Electrical Vehicle Drive in India: Challenges and Opportunities

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Abstract

It's time to step-up on the gas, as Petrol & Diesel Prices are at all-time high. Devaluation of rupee is biggest concern, to counter this, now on the serious note India needs to reduce its import.

Oil and gas plays important role in importing and its backbone of transportation system, indirectly resulting in increase of price of food and vegetables & other items.

The year 2017 will be remembered as a significant one for defining India's mobility architecture. From big ticket announcement on marque Ahmedabad – Mumbai high speed rail project to Hyperloop. India has seized its moment in the sun to announce big plans for finding next generation transportation solutions. One of them in Electric Vehicle. This EV industry is poised to take off. Although with a tiny percentage of overall vehicle market, it's started to reach an infection point where it can have very significant impact.

The paper presents the Electric Vehicle solutions that needs to be adopted to reduce the carbon emission, use of clean energy solution. The advent of EV's will have helped curb a rise in share of oil and environment friendly gas would substitute oil in many uses. Its challenges and Opportunities

Keywords: EV (Electrical Vehicle). Renewable Energy, GOI, FAME

Overview & Background:

Global warming is biggest concern all over the world. To address these concern various measures has been taken. Under Paris Agreement each member country must determine & regularly report on the contribution that it undertake to mitigate global warming. The negotiation of the agreement stated that 2^{o}C reduction in temperature target by increasing use of renewable energy and energy efficiency initiative for sustainable development. Across the globe last couple of years a transport revolution has been in making. It is slow, challenging but immensely ambitious.

Electric mobility is raising its head. The challenge to fossil fuel is daunting one. In developed countries from taming fossil fuel based vehicle to discount for EV, the regulation noose is getting tighter as nations realised that the fastest way to de-carbonise the economy is to get internal combustion engines off the roads and replaced them with electric vehicle.

For the successful deployment of EV's technology development to rise efficiency of vehicle (for longer distance in single charge) & adequate charging infrastructure to meet the potential growth of EV's in next few years.

India Story:

India adopted the 17 sustainable development goals on september-15 and enter into Paris Agreement on November-15. The Government of India launched National Action Plan on climate change (NAPCC), comprising eight missions in specific areas and announced NEMMP-2020 for promotion of Electric Vehicle (EV's) as part of NAPCC.

The Indian automotive industry is today amongst the fastest growing automotive industries globally. It is expected that, by 2020 the annual demand for passenger vehicle, commercial vehicle

and two-wheelers in India will be 10 Mn, 2.7Mn & 34 Mn units[1] respectively, thereby making India 3rd largest vehicle market in the world with Automobile industries contributes approx. 21% of GDP.

The increase in vehicular population will lead to sharp rise in demand for fossil fuels and have an undesirable impact on the environment. As per International Energy Agency (IEA) estimates[2], globally the transportation sector accounts for 30% of worldwide energy consumption and is the 2nd largest source of CO_2 emission. India's per capita emission of 1.72 t CO_2 equivalent in 2016 was 38% of world avg. (4.49t)

This coupled with hardening of the crude prices is lending to increase in the trade deficit. This poses a serious challenge to India's energy (fuel) security.

Reasons for the shift to Clean Mobility

- Air Quality Indices related to India, indicate that the air in many cities of India is no longer healthy. Automobile related pollution has been one of the causes for this.
- Aspects related to global warming needs a shift to automobile solutions that reduces/ do not produce greenhouse gas emissions.
- The need to reduce dependency on a fossil-fuel based economy. India's crude oil imports approximately 7, 00,000 crore rupees, further de-evolution of rupee also having big impact on it.
- India can become a global provider for clean mobility solutions and processes that are affordable and scalable.
- People living in some of the Indian cities are being affected by noise pollution. Some of the Indian cities have the worst noise pollution levels in the world. Electric vehicles may contribute to a reduction in noise pollution levels in the cities.
- Although Energy efficiency and emission reduction has improved in automobiles, the growth in total number of vehicles on road and the resulting total pollution and total energy consumption removed all gains made by betterment in energy efficiency and emission reduction by automobiles. Energy efficiency measures and pollution control measures did not keep pace with the sales growth in vehicles.

India offers a massive potential for EV Business

The Government has been nurturing the EV market in a comprehensive manner, evolving policies to help nurture the nascent industry. Besides giving tax rebate for vehicles, research is rewarded with concessions. On the market side, recently, EESL went in for bulk procurement of electric cars to stimulate the EV market. These vehicles are to be used by government institutions.

India's commitment to its climate goals is reflected by the notable actions being taken for transition to low carbon economy. After announcing massive renewable energy targets, the country has set yet another ambitious target to move to 100 % electric "To achieve this ambitious target, the government is formulating schemes, which will allow citizens to purchase EVs on zero down payment, allowing them to pay out of their savings on expensive fossil fuels." Though this feat may seem achievable on paper, it would be interesting to see how this mission is executed. Some significant strides have been taken towards this aspiration in the past through the launch of NEMMP (National Electric Mobility Mission Plan, 2013) and FAME (Faster Adoption and Manufacturing of Hybrid & Electric Vehicles, 2015). Under NEMMP, 6–7 million EVs/hybrid vehicles have been envisioned to be deployed on Indian roads by the year 2020. (The earlier numbers are not talking to Each other)

[1] Automotive Mission Plan

[2] As per International Energy Agency

Electric Vehicles policy Structure & Frame Work

Introduction to National Electric Mobility Mission Plan (NEMMP)

Under this mission, the government would use the following mechanisms / policies to increase the usage of electric vehicle

- **Permissive Legislations:** Legislation to allow usage of electric vehicle in various areas, if not already allowed.
- **Operational Regulations:** use of legislation framework and regulation aimed at setting safety regulations, emission regulations, vehicle performance standards, charging infrastructure structure.
- **Fiscal policy measures:** Trade related policies for shaping the market, imports & exports.
- Manufacturing policies aimed at encouraging investments
- Specific policies aimed at incentivizing manufacturing and early adoption of electric vehicles through demand creation initiatives.
- Schemes and pilot projects for facilitating infrastructure creation.
- Policy for facilitating research and development.

Faster Adoption and Manufacturing of Hybrid and Electric vehicles was launched in April 2015 to fast track the goals of NEMMP 2020 plan (FAME)

- In order to promote the sale of electric vehicles in the Indian market , the government launched FAME scheme (Faster Adoption and Manufacturing of Hybrid and Electric vehicles) in India ,as part of the National Electric Mobility Mission Plan 2020, under which, the government would provide certain incentives to lower the purchasing cost of electric vehicles .
- The Scheme has 4 focus areas i.e. **Technology Development, Demand Creation, Pilot Projects and Charging Infrastructure**.
- Under the JNNURM (Jawaharlal Nehru National Urban Renewal Mission), NEMMP (National Electric Mobility Mission Plan) and the smart city plans launched by the government, various state and local transport bodies are expected to purchase electric buses over next 5 years.

Energy efficiency Services (ESSL) - With objective of facilitating faster adoption of electric mobility, ESSL has initiated a programme which envisage the replacement of existing government vehicles with electric vehicles. The EESL aims to create a market for EV through a model of demand aggregation and bulk procurement.

Further ESSL will setup charging infrastructure in the offices where these cars will be provided .These charging stations will be connected to meters of respective government departments, which means the department have to pay through the bills.

Automotive Research Association of India (ARAI)

ARAI has been playing the crucial role in assuring safe, less pollutant and more efficient vehicles and also provide technical expertise in research and development. The government of India has recently notified the protocol adoption of standard & ARAI had publish these standard in 2016

Opportunities in the Indian Market

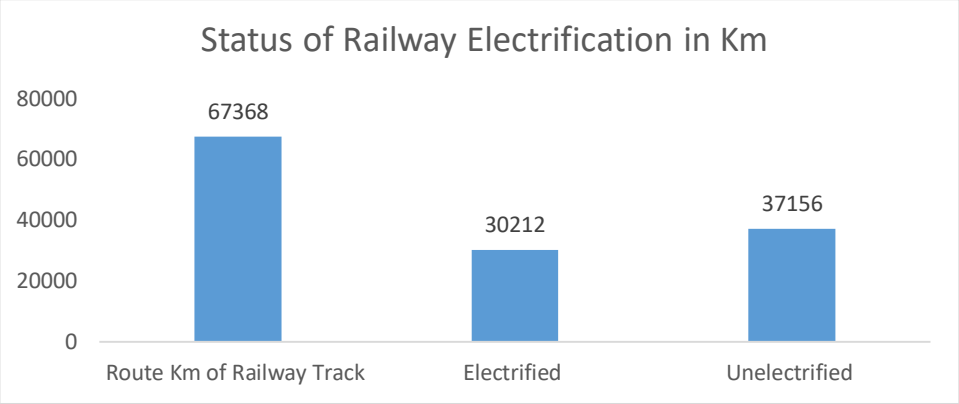
Public Transport (Railways, Bus and Fleet Cars) and 2/3W seems to be first movers towards EV India.

In India, the focus will be on getting Public transport Fleet on to electrification journey before focusing on private vehicles. Priority is expected to be given in order of electrification of railways, electric buses, 3 Wheelers, Fleet cars, 2 Wheelers and then private cars.

To push these philosophy into actions, the central government has started some key initiatives such as

- **Electrification of Railways**

  Indian Railways is one of the largest rail networks in the world with ~70000[3] km of tracks and 22,550 trains that carry 22.24 million passengers and 3.04 million tonnes of freight every day.



Indian trains primarily run on electricity or diesel. Currently, around two-third of freight and more than half of passenger traffic in Indian Railways are ferried by electric traction (engines). However, electric traction accounts for just 37% of the total energy expenses of Indian Railways. If railway tracks electrified at the earliest, then this will reduce dependence on imported fossil fuel and reduce costs for the Railways.

Government wants to improve efficiency and by saving cost make Indian Railways profitable. This without burdening the passengers," also reduce pollution.

- **Other Transportation initiatives**
- DHI has come out with schemes to assist populated cities to buy electric buses with subsidiary support for charging infrastructure.

- ESSL- With objective of facilitating faster adoption of electric mobility, ESSL has initiated a programme which envisage the replacement of existing government vehicles with electric vehicles. The company aims to create a market for EV through a model of demand aggregation and bulk procurement.

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- Under the JNNURM (Jawaharlal Nehru National Urban Renewal Mission), NEMMP (National Electric Mobility Mission Plan) and the smart city plans launched by the government, various state and local transport bodies are expected to purchase electric buses over next 5 years.
- World's 3rd largest automobile market is now starting its EV journey – India could learn from the world's largest EV market
- Lead India's EV journey in many dimensions- from helping in EV regulations & standards to being a technology provider for smart mobility program.

[3]Website Ministry of Indian Railways. As on April 2017

- EV business throws up multiple new business / technology challenges such as EV charging, smart charging, batteries, cloud based mobility etc which could be key areas where technology can be introduced.
- Business related to Charging spaces – EV chargers / smart charger (equipment/ technology) Charging infrastructure services, smart charging networks , cloud based solutions for charging.

Key Challenges in the Indian Market

- Policies are still in the making and due to multiple stakeholders, it may take a while before a clear horizon for EV emerges.
- Existing strong domestic auto industry & ecosystem could pose a challenges in terms of entry barriers. Local partnership will be vital for companies to enter the Indian market
- Indian EV market will face initial hiccups and will require some time to stabilized, companies need a longer view to succeed in India.
- "Value for money" association is vital to succeed in India- same applies for EV business as well.
- Charging infrastructure is at the heart of E-mobility and needs to be developed across the country in the same way as petrol & diesel or Gas stations.
- Unless there is adequate density of charging stations that are accessible by all, people will be not encouraged to adopt E-vehicles. At the same time, if there are insufficient E-vehicle, there would not be much incentive to set-up the charging station.

Conclusion

Within the next decade, set of four transformative low carbon technologies – LED's, Solar Energy, Wind Energy, & EV's will be reconfigure dynamics in several industries with parallel to other tech-driven developments. While India is making significant progress in first three, but there is hardly progress with regards to EV's.

EV's have long way to go before reaching deployment scales capable of making a significant dent in the growth of global oil demand and CO_2 emission. The economic environment, health & security related benefits of replacing diesel / petrol driven vehicle with EV's in India, along with listing of key areas where substantial changes are required in some of our statues, polices standard and practices

The Government of India is working on solutions to overcome regulatory gaps in order to promote E-mobility. While under FAME, the government has been setting aside money to subsidise EV purchases on an annual basis, all concerned infrastructure developers and policy makers will have to plan for the installation of sufficient public EV charging infrastructure to facilitate hassle free commuting. Workplace, public transport parking lots, multiplexes and residential townships – low hanging fruits Large private work places and cooperative housing societies (large private establishments), which are regularly maintained, could be targeted first for installing charging stations. Simultaneously, public transport parking yards could be retrofitted with charging stations.

In a scenario with 100% EV sales by 2030, India's cumulative battery requirements between 2026 and 2030 will exceed 2410 GWh from existing level of 1100 Gwh. Production volume is a key factor in determining the cost of battery packs. Therefore, Government of India (GoI) must take immediate steps to promote the creation of facilities to design and build solar cells/modules and storage systems in quantities commensurate with NEMMP 2020. Manufacturing EV batteries in India will enable Indian automakers to produce EVs at attractive prices and will potentially enable the country to become an export hub for batteries. Domestic manufacturing of batteries at this scale presents an enormous economic opportunity for India. Therefore, Government of India (GoI) should make an effort to implement all enablers required to facilitate the domestic industry to put up advanced battery manufacturing capacities in the country.

Government of India must secure key raw materials for batteries (especially lithium, nickel and cobalt) in India and/or abroad with the same zeal dedicated to acquiring oil and gas fields earlier. Government of India(GoI) must also facilitate research in the recycling and reuse of used Li-ion batteries to reduce the need for such imported minerals with limited global supplies today.

Government of India must step in infrastructure development including upgradation of local electricity grid to feed power efficiently to fast charging stations, fiscal incentives and R&D efforts to achieve the goals of NEMMP-2020.

Reference:

- National Action plan for Climate change
- National Electric Mobility Mission Plan (NEMMP)
- Energy efficiency Services (ESSL)
- Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME)
- Indian Railways Mission 2022