



Entrepreneurs

Cracking The Battery Barrier

Melanie Lindner, 02.28.08, 12:30 PM ET

Wouldn't it be great if you didn't have to worry about your cellphone losing its charge? How about your laptop, MP3 player, even your car?

While the global battery market is enormous--some \$55 billion, according to the Freedonia Group, a Cleveland-based market research firm--batteries remain one of the most limiting technologies in the modern age, thanks in great part to the pesky laws of chemistry and metallurgy. Meanwhile, the need for generating and storing renewable, sustainable energy continues to swell.

That spells massive opportunity for the tech-savvy start-ups trying to crack through these barriers--and potentially massive relief for throngs of frustrated consumers.

In Pictures: The Next Battery Kings

"It's totally a race," says Ken Lawler, general partner with Battery Ventures, a venture capital firm in Silicon Valley. "We're all trying to get our products out first to become the new industry leader."

Despite stiff competition from giants like Altair, Valence Technology, Sony, Sanyo and Procter & Gamble (owner of Duracell), which spend hundreds of millions of dollars on battery research and development every year, a cadre of start-ups--some well funded in their own right--are charging ahead.

The holy grails in battery land: expanding the amount of charge a battery holds; boosting power to add oomph to devices (a hand drill with a high-power battery can move through tough materials more easily than one run on a less powerful battery); increasing the number of times batteries can be recharged; and, last but not least, enhancing safety.

One company, Lion Cells, wants to accomplish all four goals. Founded in 2006 and backed by Battery Ventures, this Silicon Valley start-up aims to make small but powerful lithium ion batteries, which discharge energy as the ions move from an anode to a cathode. Lion's batteries, which claim to boost charge, power and reusability, also offer a vent to release potentially dangerous pressure that builds up from heat generated by all those bouncing ions.

Lithium ion batteries generally have strong energy-to-weight ratios and lose minimal charge when not in use, making them a good fit for portable electronic devices. While Lion is targeting the power-tool market, the company also has its eye on bigger stuff like motorcycles and cars. Lion licenses its technology from SRI, a non-profit sponsor of technology development. (The company won't disclose how much money it has raised.) According to Chief Executive Jeff Depew, the company's products should hit the market in 2009, perhaps sooner.

Unlike Lion Cells, EESstor, of Cedar Park, Texas, aims to solve the renewable energy problem with its "battery-ultracapacitor" hybrid technology. While traditional batteries (including lithium ion batteries) wear out and have to be thrown away, "ultracaps" can be used and recharged for decades with almost no degradation; the downside is that they tend to hold about 25 times less energy per pound than lithium ion batteries, meaning that they have to be recharged fairly often.

EESstor says it solved that problem using a ceramic ultracapacitor with a barium-titanate insulator that can absorb higher amounts of energy per given unit of mass (called specific energy). According to the company, EESstor's batteries boast specific energy of 280 watt-hours per kilogram, whereas a lithium ion battery has about 120 watt-hours and a lead-acid gel battery, commonly used in golf carts and motor scooters, has only 32 watt hours.

Zenn Motor was impressed: Last year it invested \$2.5 million for a 3.8% stake in EESstor, valuing the start-up at \$66 million. If EESstor can deliver, Zenn Motor, which makes environmentally friendly vehicles, stands to win big. According to Zenn, traveling 500 miles in an EESstor-powered midsized vehicle would gobble only \$12 in electricity vs. \$85 in gas for a combustion-engine at current U.S. gas prices.

Critics claim the technology has its limitations, mainly because producing the capacitors requires using the purest form of barium titanate--no mean manufacturing feat. EESstor Chief Executive Richard Weir says the company has been working

with the material since early this year, and plans to hit the market later in 2008.

Yet a third technology is vying for supremacy: fuel cells. These devices convert oxygen and stored hydrogen to produce electricity; the only emission is harmless water vapor. As long as fuel is present, the cells keep pumping.

Angstrom Power of Vancouver is a player here. Launched in 2001, Angstrom uses fuel-cell technology to run small consumer electronics like cellphones and MP3 players. As of 2006, Angstrom had raised \$18 million from venture capital firms, including Arête, Growth Works and Ventures West. (It has raised additional funds since, but won't disclose how much.)

In January, Angstrom released a prototype for **Motorola's** SLVR phone, with double the talk time of the lithium ion battery currently being sold with the phone. The phone also recharges in only 10 minutes, vs. several hours for lithium ion batteries.

Impressive, perhaps. But as in any industry, breaking new ground in the battery business isn't only about mastering the technology. When you're a small fry, it's also about convincing the masses to give you a shot.

"The performance advantage has to be compelling," says Lawler of Battery Ventures. "Customers are always nervous about buying from a start-up company."

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