



## Making Cars Electric, One Country at a Time

**Not that long ago, I talked about one of the most interesting startups I know of, an Israeli company called Better Place, which has the promise to accomplish what 170 years of technology innovation failed to achieve. What I am talking about is the elusive dream of electric vehicles and the constant struggle of world's best scientists to combat two basic issues with electric vehicles: the range anxiety and the high cost of batteries.**

Better Place has recognized that, where technology has failed to improve the world, a different kind of innovation is needed: a business model innovation which uses the same battery technology but fundamentally changes allocation of risks between the company and the customer, a true example of Renaissance Innovation. There were several recent updates on this innovative company which I wanted to discuss. First, the company received Series C financing from GE and UBS which values the company at \$2.25 Billion. Second, 100 vehicles were leased through a car rental company in Israel, marking first large-scale deployment of the concept. And third, Better Place experience center opened in Guangzhou, China. While I am quite enthusiastic about first two news, the third one I find less exciting. The reason for some reservations about expansion to China is a recent paper which I co-authored with Karan Girotra and Buket Avci, "Electric Vehicles with a Battery Switching Station: Adoption and Environmental Impact". But let me discuss the news one-by-one.

The business model proposed by Better Place is remarkably clever and simple (as this video explains): make electric batteries standard so an empty battery can be swapped for a charged one at a battery switching station, and make customers pay for miles driven rather than making them pre-pay for the (very expensive) battery. Not surprisingly, investors believe that Better Place can do what no company had managed to do before: give the world a sustainable transportation solution. Better Place is planning to use new financing "...to expand into Western Europe while it continues to advance the company's deployment projects in Northern California, Southern China, Japan, Ontario, Canada, and Hawaii." It looks like governments are buying into the premise that managing infrastructure (battery switching stations, inventory of batteries at the stations and charging spots) has more promise than betting on improvements in technology.

Further, "...Better Place will launch initial commercial service to a select group of customers in Israel and Denmark in the first quarter of 2012, expanding to full commercial operations over the following months. A similar process will follow in Canberra, Australia in the second quarter of 2012." This is fast: imagine challenges involved in building infrastructure in multiple countries, which greatly relies on economies of scale (how many cars must be purchased to make a single switching station cost-effective?). Of course, the blue-print for the entire world will be Israel, where Better Place has seen over 400 corporations signing letters of intent to begin switching their fleets to Better Place as the cars and the service become available. The first 100 cars leased to the largest car rental company in Israel is an indication of things to come: selling a sustainable experience driving to car rental customers is a very smart move, which allows many people experience the technology first-hand. Kudos!

So why I am less excited about Better Place building electric car infrastructure in China? As we illustrate in our recent research paper, simply replacing gasoline vehicles with Better Place vehicles is not enough: one also needs to worry about where electricity is coming from. In countries like France, where 80% of electricity comes from nuclear power, Better Place would be great for the environment. In countries like China, however, electricity comes predominantly from coal (up to 70%) and as a result, the country is currently the world's largest emitter of greenhouse gases.

Thus, replacing gasoline vehicles with electric cars is far less attractive, and may in fact do more damage to the environment (but read our paper for the caveats). The big challenge in China will be building new sustainable electricity generation facilities which will use power of wind, sun, nuclear fusion and water. This will take both time and money, with many other challenges in the tightly

regulated economy. But I remain cautiously optimistic...

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