

Inside the Electric-Car Explosion

Thursday, September 16, 2010

- Analysis by: GLG Expert Contributor
- Source: www.glggroup.com



Intelligently Connecting Institutions and Expertise

Summary:

Electric cars and plug-in hybrids are in the press and on the road. But who's doing the business and what are their prospects? Karl Ludvigsen checks the potential of this new phenomenon, discovering and explaining the vital differences between the approaches being taken by the world's auto makers.

Analysis:

Even BMW is committed! The proud company whose name means 'Bavarian Engine Works', renowned for its petrol and diesel expertise, will build electric cars. Electric! The power of humble golf carts, milk floats and invalid carriages! Such is the vigor of the car-industry's resolve to get people to drive electrically—whether they want to or not—that even racy BMW, one of the last holdouts, is joining the parade.

In fact BMW already has a toe in the electric pool with its Cowley-built MINI E, 612 of which have been leased to trend-setters in the US, Germany and the UK in preparation for their full-scale market launch. BMW's arch-rival Mercedes-Benz is doing the same with electric versions of its smart ForTwo. Both initiatives are timid compared to the bold plans of their mainstream rivals.

By midyear more than 14,000 Americans paid \$99 to reserve a Nissan Leaf, the first of which will take to US roads at the end of 2010. The all-electric compact four-door will be on the UK market in 2012 and the next year will be built in Sunderland alongside a brand-new battery factory. Renault, Nissan's alliance partner, will produce three all-electric models in parallel.

The end of this year will see the launch of the Peugeot iOn and the Citroën C-ZERO, electric mini-saloons based on Mitsubishi's I-MiEV, which will hit the market as well. Ford is tooling up for a 2011 electric launch as is General Motors, whose Chevrolet Volt and Vauxhall/Opel Ampera will have a small petrol engine that can top up the battery charge while under way. Similar technology is being explored by Jaguar, to use a Lotus-designed engine.

Twenty-thirteen is the target year for BMW, whose electric Megacity will use ultra-light carbon fibre to offset the extra weight of its batteries. The same year will see Volkswagen introduce an electric version of its seventh-generation Golf.

Underpinning the swing to electrics are government incentives on two levels. Investments are encouraged by funds that support green initiatives, in America an enticing \$25 billion pot. At the retail level tax credits and subsidies bring down the prices of electric cars, inevitably inflated by the initial cost of their exotic lithium-ion battery packs. In the UK, for example, the Plug-in Car Grant Scheme covers 25 per cent of the cost of a new battery-electric car or plug-in hybrid up to £5,000 for the first 8,600 buyers. California's scheme offers \$5,000.

Independent entrepreneurs haven't been slow to take advantage of these incentives. In fact there was every reason to expect that even without subsidies the change to radically new motive power would open the door to new entrants to the lucrative car industry.

Two decades ago Norway's THINK was a pioneer in the manufacture of dedicated battery-powered autos. Surviving its short-lived possession by Ford, THINK has achieved EU-wide certification for its Finnish-produced City, which is now available with lithium-ion battery packs. THINK hopes to market its power-train technology to third parties.

California's Tesla Motors is another pioneer. South African Elon Musk invested some of his PayPal millions in a Silicon-Valley startup that broke all the rules for the use of lithium-ion batteries in a Lotus-based sports car. His engineers wired 6,831 lap-top cells together to power the Tesla roadster.

Though pronouncing Tesla's battery technology 'shocking', apparently without irony, Toyota has invested \$50 million in the company, which also has Daimler as an interested partner. At a former GM plant in Fremont, California Tesla will build its \$49,900 Model S saloon while helping Toyota electrify its RAV4 sport-utility for a 2012 launch. Tesla's mid-year IPO of more than \$200 million was a stock-market success.

Also boasting an ex-GM factory is Irvine, California's Fisker Automotive, which has crossed swords in court over intellectual-property rights with arch-rival Tesla. America's \$25 billion fund is \$530 million poorer after helping Danish auto stylist Henrik Fisker buy the idled Wilmington, Delaware assembly plant. The former Ford and Aston Martin designer will introduce his \$87,900 Karma sports saloon later this year and follow up with a lower-priced family electric made in Wilmington.

These and other entrepreneurs are accumulating a critical mass of electric-drive expertise that they're eagerly marketing to other would-be exploiters of the anticipated craze for electric vehicles. Left in the cold so far, however, are traditional electric-motor makers who expected to benefit from the boom in battery-vehicle demand. Instead, the big auto producers are rolling their own.

'This needs to be a core General Motors technology,' said GM's Pete Savagian, who heads its electric-motor engineering. 'Back in 2002 and 2003 we saw hybrid motors as a niche product with low volume. Since then it has become obvious that vehicles are going to become increasingly electrified and motors are going to be critically important.' 'We want to control all the key elements of the value chain,' added Nissan's Mark Perry. 'How could you do that without producing the motor?'

Alignments on batteries are less clear-cut. For its important commitment Renault-Nissan has joint-ventured with Japan's NEC to form the Automotive Energy Supply

Cooperation. Similarly the Mitsubishi/Peugeot/Citroën grouping and GS Yuasa have formed a battery joint venture on the model of Toyota/Panasonic, a pioneering electric-vehicle JV. To stake its claim as a lithium-ion supplier Germany's Bosch has partnered with Samsung in Korea.

Though General Motors is buying in its batteries, for example from Korea's LG Chem, it's also working with Boston producer A123 on advanced cells. Except for Daimler, which has invested in battery-maker Li-Tec as well as Tesla, the big German auto makers are buying their batteries from a variety of sources. A supplier to Volkswagen is China's BYD, which itself aims to carve out global space as an electric-car maker. Warren Buffett is a BYD backer.

Car makers are counting on competition amongst all this talent to produce the reduction in lithium-ion battery costs that will secure the future of their electric-vehicle revolution. The Nissan Leaf's batteries, for example, are estimated to cost £15,000—a staggering burden for a small family car. A Detroit consortium has set a goal of one-quarter of today's battery costs.

In the meantime batteries are by far the most controversial components of electric cars. Britain's *Glass's Guide* derailed the bandwagon with its dusty forecast that 'the typical EV will retain only ten percent of its value after five years' thanks to battery deterioration. This would happen, the respected price guide said, 'if no special warranty cover is in place' and cars are sold rather than leased.

In a dramatic pre-emptive strike General Motors announced that the battery pack of its Chevrolet Volt—and by implication the Ampera's—as well as its charging system and electric drive will be warranted for an unprecedented 100,000 miles and eight years. For the battery pack of its Leaf Nissan is said to be mulling leasing instead of outright sale.

To help their performance the Volt's batteries will be heated in cold weather and cooled when it's warm to reduce the trip-distance variability that's a bugbear of electric cars. In BMW's trials the MINI E fell well short of its claimed 156-mile range. Users typically achieved a best result of 100 miles with range truncated to only 40 miles when weather was 'bitterly cold'. With refreshing candour Nissan admits that its Leaf's range could be anything between 47 and 138 miles depending on weather and driving style.

Even worse, electric-car users are plagued with 'range anxiety'. A trial of electric smarts in Britain's North East showed that average achievable range was 45 miles. The maximum length of actual trips undertaken, however, was only one-quarter as far. The trial's fleet drivers were leery of venturing farther afield.

Notwithstanding their nervousness the trial's drivers were twice as likely to consider an electric for their family car as they were beforehand. To counter 'range anxiety' electric-car makers are improving information flow to drivers and giving them more control options to adapt their driving style to the conditions. The ultimate solution of course is the Volt/Ampera's on-board engine-driven generator.

The final piece in the electric-car puzzle is creation of a network of public charging points. Here drivers expect local councils to step in—not to pay for the charging, of course, but to fund installation of the points at £5,000 each. Their design isn't a problem. That's been handled by Elektromotive Ltd., whose computer-controlled

Elektrobay is a bespoke hitching post for electric cars. At this writing 140-odd are installed around London and 165 elsewhere in Britain. Over the next three years it will erect 1,300 more Elektrobays across the UK.

The Brighton company is poised to upgrade its units for remote billing and higher charging capacity. Elektromotive is eager to enter other European markets as well. There's only one small problem, says managing director Calvey Taylor-Haw: "The EU is still trying to decide on a common standard for electric-vehicle plugs and charging stations." What else is new?