# ELECTRIC VEHICLES IN INDIAN MARKET

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Abstract - It is estimated that vehicles in road will grow approximately 2.9 billion units by the end of year 2050. Indian automobile industry is expanding enormously due to which resources like crude oil, natural gas and other fuels are being imported more than its limit as a result the $CO_2$ release from the vehicles are high and India stands as fourth largest emitter of $CO_2$ toxic gas in air with the contribution of 7% in globe. So to overcome this, alternate methods are to be identified and for that electric vehicles serves as a best option. Our study deals with the electric vehicles and its acceptance by the consumer in India on the cost basis along with the support provided by the government.

Key Words: Electric vehicles, Types of electrical vehicles, Pollution, Government Contribution, Comparison, Sign of acceptance.

## 1. INTRODUCTION

The history of electric vehicles starts with the beginning of automobile industry. Many of the first automobiles produced in early 1900's were powered by battery not gasoline. The invention of nickel iron rechargeable battery by Thomas Edison paved the way for the electric vehicles in early 1900's the batteries which would provide a power supply to run an electric motor. In early 1900 28% of the vehicles on the roads were battery powered[1].

Electric vehicles came to fame because it was quitter and does not make much noise and cheaper on that time. Then World War I happened which made internal combustion engine a massive boost in development of gasoline powered engine. Diesel and gasoline powered engine were successful because they were powerful, reliable and doesn't needs to charge which takes several hours. The best thing about the gasoline powered engines was the fuel used can be transported from one place to another easily and they can also be stored easily. This became disadvantage to battery powered engine as they needed several hours to charge and the efficiency of the battery weren't that much good. It was also inexpensive to build the gasoline powered vehicles and to fuel them. As deposits of huge oil were found in the USA. This made the fuel cheaper and dominated electric vehicles in the global market. Again in the early 1990's with the rise in both global warming and pollution people started to look back to make battery powered vehicles. To reduce the emission there was desperate need of alternate vehicles. That's when general motors released their first commercially produced electric vehicle model EV-I following to which hybrid electric car by Toyota Prius came to existence[1].

Until the year 2000 there weren't much electric vehicles. After the year 2000, revolution took place in the automobile industry when the electric vehicle companies like Tesla, Reva. Think and BYD came into the market in US, India, Norway and China and IC engine car manufacturers. And then following to this companies like general motors, Nissan also started to produce healthy electric vehicles. Recently tesla had released its Model Y and the sales of electric vehicles has risen. Top electric cars as of year 2019 are Nissan Leaf, Mercedes Benz B class, BMW i3, Tesla model S.

## 2. ELECTRIC VEHICLES

An electric vehicle is one which is powered by an electric motor. Electric vehicles uses energy stored in the rechargeable batteries to run the electric motor. The batteries can be recharged by household electricity. There is no emission from the tailpipe and are cheaper to operate. There are three main types of electric vehicles, and they are

- Battery electric vehicles,
- Plug in hybrid electric vehicles, and
- Hybrid electric vehicles.

### 2.1 Battery electric vehicles (BEV)

These are the types of the vehicles which are fully electrical with rechargeable batteries and doesn't contain any gasoline engine. BEV stores electricity in the rechargeable high capacity battery packs. The electric motor uses the power from the batteries to run. BEV doesn't emit any kind of harmful emissions from the vehicle. Batteries in the BEV are charged using the electricity from the external sources. Based upon the recharge timing they are classified into level 1, level 2, and level 3.

Level 1 – 120v outlet plug – 8 hours to charge 75 to 80 mile range.

Level 2 – 240v outlet plug – 4 hours to charge 75 to 80 mile range.

Level 3 – DC fast charging – 30 minutes to charge 90 mile range.

2.2 Plug in hybrid electric vehicle (PHEV)

Plug in electric vehicles recharges the battery through both regenerative braking and plugging in electric power.

2.3 Hybrid electric vehicles (HEV).

This type of electric vehicles are powered by both gasoline and electricity. To recharge battery vehicle's own braking is used. While starting electric motors are used and the gasoline engine start to perform as the speed increases.

3. GASOLINE VEHICLES

Gasoline powered vehicles are the one which uses fossil fuel as its source to run the engine and produce the power required to the vehicle. The fuel is stored in the storage tank. The emission from the tailpipe is one of the reasons for air pollution.

4. $CO_2$ EMISSION IN INDIA

Indian market scenario is different as the market share of electric vehicles is only about 0.1%. India imports 70% of oil required per year[3]. As of now almost all the vehicles running in roads are based on fossil fuel. This paves the way for the increase in greenhouse gases and increase in pollution in atmosphere. The population in India is high when compared to other nations due to which the number of vehicles used in India are high and the release of the greenhouse gases are high. Because of urbanization, rapid increase in personnel vehicle is observed. India is the third biggest importer of crudes oil. India has emitted 2299 million tonnes of carbon di oxide in the year 2018, a 4.8% rise from the previous year.

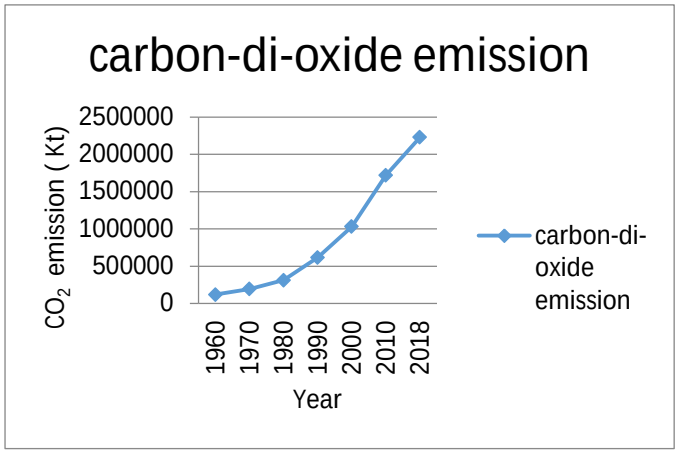


Chart -1: carbon di oxide emission[4]

5. GOVERNMENT CONTRIBUTION

The government is pretty much inclined in converting possibly all automobiles on Indian roads to electric vehicles. The goal to achieve this feat was earlier planned at the maximum rate they are now aiming for 30% electric vehicles on road by the year 2030. There have been intent moves, since 2017 when government of India released they are lagging behind achieving the goal they set for 2030.

The energy efficient services ltd (EESL) run by government of India, in 2017 offered 1120 crore rupees to TATA Motors ltd for manufacturing 10000 electric cars. The cars will be delivered in two phases. 500 cars were delivered in November 2017, out of which 150 were manufactured by Mahindra and Mahindra ltd, and the rest 9500 is expected to roll out in coming years. All of these cars are meant to replace the petrol and diesel run cars owned by the government. Of course, this doesn't mean replacing the entire fleet of government owned cars. For the government of India and its bodies own about half a million cars. But this is powerful initiative step taken by the government of India.

The government of India has already commissioned the EESL ltd for further Electric Vehicles sourcing. The next tenders are going to be declared for E-Autos and E-Rickshaws, under the faster adoption and manufacturing of electric vehicle (FAME) scheme. The FAME is the implementation body think tank of ideas for supporting and increasing the number of Electric Vehicles in India.

In 2017, Karnataka government approved Electric Vehicle Policy. The target of the policy is to acquire investments worth 31000 crore rupees from private and public sector which consists of infrastructure for electric vehicle charging zones – airports, railway station metros and other public places and electric vehicle manufacturing zones together by which 55000 employment vacancies are produced. The policy also charts out schemes to support start-ups supporting electric vehicles.

Just very recently, the government has decided to offer a direct subsidy for around 1.4 lakh rupees for each electric car. The decision was a result of the ministry of finance raising the subsidy on e-vehicles to 4500 crore rupees under the FAME scheme.

National Institution for Transforming India called as NITI AAYOG declares it is mandatory for multi-storey apartment to have charge point for electric vehicles.

NITI AAYOG has also ordered public places like shopping malls, residential areas, commercial building and offices should reserve 10% parking space for e - vehicles and set up charging points for them.

National Mission for electric mobility (NMEM2020) plan has been launched by the Indian government.

Government has approved phase two of FAME due to which subsidy of rupees 2.5 lakh can be obtained from the government and can be exempted by paying road tax, registration fees and parking charges for both electric and hybrid vehicles.

Government of India had planned in April 2014, the plan will have subsidies upto rupees 1.5 lakh for cars and rupees 30000 for two wheelers and this amount has been doubled in the year 2019[5].

## 6. ELECTRIC VEHICLES BRAND IN INDIA

Several automobile companies have their electrical vehicles in India

Table – 1: EV's in India

| ELECTRIC VEHICLE | PRICE |
|---|---|
| Mahindra Reva e2o plus | Rs 7.46 – 8.22 lakh |
| Mahindra E Verito | Rs 12.67 – 13.03 Lakh |
| Hyundai kona EV | Approximately Rs 25 lakh. |
| Tata Tiago EV | Rs 10 – 12 lakh |

Table -2: Hybrid vehicles in India

| HYBRID VEHICLE | PRICE |
|---|---|
| Maruti Suzuki Ertiga | Approximately 8.85 lakh rupees |
| Lexus ES 300h | Approximately 59.13 lakh rupees |
| Toyota Prius | Rupees 44.8 lakh –Rupees 47.2 lakh |
| Honda Accord Hybrid | Approximately 43.21 lakh rupees |
| Toyota Camry | Approximately rupees 37.5 lakh |
| Maruti ciaz diesel | Rupees 1093 lakh –Rupees 12 lakh. |

There are also several two wheeler electric vehicle companies have launched their product in India like hero electric flash, Mahindra GenZe.

## 7. COST ANALYSIS FROM CONSUMER POINT

We can calculate cost benefit analysis of an electric vehicle and petrol powered vehicle

### 7.1 Electric vehicle – Mahindra e2o

Electricity required for Full charge – 37 units.

Consumption rate rupees 6 per unit.

Total price for charging 222 rupees.

On full charge Mahindra e2o gives 110 kilometres mileage which gives 3km/unit with the cost of rupees 80 for 40 kilometres.

Considering the vehicle is being used 40 kilometres per day for 5 years which gives cost of electricity 1.46 lakh rupees for 5 years.

Cost of vehicle – rupees 7.46 lakh.

Total cost including cost of vehicle and cost of fuel for 5 years and neglecting service cost – 8.92 lakh rupees.

### 7.2 Petrol car – Mahindra verito

Fuel price- Approximately rupees 72

Mileage 14 kilometres approximately.

Cost of fuel for 5 years 3.75 lakh rupees.

Cost of vehicle 7.61 lakh rupees.

Total cost including cost of vehicle and cost of fuel for 5 years and neglecting service cost – 11.36 lakh rupees.

By comparing both the cost, it clearly shows that using electric vehicles saves 2.44 lakh rupees.

But lack of acceptance of electric vehicles by consumers in India is because of reasons such as Lack of awareness about government schemes for electric vehicles, lack of charging station, battery charging time of electric vehicles.

To overcome this type of issues government of India is working on their side by providing guidelines to install charging station for every 25 kilometres, invention of superchargers help to decrease the time of charging.

## 8. REASONS TO SHIFT TOWARDS ELECTRICAL VEHICLES

Poor air quality in India.

To reduce the emission of greenhouse gases.

To reduce the global warming.

Reduce the dependency on fossil fuel based transportation sector (In the year 2014-2015 India has imported 112 billion dollars of crude oil from global market)

To reduce noise pollution.

## 9. SIGN OF ACCEPTANCE OF EV's IN INDIA

There are significant signs which indicates the acceptance of the electric vehicle.

Electrotherm India limited which produces popular yo-bikes and reported the revenue of 200 million in july – September 2011 and reported 54% rise in their sales.

On 22 may 2018 ATHER Energy launched its charging infra service in Bangalore called ATHER grid.

Approximately 250 start-ups and companies are working towards electrical vehicle.

## CONCLUSION

Based upon our study we can conclude that the electric vehicles are paving their way to the Indian market. The government contribution and awareness among the consumers have made sure that the electrical vehicles are being accepted by the people of India. By the end of 2030 we could see more electrical vehicles than gasoline ones in India.

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