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Scope and Opportunities for Electric Vehicles: Indian Scenario

Chode Manikanta Kumar[1]

[1]PG Scholar, Department of Electrical Engineering, Andhra University College of Engineering (A), Visakhapatnam, India

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Abstract - Electric vehicles have seen unexampled growth over the previous decade round the world. In this paper, we tend to initial discuss the scope and opportunities of electrical Vehicles in Bharat. We also discuss numerous policies and frameworks in situ by the Government of Bharat. Then, we tend to study the assorted case studies from round the world on adopting Electric Vehicles. we tend to finally conclude with however Bharat could implement and take pleasure in these ways at the native yet as national level.

KeyWords:E-Vehicle, Battery Technology, Electric charging station, Emission.

1.INTRODUCTION

Driven by incredible ecological, macroeconomic and innovative elements, the worldwide transportation area is in a time of memorable change. New plans of action, for example, portability as a help and the expanding monetary reasonability of advances, for example, electric vehicles will before long change the manner in which we travel. As per research by the International Energy Agency (IEA), the worldwide armada of electric vehicles has expanded from only 5,000 vehicles in 2008 to in excess of 2,000,000 out of 2016. This is because of central patterns, including developing ecological concerns, a lessening in battery costs and the developing accessibility of charging foundation. The entirety of this has driven specialists to foresee fast development in EV use throughout the following decade - development estimates for the current year range from 27% to 33% until 2030. [1]

As per numerous pointers, China is at the top of the worldwide unrest of electric vehicles. A lot of the worldwide electric vehicle armada arrived at 32% in 2016, outperforming the United States interestingly. Its offer was just 11% in 2011. Then again, India's set of experiences of EV has been disillusioning up until this point. Absence of stacking framework, conflicting government support and early item disappointments have all prompted the stale development as of late. Notwithstanding, the public authority has set a reasonable and aggressive objective of receiving 100% electric vehicles by 2030, and the nation's driving research organization, NITI Aayog, laid out the diagrams of a drawn out worldwide versatility technique. This has effectively prompted solid measures to help animate the development of electric vehicles. Energy Efficiency Services Limited (EESL) has dispatched a delicate for 10,000 four-wheel electric vehicles in 2017, the biggest buy on the planet up until now. In the three-wheeled vehicle and transport portions, the public authority intends to acquaint battery supplanting with independent battery costs from vehicle costs and encourage the charging cycle. Norms for the original of public chargers for electric vehicles have been characterized and a subsequent age is in planning. The methodology for developing electric vehicles in India spins around two fundamental suppositions: collecting interest for types like EESL can help scale up rapidly and the battery trade model can help diminish starting expenses of electric vehicles and improve the charging experience. Electric vehicles are multiple times more productive than vehicles emanating emissions.[2] If request combination and battery trade are effectively carried out, India hopes to arrive at EV deals of more than 1.6 million vehicles in FY23. Public obtainment and public vehicle will be the principle drivers of this development, through the acquisition of government vehicles, three-wheeled vehicles and transports for public vehicle. Development in the four-wheel vehicle market is likewise expected to be driven by private armada ventures like Ola and Uber, where expanded every day traffic makes electric vehicles all the more financially reasonable. The space saved for two-wheeled vehicles will be for the most part overseen by private proprietors and by endowments and will be described by the relocation of lead-corrosive batteries to lithium-particle batteries and low-speed vehicles to fast vehicles.[9]

II. REVIEW OF LITERATURE

The Indian automobile industry is the fourth biggest on the planet and is relied upon to turn into the third biggest in 2021. The business represents 7.1% of India's total national output (GDP) and the 2016-2026 auto mission plan of India. The Indian government means to: This figure is relied upon to arrive at 12%. The Indian car industry (counting segment fabricating) is required to develop at 5.9% each year and arrive at INR 16.18-188 billion (251.4 to 282.8 billion US dollars) by 2026, which will make it the quickest developing. industry in the country. As per the report of the National Mission Plan for Electric Mobility 2020, the Indian vehicle market is administered by two-wheeled vehicles, which represent 75% of the absolute number of vehicles sold in the country. What's more, the traveler vehicle section is overwhelmed by the little vehicle portion and almost certainly, the number will increment fundamentally by 2030. This data was substantiated by the report of the Society of Indian Automobile Manufacturers (SIAM) named "The Car Industry in General Growing Steady with Marginal Double-Digit Growth in Passenger Vehicles", which demonstrates that the area has delivered a sum of 1.95 crore vehicles, including business, business, three-haggled wheeled vehicles and quadricycle in April-October 2018, contrasted with 1.71 crores in April-October 2017, recording development of 14.39%. As to the offer of vehicles in the business, the traveler vehicle section expanded by 5.87%, the business vehicle fragment by 35.68%, the three-wheel portion by 31.97% and bikes 11.14% in April same time of the earlier year.

India's electric vehicle industry should definitely get a makeover thanks to the government's initiative. The differentiator will be how automakers will deliver unique, tailored services to different segments while meeting prescribed standards, quality and rate of innovation. This will catapult some organizations to the next league and, at the same time, will see others fall.

India EV Scenario

National Electric Mobility Mission Plan (NEMMP) 2020

- To deploy between 5 and 7 million electric vehicles in the country by 2020.
- Stresses the importance of government incentives and coordination between industry and academia.
- Target of 400,000 passenger battery electric cars (BEVs) by 2020 ~ avoiding 120 million barrels of oil and 4 million tons of CO2.
- Reduce vehicle emissions by 1.3% by 2020
- Total investment required of 20,000 to 23,000 notches (approximately 3 billion USD). [4]

Electric vehicle sales declined steadily between 2012 and 2015, before showing signs of recovery. India's electric vehicle market was dominated by two -wheeled vehicles, accounting for more than 90% of the two Lakh electric vehicles in India. Although the majority of electric four-wheeled vehicles on the road now use lithium-ion batteries, most two-wheeled electric vehicles and almost all three-wheeled electric vehicles still use lead-acid batteries (unlike 'other countries).

A variety of reasons, from infrastructure to strategies to early product failures, have contributed to this trend. Among these, note: [13]

- Charging facilities are virtually non-existent, although charging station installations have recently started modestly due to recent efforts by entities such as Tata Power and NTPC.
- Government support has been uneven so far, with reduced funding and delays in implementing EE policy.
- Local component manufacturers are few in number and heavily dependent on Chinese imports.

The main results of two-wheeled vehicles and four-wheeled vehicles endured misfortunes. For instance, the principal rivals in the two-wheeled electric vehicle area in India were low-power Chinese electric mopeds that performed inadequately as far as force and toughness. Mahindra Reva, India's driving rival in the four-wheel drive electric vehicle market, has flopped because of absence of stacking foundation and high starting expenses .

III. TECHNOLOGIES

Principle: the electric engine is fueled by a regulator that recovers it from a battery-powered battery. The electric vehicle works on an electric/flow standard. he utilizes a battery to control the electric engine. The motor at that point utilizes power (voltage) got from the battery to pivot the transmission framework, along these lines turning the wheels. A potentiometer is associated with the gas pedal that tells the regulator how a ton of force must be conveyed .

Battery Technology

In the course of recent years, lithium particle has developed drastically and has gotten broadly utilized for versatile electrical items. The most utilized battery in an electric vehicle is the Li-particle battery. These batteries have been tried out and about everywhere on the world and are the most appropriate for electric vehicles applications . [14]

Principle of the Li-ion battery

Lithium particles are embedded or removed from the interstitial speed between the nuclear layers inside the dynamic material of the Li-particle battery during an ordinary charge/release cycle. In straightforward as such, the Li-particle is traded among anode and cathode through a lithium electrolyte.

The activity of a Li-particle battery relies upon the "intercalation" component (for example incorporation of an atom in materials with a separated design). This cycle remembers the consideration of Li particles for the gem grid of the host anode without influencing its quality precious stone design. The terminals engaged with Li-particle batteries have two fundamental properties:

I. They have an open crystalline structure that allows the insertion/extraction of Li-ions freely.

II. Electrodes have the ability to accept compensating electrons at the same point of time.

The efficiency of Li-ion batteries has a typical range of 95-98% in its life cycle.

Electric Vehicle Charging Methods

The efficiency of a battery charger is a measure of the efficiency of the power electronics used to convert the mains AC power supply to a regulated DC voltage across the battery terminals. The efficiency of the battery charger according to current technologies available worldwide varies in percentage from low 70 to high 90. Existing technology supports mainly three types of charging methods:

1. Alternating current and an onboard charger (normal charge) - In this charging method, the vehicle is connected to an AC power source (normal 16 A plug - domestic load) from which the alternating current is transmitted to an on - board station charger. The function of the charger is to convert the AC power to DC power and to provide the resulting current to the Li-ion battery. Therefore, it takes 6-8 hours (in the Indian context) fully charge an electronic vehicle by this method of loading, which can be carried out according to the domestic consumption of electrical units per month. It is charging source a little cheaper than the fast charging method.

2. DC power and external charger (fast charge) - This method of the load involves an external charger or fast charging equipment that directly converts the alternating current supplied by the network into direct current for the use of the battery.

   This method takes about 90 to 110 minutes (Indian context) to fully charge an electronic

vehicle. This billing method requires a larger initial investment and represents a higher cost. charging method.

3. Wireless charging method - This charging method uses coupled systems magnetic field to transmit power without any physical connection. There are three types of wireless charging techniques - using the principle of electromagnetic induction, electromagnetic resonance and radio frequency waves to transmit power.

Comparison among Internal Combustion Engine, Hybrid and Electric Vehicles

Parameters	ICE Vehicles	Hybrid Vehicles	Electric Vehicles
Efficiency	Converts 20% of the energy stored in gasoline to power the vehicle	Converts 40% of the energy stored in gasoline to power the vehicle	Converts 75% of the chemical energy from the batteries to power the vehicle.
Speed (Average Top Speed)	199.5 km per hour (kmph)	177 km per hour (kmph)	48-153 km per hour (kmph)
Acceleration (average)	0-96.5 kmph in 8.4 seconds	0-96.5 kmph in 6-7 seconds	0-96.5 kmph in 4-6 seconds
Maintenance	High maintenance owing to more number of moving parts	Same as an ICE vehicle	Maintenance is minimal due to lesser number of moving parts.
Mileage (average)	Can go over 480-500 kms before refuelling. Typically achieves 10-12 kmpl	Typical achieves 20-25 kmpl	Can travel 120-200 kms before recharging.
Cost (average)	INR 0.7-1.1 million	INR 1.2-2 million	INR 0.9-6 million

Fig. 1: ICE, Hybrid and Electric Vehicle Comparison [3]

IV. INDIA'S STRATEGY AND POLICY FRAMEWORK

The main initiatives taken by the government for each category of electric vehicle development are: [6]

3 wheels: The government manages public procurement via EESL. For the sake of efficiency, a consensus is being made between Original Equipment Manufacturers (OEMs) on the efficiency and specifications of modular locking batteries. This last point is essential to ensure that replaceable batteries are interoperable and cannot be tampered with. The government is working with more than 50 manufacturers to implement common specifications for modular latching batteries. The objective is to use a permutation with locked batteries with a range of 50 km and an efficiency of 35 to 45 Wh / km. The government can launch a tender for 25,000 vehicles this year in this segment.

4 wheels: In this segment, the focus is on taxi fleets, whose higher mileage makes the transition to electric vehicles more economically viable than private owners. Government initiatives have been around to allow a combination of fixed and exchangeable battery in the future. A tender for 10,000 electric vehicle vehicles was launched, won by Tata and Mahindra in October 2017. EESL recently announced its intention to launch an additional call for tenders for 10,000 electric vehicles from March to April 2018.

Buses: The government allows the exchange of bus batteries with a range of 50 km. The effort required to charge the batteries will be one of the main challenges associated with exchanging batteries for buses. Therefore, it is planned to use robotics at the endpoints. In this segment too, the government is building consensus on efficiency specifications and locked batteries. It hired 30 manufacturers to enable the definition of common modular locked battery specifications. An efficiency of 900 Wh / km is targeted. A tender for 2,000 buses could be launched in 2018.

Public Chargers: Applying the Public Call Office Model (PCO) / Standard Toll Numbering (STD) to battery exchange would allow private participation in the purchase of batteries and the operation of public battery exchange stations. This model will be critical to achieving the scale and penetration required in load infrastructure. The government has set standards for the use of Bharat AC-001 and DC-001 chargers for 2- and 4- or 4-wheel vehicles. The standards for fast chargers for large vehicles (AC-002, DC-2) have yet to be defined. A call for tenders for 4,000 chargers compliant with AC-001 / DC-001 was launched in August 2017. An additional call for tenders for 250 chargers was launched in November 2017 [7].

E-Rickshaw:

- The Indian government announced the Deen-Dayal program in June 2014, which would contribute to the financing and acquisition of battery rickshaws in the country.
- In March 2015, the Motor Vehicle (Amendment) Bill was approved establishing battery-powered electric rickshaws as a valid means of commercial transportation.
- Battery operated 3-wheeled vehicles with a maximu m power of 4,000 watts.
- The number of battery-powered electric rickshaws in Delhi increased from 4,000 in 2010 to more than 1,000,000 in 2014 and is now an integral part of the state's transportation ecosystem.
- 4 passengers, luggage of 50 kg and with a single journey of fewer than 25 kilometres.
- In January 2014, Tripura became the first state in India to regulate the operation of e- rickshaws. To this end, they have come up with the battery-powered Tripura rules of the 2014 battery.
- The Tripura Battery Operated Rules 2014 Regulation contains standards and guidelines such as the driver's age limit, registration fees, renewal fees, traffic taxes and provisions for the vehicle's certificate of suitability. rickshaw insurance and route identification for the use of these vehicles.
- 22,000 licenses granted.[5]

These initiatives must support the ambitious goals set by the Indian government for the adoption of VE across the country. Key ministers' statements also announced the ambition to completely eliminate gasoline and diesel cars by 2030.

Public procurement: the government pushes the adoption of electric vehicles through major tenders for private manufacturers of electric vehicles. He launched a call for tenders for the acquisition of 10,000 electric vehicles via EESL. This tender was jointly won by Tata Motors and Mahindra. A second call for tenders is expected in the first

half of 2018. Similarly, calls for tender for the acquisition of buses are expected in 2018 [6].

Fleet Vehicles: Fleet owners such as Ola and Uber have confirmed their intention to purchase electric vehicles as part of their fleet. Ola, who manages 200 cars in Nagpur as part of a pilot program, plans to expand its fleet of electric vehicles in the future.

Private vehicles: The penetration of lithium ion vehicles into the private ownership segment would be slow as it faced many obstacles. The initial cost of the vehicle and the battery remains high. Since the mileage of vehicles used by private individuals is much lower than that of a taxi, the possibility of recovering the cost thanks to fuel savings is less. In addition, the lack of charging stations and the worry of running out of charge make it very difficult for private owners to switch to electric vehicles immediately.

V. CONCLUSION

Our examination drives us to three primary decisions about the fate of EV reception in India.

In the event that both the trade and collection of interest fill in true to form, India could arrive at a volume of electric vehicle deals of more than 1.6 million vehicles in monetary year 23, for the most part due to public agreements and three-wheeled vehicles.

Public acquirement is relied upon to be a significant driver of development in the coming years, with the acquisition of four-wheeled vehicles for government workplaces, three-wheeled vehicles and transports for public vehicle. Speculations by armada administrators like Ola and Uber, just as certain administrators of food dispersion administrations, are likewise expected to help the underlying development of two-and four-wheeled electric vehicles. Nonetheless, the reception of private four-wheelers and bikes could likewise arrive at an enunciation point in the following five to six years, because of lower battery costs and expanded battery accessibility. charging framework. The structure of the customers and the deciding components for every class ought to be as per the following:

4-wheelers: this will be generally determined by open business sectors and armada administrators. Public agreements ought to be 30,000 vehicles until 2023, when there might be a defining moment for appropriation by private proprietors with low mileage.

Situation where India meets its desire for 2030: Achieving the public authority's objectives for 2030 will need in any event 3,500 GWh of batteries, for an all out estimation of US

$ 300 billion, which likens to around 20 Cr lakh. Indian producers can take 25 to 40% of the estimation of this market on the off chance that they gather bundling in the homegrown market. Subsequently, cell imports would add up to 12-15 INR lakh Cr. Imports of fuel and diesel ought to be decreased to 17 INR lakh Cr, which will set out a freedom for investment funds of 8 INR lakh Cr.

Electric vehicles are an inescapable interruption that is changing the manner in which we travel all throughout the planet. Building up a forceful methodology for the selection of EVs in India and guaranteeing a professional execution is both a test and a basic for the public authority. The geology and variety of this nation will introduce issues that require insightful arrangements that are not yet obvious in the field.

Mahindra and Tata will keep on expanding their essence to meet government agreements and developing private interest. Multinationals, for example, Nissan, Hyundai and Honda are likewise expected to enter the following not many years.

Two-wheeled vehicles: the section will be exclusive and sponsored, and will be described by movement from lead-corrosive batteries to lithium-particle batteries and from low-speed vehicles to rapid vehicles. For instance, all significant gear makers, for example, Hero, Ampere, TVS and Lohia have two amazing electric wheels. Numerous new businesses zeroing in on higher-performing vehicles are additionally showing up and will start deals in 2018, like Ather, Tork and Emflux. In any case, the vast majority of these makers will keep on bringing in electronic segments.

3-Wheelers: Electric carts are likely the quickest developing section - producers, for example, Mahindra, Kinetic Green and Autolite have effectively dispatched models or will dispatch models in 2018, which will reinforce the utilization of guidelines and enlistment, subsequently making an incredible driver market. Electronic vehicle deals are additionally expected to increment because of the appearance of OEMs like Bajaj and TVS, despite the fact that they will keep on addressing a moderately more modest portion of the general class of three-wheeled electric vehicles. Collection of interest through government obtainment and battery trade is required to assume a significant part in early appropriation.

Bus: Major OEMs, for example, Ashok Leyland, Tata and BYD will proceed to test and test in the coming years. The battery trade will decrease starting expenses and increment buys from EESL and STUs. Notwithstanding, the increment in burden might be more slow than that of 3-wheeled vehicles

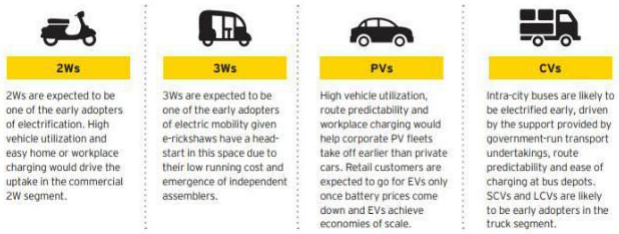

Figure II [8]

In the long run, the innate economic and social attractiveness will make an electric vehicle boom inevitable in India.

The continued decline of lithium-ion batteries will significantly reduce initial costs. Improved battery technology will make EVs more affordable and more efficient. Private investment in infrastructure will likely be a function of demand related to the above. To remain cost-competitive and enable faster ramp-up, electric vehicle manufacturers will increase their domestic purchases.

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AUTHOR PROFILE

Chode Manikanta Kumar is currently pursuing his Post Graduation in Power Systems and Automation in the Department of Electrical Engineering at Andhra University, Visakhapatnam, Andhra Pradesh, India. Did his B.Tech in the Department of Electrical and Electronics Engineering from Anil Neerukonda Institute of Technology and Sciences, Visakhapatnam, Andhra Pradesh, India, in 2019.