The BIG Loads

There are four household uses of electricity that deserve special attention. In each case, the product of the electrical usage is heat, and these cannot be tested with the Kill-A-Watt meter because they operate at 240 volts. The Big Four include:

- electric space heating (baseboard; 240 volt, built in)
- electric hot water (240 volt)
- electric clothes drying (240 volt)
- electric stove (240 volt)

- **Electric space heating.** This is the most expensive heating system to operate. Baseboard electric heat is rarely installed in new homes these days, but can still be found in older homes, and is sometimes used to supplement other sources of heat.

- **Electric hot water.** Electric water heaters have the highest operating cost of any hot water choice. The amount of electricity used by electric water heaters is primarily driven by the number of household occupants: on average, 3 kWh per-person per-day. Electric hot water tanks are also characterized by the slowest recovery rate ("new" gallons of hot water/hour), compared to other choices.

- **Electric clothes drying.** Members with electric dryers have another potentially significant electrical "load" – although their impact on the household electric bill is subject to several variables (number of occupants, frequency of use, seasonal or year-round use of the appliance). In one hour of continuous operation, the typical electric clothes dryer is capable of consuming up to about 5 kWh of electricity. The relative operating cost of a propane clothes dryer is less, and the least-cost approach is a clothes line or a clothes rack.

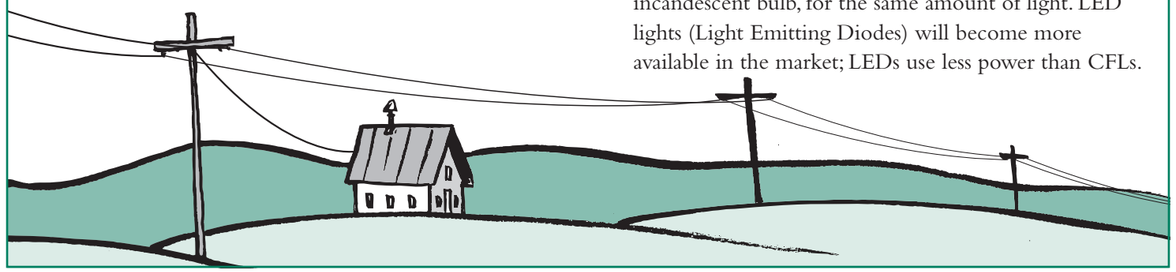
- **Electric stoves.** While electric stoves draw significant power when in use, people seldom operate them for extended periods of time and therefore, in most homes, they do not add many kWh's to the daily average. However, if your home is equipped with propane already, as for a clothes dryer, it may make sense also to use propane for cooking.

A billing meter reading cannot reveal the details of these 240-volt loads; ***it reflects only how much power all loads in the house used over a period of time.*** However, there are other electrical loads that may contribute significantly to your bill, and their impacts can be measured and, potentially, reduced. By borrowing a Co-op kWh test meter you can directly measure any 120-volt load – typically the most ubiquitous loads in a household. (The meter will also enable you to measure the impact of "parasitic" loads, which are the fastest-proliferating loads in many households.)

Examples of items that CAN BE TESTED:

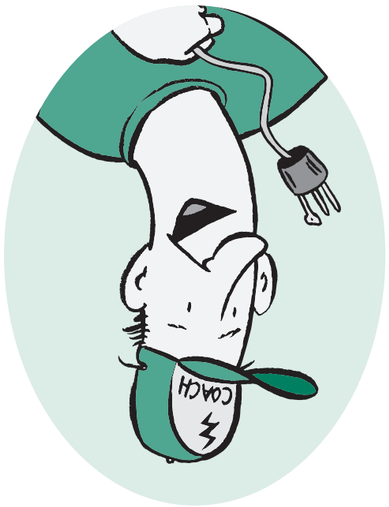
- Refrigerators/freezers
- Chargers/power supplies for digital devices (cell phones, game boxes, etc.)
- Portable heaters (120 volt; including ceramic, oil filled, infrared, or radiant)
- TV/entertainment systems
- Air conditioners
- Dehumidifiers
- Block heaters, heat tape, and trough deicers

- **Lighting.** Traditional incandescent lighting may be another significant electricity cost over the course of a year. (By federal law, stores will discontinue selling some sizes of incandescent bulbs.) Compact fluorescent bulbs (CFL) use approximately 1/3 the power of the incandescent bulb, for the same amount of light. LED lights (Light Emitting Diodes) will become more available in the market; LEDs use less power than CFLs.



Most people think about their home's electrical use in terms of how many dollars it costs. That's natural, because that's what your electric bill tells you every month.

But your electric bill also provides another number, just as important: your kilowatt-hours (kWh) of electric use. Your bill shows your TOTAL kWh usage for the billing period, and also your ***average kWh per day.*** Kilowatt-hours are the measure of electric consumption, the basis on which your bill is calculated, and each electrical "load" in your home consumes power at its own, identifiable rate.



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What's It Costing You to Run Your Household Equipment?

As you tally your daily electrical usage, keep in mind that the Vermont residential average is around 20 kWh per day. But here's one place where your goal should be to be "below average!"

Your Friend, The KWH Test Meter

What it tells you, and how that can help

Every appliance's energy consumption is a product of its load (or wattage) multiplied by the number of hours that the appliance is in use. A watt is a small unit of energy measure, so a member's bill tracks electric energy usage measured in "kilowatt-hours" ("kilo" meaning 1,000).

One thousand watts is one kilowatt ("kW").
Kilowatt-hours (kWh) denote the energy used by the load, over time.
Example: 1,000 watts for one hour = one kilowatthour (kwh).

Examples Of What You Get For A Kilowatt-Hour (kWh)

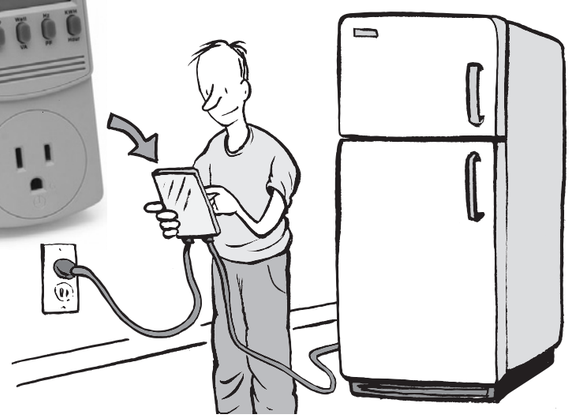
Device	Watts	Time used/on	kWh	Service delivered
Fluorescent bulb	25	40 hours	1	8 evenings of lighting
Incandescent light	100	10 hours	1	2 evenings of lighting
Computer	200	5 hours	1	>Half a day's work
Dryer	5000	12 minutes	1	< than 1 drying cycle

What you learn by using a kWh test meter is how much any measured 120-volt "load" consumes in its normal operation. That information might encourage you to replace older units with energy-efficient equipment. Or you may find that your increased energy awareness leads to savings through changes in behavior or how you operate your equipment.

Refrigerators: Refrigerators are a good example. Today's best ENERGY STAR refrigerators use about 1 kWh/day. (A freezer may use even less than a kWh per day). If you have an older unit the test meter may tell you it's using 3 or 4 kWh a day – possibly 400% more power than necessary, 365 days a year. The cost of a new unit using 1 kWh/day can be quickly "paid back" from the energy savings. The best way to determine whether a refrigerator or freezer should be replaced is to measure its usage with a 120-volt kWh meter before buying a new unit. ***Bear in mind that if there are wide swings in the overall electrical usage in a home it is unlikely to be due to a refrigerator or freezer.*** Members experiencing such inconsistencies are invited to call the Co-op for advice.

Here are the most important 120-volt loads to measure (if present):

Refrigerator/freezer
Dehumidifier; there are two basic dehumidifier types: manual and automatic discharge. A manual dehumidifier will stop operating once the container is full. An automatic unit drains directly into your sink or other receptacle, and therefore operates continuously until you shut it off. That means it uses more electricity. Even an ENERGY STAR-rated unit can use many kWhs per day, depending on the setting and humidity present.
Air conditioners; seasonal load; energy use varies with size
Oxygen concentrators; can be a significant cost of operation.
Game consoles

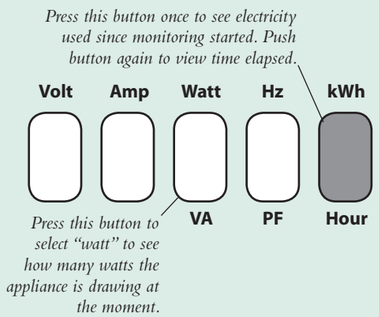


For assistance in understanding the measured data of your appliances, contact the Energy Coach.

Kill-A-Watt Monitor Operating Instructions

For assistance in evaluating kWh meter data, and making good economic decisions, please contact the Energy Coach at the Co-op.

Our kWh test meter measures several aspects of electric activity. The most important of these for decision-making are your accumulated electricity usage in kilowatt-hours (kWh), and the watts being consumed instantaneously by devices in your home. These functions are achieved by selecting the button on the right, and the center button. See illustration below. *(Note: buttons that are labeled both above and below the button itself have two functions, which can be toggled back and forth; the display will show which function is selected.)*



How to measure an appliance's electric usage:

1. Plug the kWh monitor into a standard 3-prong outlet. (Suggestion: when monitoring a refrigerator or freezer, where access to the plug may be obstructed, use an extension cord from another outlet, connect to the meter where it can be read conveniently, and then plug the refrigerator into the meter.)
2. Turn on the equipment you're testing.
3. To see how much electricity the equipment is drawing instantaneously, push the middle Watt/VA button to set to "watts" ("VA" reads volt-amperes).
4. WEC recommends that a 120-volt load be monitored for five 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 know the *absolute* amount of energy being used as well as the proportion of the total drawn by the appliance you are testing. **Use the log sheet provided to gather both sets of data.** The kWh meter will "lose" all stored data when disconnected, so **write the values down daily.**

Reading the buttons

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 Your Equipment

To determine the long-term costs of running a piece of equipment, you need to extrapolate that information based on its energy consumption during the time you monitored it. If you monitored for 5 days and it used 15 kWh, and you want to know how much it costs to run it for one year, first divide the energy used over those 5 days (15/5) and calculate the average daily consumption (~ 3 kWh/day). (Note: the formula assumes the load is operated year round; adjust accordingly for seasonal loads, or occasional loads.)

# of kWh/ day	KWh/ year (x 365)	Cost per kWh	Annual cost

Comparing Your Equipment with 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 increases your electric bills and 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.

Measuring "Phantom" Loads, the Energy the Equipment Consumes When Not in Active Use

Some appliances use electricity when they are plugged in but turned "off." These loads have "continuous standby" energy consumption. Examples include anything with an LED light or digital display that remains energized when the item is "off" (microwave, VCR, TV, game consoles, etc.), as well as computers, copiers, fax machines, stereos, DVD and CD players, and satellite receivers.

The cost of standby energy is easily estimated: Each watt of "continuous standby "load consumes about 9 kWh of electricity per year, assuming that the device with the "continuous standby" load is energized year-round.

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. (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 for 3 days at least. 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 energy use of appliances when "off"— even those labeled "Energy Star" — is a growing portion of household usage and an enormous impact on a national scale. Some new Energy Star-rated large-screen TVs use more electricity when "off" than the TV which was replaced did when it was "on." One way to avoid phantom electric usage is to use a "Smart Strip"; this is a surge-protection device that allows for all connected loads to be automatically de-energized when a primary load is shut "off." See www.energyfederation.org/washingtonelectric/default.php

Measuring Your Equipment's Percentage of Overall Household Electrical Use

When monitoring your equipment's power usage, read ***both*** the billing meter and the kWh meter daily. It is useful and informative to know how much your machines, devices, and appliances contribute to your home's total energy consumption. When reading (and recording) the numbers on your electric meter, subtract yesterday's value from today's; the difference will show how many kWhs were consumed by all household loads.

How long should I monitor a piece of equipment?

For most 120-volt loads, WEC advises monitoring their energy usage for five days. However, there can be exceptions. Lights, for example, use the same amount of electricity whenever they are on (unless they are 3-way or dimmable lights), so you can use the Kill-A-Watt to monitor for a single hour, from which you can calculate yearly energy use for that item. (There are 8,760 hours in a year.)

However, many electrical appliances use *varying* amounts of energy:

- 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. Also, you can set them at various settings, which affects electric usage. Depending on the weather, a few to several days' worth of data may be needed to get an accurate picture of their energy use. Electric clothes washers and dishwashers have a range of settings for heat and duration that affect their 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 use the same settings. However, by monitoring the electrical use for various settings you can identify the setting that achieves the results you want with the lowest possible electrical use.

Measuring 240-Volt Loads

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

Contact the Energy Coach at the Co-op for information on using a different meter to directly measure 240-volt loads.