

Challenges in Adoption of Electric Vehicles

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Abstract—With increasing pollution in the environment, there is a need of sustainable generation and utilization of energy. Transport is the technologically most challenging major contributor to environmental pollution. With increasing global adaption of renewable energy generation, if somehow, the transportation energy supply can be shifted to renewable sources; then, it will be major leap in justifying the impact of pollution on human beings. Battery electric vehicle provides the most feasible solution right now, which has a developed and demonstrated infrastructure in terms of technology development and fuel, in this case electricity, distribution network. Most car manufacturers do have electric car platforms ready and since EVs have a smaller number of moving parts, building them once the production lines are in place could actually be easier compared to fossil fuel-powered cars. The success of electric cars in India depends on a domino effect. If the charging network expands, more people will be willing to buy electric cars. If the demand increases, manufacturers can invest in the production of EVs and simultaneously, the government needs to go easy on taxing such cars, to offer the all-important motivation. Suitable regulations, which require the makers of batteries to finance the costs of collecting, treating and recycling all collected batteries, and encouraging tie-ups between carmakers and recyclers needs to be formulated simultaneously.

Keywords: Electric vehicle Lithium battery Sustainable transport technologies, infrastructure, government incentives.

1. INTRODUCTION

The growth of Indian middle class with increasing purchasing power along with strong growth of economy over a decade has attracted the major auto manufacturers to Indian market. The market linked exchange rate and availability of trained manpower at competitive cost have further added to the attraction of Indian domestic market. The increasing pull of Indian market on one hand and the near stagnation in auto sector in markets of USA, EU and Japan on the other have worked as a push factor for shifting of new capacities and flow of capital to the auto industry of India. The increasing competition in auto companies has not only resulted in multiple choices for Indian consumers at competitive costs, it has also ensured an improvement in productivity. Cheap manpower and infrastructure cost with liberalization of regulation and tax structure has enticed global giants to set up exclusive production facility for export in India viz., General Motors.

Major challenge of the auto industry has been to give shape to a futuristic plan of action with full participation of the stakeholders. Besides making concerted efforts for removal of obstacles for accelerated growth, the prime need is to put in place required infrastructure to facilitate growth and suitably train and modify the labor laws to facilitate availability of quality manpower. Through the Automotive Mission Plan Government wants to provide a level playing field to all players in the sector and to lay a predictable direction of growth to enable the manufacturers to take more informed investment decision. Contribution of the auto industry to the India growth, technological maturity, global footprints, and competitiveness will be the main drivers in the coming decade. Off late trajectory of evolution of the automotive ecosystem including the glide path of specific regulations and policies that govern research, design, technology testing, manufacturing, import/export and recycling of vehicles are gaining primacy. India is at the threshold for a major take off in the automotive sector. Time bound implementation of Automotive Mission Plan 'AMP 2016-2026' together with establishment of world class testing, homologation and certification facilities along with state of art R&D centers under National Automotive Testing & R&D Infrastructure Development Project (NATRIP) will ensure Indian Automotive Industry a distinct edge amongst the newly emerging automotive destinations of the world.

Cost and mileage are important, but not the only factors holding adoption back. After more than 100 years, the automobile landscape is changing, but there are still major barriers to adoption of electric vehicles. As more countries pledge to go electric in the next two decades, here's what will need to change. The technology behind electric vehicles is advancing. Tesla's new Model 3 and the Chevy Bolt both have ranges well over 200 miles — in 2015, the world's top-selling electric car only had a top range of 80 miles.

But for all the hype, electric vehicles make up only 0.2 percent of passenger vehicles worldwide. We are seeing those numbers creep up, but slowly. For all the enthusiasm for electric vehicles in the news, actual progress in the market is still taking some time to emerge. Thanks to some new policy changes, those numbers are going to get much bigger within the next 20-plus years. Last month, both France and the U.K. banned the sale of gas and diesel cars and vans starting in 2040 in response to rising levels of nitrogen oxide in the air

posing a public health risk. (Air pollution is estimated to cause up to 40,000 deaths in the U.K. each year.) Norway and India have both pledged to make the change even sooner, in 2025 and 2030, respectively.

But while 2025 is only eight years away, 2040 may still seem like a long way off. However, in that time, adoption of electric vehicles has to go from a very small amount to 100 percent — and there are many barriers to adoption that have to first be overcome.

Automobile Domestic Sales Trends

2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2017-18
Passenger Vehicles	26,65,015	25,03,509	26,01,236	27,89,208	30,47,582	32,87,965
Commercial Vehicles	7,93,211	6,32,851	6,14,948	6,85,704	7,14,082	8,56,453
Three Wheelers	5,38,290	4,80,085	5,32,626	5,38,208	5,11,879	6,35,698
Two Wheelers	1,37,97,185	1,48,06,778	1,59,75,561	1,64,55,851	1,75,89,738	2,01,92,672
Grand Total	1,77,93,701	1,84,23,223	1,97,24,371	2,04,68,971	2,18,62,128	2,49,72,788

Source: SIAM

2. VARIETY

While nearly all car companies are developing or already have products in the electric vehicle space, we need more variety in the number of vehicle models available. Currently, most electric cars are small, midsize, or compact, so consumers wanting pickup trucks or SUVs are mostly out of luck. But all that is starting to change. Various carmakers have announced plans to produce more models of electric vehicles, and Volvo is going all in; its entire lineup of vehicles introduced starting in 2019 will be either hybrid or electric. Right now, though, as a whole, electric cars are expensive, the range is not great in most models, and they take a long time to recharge — and that time can vary greatly depending on the charging standard each EV uses.

3. INFRASTRUCTURE

Another hurdle to overcome when it comes to electric vehicle adoption is the infrastructure currently available. While people driving gas vehicles can go on long trips secure in the knowledge that they will be able to refuel quickly en route, for electric vehicles drivers, the same trip requires researching the location of charging stations along the way, and setting aside time to charge up. (This same issue does not necessarily apply to local delivery trucks, Ubers, taxis, police cars, or service vehicles that don't drive long distances.) To change that, we have to get the infrastructure around electric vehicles up to speed. We need charging of electric vehicles to be as easy as driving a gasoline vehicle today. That means building the actual charging stations themselves, and then having an electricity grid that can support this additional demand for electricity. If we want fast charging, that means we need to provide a lot of electricity, often in locations where the grid may not necessarily be built for it today. It also means having mechanics who know how to fix electric vehicles — building

out the whole ecosystem is critical and that is going to take a long time.

4. MINDSET

Perhaps one of the biggest barriers to adoption is that most people just don't think about electric vehicles when they are buying a new car. For 100 years we have driven cars the same way. Electric vehicles challenge our long-held norms and practices about how we use our vehicles. A big part of this meant knowing that we had a car in the driveway with a full tank of gas. Additionally, most people have never ridden in an electric car, contributing to the fact that buying electric isn't even on their radar. As more people start to see increasingly more electric cars around them, it will act as a sort of social contagion, increasing the number of electric cars even more. Electric vehicles are a step in the right direction — they give off no emissions, so cities themselves will be cleaner. But he also points out that the energy we are using to charge our electric vehicles matter. If consumers are recharging their vehicles with coal or natural gas, the plants that provide that energy are still giving off emissions, it is just happening outside of cities. Electric vehicles help, but in the long run, electric vehicles need clean electricity in order to maximize their environmental benefits.

India's push for electric vehicles (EV) may lead to a substantial change in its energy security priorities, with securing lithium supplies, a key raw material for making batteries, becoming as important as buying oil and gas fields overseas. The government is exploring measures ranging from leasing of electric vehicles to transferring technology to firms for commercial production of lithium-ion batteries developed by the Vikram Sarabhai Space Centre for use in automobiles. However, India does not have enough lithium reserves for manufacturing lithium-ion batteries.

Acquiring lithium fields in countries such as Bolivia, Australia and Chile, given its need in manufacturing lithium-ion batteries. “Government as well as the private sector companies should acquire them. This comes against the backdrop of ambitious government plans for a mass scale shift to electric vehicles by 2030 so that all vehicles on Indian roads by then—both personal and commercial—are powered by electricity. As part of this programme, the government is also exploring a strategy to task a company with buying EVs in bulk and then leasing them to companies such as taxi aggregators, in an attempt to bring down the cost of such vehicles. The centre has set a target of 6 million electric vehicle sales by 2020 under the National Electric Mobility Mission Plan.

State-owned firms such as Bharat Heavy Electricals Ltd (Bhel), Power Grid Corp. of India Ltd and NTPC Ltd are looking at new businesses in this space. While Bhel wants to make EVs, PGCIL is considering setting up charging stations. Meanwhile, Vedanta Resources Plc. is looking at developing storage solutions. Analysts say India’s plans to make EVs more cost effective and popular will be difficult to implement. The Indian electric vehicles market poses formidable challenges for policymakers, according to consulting firm Bridge to India.

It must also study the costs and benefits of adoption of electric vehicles in the coming years. Though the cost of electric battery has declined recently, it still remains high. At the same time, its operating cost per kilometre driven is lower and it contributes to cutting city pollution

Shifting to electric vehicles will check pollution and reduce fuel imports. India paid Rs4.16 trillion to buy 202.85 million tonnes of crude oil in 2015-16. With around 81% of India’s oil needs and about 37% of gas needs being met through imports, state-owned firms have acquired hydrocarbon assets in 25 countries.

5. LEARNING FROM THE THE PIONEERS IN ADOPTION

Lessons to learn from Norway, which has been a pioneer in adopting EV technology. The Scandinavian country says it is willing to collaborate with India as it tries to make the shift to electric mobility. India has a rather ambitious target to be selling only electric cars by 2030. Ambitious and bold, because Norway, which was one of the early adopters of electrification of vehicles, starting in the late 90s and boasts of a robust infrastructure to support e-vehicles, has a target just five years short of India’s 2030 vision. To “bulldoze” the initiative; the shift in itself is neither going to be that easy nor will it be simple.

To understand how Norway became one of the pioneers in adopting electric mobility and the reasons that stood out were the presence of a strong political will, resultantly, government push in form of tax incentives and other benefits, harmonious public-private partnership for building and maintenance of

charging infrastructure. The citizens also seemed to have played a key role by being more environment conscious. Surveys suggest that Norwegians do not mind polluting vehicles being heavily taxed or being curtailed from plying especially on days when there is a spike in pollution levels. Norway is willing to collaborate with India and handhold it, as the nation of over a billion tries to make the shift to electric mobility.

China started promoting EVs around the same time as India a decade ago. While India’s EV stock grew 11 fold from 370 cars in 2008 to 4800 in 2016, China’s grew by more than 1,300 times to reach 648,770 cars in 2016, up from 480 cars in 2009, said the IEA study (International Energy Agency). The uptake of electric vehicles has been slow to take off in the country. But India has an ambitious target to sell only electric cars by 2030 in an effort to reduce pollution and the country’s carbon footprint. Companies are eyeing the opportunity with interest. The road ahead is however lined with obstacles, including a lack of infrastructure to support such vehicles and high purchase costs. Lack of charging points in the country means that potential buyers are put off by the uncertainty about whether they will even be able to recharge their car on a long journey, often referred to as “range anxiety”. The key challenges to adoption of electric vehicles in India is primarily due to low penetration of charging infrastructure and perceived higher initial cost of acquisition.

Mahindra Group, an Indian conglomerate, is the first Indian company to manufacture and sell electric vehicles in India. Other Indian companies are also starting to move into the market – Tata Motors is developing its electric car strategy and planning to launch soon. Foreign brands are showing cautious interest in the market. Many more electric vehicle manufacturers are set to enter into the fray, translating huge gains for the end users. High levels of pollution, which affect the population’s health, are also a major concern. Rising incomes fuelling demand for cars in India is further adding to the congestion. There are almost 140 million vehicles in India and vehicular pollution alone contributes to the 30 to 35 per cent of the total pollution.

Another factor at play in the government’s desire to move away from petrol and diesel vehicles is that India is eager to reduce its heavy dependence on oil imports – something which weighs heavily on the country’s current account deficits. The electric vehicle industry in India, excluding e-rickshaws, managed to sell 25,000 units during the financial year to the end of March 2017, according to SMEV. Out of these, motorbikes and scooters accounted for 23,000 vehicles, while the remaining 2,000 units were electric cars. Mahindra is investing to scale up its electric vehicle production, despite mass demand not being there now, to be ready for a shift towards electric vehicles. It plans to double its production of electric vehicles to 1,000 units later this year. However, the company acknowledges the challenges in India that are putting off the average consumer from going electric.

Mahindra's electric vehicles include the e2oPlus, a hatchback aimed at urban commuters in India and the eVerito, a sedan, priced at about 750,000 rupees (Dh42,720) and 900,000 rupees respectively for ex-showroom models. The eVeri can run for 110 kilometres on one charge. As far as affordability is concerned, when compared to fossil fuel vehicles, electric vehicles still seem to have a higher cost of acquisition, even though the total cost of ownership is substantially lower. Mahindra says its typical electric car buyers currently are those who are particularly concerned about the environment. Beyond personal vehicles, Mahindra sees huge opportunities in the commercial vehicle space for transportation of people and goods. For example, Big Basket, an online grocery in India, has bought electric vans from Mahindra. Going forward, Mahindra Electric has announced the future road map for electric vehicles in the country and this involves products being launched in the mass mobility e Bus and electric three wheeler as well as high performance luxury segments. The future of electric vehicles looks quite promising but that long-term government policy on electric vehicles is very much required and the lowest possible taxation is needed to boost the industry. The biggest expense that goes into producing electric cars in India are the batteries. These are largely being imported from countries such as China at the moment because there is not a critical mass of electric vehicle production, industry insiders say.

But if more players enter the electric vehicle sector in India, it could help reduce manufacturing costs. The government's ambition sets the stage for an even more favourable policy push towards electric vehicles. Charging infrastructure is going to be very important. If such developments materialise, it could be an easier ride for both manufacturers and customers when it comes to electric cars in India.

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