depending on the amount of use, but an average (2009) value is $.14/kWh).

Comparing Equipment with and Getting More Information on New ENERGY STAR Models
Older appliances and equipment, and even some newer ones, are not as energy-efficient as new ENERGY STAR-labeled models. ENERGY STAR-rated equipment uses at least 10-50% less electricity and water than conventional items. Operating less efficient equipment costs you money, in the form of higher electric bills, and increases your carbon footprint. Reducing your electricity usage will save you money and reduce greenhouse gases that cause climate change. ENERGY STAR-rated appliances include refrigerators, freezers, dishwashers, washing machines, room air conditioners, dehumidifiers, televisions, VCRs, DVD players, stereo equipment, cordless phones, home computers, printers, furnaces, boilers and fax machines. For a complete list, visit <www.energystar.gov>.

Determining If and How Much Energy Equipment Uses When Not in Active Use – Measuring Phantom Loads
Some appliances use electricity when they are plugged in, but turned off. Examples include anything with an LED light or digital display that is on when the item is off (microwave, VCR, TV, etc) as well as computers, copiers, fax machines, stereos, DVD and CD players, and satellite receivers. If you want to determine whether an appliance uses electricity when in the off position, plug it into the Kill-A-Watt monitor, turn it off and press the Watt button. If it registers 0.0, the equipment does NOT draw power when it is turned off. If it registers any number other than 0.0, it DOES draw power when not in active use. (Note that it may take a several seconds to register power draw.)

To get an accurate picture of how much power an appliance draws when not in active use, monitor it over a longer period of time, e.g., a day or more. Use the steps above to determine the cost of these "phantom" loads. Estimates are that 3-5% of the average home's electric use is from wasted phantom loads. The "phantom" energy use of appliances when "off", even those labelled "Energy Star" is a growing portion of household usage, and an enormous impact on a national scale. Some new Energy Star rated big screen TV's, for example, use more electricity when "off" than the prior TV being replaced did when it was "on". One way to avoid "phantom" electric usage is to use a "Smart Strip"; this is a surge device that allows for all connected loads to be automatically de-energized when a primary load is shut "off". See:
http://www.energyfederation.org/washingtonelectric/default.php

Measuring the Percentage of Overall Household Electrical Use
It is highly useful to make Kill-A-Watt measurements of any targeted load, while also reading and recording the house electric billing meter. Simply record the values shown, daily. Subtract yesterday's value from today's; the difference will be how many kwh's were consumed by all household loads.

How long should I monitor a piece of equipment?
The length of time you will need to accurately determine electricity usage depends on the equipment you are measuring. Some appliances, like lights, are either on or off and they use the same amount of electricity whenever they are on—unless they are 3-way or dimmable lights. You can use the Kill-A-Watt to monitor for a single hour and use the data to calculate yearly energy use for that item. (There are 8760 hours in a year.)

However, many electrical appliances use varying amounts of energy:

- Certain appliances go through various cycles during normal operation. For example, refrigerators go through standby, cooling, and defrosting cycles. Accurately measuring a refrigerator's energy use requires several days' worth of data.
- Air conditioners and dehumidifiers turn on automatically when settings and atmospheric conditions tell them to, and you can have them set at varying humidity levels and fan speeds,

which affect electric usage. Depending on the weather, a few to several days' worth of data may be needed to get an accurate picture of energy use. Viewing the watt usage at different settings may help you in establishing an efficient setting for your situation.

- Electric clothes washers and dishwashers have varying wash and heat settings that affect the energy use. Monitoring a single use (e.g. one dishwasher load, or an average load of clothes) may be enough to get the data you need, if you usually do not change the settings. However, you can use the monitor to test the electrical use for various settings to select the setting that achieves the results you want (e.g., clean dishes, dry clothes) with the lowest possible electrical use.

Measuring 240 Volt Loads

The Kill-A-Watt meter (and other similar 120-volt meters) is not intended to be used to measure 240 volt loads, such as electric hot water tanks, electric clothes dryers, heat pumps, or submersible water pumps. For these type loads other measuring devices are available; however, it may be more convenient to make estimates of electric usage based on engineering assumptions.

Here are a couple rules of thumb:
An electric hot water tank, insulated with a tank wrap and set to 120ºF may use 3kwh/day per person in the household. An electric clothes dryer is typically a 5,000-Watt load; each hour of use will consume 5 kWh's. A submersible water pump in most residences typically might use 1 kWh/day, or less (directly related to length of operating time/day), assuming typical water usage (ie, no livestock, swimming pool, or irrigation use). Contact the Co-op for information on using a different meter to directly measure 240 volt loads.

Reducing Your Carbon Footprint

There are several online calculators for determining your carbon footprint. Because Vermont gets much of its electricity from cleaner sources than some other states, it is most accurate to use a calculator that takes your state of residence into account, such as the Bonneville Environmental Foundation calculator at <www.b-e-f.org>. The 10% Challenge has another good calculator, at: <www.10percentchallenge.org>.

Discounts and Tax Credits on Efficient Appliances

Note that Efficiency Vermont (EVT) offers rebates on energy efficient models of appliances, so check <www.efficiencyvermont.org> before selecting a replacement model for any appliance. Appliances that qualify for Efficiency Vermont rebates vary over time.

Some equipment, such as tankless water heaters and super-efficient boilers, may qualify for federal tax credits. Visit the ENERGY STAR website at <www.energystar.gov> and click on the link "Tax Credits Under the Energy Bill" at the bottom of the homepage for more information.