Fuel cells already in use for battery backup, coming soon for handsets

Collaborative effort targets consumer mobile applications

Fuel cells are closer to reality than we may think, although we won't see hydrogen powered cars on the road anytime soon. Instead microelectronics players such as Entegris, Nokia, and STMicroelectronics are developing the cartridges to drive portable electronics gear, according to speakers at Wednesday's Emerging Technologies TechXPOT.

"Fuel cells are real, but they're not going to jump to cars," said John Goodman, Entegris SVP and CTO. "It's going to be the portable applications, driven by the semiconductor industry, that use them first."

Goodman noted that the cells already match batteries' $10,000/kW cost and are showing up first in applications that supplement batteries when there's no grid for recharging, such as charging batteries to run appliances in recreational vehicles. The military is already using fuel cells to extend battery life, and for power in remote places.

Nokia is working on developing a universal fuel cell cartridge to power its handsets, collaborating with STMicroelectronics, Societe BIC, and an unidentified ODM using technology from the French research institute CEA. ST is developing the fuel cell core and the charger IC. Nokia is doing the product specs and universal electrical interface. And BIC, of lighter fame, is building the miniature reactor to generate hydrogen, providing the distribution channel for the replacement cartridges and leading the negotiations with the airlines to allow passengers to take the units on planes.

"We now have a very clear approach to get this into a consumer product," said Nokia's Andre Brockmoeller, who heads innovation development. "To see when it's coming out, check our web page."

Jadoo Power is already offering an emergency backup power cell and refill system starting for about $2000, which runs on $35 canisters of hydrogen. The refillable cells are about the size of a can of tennis balls and use metal hydride fuel cell technology to produce 130 W/hr. The company targets what it sees as the niche with the lowest entry hurdles—mission critical battery replacement and support with middling power demands of 3kW–20W. And it figures just that could be a whopping $9 billion market.

"Fire departments discovered in Katrina that they couldn't recharge their portable equipment when there was no grid," said Jack Peterson, Jadoo VP of sale and marketing. He claimed Jadoo systems can supply 250W of power and have demonstrated real run time of 75,000 hours in hundreds of uses.

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Finally, SiGNa Chemistry has a radical new hydrogen fuel technology that could make fuel cells easier to make and use, with a stable sodium silicide powder that generates hydrogen when water is added. The NaSi particles are given a protective coating to prevent the alkali metal silicide's nasty tendency to catch on fire. The process produces as a byproduct only harmless sodium silicate, a common ingredient in toothpaste. President and chief science officer Michael Lefenfeld said the reaction gets a 6% conversion rate by weight, and if some of the water off product is cycled back to produce more hydrogen, rates reach an average of 9%. Since both Na and Si powders cost less than $3/kg, the cells should be cheaper than the other existing technologies. SiGNa is working on a fuel cell design with unidentified partners, and apparently also targeting the emergency backup market.

"It can be completely off the grid," Lefenfeld said. "The water doesn't have to be drinkable." Yes, they tested bodily fluids, and yes, they do work.

"It's going to be the portable applications, driven by the semiconductor industry, that use fuel cells first."

John Goodman, Entegris

Despite the hype, fuel cells probably won't show up powering cars anytime in the near future because of the high power demands and the need for major infrastructure development. But some common concerns aren't turning out to be real problems. Experiments igniting gasoline and hydrogen powered cars showed that the hydrogen model was actually much less of a fire and explosion hazard than the gasoline one. The hydrogen gas all vented quickly out of the gas tank, while the liquid gasoline spilled all over and the car was completely engulfed in flames.