



The Future of the Automobile

By Robert Huebscher

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If you hailed a cab in New York at the turn of the last century – say, around 1900 – it's likely that it would have been an electric car, built by the Electric Wagon Company of Philadelphia. The technology behind those taxis, which became the first electrified fleet in 1897, is likely to power the next generation of cars – sometime in this century.

Several electric vehicles (EVs) are already on the market, including the Nissan Leaf. They've only just been introduced, but those cars have already garnered twice the market share that hybrid vehicles had at this stage of their introduction.

One company making this happen is Better Place, a venture founded by Shai Agassi, an entrepreneur who was previously a top executive at SAP. Agassi has raised a staggering \$750 million in capital, and his mission is to provide and service the key element in EVs – the battery.

Michael Granoff, the head of oil independence policies at Better Place, spoke at a Boston Security Analysts Society lunch on April 24 and discussed what he claims will be the future for automobiles.

Better batteries

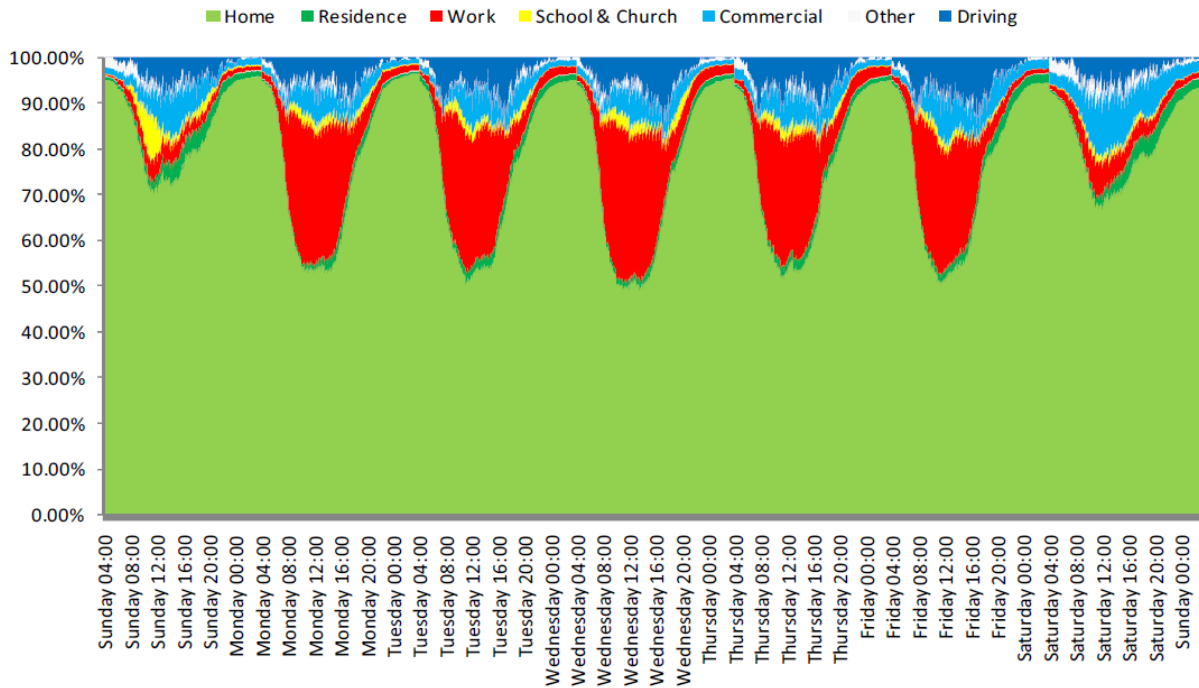
Two facts explain why it has taken over 100 years for EVs to reappear on the roads, Granoff said, and they both have to do with the battery. EV batteries are too expensive, costing about \$12,000 – roughly half the cost of a typical EV – and they provide a range of only 100 miles.

Better Place intends to solve those problems. It will provide the infrastructure to support the batteries – charging and replacing them. Better Place will build and operate battery-changing stations, similar to a car wash. As you drive through, your battery, stored underneath the car, will be replaced with a freshly charged one, without your ever leaving your vehicle – all in less time than it takes to fill your car with gas.

Better Place is currently deploying these stations in two countries, Denmark and Israel. By strategically locating them throughout the country, the firm has made it so you can drive more than 100 miles, replacing your battery along the way. Computers inside the cars will plan your route and determine the optimal times and places to stop for a new battery.

But accommodating distances greater than 100 miles is only one hurdle to adoption of EVs. Ron Minsk, a senior fellow at Securing America's Energy Future, a think tank

dedicated to achieving oil independence, provided the following data on where cars spend the most time:



The area shaded in green represents homes and the red area represents work. Together, cars spend over 90% of their time at those locations, so providing a way to recharge there – which is part of what Better Place intends to offer – eliminates the fear of your battery running out. The company also plans to offer charging stations at locations, like malls and sports arenas, to which people often drive.

The economics of EVs

Granoff said that Better Place is targeting the 50% of the market that drives 12,000 miles or less per year. He acknowledged that drivers who put on more miles than that – and who frequently drive more than 100 miles in a trip – will not find his solution economical or convenient.

Better Place charges by the mile, and at 12,000 miles per year you will pay about \$300 per month. That’s about 20% less than the cost of gas in Israel (where it costs about \$6.75 per gallon). That price makes it uncompetitive in the US market, where gas costs about \$4.00 per gallon, but Granoff said he expects prices to come down as Better Place expands and develops economies of scale.

The estimated cost of operating the Nissan Leaf is approximately \$1.00 per gallon, so it is already competitive relative to gas-powered cars in the US. But that is without the charging infrastructure that Better Place provides.



Better Place's Customers sign up for a four-year contract, and prices are locked in. "That approach is fairly profound," Granoff said, "in a world where the cost of gasoline has doubled for the average American household in the last 10 years."

Stable and predictable electricity prices underlie Better Place's business model. Granoff and Minsk said that the electric grid has ample capacity to accommodate the demand that will come from EVs.

Charging an EV battery draws as much power as a large hair drier, Granoff said. That won't be a problem in most locations, unless many EV owners attempt to charge at the same time. He said that part of the Better Place solution will be to optimize the times at which batteries are charged, based on a number of factors, such as the level of charge already in the battery, the excess capacity in the grid and the time of day.

Hybrids, such as the Toyota Prius, are inferior from a technological and economical standpoint, Granoff asserted, saying that it is too expensive to support both electric and gasoline fuel sources.

Indeed, he said Better Place made a bold offer to potential Prius buyers. In Israel, a Prius costs 155,000 shekels, but for that price the company offered an EV (in this case, a Renault Fluence) plus three years of free driving. "That pretty much ended the conversation," Granoff said.

Like cell phone batteries, EV batteries degrade and eventually will hold only 80 miles of charge, at which point Better Place considers them fully depreciated. But Granoff expects there will still be a market for those batteries – people who might pay \$200 per month for a smaller driving range.

Will it come to the US?

Building a network in the US is far more challenging than in Israel or Denmark, Granoff admits. But the Better Place solution can be deployed in local markets first.

The larger challenge, he said, was overcoming drivers' fears of their batteries running dry – what he called "range anxiety." Granoff expects that households will have two cars – a gas car for longer drives and an EV for everyday use.

Back in the early 1900s, there was a big argument as to what would be the energy source for cars – electricity, gas or steam were proposed, according to Granoff. Many thought a high proportion of the market would stay on horses.

Everyone thought there wasn't a "silver bullet." But one emerged, and it was oil.



“We are in a very similar situation today,” Granoff said, with solutions including hydrogen, natural gas and electricity posited as the future fuel for cars.

But Granoff is confident. “We will look back at the 21st century as the one that was almost exclusively electric. The logic and the economics simply lead in that direction.”

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