Renewable Energy Terms

Battery—Electrochemical Energy Storage Device

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Derivation: The word "battery" is originally from an Old French word meaning "to beat." It later came to mean a physical confrontation ("assault and battery"), then a group of weapons ("a battery of mortars"), and finally a group of other things ("a battery of tests"), including electrochemical cells.

One reference book suggests that there's also a connection between a weapon discharging and a battery discharging. Today many people use the term to mean not only a group of cells, but also an individual cell ("flashlight battery"), stretching the word's meaning once again. Many technical people think that "battery" should only be used to designate a group of cells.

A battery in a renewable energy (RE) system is an energy storage device. Stick with me while I suggest a new analogy for this device. We often compare electricity to hydraulics, and electron flow to water flow. To carry this analogy further, you can think of a battery as an electron pump. But this pump not only drives electrons, it is driven—or charged up—when the electrons flow in the other direction. Imagine a spring-loaded, wind-up water pump that sends water out to a faucet as it unwinds, but can also be wound up by driving the water back through it. Instead of water, a battery pumps electrons.

When a battery is powering a light bulb, the electrons flow in a loop, through the battery, to the the load, and back through the battery. How much water does a wind-up water pump store? None. How many electrons does a battery store? None.

A little wind-up water pump could be wound up to its maximum capacity by pushing a certain number of gallons through it. Yet the little wind-up water pump does not store any water at all, since the water is pumped *through* it. It's the same with a battery. A battery does not store electrons. It stores potential energy in a chemical form. The wind-up water pump stores potential energy in the spring.

Batteries are direct current (DC) devices that store chemical energy. This chemical energy is based on electrical energy, but there is a difference. Electrical energy can be accessed directly (as in discharging a capacitor), while chemical energy requires a chemical reaction to access the energy. If we let a battery run all the way down to zero charge, then its chemical reaction has been completed in one direction. When we charge the battery, the chemical reaction runs the other way. When this reaction is complete, we say the battery is "full." A certain number of electrons have been pumped back through the battery. The battery is now ready to supply energy by moving the electrons in the other direction, doing work in the process.

Of course, this isn't a perfect process. Some energy is lost to heat and other inefficiencies. Generally speaking, we get about 80 percent out of the battery for whatever we put in. And we're limited to what our renewable energy systems generate.

Our neighbors on the subsidized utility grid have an unlimited supply—they can leave the hose running full blast all the time, though they'll see it on the bill. We have only what our spring-loaded pump will store—whatever energy our renewable energy systems have generated. This is why we have to be very careful not to lose our limited supply of energy through wasteful appliances and lights, or through carelessness.

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