PEP POWER EFFICIENCY PROJECT

Professor Max Powers' Power Efficiency Project (PEP) is brought to you by the Kansas Corporation Commission and Kansas State University Engineering Extension. Funding provided by a grant from the U.S. Department of Energy.

Understand Energy Consumption and Demand

Let's start with a basic term – **watt**. You've probably seen this word when buying lightbulbs or reading the directions on how to microwave a frozen dinner. A watt is simply a way to measure how much power is being used. There's no need to get too technical about it unless you're really interested. For now, it's enough to know that if a lightbulb is rated at 60 watts, that value refers to the rate at which that lightbulb will use power. Similarly, a 1,000-watt microwave will use 1,000 watts when operating.

If you're familiar with the metric system, this next part will be easy to understand, but even if you're not, it's still straightforward. A **kilowatt** (kW) is equal to 1,000 watts (just like a kilogram is equal to 1,000 grams). A **megawatt** (MW) is greater – it's equal to 1,000,000 watts. There are other terms, but watt, kilowatt, and megawatt are the ones you're likely to see most often.

Now back to that microwave. Knowing what we just learned, you can see that our 1,000-watt microwave is equivalent to one kilowatt. If you had some really frozen food and needed to leave the microwave on full power for one hour, at the end of the hour, it would have consumed one **kilowatt-hour** of electricity (which is abbreviated as "kWh"). You're really just multiplying the rate of electricity use (kW) by the length of time (hours) to get kilowatt-hours (kWh).

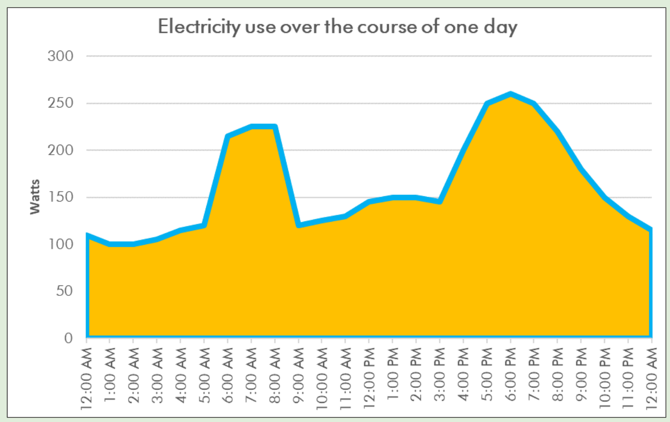
If you ran the microwave for two hours? Two kilowatt-hours (kWh).

A half hour? 0.5 kWh.

Figure 1 shows what this might look like as a chart of a home's energy use. The rate of electricity use (watts) is represented as the light blue line. The gold area underneath that line indicates the amount of electricity used (kWh).

Figure 1:

Chart representing an example home's electricity use during the course of one day.



Here's another example, as illustrated in **Figure 2**. Think of using electricity like filling up a bucket of water with a garden hose. The rate at which the water flows through the hose represents our rate of electricity use, also known as **demand** (kilowatts). The amount of water collected in the bucket represents how much energy we consume over time (kilowatt-hours). Although this illustration is useful for understanding the difference between kW and kWh, electrons do not actually flow through wires the way water flows through a hose.

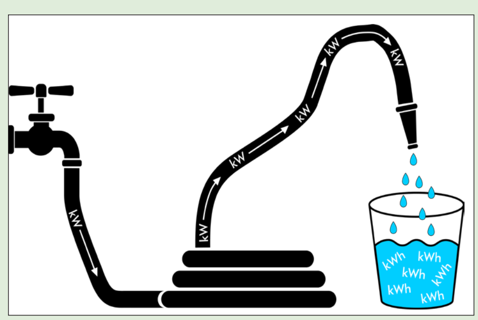


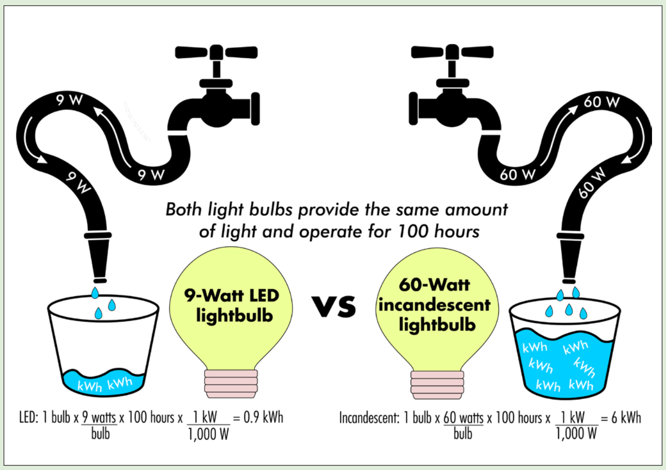
Figure 2:

Comparing electricity use to filling a bucket of water using a garden hose.

Of course, with a garden hose, we can turn the faucet handle to fill up the bucket faster or slower. Similarly, if we can adjust our rate of electricity use (our demand), we can also slow down or speed up how quickly we are consuming electricity.

One example of how we might do this is to switch from an incandescent light bulb to an LED bulb. Typically, an 8.5 or 9-watt LED bulb will produce as much light as a 60-watt incandescent. **Figure 3** shows what this light bulb-replacement project might look like using our garden hose example. If we operated each of those light bulbs for 100 hours, at the end of that time, we would have used significantly less energy – all while producing the same amount of light! That's what we call **energy efficiency**. In this example, switching light bulbs reduces our energy use by 85%.

Figure 3:
Reducing energy demand and energy use by changing light bulbs.



Have you noticed sometimes this fact sheet refers to power and other times to energy? It's not a mistake! There really is a difference. **Power** refers to the rate electricity is being transmitted (typically watts or kilowatts), which is known as demand. **Energy** refers to the power used over time (typically kilowatt-hours), otherwise known as our energy consumption.

How does consumption and demand affect you?

Most residents are only billed for their energy consumption (kWh), however there are some electric utilities that also charge fees based on the demand (kW). If your utility is one of them, that means it's important to reduce both the total energy use over the course of each month and also how quickly you're consuming electricity at any one time. Even if your utility does not charge based on electricity demand, lowering it has the added benefit of reducing the demand on the electric grid!

Here's an example of what reducing demand might look like at your house: If you have been gone all day and as soon as you arrive home, you flip on several lights, start up the air conditioner, begin cooking something in the microwave, and also turn on the clothes dryer, your house will suddenly be demanding a significant amount of electricity that your utility must now provide.

On the other hand, if you can wait until later in the day to cook your food or dry your clothes, it won't reduce the overall electricity consumption (kWh), but it will reduce the electricity demand (kW).

For more information on energy consumption and demand, contact Kansas State University Engineering Extension at 785-532-4998 or dcarter@ksu.edu.