What's next for the electric car? Wireless power, lithium-air batteries and more

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The first generation of electric cars arrived in the early days of last century, and died out largely because batteries couldn't compete with gas tanks. The second generation arose largely in the last decade, led by Tesla, but while batteries have improved significantly over the last century, they're still the limiting factor. Meanwhile, the economy of gasoline cars has also improved significantly, giving electric stiffer competition than the gas guzzlers of decades ago.

While the third generation of electrics will bring a number of improvements, the most important ones will address the pressing issue of power. There are a number of technologies that could, separately or together, finally make electric vehicles kick gas-powered cars off the playing field.

Inductive charging

Inductive charging allows a device – whether a smartphone or an electric car – to charge without a physical connection to a power source. Interestingly, nissan and Infinity will be among the first to offer it, even though Tesla has led pretty much every other aspect of electric vehicles since it launched in 2003. (This is especially unusual since one of the first demonstrationsof thistechnology on a car was with a Tesla Roadster, but apparently without much interest from Tesla.)

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Qualcomm has a version of inductive charging, called Halo, designed for both parking spots and interstate highways. It requires close proximity, but not contact, which would still be a vast improvement over having to actually plug the car in. Part of the improvement is that the device could be completely buried, making it far more difficult to vandalize, or for inexperienced drivers to damage. In most cases, you simply park your car and any power your car consumes is either free (as an incentive to get you to park there, something a shopping center or retailer might do) or you'd get a bill at the end of the month for whatever you consumed.

Unless this technology was installed in roads, as Qualcomm is promoting, it wouldn't solve the battery-life issue, but it would reduce the related problems, making charging far more transparent and reliable. However, there could be a problem with conflicting standards (a problem that already plagues the electric car industry) which could mean you'd have to look for a parking spot your car will function with and make in-street solutions unworkable. This might be what's holding Tesla up. Right now, Tesla has a unique native charginf system far faster than the implemented standard, and I expect it wants to do the same thing initially for inductive chargers.

Lithium-air batteries

IBM and others are working on a promising technology called lithium air, which approachesthe energy density of a gas tank. There have been significant advances in metallurgy over the last several years making a battery based on lithium-air technology viable within a decade. If you can have the same energy capacity in a battery that only has to be the same size as a gas tank, and were to place it in the massive battery bank of a Tesla S, you likely could likely take that car's range and quadruple it. With 1,000 mile range, you wouldn't have to worry about chargers much. More likely, engineers would just use a smaller battery, ultimately making the car lighter and cheaper. Coupled with more prevalent chargers, this would be a game changer for the electric-car industry, and represents the potential for energy efficiency better than gas.

Supercapacitors and ultracapacitors

Supercapacitors and ultracapacitors are an alternative to batteries that is actually already being implemented in commercial vehicles. Capacitors are solid state, they have a nearly unlimited cycle life, and they can both charge and discharge thousands of times more quickly than a lithium-ion battery without damage. In a way, capacitors are to ordinary batteries what flash memory is when compared to magnetic hard disks. Initially flash performed far better, but was far more expensive than magnetic media. Even iPods initially had hard drives. But as flash dropped in price, it took over more and more of the market, and now magnetic drives are in the process of being phased out.

Unfortunately, capacitors are still at the beginning of that transition. Right now, they are just god awful expensive, they lose charge over time, and they have low energy density even when compared to batteries. This all makes them an unlikely near-term solution, but like flash, prices are expected to drop sharply, energy density should increase, and self-discharge rates (likely the biggest problem) will improve. Over time and they could sidestep the battery problem all together. However they're alreadybeing used in hybrid configurations, where you can charge the capacitors fast, say in minutes, then they charge the batteries as you drive. This is a fascinating technology that I don't think folks are looking at closely enough.

Where's the next Tesla?

I'm not referring to Tesla the company, but Tesla the man. He was, until his mysterious and untimely death (apparently connected to a mystical death ray), working on broadcast power. Intel and others have been making great inroads into this lately, but they are still likely years away from getting this to work with personal electronics, and decades away from getting it to work with cars. But once developed, this would remove batteries as a problem forever and we'd live in an electric world. Granted, there are some health concerns that will have to be overcome: Although the idea of glowing in the dark could be kind of cool, we'll need to get around the "death ray" part. In any case, I think broadcast power will herald the final, lasting generation of electric vehicles. If we move to something else after that, it won't be electric, and most of us likely won't be around.

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