Ultracapacitor Power Cells

(May Eliminate the need for the Combustion Engine and Oil)

Steve Krar

Energy storage has long been the bottleneck for innovation, holding back new energy-sucking features in mobile devices and preventing everything from the electric car to renewable power systems from reaching their full potential. Build a radically better battery at lower cost, experts say, and the world we know will be forever transformed.

A Safe, Non-Pollutant Energy Source

An electrical energy storage unit, an ultrcapacitor, that could have 10 times the energy punch of a lead-acid battery of similar weight and may cost half as much and should be available sometime in 2008. It contains no hazardous materials yet acts like a battery by storing electricity. If it works as it's supposed to, it will charge up in five minutes and provide enough energy to drive 500 miles on about $9 worth of electricity.

EEStor’s ultracapacitor’s energy storage technology is not explosive, corrosive, or hazardous lead-acid and will outlast the life of any commercial product it powers. It can also absorb energy quickly, meaning a small electric car with a 17-kilowatt-hour system could be fully charged in four to six minutes versus hours for other battery technologies.

EEStor’s Technology

EEStor's technology isn't really a battery at all but a ceramic ultracapacitor with a barium titanate dielectric that contains no hazardous or dangerous material. It is designed to combine the superior storage abilities of a battery with the higher power and discharge characteristics of an ultracapacitor. Reliable in the coldest winters and warmest summers, "ultracaps" can typically be cycled — that is, completely discharged and recharged — more than a million times, outlasting any iPod or the electric scooter in your garage

The quick power burst that ultracaps provide is why they're already showing up as a complement to batteries in hybrid-electric vehicles and fuel cells in hydrogen-powered cars and buses, which benefit from the extra kick that's needed to get from a stop-to-start position or to assist in acceleration.

An electrical-energy-storage unit (EESU) has as a basis material a high-permittivity composition-modified barium titanate ceramic powder. This powder is double coated with the first coating being aluminum oxide and the second coating calcium magnesium alumina-silicate glass. The components are arranged into a multilayer array with the use of a solder-bump technique as the enabling technology so as to provide a parallel configuration of components that has the capability to store electrical energy in the range of 52 kWh. The total weight of an EESU with this range of electrical energy storage is about 336 pounds.

The ultracapacitor (battery) charges in minutes while to charge a battery usually take hours. With lead acid batteries you might get lucky to have 500 to 700 recharge cycles, the EEStor technology has been tested up to a million cycles with no material degradation.

Foreseeable Uses

Imagine the day when cellphones charge up in seconds, laptop batteries never degrade, and electric cars have the same power, driving range and purchase price as their gas-powered cousins. It's a consumer's dream and an engineer's fantasy: Safe, affordable and eco-friendly batteries that can store immense amounts of energy, allow for lightning-fast charging, and handle virtually unlimited discharging with little affect on quality.

EEStor's technology could be used in more than low-speed electric vehicles. The company envisions using it for full-speed pure electric vehicles, hybrid-electrics (including plug-ins), military applications, backup power and even large-scale utility storage for intermittent renewable power sources such as wind and solar.

The EEStor technology has been tested up to a million cycles with no material degradation compared to lead acid batteries that optimistically have 500 to 700 recharge cycles, Because it's a solid state battery rather than a chemical battery, such being the case for lithium ion technology, there would be no overheating and thus safety concerns with using it in a vehicle.

Ultracapacitor Advantages

- The electrical energy storage unit can pack nearly 10 times the energy of a lead-acid battery of similar weight and cost half as much.
- The cost of the engine itself depends on how much energy it can store; an EEStor-powered engine with roughly equivalent to that of a gasoline-powered car would cost about $5,200. A slight premium over the cost of the gas engine and the other parts the device would replace -- the gas tank, exhaust system, and drivetrain. Getting rid of the need to buy gas should more than make up for the extra cost of an EEStor-powered car.
- A number of these ceramic batteries could be used at "electrical energy stations" where people on the road could charge up. The power burst that ultracaps provide can assist with stop-start acceleration, and the energy is more efficiently recaptured through regenerative braking
- By some estimates, it would only require $9 worth of electricity for an EESU-powered vehicle to travel 500 miles, versus $60 worth of gasoline for a combustion-engine car.

Millions of Recharges

- Solid-state devices that use ultracapacitors recharge in minutes as compared to the conventonal battery which tabe as much as 6 hours.
- An ultracapacitor can be charged/discharged a million times or more without significant degradation of its performance.
- The operating range for EESUs is minus 20 Celsius (minus 4 Fahrenheit) and 65 C (149 F), Lithium ion, nickel metal hydride and lead acid batteries [are] all significantly challenged at extreme temperatures