Finally, a breakthrough in batteries

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For more than a century, mankind has been struggling to make its prime portable power source -- the battery -- a smaller, lighter and longer-lasting package. It's a pivotal factor in the quest for everything from a practical electric auto to a silent army Jeep to a power lawn mower that's as light as a garden rake.

So far, it has been rough going. But a hardy band of engineers in Peoria now has scored scientific breakthroughs that are making that quest attainable. Beyond the portents for all of us, a notable aspect is that this group was spawned not by a university think tank or electrical giant but by a tractor maker.

The gestation was at Caterpillar in 2002, as part of its ongoing program of devoting research dollars to non-core technologies and supporting adventurous, early stage risk-taking R&D. Its chief material scientist, Kurt Kelley, devoted some of his efforts to battery chemistry, and he discovered that if he could remove the corrosive heavy lead grids of a conventional battery and replace them with carbon-graphite foam, he might end up with a lead acid battery that is far lighter, smaller and stronger, with two-thirds of the lead absent.

To take the idea to the next level and seek practical commercial applications, Caterpillar in 2003 chose to dub the operation Firefly Energy, and spun off the operation to a private investor group, retaining the largest share of equity but not control. Today, the young company is owned by the partial parent, plus Chicago venture capital firm KB Partners, BAE Systems, the State of Illinois Finance Authority, Husqvarna and several top Firefly employees. These include Kelley, who now devotes full time as chief technology officer; co-founder Mil Ovan, now senior vice president, and CEO Ed Williams, a co-founder.

As the man responsible for turning a stunning invention into a usable product, Williams admits he had to learn batteries on the job.

"The first thing is to know what you don't know -- and I made that paramount," says Williams, 56, an MBA grad from the University of Detroit, a CPA, and veteran of Apple Computer. His task at Firefly is to not only win applications where its 3D battery can replace the standard lead acid model, but also to replace the most advanced breed of batteries on the market -- those made with nickel metal hydride and lithium.

Where to go first? Williams is targeting four key markets: lawn and garden power equipment, military vehicles, commercial trucks and hybrid autos. In all these applications, he says, the 3D technology provides important advantages, with battery life being No. 1.

One of the first applications will be in military vehicles, he says, with prototypes being tested by the Army in early 2008. The 3D model will enable "silent watch," where Army surveillance/attack vehicles will operate on noiseless electric power, with gas engine turned off, and with a battery that has extended life in hot climates.

Meanwhile, the Group 31 battery program will be an ideal and timely solution to help commercial truckers meet the tough new landmark California "anti-idling" rules effective next year. These prohibit the traditional practice of drivers idling their engines while using TV, air conditioning and other battery-fed appliances at rest stops. Instead of the nation's 500,000 long-haul trucks consuming an estimated 840 million gallons of diesel fuel annually while idling, and polluting the air, the 3D battery can easily sustain all systems while the engine is off, Williams says.

What's ahead? Williams reports that Firefly already has developed a next-generation battery called the 3D-Squared, that is 30 percent smaller and lighter than 3D. Considering that more than 8 million such batteries are sold in North America each year, adding up to an $18 billion market, Williams has a delectable buffet to taste. And that's before he even takes a bite out of the passenger car market.

With about $5 million in revenues from research in 2007, Williams sees quantum growth in 2008, a break-even by 2009 and "several hundred million" in revenues within five years. Not a bad experiment for the old Peoria tractor maker and its offspring.

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Small but mighty