

Future of Electric Vehicles in India

Submitted by: -

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Abstract:

During Pandemic and lockdown period in India, there was an improvise in the environment as the industries were shut people were staying at home and most significant thing there were no passing of vehicles at that period, things got normal when the COVID got shrunk but there was a negative impact on the environment due to the fear and losses of the industry, the usage of exploiting resources was twice, On the other hand, the prices of fuel increasing was a terrific situation. Hence, the Government of India implemented electric vehicles. Though there were hybrid cars, but they need fuel.

Many countries have accelerated the development of electric vehicles to reduce reliance on oil and pollution. The adoption of EVs, particularly battery electric vehicles, is seen as a solution to the energy crisis and environmental concerns. This paper provides an in-depth examination of the technical advancements of EVs and emerging technologies for their future applications. The following technologies are summarised: batteries, charging technology, electric motors and control, and EV charging infrastructure. As another contribution, this paper highlights the technical challenges and emerging technologies for improving the efficiency, reliability, and safety of EVs in the coming stages.

The Indian government are taking great initiatives in addressing the environmental concerns with new regulations, policies, framework they are doing this because of the fear that the United States is backing out from their commitment to The Paris Climate Treaty.

Introduction:

The growing number of internal-combustion vehicles that use non-renewable conventional fuels has resulted in both energy and environmental issues. As a result, many countries have implemented new energy vehicles (NEVs) as alternatives to conventional vehicles to reduce reliance on oil and air pollution caused by conventional vehicles. China, as the world's largest automotive market, has made a commitment to promoting NEVs to reduce oil consumption and imports. In Europe, Germany plans to have one million EVs on the road by 2020 to reduce CO2 emissions. France and the United Kingdom have also set a target of restricting the in-

country sale of conventional vehicles by 2040. Many countries provided subsidies and special tax policies to encourage the adoption of NEVs.

Electric cars are vehicles that use electric motors or motors that run purely on traction for propulsion of wheels these vehicles are powered by a self-contained battery, solar panels, or, in the case of larger vehicles, electric generators. Unlike conventional energy sources on the market today, electric vehicles convert electricity into fuel for motors without the need for fuel. Electric sources of fuel for motor vehicles are indeed clean, or at least they are when compared to conventional fuel sources such as fossil fuels. Such motors have the advantage of being non-polluting and noiseless, which is an engineering feat that is nearly impossible to achieve with conventionally run motors. Furthermore, the fuel source that we have been using since motor vehicles were invented is not a renewable source of energy, resulting in a constant fear of energy sources drying up and becoming extinct, as well as an increased search for electric fuel sources.

Mahindra had a car named e2O, but the response was not reasonable things began to change when there was a proposal given by our Honourable Prime Minister Mr. Narendra Modi to Elon Musk to bring his car tech in India, things started to work, people started understanding the use of EV, but the awareness was not adequate. The costing of a Tesla car was quite high, then Tata brand brought the first EV car which changed the whole table , people started understanding and they were buying the tata car , Tata Nexon EV , was the first EV car launched by the brand and they got surprising response , the demand is high and the supply was less , there was a minimum 6 months waiting period in the delivery of the car, same applied to the Morris Garage car.

Objective of the study

The objective of the research paper is

- (i) To know will electric car able to sustain in the Indian automobile sector.
- (ii) To know whether the people will use the electric car as a primary or secondary.
- (iii) To know why the Indian government influencing people to get an electric car.
- (iv) To measure the anxiety level of the people while they are using the electric car and it gets breakdown in middle.
- (v) To know will the people accept this new technology.

Literature Review

This paper aims to inform the debate over how an electric vehicle technology will fit and sustain into a lower-carbon 2020-2030 new vehicle fleet in India by collecting, analysing, and aggregating the available research literature on the underlying technology costs and carbon emissions. Greenhouse Gas emissions and energy demand for electric and conventional vehicles are presented on a well-to-wheel (WTW) basis, capturing all direct and indirect emissions associated with fuel and electricity production and vehicle operation. The authors discover that the carbon emissions of battery electric vehicles (BEV) powered by Indian grid-mix electricity

are roughly half of the average Indian vehicle emissions, with HFCEVs and PHEVs having a lower potential for emissions reduction. By 2020, a lower-carbon grid and improved power train efficiency could reduce average electric vehicle emissions by another third.

Research has been conducted on how to speed up the process of decomposition of organic matter in order to generate fossils, but the closest time one has arrived at as of now is a period of 10 years, which is quite low when compared to the rate of consumption of fossil and the rate of creation of fossil. As of 2019, it is estimated that 73 percent of the electricity produced as a source for EVs came from fossil fuels. It would be a more sustainable choice to rely on renewable energy sources, which are abundant throughout the world.

However, as many people believe, using electric energy as a fuel source for vehicles is not an entirely clean source of energy. To generate electricity, fossil fuels are burned to generate heat, which is then converted into electricity. Whatever the nature of the energy source, the burning of fossil fuels is imminent and, in a sense, unavoidable. With the current rate of depletion of fossils, there is a chance that they will no longer exist as a fossil fuel for future generations by 2040.

Research Methodology

In this study, an extensive method is used to take into account all relevant questions related to electric vehicles. This method examines the suitability and mobility of electric vehicles in people's daily lives. Users were questioned and a valid conclusion was drawn on the reception of electric vehicles and their impact on the general daily market. The research paper has a secondary data and to clarify the doubts and thoughts of the people here are some conceptual highlighting points of an electric car.

Concept of the electric cars

History

At the start of the automobile's history, there were two competing approaches to engine-driven vehicles: one with an internal combustion engine (ICE) and one with an electric drivetrain. Thomas Davenport, an American inventor, built the first electric car in 1834. Benz and Daimler in Germany created the first Internal Combustion Engine Vehicles (ICEV) in 1886. Electric cars had a significant share of all engine-driven cars around the year 1900. Simultaneously, F. Porsche developed a hybrid electric vehicle with an ICE range extender and wheel hub electric engines. The two different drive trains competed until Henry Ford chose an ICEV for the first mass production car in history in 1908.

Electric car segments

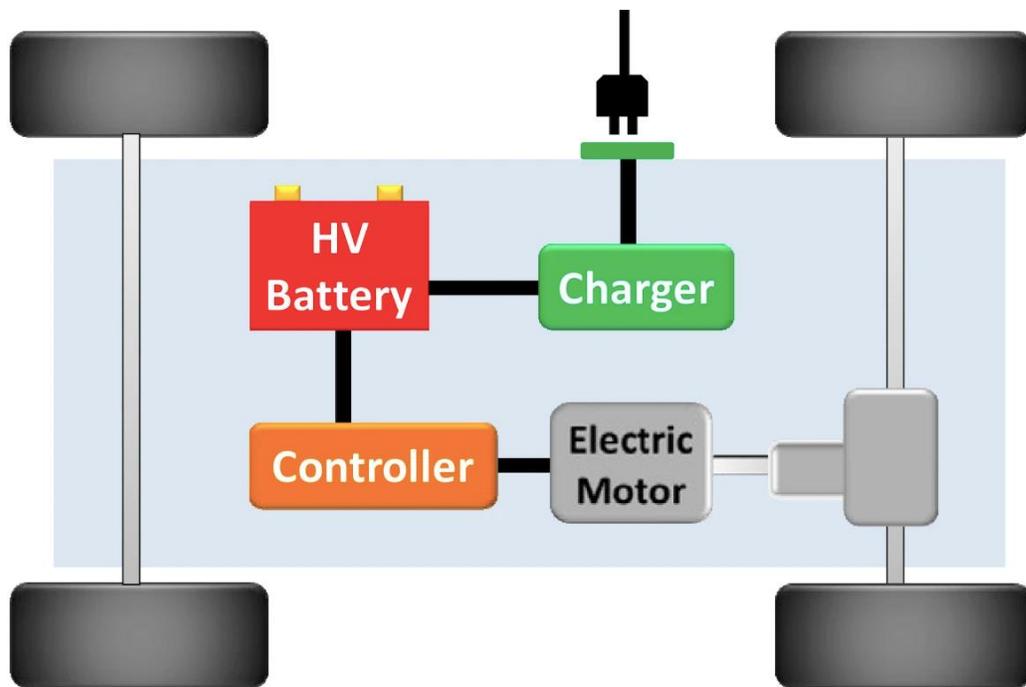
Because of California's Zero Emission Act, electric cars were once again offered as series products in the 1990s. Following the suspension of the Zero Emission Act, the Californian government preferred Partial Zero Emission cars, prompting Toyota to develop the hybrid vehicle, which combines an electric and a combustion engine. Energy efficiency improved dramatically as a result, and the concept of the electric car spread globally in tandem with the success of the Toyota Prius. Because a full hybrid vehicle can drive electrically, it only

requires a plug and a larger battery to be charged like a BEV. As a result, the category of plug-in hybrid vehicles (PHEV) was created, Various drivetrain concepts based on electric motors have been developed over the last ten years and will soon enter mass production. All-electric drive and hybrid electric drive must be distinguished. In contrast to hybrid electric drive, the only energy converter in an all-electric vehicle is an electric motor.

Electric vehicles will be mostly small or mid-size in the coming years for two reasons: First, the weight restricts the range of operation, which is a factor in daily usability. Second, battery costs establish yet another important regulating factor: larger cars require larger batteries which are quite expensive.

Technical components of an electric car

Electric car has two main components that is the electric battery, the electric motor, and a motor controller. Electric car's technical structure is simpler than that of an ICEV because no starting, exhaust, or lubrication system, usually no gearbox, and sometimes even no cooling system are required.



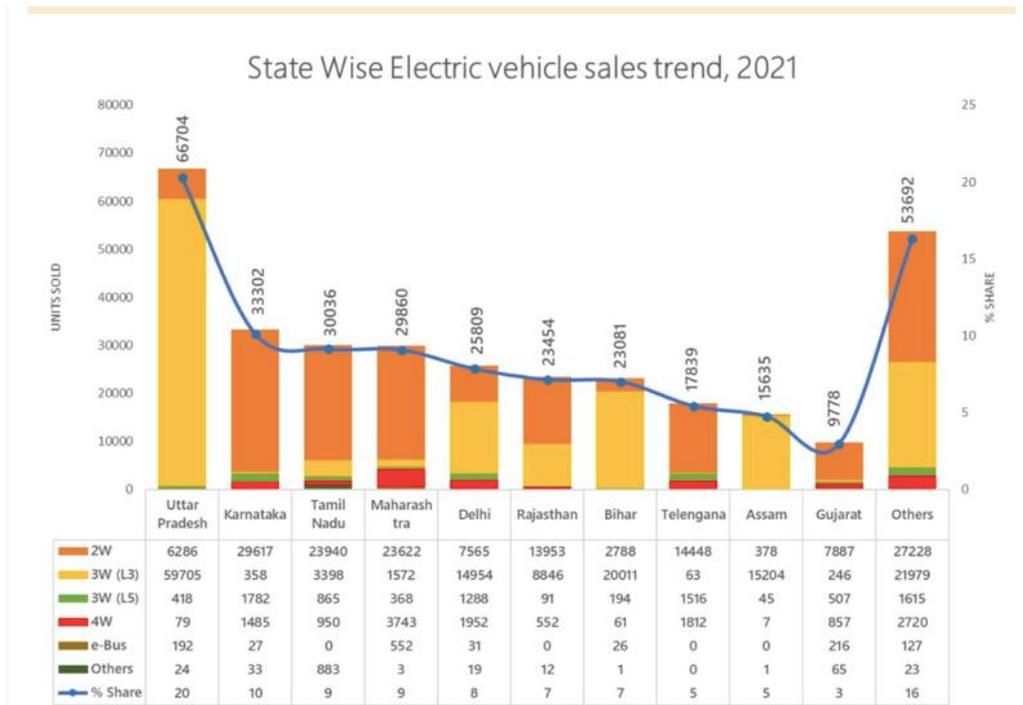
The battery is charged with electricity when it is plugged into the power grid via a charging device or when it is braking through recuperation. The charger is an important component because its efficiency can range between 60% and 97 percent today, wasting 3% to 40% of grid energy as heat. The motor controller provides

variable power to the electric motor based on the load situation. When used in a drivetrain, the electric motor converts electrical energy into mechanical energy and torque. So far, central engines have been used in series BEV production; however, hub wheel electric engines are also possible and would be available for mass production.

Importance of Electric Vehicle in India

- Due to the growing pollution problem, the Indian government has promoted several alternative mobility solutions, the most important of which are electric vehicles. Indeed, they use electricity as fuel rather than fossil fuels and thus hold the key to India's growing problem of air pollution.
- In the long run, owning and maintaining electric vehicles is simpler and less expensive. A battery electric vehicle (BEV) has fewer components than a conventional petrol or diesel car, making electric vehicle maintenance and upkeep much less expensive than in petrol- and diesel-powered vehicles.
- Electric vehicles, unlike conventional vehicles, produce no noise because they lack an internal combustion engine and have fewer components. As a result, it aids in the reduction of noise pollution, particularly in urban areas.

Statistical Data

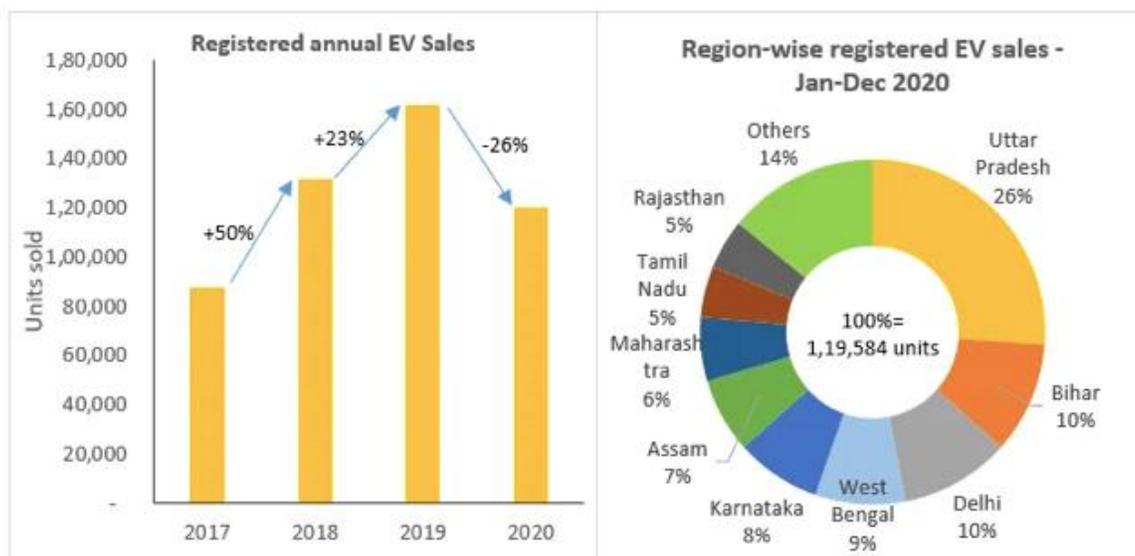


With 66,704 units sold in 2021, Uttar Pradesh has the highest share (20%) of electric vehicles sold.

Karnataka, Tamil Nadu, Maharashtra, Telangana, and Rajasthan have the highest sales share (67%) of all high speed electric 2Wheeler (high speed) sold in 2021.

Uttar Pradesh, Bihar, Assam, and Delhi have the highest L3 category e3-wheeler sales, accounting for approximately 75% of total sales while the highest number of high-speed L5 category e3-wheelers are sold in Telangana, Karnataka, and Delhi.

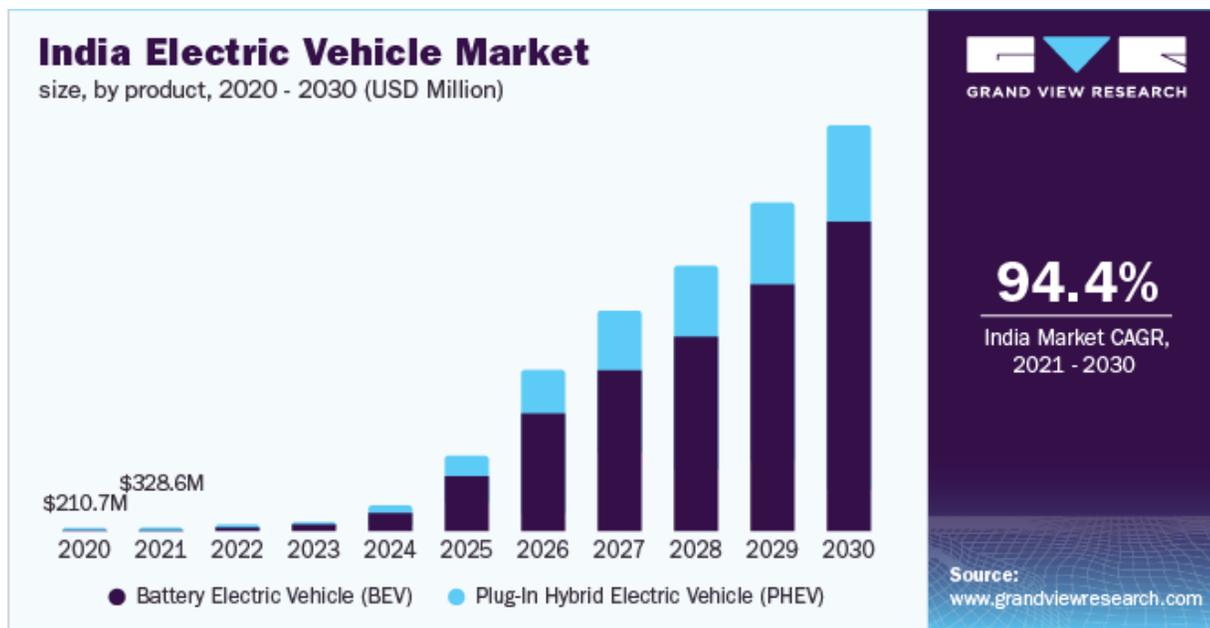
Maharashtra has the highest 4wheeler sales for 2021, with 3743 units (26%) followed by Delhi and Telangana, each with 1900 units (13%) sold. Maharashtra and Gujarat have the highest e-Bus sales in 2021 with 552 (47%) and 216 (18%) units sold, respectively.



The last year saw a significant shift in the direction and dynamics of global markets. The effects of the global pandemic had a significant impact on the e-mobility or electric vehicle (EV) domain, just as they did on any other industry. Various YOY trends depicting the erratic track of EV sales are summarised below.

Overall registered EV sales in India fell by 26% in 2020 compared to 2019. The year 2019 continues to be a watershed moment for registered EV sales, surpassing the 1,60,000 mark.

Prior to Covid-19, market growth had been declining for about 12-18 months due to weakening demand in an ailing economy. Furthermore, due to a covid-induced lockdown, EV sales were severely hampered during April-May 2020.



The India electric vehicle market was valued at USD 220.1 million in 2020 and is expected to grow at a CAGR of 94.4 percent between 2021 and 2030. The attractive incentives being offered by the Indian government on the production and purchase of electric vehicles to encourage their adoption are expected to drive market growth over the forecast period. The outbreak of the COVID-19 pandemic caused a significant drop in overall passenger and commercial vehicle sales in 2020. However, electric vehicle sales in India were unaffected. The post-lockdown sale of pure and hybrid electric vehicles is a significant driving factor in India's electric vehicle market. The government's stringent Green House gas (GHG) emission norms, such as the Bharat Stage (BS) VI emission standards introduced by India's Ministry of Road Transport and Highways are also expected to play a significant role in driving market growth.

Indian automakers such as Tata Motors and Mahindra and Mahindra Ltd. have made aggressive efforts to expand their product portfolio with electrified vehicles, which is expected to encourage Indian consumers to choose electric vehicles. All these factors point to the electric vehicle market in India expanding over the forecast period.

Limitations

There are some limitations by which there are chances of people not obtaining the Electric car which are mentioned below:-

- i. Awareness not provided adequately about shifting into an electric vehicle.
- ii. Chances of explosion of an electric car is high as the dependency is high on battery.
- iii. People having anxiety of using an electric car.
- iv. Proper infrastructure is yet to be execute in India.
- v. Subsidies not provided in the states like Maharashtra, West Bengal, etc.
- vi. Expensive than regular cars.

Conclusion

The shift to complete EV comes with a price in which most people cannot afford at the moment of such massive revolution. To enable sustainable development, the shift is inevitable but far away in the future for a nation like India. Such a shift in technology is not on the top of the agenda for the nation right now. The technology is borrowed from other nations to use in India. Thus there exists a barrier in the process of change. It would take years for India to create the technology required to effectively shift the source of vehicles in India, as the nation currently lacks the human resource and funds to allocate for the proper development of technology. It shall be a burden with additional societal issues India faces at the moment.

Bibliography

1. Pandey, D., Manoocha, D. and Saini, D., 2020. Automobile and revolution of future of Electric cars in India. *International Journal of Management*, [online] 11(3), pp.107-113. Available at: <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3568382> [Accessed 3 July 2022].
2. Ramu, D., 2022. Future of electric cars in India. *Elementary education*, [online] 20(1), pp.1682-1691. Available at: <https://www.researchgate.net/profile/Murugan-Ramu/publication/350963949_THE_FUTURE_OF_ELECTRIC_CARS_IN_INDIA/links/607cf2f4907dcf667bab4d12/THE-FUTURE-OF-ELECTRIC-CARS-IN-INDIA.pdf> [Accessed 3 July 2022].
3. Pandey, M., 2014. Customer perception towards purchase of electric car in India. *Journal of emerging technologies and Innovative research*, [online] 8(8), pp.1-12. Available at: <https://www.researchgate.net/profile/Subha-Krishnamoorthy-2/publication/354271313_Customer_Perception_towards_purchase_intention/links/612f51880360302a006fc894/Customer-Perception-towards-purchase-intention.pdf> [Accessed 3 July 2022].
4. grandviewresearch.com. 2021. *Electric Vehicle market size, market share and trends*. [online] Available at: <<https://www.grandviewresearch.com/industry-analysis/india-electric-vehicle-market-report>> [Accessed 3 July 2022].
5. Helmars, E. and Marx, P., 2013. Electric cars: technical characteristics and environmental impacts. *Springer Open*, [online] 24(12), pp.12-22. Available at: <<https://enveurope.springeropen.com/articles/10.1186/2190-4715-24-14#citeas>> [Accessed 3 July 2022].
6. Prabhakaran, M. and Selvalakshmi, M., 2020. Customers Interest in Buying an Electric Car: An Analysis of the Indian Market. *Springer link*, [online] 5(12), pp.493-509. Available at: <https://link.springer.com/chapter/10.1007/978-3-030-64849-7_44#citeas> [Accessed 3 July 2022].
7. Prodan, G., 2021. *ARE ELECTRIC CARS REALLY GREENER?*. [online] conference.com. Available at: <<https://conferencii.com/files/archive/2021-03.pdf#page=153>> [Accessed 3 July 2022].