

MEASURE ENERGY CONSUMPTION

Determining how much electricity your appliances and home electronics use can help you understand how much money you are spending to use them. Use the information below to estimate how much electricity an appliance is using and how much the electricity costs so you can decide whether to invest in a more energy-efficient appliance.

There are several ways to estimate how much electricity your appliances and home electronics use:

- Reviewing the [Energy Guide](#) label. The label provides an estimate of the average energy consumption and cost to operate the specific model of the appliance you are using. Note that not all appliances or home electronics are required to have an Energy Guide.
- Using an electricity usage monitor to get readings of how much electricity an appliance is using
- Calculating annual energy consumption and costs using the formulas provided below
- Installing a whole house energy monitoring system.

Electricity Usage Monitors

Electricity usage monitors are easy to use and can measure the electricity usage of any device that runs on 120 volts. (But it can't be used with large appliances that use 220 volts, such as electric clothes dryers, central air conditioners, or water heaters.) You can

buy electricity usage monitors at most hardware stores for around \$25-\$50. Before using a monitor, read the user manual.

To find out how many watts of electricity a device is using, just plug the monitor into the electrical outlet the device uses, and then plug the device into the monitor. It will display how many watts the device uses. If you want to know how many kilowatt-hours (kWh) of electricity the devices uses in an hour, or a day, or longer, just leave everything set up and read the display later.

Monitors are especially useful for finding the amount of kWh used over any period of time for devices that don't run constantly, like refrigerators. Some monitors will let you enter the amount your utility charges per kilowatt-hour and provide an estimate how much it cost to run the device since it was plugged into the monitor.

Many appliances continue to draw a small amount of [stand-by power](#) when they are switched "off." These "phantom loads" occur in most appliances that use electricity, such as televisions, stereos, computers, and kitchen appliances. Most phantom loads will increase the appliance's energy consumption a few watt-hours, and you can use a monitor to estimate those too. These loads can be avoided by unplugging the appliance or using a power strip and using the switch on the power strip to cut all power to the appliance.

Calculating Annual Electricity Consumption and Costs

Our appliance and electronic energy use calculator allows you to estimate your annual energy use and cost to operate specific products. The wattage values provided are samples only; actual wattage of products varies depending on product age and features. Enter a wattage value for your own product for the most accurate estimate. Wattage and utility rate data sources: [2010](#)

[Buildings Energy Databook, Table 2.1.16](#); [Home Energy Saver](#); [EIA Average Retail Price of Electricity - Residential](#).

Follow these steps for finding the annual energy consumption of a product, as well as the cost to operate it.

1. Estimate the number of hours per day an appliance runs. There are two ways to do this:

- Rough estimate

If you know about how much you use an appliance every day, you can roughly estimate the number of hours it runs. For example, if you know you normally watch about 4 hours of television every day, you can use that number. If you know you run your whole house fan 4 hours every night before shutting it off, you can use that number. To estimate the number of hours that a refrigerator actually operates at its maximum wattage, divide the total time the refrigerator is plugged in by three. Refrigerators, although turned "on" all the time, actually cycle on and off as needed to maintain interior temperatures.

- Keep a log

It may be practical for you to keep a usage log for some appliances. For example, you could record the cooking time each time you use your microwave, work on your computer, watch your television, or leave a light on in a room or outdoors.

2. Find the wattage of the product. There are three ways to find the wattage an appliance uses:

- Stamped on the appliance

The wattage of most appliances is usually stamped on the bottom or back of the appliance, or on its nameplate. The

wattage listed is the maximum power drawn by the appliance. Many appliances have a range of settings, so the actual amount of power an appliance may consume depends on the setting being used. For example, a radio set at high volume uses more power than one set at low volume. A fan set at a higher speed uses more power than one set at a lower speed.

- Multiply the appliance ampere usage by the appliance voltage usage

If the wattage is not listed on the appliance, you can still estimate it by finding the electrical current draw (in amperes) and multiplying that by the voltage used by the appliance. Most appliances in the United States use 120 volts. Larger appliances, such as clothes dryers and electric cooktops, use 240 volts. The amperes might be stamped on the unit in place of the wattage, or listed in the owner's manual or specification sheet.

- Use online sources to find typical wattages or the wattage of specific products you are considering purchasing. The following links are good options:

The [Home Energy Saver](#) provides a list of appliances with their estimated wattage and their annual energy use, along with other characteristics (including annual energy use, based on "typical" usage patterns. Continue using the equations here if you want to find energy use based on your own usage patterns).

[ENERGY STAR](#) offers energy-use information on specific products that have earned the ENERGY STAR. The information varies across products, but if you are considering purchasing a new, efficient product, ENERGY STAR allows you to select and compare specific models. In some cases,

you can use the provided information to do your own estimates using the equations here. The information may also help you compare your current appliances with more efficient models, so you understand potential savings from upgrading to a more efficient appliance.

3. Find the daily energy consumption using the following formula:

(Wattage × Hours Used Per Day) ÷ 1000 = Daily Kilowatt-hour (kWh) consumption

4. Find the annual energy consumption using the following formula:

Daily kWh consumption × number of days used per year = annual energy consumption

5. Find the annual cost to run the appliance using the following formula:

Annual energy consumption × utility rate per kWh = annual cost to run appliance

Examples:

I. Following the steps above, find the annual cost to operate an electric kettle.

1. Estimate of time used: The kettle is used several times per day, for about 1 total hour.
2. Wattage: The wattage is on the label and is listed at 1500 W.

3. Daily energy consumption:

$$(1,500 \text{ W} \times 1) \div 1,000 = 1.5 \text{ kWh}$$

4. Annual energy consumption: The kettle is used almost every day of the year.

$$1.5 \text{ kWh} \times 365 = 547.5 \text{ kWh}$$

5. Annual cost: The utility rate is 11 cents per kWh.

$$547.5 \text{ kWh} \times \$0.11/\text{kWh} = \textbf{\$60.23/year}$$

II. Following the steps above, find the annual cost to operate a paper shredder.

1. Estimate of time used: The shredder is used for about 15 minutes per day (0.25 hour).

2. Wattage: The wattage is not listed on the label, but the electrical current draw is listed at 3 amperes.

$$120\text{V} \times 3\text{A} = 360\text{W}$$

3. Daily energy consumption:

$$360 \text{ W} \times .25 \div 1000 = 0.09 \text{ kWh}$$

4. Annual energy consumption: The shredder is used about once per week (52 days per year).

$$0.09 \text{ kWh} \times 52 = 4.68 \text{ kWh}$$

5. Annual cost to operate: The utility rate is 11 cents per kWh.

$$4.68 \text{ kWh} \times \$0.11/\text{kWh} = \textbf{\$0.51/year}$$

Whole-House Energy Monitoring Systems

If you want more detailed data on your home's energy use (as well as the ability to measure the energy use of 240-volt

appliances), you might consider installing a whole-house energy monitoring system. The features of these systems vary, and the cost and complexity depends on the number of circuits you want to monitor, the level of detail of the data, and the features available. The monitors are often installed directly in the main breaker panel of the home, and some may require an electrician to install. Some monitors must be connected with your home's wireless network and data is viewed on a computer or smartphone, while others come with a dedicated display.

In addition to providing information on the energy consumption of your appliances, these monitors help you understand where and when you use the most energy, allowing you to develop strategies to reduce your energy use and costs.