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Electric Cars: The Future of Indian Automobile

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ABSTRACT: If we see the numbers of electric vehicles used in some of the developed nations, India in that competition is nowhere near them. The overall purpose of this study is to bring awareness towards people regarding upcoming automobile technology and to sort out misconceptions people have about electric mobility. These misunderstandings may be stopping electric cars to enter India. We also analysed some faults and its reason as to why EVs are not as common as regular gasoline powered cars. We now have better understanding about the present scenario and government's plans for this segment. We found that once more and more people come across this trend, they will appreciate its benefits rather than counting its aberrant problems and that's why manufacturers are pushing and showing off their technologies andare investing a lot in EV sector because they know its high potential.

KEYWORDS: EVs, manufacturers, improve living, challenges, present scenario, government, technology, battery, range, efficient, future and green.

I. INTRODUCTION

Electric cars are much older than we think of it. Yes, the first electric car was introduced in 1832 by Robert Anderson which shows how early this revolutionary era began. But after the introduction of Internal Combustion Engine technology which was cheap, provided more range, was easy to use, the progress of electric motor car was stuck. However today, the trend of electric vehicles is increasing drastically. An electric vehicle is an alternative fuel automobile that uses electric motors and motor controllers for propulsion, in place of more common propulsion methods such as the internal combustion engine (ICE). Electricity can be used as a transportation fuel to power battery in electric vehicles (EVs). We can classify car type on the basis of how it get powered. Most common is ICE (Internal Combustion Engine) which requires fuel/gasoline. Another is PHEV (Plug-in Hybrid Electric Vehicle) which can run on both fuel as well as electricity but its efficiency is the least. One more type is the one getting notability nowadays is BEV (Battery Electric Vehicle) or commonly called EV (Electric Vehicle) which is fully powered by batteries.Today, there are many EV producing manufacturers out of which some are only EV based manufacturers like Tesla, Rivian, Nio, Rimacand Polestar while other manufacturers like Jaguar, Audi, BMW, Mercedes, Nissan, Hyundai and Kia produce electric cars as their side products. These companies are developing their electric cars as a contribution to sustainable development but more importantly to keep up their brand with this EV trend.

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(Fig.1 : Tesla Model 3)

At present, China is the largest EV user by number but if we see by percentage, Norwegian people are most familiar with EV as 31.2% of total car sales last year was EVand the percentage will even increase this year.[1].

Coming to India, it lags behind in this trend. There are only 750,000 EVs out of total 260 million vehicles sold in India in which also, maximum numbers come from public transport vehicles [2]. However, many companies are initiating EV ideas and we will be able to see it commonly on roads within few years.

II. HOW IT CAN IMPROVEOUR LIVING

1. Environment friendly :

According to World Health Organization (WHO), there are about 4.2 million deaths every year worldwide as a result of exposure to ambient (outdoor) air pollution [3]. Coming to India, a recent report stated that out of 30 most polluted cities in the world, 22 cities are from India [4].

Keeping these data in mind, it is essential to promote electric vehiclesas it will help to save our environment which will finally benefit us by preventing many health problems like Asthma, Lung cancer and cardio logical diseases. This is because it runs on electric motors powered by batteries which though require coal plants in production but that amount of coal is negligible making it a clean source of energy whereas a regular gasoline car emits vicious and toxic gasesin environment creatingenormous air pollution.

The impact will be also visible in climate change.At this time, with so much emission of greenhouse gases, there is drastic increase in Global warming. The effect might not be seen directly but the impact is real. According to Times of India, a study suggests that the Himalayan Glaciers are melting twice as fast which will be the cause of water crisis [5].

This all shows that air pollution not only worsen the quality of air, but indirectly it affects many other things also.

The main cause behind this is present commute vehicles which are major emitter of these gases and it's more threatening as automobile sector in India is booming very rapidly and that's why there is an urgent need to revolutionize our vehicles.

2. More cost efficient:

To be frank, most peopledon't care about how their property is affecting environment but, what they care is how much their property is providing benefits to them.

What a great product would it be that will keep both environment as well as the owner happy?

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According to Wikipedia, an electric car is around three times as efficient as cars with an internal combustion engine. Also according to Cleantechnica, which is an EV based news website, stated "EVs convert about 59%–62% of the electrical energy from the grid to power at the wheels. Conventional gasoline vehicles only convert about 17%–21% of the energy stored in gasoline to power at the wheels" [6].Moreover, gas prices are at its peak, especially in India where the price of petrol is $4.1 per gallon. Since electric vehicles don't require any fuel or gas to power it, a user can escape the steep rise in prices of these commodities. All they need is to charge their vehicles from charging stationwhich is way cheaper. It can be even more beneficial as one can setup the charger at home. This will save a lot of time as one can put the car in charge while doing other work. Also unlike public chargers, there won't be any direct profit involved in charging through home making it to save even more bucks. It won't be possible to setup gas dispenser machine at home though.

(Fig.2: An EV charging at home)

It might seem that the initial cost of electric car is little high but considering the total ownership cost of like 5 years, electric vehicle will be more cost effective because of very low maintenance. Unlike ICE cars, EVs doesn't require any oil change or any other engine work as it operates on a single mechanism of motor. Its batteries are not needed to be replaced for long time. Currently, most manufacturers are offering 8-10 year or 161,000 km/100,000 mile warranties for their batteries. Even if there is something for maintenance, it will be something basic malfunctioning that will not make hole in the user's pocket.

The initial cost is high because of lack of battery technology. In coming time, with better technology, it will be even cheaper to ownan EV than its competitive gasoline car.

3. Safe to drive:

In 2015, India witnessed more than 500,000 car accidents in which almost 150,000 people were killed [7]. This is every year scenarioand as car sales is increasing, it seems more threatening. It could happen in anyway whether it is from car catching fire or due to lack of safety features like airbags, ABS etc. As electric car is a new technology machine, it is more advancely packed with safety equipment like standard airbags, ABS, collision avoidance system, cruise control. This system not generally comes standard ina regular car.

Also, thebatteries of an EV are quite heavy and are packed linearly in the bottom area of whole car. This creates a low center of mass and provides an excellent handling which will help the driver to prevent a crash and also in blind spit turns.

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Moreover, the batteries are packed and sealed tightly in a way that there is very less chance to catch fire which is not the case with ICE cars that can easily catch fire due to its inflammable fuel. And even if EV catches fire, it will ignite slowly creating an easy chance for passenger to escape while the ICE vehicle will burst out in seconds giving very little possibility for the passenger to escape.

(Fig.3 EV's battery sealed flat at bottom)

4. Comfortable ride

The gasoline engine has a myriad of rotating parts inside. In order to produce power, they have to constantly keep grinding and hitting against each other. The sound waves created from the contact between these parts is heard as the exhaust note and felt inside the car's cabin as vibrations. This is not the case with electric cars as it does not have a lot of moving parts inside. In fact, they have only one moving part, which is the electric motor. Hence electric cars have ability to curb noise pollution.This mechanism is also considered for a comfortable ride as more silent and smooth ride lead to relaxing and soothing ride.

Also being technology advanced vehicle, EVs are designed in a way to have least knobs and button in the interior making it to look minimalistic. This also gives comfort to the driver by giving better visibility ahead and less complex mechanism to operate.

5. Easiest driving operation :

Electric cars have the simplest driving method in the world of automobiles. Commercial electric cars come with a transmission comprising of only one really long gear. They also don't suffer from the problem of stalling as petrol cars do. This effectively eliminates the need of adding a clutch mechanism to prevent that from happening. So what this essentially means is that you can operate an electric with just the accelerator pedal, brake pedal and steering wheel. This will also prevent from accident as direct action can be taken by stopping or diverting car unlike petrol cars which will be needed to change gears and adjusting clutch pedal making it slow change. The mechanism of electric car also helps it for crazy acceleration as there is no time lag and hence overtaking can be done easily which also makes itvery fun-to-drive car. The fastest accelerating car is also going to be an electric car, i.e. Tesla Roadster doing 0-60 mph in just 1.9 seconds [8].

Another really useful feature of electric cars is regenerative braking. In normal cars, the braking process usually results in total wastage of kinetic energy that gets released as frictional heat. However, in an electric vehicle, the same energy instead of getting lost in heat is used to charge the batteries.

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(Fig.4 EV vs ICE interior)

III.CHALLENGES FOR ADAPTATION

1. Charging issue:

Presently, electric cars are limited by range.Some EVs might be achieving long range like Tesla, which is leading EV manufacturer, has a range up to 595 kms but for an average, EV have a 210-380 km of range whereas an average gasoline powered car can go up to 600-700 km on full tank.

Moreover there are negligible charging stations in India and setting up of charging points in a country with a total area of 3.287 million km² will be a big headache because it will require a lot of workers, full-time electricity connection and so the capital of heavy amount.

Adding more issue, while it takes just a couple of minutes to fuel a gasoline powered car, an electric car take about 2-3 hours to get fully charged. Again there exists some top end EVs which requires just 40-50 minutes to charge fully. Therefore, you need dedicated power stations as the time taken to recharge them is quite long though you can charge your EV at home also.

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(Fig.5 Electric car charging at charging station)

2. Expensive initial investment :

At this moment, where EV revolution has just began, if we see the foreign countrieswhere there is EV options are common, the cost of electric cars are very high compared to its rival ICE cars. This is because as of now, the battery technology hasn't evolved much and that's why a large amount of money of producing an EV is invested in battery which makes it less value for money. However, this is just an initial problem. Taking average usage, an electric car for 5 year use will make it more cost effective than its rivalries. Moreover, if EV revolution continues and its car starts producing in mass, the battery cost will be reduced significantly making it even more worth.

3. Less choice :

Although the first electric was introduced in 1800s, there was negligible development for it then.

In 21st century, some manufacturers like Toyota and Nissan bought their Hybrid and electric cars but that models were too unusual looking both from exterior as well as interior for no reason. That's one of the reason why people started avoiding electric vehicles. Though many manufactures are trying to make EVs, very few models are selling successfully mainly Tesla all models, Nissan Leaf, BMW i3 and that too the "success" is nowhere near the mainstream cars. Coming to India, there are just 2-3 electric cars presently and that too such a bad models which lacks looks, range, features and technology. No company has seriously taken EV market seriously and one of the reason is consumer unawareness. There is no demand for EVs here therefore no choice to choose from.

However, we can expect from Kia, Tata & Mahindra to come up with some good electric cars in upcoming years.

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(Fig.6 Mahindra's present EV, e20 plus)

IV. PRESENT SCENARIO

As of now, electric vehicles are not considered as a regular vehicle in India because it is very rare to see one. However, the freak for experiencing electric vehicle is increasing rapidly and people are gaining interest to know more about it.

For two wheelers, startups are more willingly working than pre-existing manufacturers on electrifying bikes and scooters as an opportunity because two wheeler is the most common way to commute for people. Thesecompanies are Ather Energy, Twenty Two Motors, Okinawa Motors etc. for electric scooters and Revolt, Emflux, Tork coming up with their electric bikes.These startups came with really good design and usable technology.

(Fig.7 Ather 450)

(Fig.8 Revolt RV400)

Coming to cars, truly speaking there is no pure electric car that can be consideredbuyable right now. However, there exist some 4-5 hybrids cars but have least popularity and some of them like Toyota Prius is discontinued because of having almost zero demand. Reason is simple.The battery technology, charging network and the whole mechanism is not developed yet to build a successful electric car. And that's why there is no such awareness about it and people are not getting any purpose of buying it. For example, the only brand that offers electric car is Mahindra. Its one electric car is eVerito which is the electric version of Verito model. The electric version cost double the price from regular Verito and that too offering much low range, charging network limitations and even some features are missing out. Why one would buy such EVs?

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However, companies like Tata motors, Hyundai, Mahindra, Kia and Nissan are spending their time to give India an EV future. These companies are working on better technology, charging network and will be launching their competitive electric cars within next 2-3 years.

(Fig.9 Tata's upcoming electric car)

If we notice, currently electric two wheelers are becoming more common and successful than electric cars (news screenshot) because of its easy design and less risky manufacturing.

Another thing becoming more common is electric commercial vehicles. We can commonly see e-rickshaws, which is the electric version of a three wheeler used as public transport. Also companies like Tatamotors and Ashok Leyland have launched e-buses and many cities havestarted using it for public transport.

(Fig. 10 e-rickshaw)

With all these, it can be understand that people are getting interested in EV sector and in coming years, if manufacturers work in right direction for electric models, there will be a drastic growth seeing the consumer base from a whopping 1.3 Billion population.

V. GOVERNMENT'S TAKE

In order to encourage the use of electric vehicles, government is offering financial offers. The government wants to see fast results on the electric vehicles front, therefore, it has doubled allocation to the scheme to INR 10,000 crores from the earlier INR 5,500 crores. As per the scheme, a total of 55,000 electric cars will be offered a subsidy of up to INR 2.5 lakhs; 20,000 hybrid cars will be offered subsidy of INR 20k. Under the scheme, subsidy will also be offered to 10 lakh two wheelers, 5 lakh three wheelers and 7,000 buses [9].

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Already the manufacturing cost of EV is high and if companies start to import the cars, people will find useless to buy a Hyundai EV at a cost of regular Mercedes that's why government is forcing EV makers to localize manufacturing for cost management.

Our present Prime Minister, NarendraModi even visited to Tesla, which is no. 1 electric car manufacturer in Fremont, CA to experience it and talked to Elon Musk, Tesla's founder for future India plans. Even Nitin Gadkari,Minister of Road Transport and Highways of India talked to Elon Musk for future EV support.

(Fig.11 Narendra Modi at Tesla Headquarter in 2015)

The reason for such manufacturers to not enter the Indian market is high import taxes and complex policies for setting up factories and selling of cars.

The government expects 25 percent of the total vehicles on roads will be electric vehicles by 2030 and so to establish this aim, it is necessary to setup charging network throughout the country. The government has issued a set of guidelines to set up charging stations for electric vehicles across the country, outlining ways to build such fuelling points every 25 km.

The government will within this week float two large proposals offering subsidy to states for deployment of 5,000 electric charging stations in cities and highways [10]

VI. CONCLUSION

It is very necessary to bring this change because of India's humongous population and bringing this change will somewhere affect parts of world because it will involve exchange and sharing of technology and manufacturing parts from other countries. It will reduce climate change and control pollution. It will also create employmentand will upgrade India's position in globalization index. These all benefits are complimentary to the above mentioned advantages of electric mobility. It will serve very big platform. We hope that government supports electrification of vehicle by giving subsidies to companies, by giving incentives to consumers for initializing this segment and by making effective and strict policies to maintain it. This will provide help tocompanies and right choice to people.

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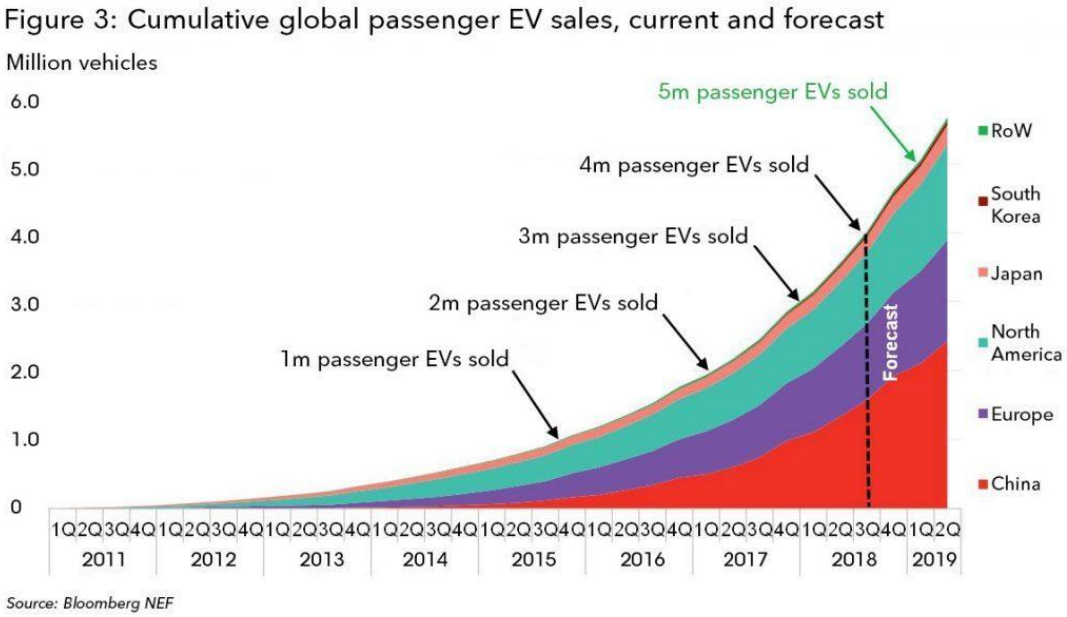

Fig.11 EV sales drastically increasing Worldwide

REFERENCES

(Data reference)
[1] http://www.norwaynews.com/electric-car-sales-hit-31-2-of-all-sales-in-norway/
[2]https://www.autocarindia.com/car-news/ev-sales-in-india-cross-75-lakh-mark-in-fy2019-412542
[3] https://www.who.int/airpollution/en/
[4] https://www.theguardian.com/cities/2019/mar/05/india-home-to-22-of-worlds-30-most-polluted-cities-greenpeace-says
[5] https://timesofindia.indiatimes.com/home/environment/global-warming/himalayan-glaciers-melting-twice-as-fast-study/articleshow/69867917.cms
[6] https://cleantechnica.com/2018/03/10/electric-car-myth-buster-efficiency/
[7] https://www.bbc.com/news/world-asia-india-36496375
[8] https://www.theverge.com/2017/11/17/16669024/tesla-roadster-2017-fastest-car-world
[9] https://www.rushlane.com/electric-cars-to-get-subsidy-phase-2-fame-12298810.html
[10] https://economictimes.indiatimes.com/industry/auto/auto-news/subsidy-proposals-this-week-to-set-up-5000-e-charging-stations/articleshow/69749146.cms?from=mdr
(Information reference)
[11]https://www.conserve-energy-future.com/advantages-and-disadvantages-of-electric-cars.php
[12]http://www.greenworldinvestor.com/2018/02/26/advantages-and-disadvantages-of-electric-vehicles/
[13]http://www.pluginindia.com/ev---faq.html
[14]https://www.weforum.org/agenda/2017/10/three-ways-electric-vehicles-will-change-our-world