The difference between energy and power...or how fast can you climb the stairs?

In construction, you run across the terms “energy” and “power” constantly when discussing heating and electrical appliances. Though the terms are often used interchangeably, energy and power are two different—though related—quantities.

Energy is the ability to do work, so a high amount of energy is a high capacity to perform “work,” such as heating a house or running an appliance. For instance, one gallon of kerosene contains roughly 132,000 BTUs of heat energy and thus can provide that much heat to a home when burned. Similarly, a handful of nuts might have 200 Calories of energy, presumably allowing you to do more work than if you ate a 1-Calorie radish.

Power, on the other hand, is a rate - specifically the rate at which energy is expended or used. Mathematically, we say that power is energy divided by time, but you can also think of it as how quickly energy is used or converted from one form to another (such as from chemical energy in kerosene to heat energy in your home).

One thing to keep in mind is that energy can be stored - in a gallon of fuel oil, in a battery, in a bowl of pasta. Power, on the other hand, is energy in motion - kerosene changing from a chemical into heat, or electricity in a toaster changing into heat to toast your bread.

So how can you get a feel for energy and power? Climb some stairs! By climbing anything, (stairs, a hill, a stepladder) you are working against gravity and thus giving yourself some energy. If you’re on skis, that energy will be put to use soon as you coast downhill at high speed. If you’re chopping wood, the work of lifting an axe is redeemed as it falls back down and splits a log. The “energy” in this example is the potential you have given yourself by climbing - potential to move as you drop back down in height.

Power, on the other hand, is how fast you climbed. Did you trudge up the staircase slowly—using low power—or run up as fast as you could, using higher power? Either way, the energy at the top was the same, but power shows how quickly the energy was obtained.

What does this have to do with housing? The electrical unit of power is the watt (W) or kilowatt (kW, or 1,000 watts). Most appliances list the amount of power they use so consumers have an idea of how much electricity the device will require. For instance, a 100-Watt light bulb is using electrical energy at the rate of 100 Watts. A 1,000-Watt, or 1 kW, coffee pot will use electricity at the rate of 1 kW.

The electrical unit of energy is the kilowatt-hour (kWh) and reflects the amount of energy used during a given time period. If you use a 1 kW coffee pot for 3 hours, then you will have used 3 kWh of energy (and GVEA will charge you accordingly). If your 2-kW clothes dryer runs for one hour, it uses 2 kWh of electricity. All of this energy is tallied up to produce the monthly total on your electric bill.

Heating appliances also are rated in terms of power, typically in BTU per hour. A BTU, or British Thermal Unit, is about the amount of heat produced by burning one match. The heating appliance will specify its power so it can be compared to your home heating demand.
For instance, on a cold day in Fairbanks, a house might lose heat at a rate of 60,000 BTU per hour. Thus, you would need to find a boiler, furnace or heat pump capable of producing power at 60,000 BTU/hour.

Heat energy comes from the energy stored in fuel oil, propane or another source and is converted by the appliance at a given rate into heat for your home. Of course, you should consider more than the power of the heating appliance when you purchase it. You’ll also want to check its efficiency, or how much heat from the fuel it can convert into heat for your home, as opposed to sending up the stack.