

Renewable Energy Terms

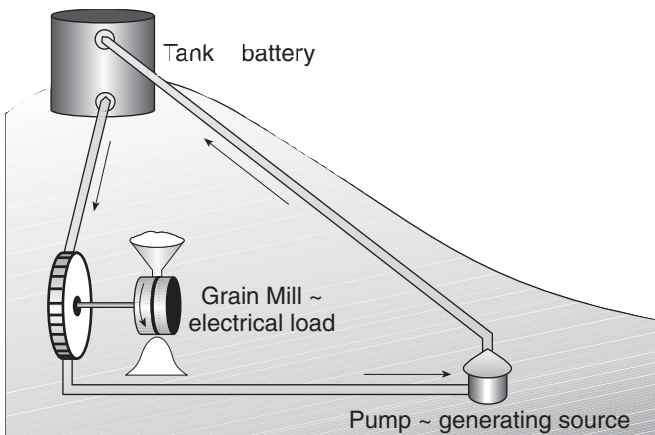
Electricity: An Analogy

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For a long time, folks have been wrestling to come up with a comprehensive analogy for basic electrical terms and functions. With help from a variety of smart people, I think I've come up with something. I hope it helps you visualize things, and clears up some of the confusion caused by the misuse of electrical terminology.

Volts ~	water pressure
Ohms ~	resistance of the pipe, fittings, and mill
Amps ~	gallons per hour
Amp-hours ~	total gallons through the mill
Watts ~	grain ground per hour
Watt-hours ~	total grain ground



In the diagram below, the pump is analogous to the generating source—PV, wind generator, etc. The tank is analogous to the battery in a simple DC system. The plumbing represents the wires, and the water represents the charges or electrons that flow in the wires.

Volts are analogous to pressure in the water pipe. It's the “push” that gets the water up to the tank, and the same “push” that the water in the tank exerts on the pipeline down to the mill. Ohms are analogous to the resistance of the pipe walls and fittings, and of the pump, battery, and mill.

Amps are analogous to gallons per hour of water flowing in the pipe. An amp is the rate of charge flow (coulombs per second). Amp-hours are analogous to the total gallons pumped through the system. An amp-hour is accumulated charges over a period of time.

Notice that this is a closed loop system. There's a certain amount of water in the system, and it just flows around and around. In the same way, charges in an electrical circuit flow around and around. They are not “used up,” nor do they flow out the end of the wire like water out of the end of a hose.

Two things flow in an operating electrical circuit—charges and energy. In this analogy, the water system is showing only the flow of charges (you can think of them as electrons). To get to the flow of energy, I've introduced a grain mill, powered by water (representing an electrical load, powered by charges).

Watts are analogous to the grains per hour being ground by the mill. It's the rate of energy transfer. The energy is transferred by the charges, but it travels instantly from source or battery to load in a one-way trip. Energy is applied to the system at the generator, and the grain mill instantly grinds some grain. A watt is the rate of energy flow (joules per second).

Watt-hours are analogous to the total grain that has been ground—energy used. The charges drive the mill, and the energy is instantly transferred from the pump (generating source) or tank (storage device) to the grain mill (electrical load). A watt-hour is energy generated or used over a period of time.

All analogies are imperfect in one way or another. Or as one scholar said, “All models are wrong. But they're useful.” I hope this one helps sort out a few of the mysteries of common electrical terms.

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