

GREEN TECH THE SERIES COLUMN FOR NOVEMBER 30, 2016
HEADLINE: IS D.C. POWER MAKING A COMEBACK?

For the past couple of weeks, I have been looking into electricity; how to save as much as you can; how the system is operated and, this week, I will take, as much as possible, an untechnical look at direct current (DC) electricity.

First, what is electricity? A quick trip back in history will answer that. The popular answer has to do with Ben Franklin and his kite, where he showed that lightning and tiny electric sparks were the same thing. The first known steady flow of electric charge was produced by Italian physicist, Alessandro Volta, in 1800. He constructed the first rudimentary battery by using direct current. Although refined considerably, that battery evolution is still in use today.

In 1878, Thomas Edison invented a filament light bulb, at about the same time as British scientist, Sir Joseph Swan. Edison used this direct current, operated from an electric dynamo, leading to the first street light in 1882. Another scientist, Nikola Tesla, (ever wonder where the Tesla electric car name came from) had left Edison's lab and invented numerous electrically operated items. He actually competed with Marconi for the invention of the radio, but he is best known for his work on alternating current or AC as we know it today. Industrialist George Westinghouse bought Tesla's inventions. A huge fight ensued in the US between Edison's DC and Westinghouse's AC, with the later winning out because it was easier, at the time, to build transformers to transmit AC power over long distances. As well, AC had the ability to transform to different voltages and to utilize small motors for things like appliances.

That said, AC power is more efficient using copper wire. An average home has approximately 400 pounds of copper wire in its electrical system and it is estimated that 40% of copper production goes into home and commercial buildings. The concern here is that production of copper will peak around 2030.

While DC power dropped off in the home and commercial market, it did not die off totally, as it is a battery capable power. Most cars, trucks, small boats and even trains run on DC power. In fact, there is a huge DC sub-sea transmission line that runs from Sweden to Germany, where the DC power is converted to AC; it's 250 kilometers long. Another, 580 km long, line runs from power stations in Norway to Holland.

So why all the interest in DC power, recently? AC power, over long distances, does not flow efficiently. In fact, between 8% and 15% of the power transmitted is lost by the time it gets to your home. Distance calculations can have an effect in a

home, too. A few years ago, we buried a cable from our home to the garage. The distance, size of wire and power loss dictated the size of breaker we could use. This loss is one of the factors in your hydro bill, hidden amongst a number of other charges.

So, batteries aside, where else is DC power used? Every home today has electronics, computers, some sound systems, television sets, motion sensing lights, doorbells, alarm systems and LED light bulbs that operate in DC power. Every cell phone does, as well, along with most cordless drills and, in many newer high efficiency furnaces, the fan motor is DC power. Some studies state that a furnace blower/fan, fitted with a brushless or an electronically commutated motor (ECM) as they are called, operates anywhere from 40 to 80% more efficiently than a conventional AC motor. When you factor in the availability of more than one speed, or a variable speed ECM motor, this can be a significant energy savings.

In many institutions, there is a movement, all be it small, to rethink the use of DC power. In the US, a group called EMerge promotes a 24 volt DC office system that reduces consumption using solid state lighting and device controls running off of a photovoltaic solar panel rack. The EMerge Alliance Group estimates that, in a commercial environment, these buildings will save from 7 to 28% overall by converting to a DC micro grid. Solar power is always provided in DC and is then, if it's provided to the power grid, converted to AC for general use.

Another question is, are there household appliances that can operate on DC power? The quick answer here is, yes. There is one company on line called Back Wood Solar that has a complete catalogue on DC products ranging from bed warmers, lights, garage door openers to electric fence chargers and refrigerators. Another company offers programmable timers that control both AC and DC appliances.

While the public interest in DC power is still small at this time, the benefits are becoming obvious, especially when you factor in the energy savings. Today, we have a considerable level of DC powered products in our homes. A recent Department of Energy study in the US stated that lower capital costs, due to less components needed and, with that, better reliability; better power quality and resilience when batteries are used, means that DC power holds a bright future. Another study stated that, within 10 years, entire homes will operate on DC power. As we strive to find ways to reduce electrical use, this has to make sense.

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