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Points to ponder as India eyes all-electric-car future

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September 12, 2017 Milind R 0



Nitin Gadkari's recent plans to [“bulldoze” India into a switch-over to electric vehicles](#) has met with a fair bit of scepticism across quarters, perhaps because of the peremptory nature of his announcement and the lack of a detailed roadmap for the transition. However, this does create yet another window of opportunity to assess and analyse what's making the move towards cleaner vehicles so difficult, and what could be done to remove the obstacles.

The thrust on electric vehicles, considered to be a potential solution to the problem of alarming levels of air pollution in our cities, had in fact come about as far back as January 2013. This was when the Government of India (GoI) announced the National Electric Mobility Mission Plan (NEMMP) with an aim to achieve fuel security by promoting hybrid and electric vehicles (EVs). However, despite the stated intent, the actual demand for EVs (both two wheeler and four wheeler) has not picked up.

Data indicates that the demand for EVs in the two-wheeler category reduced to almost one-fourth of what it was in 2010-11 (70,000 electric two wheelers), while the demand for four-wheelers has remained negligible (approximately 2000 electric four-wheelers). While technological and cost-related challenges are the main cause for the lacklustre demand for EVs, solutions to these problems exist.

What's stopping the move to EVs?

One of the biggest technology-related challenges of an EV is the size of its battery. EV batteries, which power both the auxiliary load and drive the wheels of the vehicle, are heavier than conventional (fossil-fuel powered) vehicle batteries, which power only the auxiliary load. In theory, bigger batteries mean higher range; however, when

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behavioural and operational similarities.

Swap stations have the ability to plan the charging schedule according to power availability from the grid. They can act as bulk consumers of electricity, similar to heavy industries, which buy power from generators through the grid, directly, via open-access. Open-access also allows them to access the short-term market to buy power at cheaper rates at times of excess supply. Swap stations have the potential to reduce stress on the grid by acting as a flexible and dispatchable load.

Business models of battery leasing can easily be integrated with battery-swapping technology. Battery leasing can also eliminate the consumer's concerns about battery performance and replacement cost of the battery at its end-of-life.

The trials so far

While battery swapping has been used since decades in short-range special purpose vehicles like forklift trucks, its relevance to personal vehicles is more famous due to a [technology demonstration by the electric car pioneer Tesla Motors](#). They were able to swap the battery pack of a Model S twice within the time required to fully fill a similar petrol car's fuel tank. Chinese company [Aleees also offers electric buses with swappable batteries](#) as a complete system.

The most famous battery swapping initiative worldwide was made by the [Israeli company Better Place](#) in which they sold specialised versions of electric cars such as Renault Fluence along with access to a network of battery swap stations. The purchase of these cars came with a leased battery. However, Better Place failed to garner sufficient sales and wound up in 2013, a problem [some critics attribute to the high capital cost of setting up swap stations](#).

In India also, there has been some interest in battery swapping for electric automobiles, apart from relatively high uptake for electric-assisted vehicles like cycle rickshaws. Ola in partnership with Mahindra is setting up [a battery swapping pilot program](#) in Nagpur. The battery swapping and charging stations will be provided by ACME, and will support buses, autos, and cars. Currently electric cars and the charging stations are operational, while the swap-stations are not yet functional.

Considering the longer term, heavy vehicle giant [Ashok Leyland has partnered with SUN Mobility](#), a start-up, to develop a battery swapping system for urban electric buses. They are also thinking of extending it for delivery trucks, inter-city buses, and long-haul trucks.

The government has, of late, become keen on developing battery-swapping infrastructure, and has even recruited IIT Madras professor Ashok Jhunjhunwala, a staunch advocate of EV battery swapping, as an Advisor to the Ministry of New and Renewable Energy (MNRE).

Roadblocks

It should be noted that battery swapping comes with its own set of technical and business related challenges. To begin with, setting up battery swap stations is highly capital-intensive. The high cost arises primarily due to the requirement for robotic battery swapping equipment, made more challenging in the case of larger vehicles like buses. Such batteries can weigh more than a couple of tons. At the same time, the cost of power procurement for fast charging stations is not reflected in the current electricity scenario.

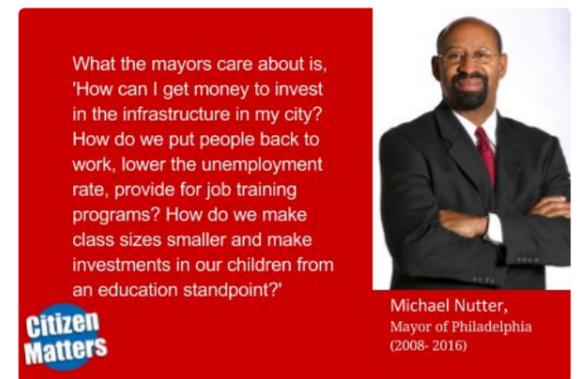
Furthermore, it would require a good volume of vehicles in the service area to make it economical. The fire hazard associated with batteries might hamper the adoption of swapping at existing petrol stations.

In addition to this, battery swapping for a variety of EVs will require some standardisation of batteries in terms of physical form, operational and electrical

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parameters, etc. Creation of these standards could reduce the profitability (through product differentiation) of EV manufacturers. The mechanism will also require sharing of proprietary information on battery design and thus vehicle design; this will not be a very popular idea for EV companies. Therefore, manufacturers are, currently, not receptive to the idea of swapping.

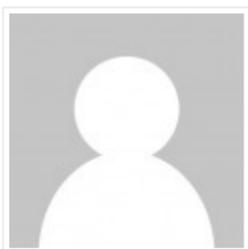
Tesla no longer offers battery swapping facility due to low demand, especially considering that their batteries are capable of being charged, through the super charging facility, to give a range of around 270 km in just 40 minutes. However, at present, customers of Tesla are paying a big premium for the super-charging facility through a high vehicle cost. In a country such as India, customers may prefer paying a small periodic fee for swapping service, instead of a huge premium capital cost, to overcome the disadvantages of time consuming home charging.

To make battery swapping a reality, government intervention is important to facilitate cooperation among industry players, government utilities and consumers. A set of standards for EV batteries, covering a range of sizes and electrical and mechanical (loading and unloading) operation parameters should be developed. They should cover communication methods for allowing smart chargers to negotiate the optimal charging voltage and current.

The standards should be established in consultation with vehicle and battery manufacturers, research labs and public representatives. The government should also establish a rational pricing mechanism for transparent sale of electricity, if such swap stations are established, because currently sale of electricity is allowed only by utility companies.

These measures would make EVs affordable and convenient, and encourage a thriving market for EVs and batteries, and then perhaps the dream of an all-electric-vehicle India may not seem so quixotic after all.

[This article is co-authored by Ganeshprasad Pavaskar, Research Engineer at the Center for study of Science, Technology, and Policy (CSTEP).]



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Milind R is a Research Engineer at the Center for Study of Science, Technology and Policy (CSTEP).

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