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A Study on Development of Electric Vehicles in India

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Abstract – In recent year, Electric Vehicles (EV) continue to evolve at a fast rate. Electric Vehicles scenario has been in development throughout the generations. This paper gives an idea of the work done in the sector of Electrical Vehicles. The paper gives the account of the development in this EV sector and analysis the different types of Electric Vehicles and the market of Electric Vehicle in India. There are also many challenges and issue that is discussed in this paper. As a conclusion it finally gives the future scope of Electric Vehicles.
Keywords – Electric Vehicles, market analysis, policies, Future Scope.

I. INTRODUCTION

The Transport sector is one of the extensive networks in the world. It plays a major role in the economy of the world. The GDP of the country is dominated and depends on the share of the transport sector. It also plays the major role in the pollution of the world. According to EPA, motor vehicles combined give rise to 75 percent of air pollution in the US EDf, In India Diesel Vehicles are behind the 66 percent of air pollution death, 27 percent of the air pollution is caused by vehicles in India. It also emits significant amount of carbon monoxide, nitrogen oxide and other gases that cause air pollution. To avoid this death and for the benefit of humanity and to control the air pollution Electric Vehicles is comes to the road. Indian Government launches many policies that improve the development and knowledge about the Electric Vehicles, So what is an Electric Vehicles: It is a vehicle that operates on the electric motor. There is no internal combustion system, because of this it doesn't emits any smog and not cause air pollution. There are mainly three types of Electric Vehicles that will be discussed further in this paper.

A. Hybrid Electric Vehicles

Hybrid Electric Vehicle (HEV) is just like a commercial Electric Vehicle (EV), the main term that make HEV different to other EV is there system because its runs on both the batteries and internal combustion engine (ICE) that runs on fuel. The batteries help the ICE to enhance the speed and run rate of the vehicle.

B. Plug-in Hybrid Electric Vehicles

Plug-in Hybrid Vehicle or PHEV is a type of vehicle the works on two modes of charging, these types of vehicle have a inbuilt regenerative braking, this regenerative braking is an energy recovery mechanism that converts the kinetic energy of the vehicle and use it to charge itself. Just like HEV it also runs on both batteries and ICE.

C. Battery Electric Vehicles

Battery Electric Vehicle or BEV is fully electric vehicle with rechargeable batteries that does not have any gasoline engine. These types of vehicles run on pack of batteries which is rechargeable and it doesn't emit any harmful gases that cause pollution.

II. ELECTRIC VEHICLES MARKET

India has one of the largest automotive industries in the world, currently it is a fifth largest automotive industry in the world and it is predicted to be the third largest by 2030. If India shifts towards the Electric Vehicles, it may get benefits in many ways in the sector of automotive industries because of relative abundance of renewable energy resources and in India there is a lot of availability of man power in this sector.

A. Market Review

The Electric Vehicles Market of India was evaluated at USD 5.1 billion in 2020 and it is expected to reach up to 47.3 billion by 2026 registering annual growth rate of 44%+ during the forecast period (2021-2026). The outbreak of COVID-19 pandemic, the electric vehicles market of India is suffered due to continuous lockdown and travel restrictions across the country the supply chain and manufacturing units is stopped and disrupted but, still electric vehicle market of India is in its growing stage.

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In India, e-mobiles will first pierce the commercial and fleet market. Government are trying to adopt the e-Mobility but mass adoption is not certain to happen in just a short term period, two wheelers EV are already dominated the automobile sector but still it doesn't match the performance of a fuel based vehicle. Especially the battery capacities of EV in not as much as the requirement that's why the two wheelers EV has more chance to be successes as compare to Three wheelers because it takes less power and can be used as a short distance travel. E-commerce companies like Amazon are now launching their new initiative which is to use e-Mobility. This initiative is to use e-mobile for deliveries to reduce the air pollution rate. India is also trying to put e-mobiles as a public transport such as buses to some major cities, with state government policies regarding the deployment of EV in India many state are now trying to make EV as a primary source of traveling and transportation especially in two wheeler sector because of its optimistic growth and supplies in India.

B. Current State of EV Market

The COVID-19 pandemic had lot of impact on the automobile industries however; the demand of Electric vehicles still remains due to companies new models such as Tata Nexon EV, Tata Tigor EV, and Mercedes- Benz EQC. The supply of the pack of lithium-ion batteries got impacted due to the COVID-19 pandemic. Also Indian Government stopped the shipments of the batteries from china due to internal reason; this leads to Government to focus on the manufacturing of the batteries. India is highly pushing towards the Electric Vehicles to create opportunities for companies. Government initiates many policies regarding Electric Vehicles that helps in growth and Knowledge for companies and consumers.

III. MAJOR CHALLENGES AND KEY INITIATIVES

There are some major advantages of Electric Vehicles but with their advantages there are several challenges and obstacle that are linked with Electrical Vehicles that are:

A. Charging Infrastructure

Electric Vehicles runs on batteries therefore batteries should be charge enough to run the EV but what will happen if the battery run out of charge, in this situation charging station is needed to charge the batteries. In India there is no proper charging infrastructure, there is only 300 charging station are currently present in India. So Government is focusing on this term and initiates a policy for the development of charging station.

B. Higher Cost

Consumer cannot invest in something new which is so costly. The price of Electric Vehicle can't justify with the people that want to buy it, the new Tesla model 3 is cost approximately 60 lakh Indian rupees whereas a fuel based combustion system vehicle is cost up to 9 lakh Indian rupees with same features. So the make consumer to invest in EVs the price should be in moderate level for the Indian people. To make it possible first we should not depend on other countries for materials because it increase the cost of the materials and provide some incentive to the companies that are making EVs it will help them to produces more EVs.

C. Lack of Technology

Globally the Electric Vehicles development is more reliable as compare to Indian Electric Vehicles Technology. In India, EVs are not so powerful in speed, reliability, performance. It effects the growth of EVs. Also India is depends on other country for the component of Electric Vehicles like china, because of this India's import is increase and value of money decrease. In this COVID-19 pandemic the import of EVs components and material are stopped from China so now India in developing their own materials for EVs with the initiative policies.

D. Lack of Skilled Workforce

Workforce plays a major role in any industries, Electric vehicles industries is a most innovative industry as now, many people doesn't have any prior knowledge regarding EVs without it laboring is become a major task to done in EV. To overcome this situation a proper knowledge lesson regarding the Electric Vehicles technology should be provide to the labor, by this its improve the production and precision in the making of Electric Vehicles.

IV. POLICIES MEASURES

Indian Government takes some measures regarding the Electric vehicles situation and comes up with some policies as follows:

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A. *National Electric Mobility Mission Plan (NEMMP) 2020*

Initially this mission is launched in 2013 by the Department of Heavy Industry (DHI), the main objective of this policy is to encourage affordability, reliability and efficient Electric Vehicles that fulfill the performance and price for the consumers through government. There is a target in this policy to achieve 6 to 7 million sale of EVs from year 2020 onwards.

B. *FAME India (2015)*

Faster Adoption and Manufacturing of Electric Vehicles in India (FAME India) is launched in 2015.This is the second phase of the scheme, the first phase initially launched in 2015. The aim of the scheme is to promote eco-friendly vehicles, development in technology, increase in demand, charging infrastructure and pilot projects.

C. *Phase Manufacturing programme (PMP)*

This programme is comes under the FAME India II .this scheme aimed to increase the manufacturing of Electric Vehicle components and materials locally , to assembly to sub assembly, parts/sub parts will manufactured in India to decrease the dependency on other country and improve the profit and value of the EVs locally.

D. *National Mission on Transformative Mobility and battery Storage*

This mission is approved and set up by the union cabinet of India, the mission aims to promote clean and holistic mobility, it improved the quality of the EVs and performance of the battery that enhances the power of the EV. Also it decreases the dependency on other country the pack of batteries.

V. FUTURE SCOPE

Electric vehicles have a lot of potential to dominate the Indian automotive industry. Company like Tesla already trying to digs their feet in India and many Indian Company like Tata motors already working to improve their EVs models. Indian Government are also pushing to make India 100% Electric Vehicle Nation by 2030, so there is a many possibility that EV will become new trend in India but there are some areas where should be focused more that are:

- Charging Infrastructure.
- Research and Development in Battery Technology.
- EVs Education.
- Cost of EVs.

It is hard to tell that what is the future of EVs but this industry have a lot of potential to make their own image as a largest industry not only in India but globally.

VI. CONCLUSION

Electric Vehicles have some major advantages that can create and revolution in the automotive industry, India is the fifth most polluted country in the world and fuel based vehicle play a vital role to make air pollution. EVs will change the pollution crisis in India as well as noise pollution because it doesn't emit sound or smog. After the huge discussion we know that Electrical Vehicles are the future but as now there are many challenges occur in the EVs sector, these challenges can be conquer by the initiatives and Government policies. The agenda is to make India 100% Electric Vehicle Nation by 2030. Hence all these initiatives will improve the infrastructure and adaptation of EVs in India

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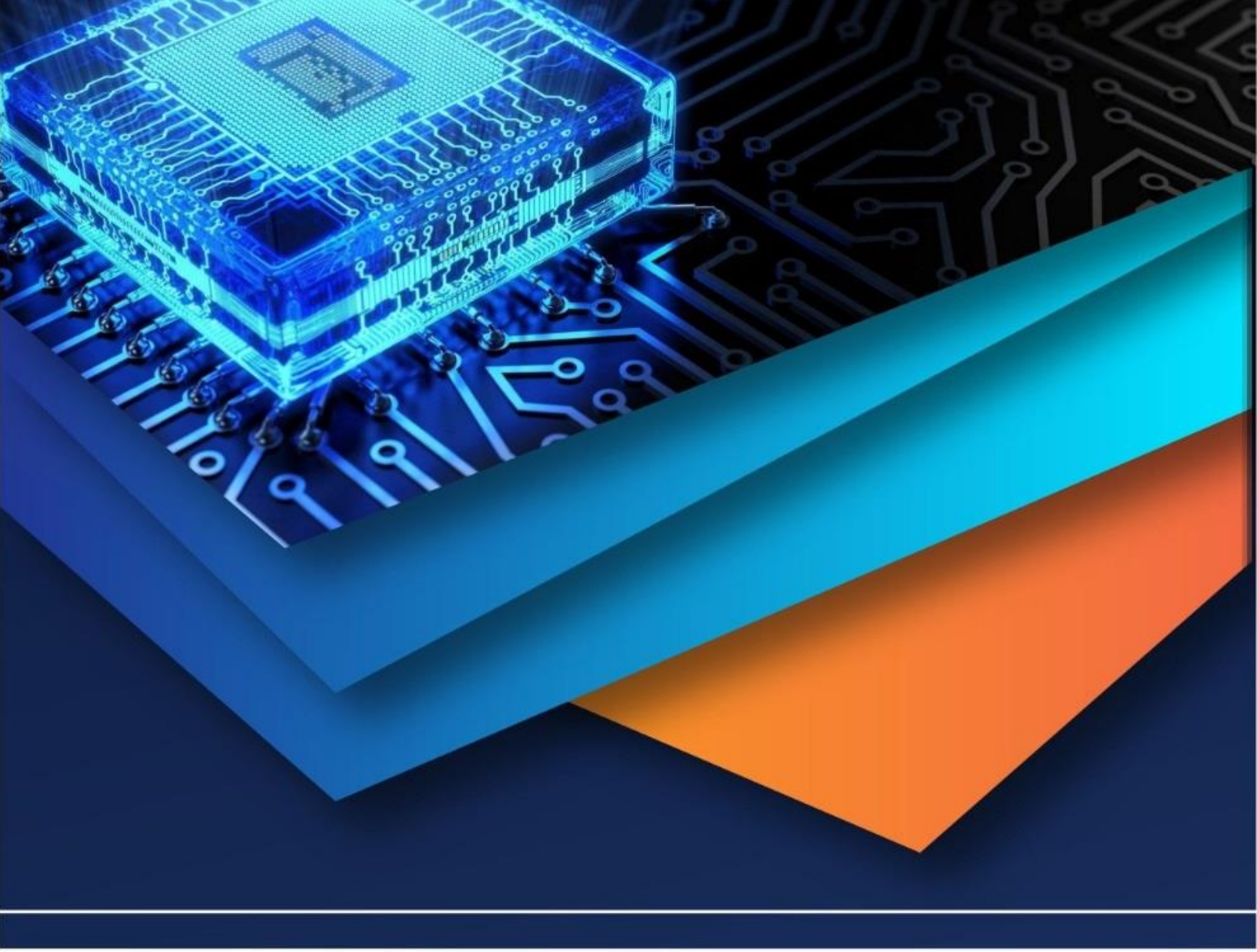

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