Watt—unit of power, rate of energy use or flow

Ian Woofenden

Derivation: The watt as a unit was originally proposed in 1882. It was named after James Watt, who invented an improved steam engine.

If I ran the circus, I might rename the watt. This isn't because I have anything against James. But a watt, like an amp, is a *rate,* while neither term *sounds* like a rate. A watt is technically a joule per second, a specific amount of work done in a specific amount of time. Because the term doesn't sound like a rate, it's easy to slip into thinking it's a quantity of "stuff"—of electricity or of energy.

A watt in itself doesn't tell us how much energy is being used, only how quickly it is being used. A 100 watt light bulb uses energy twice as fast as a 50 watt bulb. But saying that you "used 50 watts" is about like saying you "took a 50 mph trip." Unless you tell us how many hours your trip took or how many hours you ran the electrical load, we can't figure out how far you traveled or how much energy you used. Think of the watt as an instantaneous measurement, like the cop catching you at 75 mph with his radar gun.

To calculate watts (joules per second), multiply amps (coulombs per second) times volts. A renewable energy (RE) system with a voltage (electrical "pressure") of 24 volts and a load drawing 3 amps (rate of electron flow) will be delivering energy at the rate of 72 joules per second, which we call 72 watts. The formula is *amps x volts = watts.* It can be reversed to calculate amperage when only watts and volts are known, or to calculate voltage when only watts and amps are known.

Since a watt includes voltage, it is a measure that allows comparisons regardless of system voltage. A 100 watt 12 volt DC bulb is using energy at the same rate as a 100 watt 120 volt AC bulb. With traditional incandescent light bulbs, we grew up seeing a watt as a measure of light output and we compared the brightness of different bulbs by their watt rating. With the advent of super-efficient compact fluorescent light bulbs, these comparisons are no longer valid. A modern 15 watt compact fluorescent puts out about the same amount of light as a 50 watt incandescent bulb. This can remind us of two things: that a watt actually tells us the rate of energy use, *and* that we should buy compact fluorescents!

To get to the ultimate measure of energy use in our RE system, we have to add *time* to the equation, which I'll do in my next column when I talk about *watt-hours.*

Access
Author: Ian Woofenden, PO Box 1001, Anacortes, WA 98221 • Fax: 360-293-7034
ian.woofenden@homepower.com