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A STUDY ON ELECTRIC VEHICLES (EV) WITH CHALLENGES AND OPPORTUNITIES OF PRODUCTION

Dr. Brajesh Kumar
Lecturer Department of Mechanical Engineering, Govt. Polytechnic Gaya Bihar – 823001
Life time membership of I.S.T.B., I.E.I. & I.E.A.

Abstract: The progressing mechanical improvement in the car business has since incited the development in ecological and vitality productivity mindfulness. Electric vehicles (EVs) are believed to be likely options for traditional inner ignition motor (ICE) vehicles as they have various favorable circumstances. In this paper, the difficulties and chances of EVs in mass market arrangement are assessed. This proposal presents a review of the various sorts of half breed electric vehicle structures and fundamental rules with respect to selection of parts. The reproduction model of a half breed electric vehicle was made for this proposal to research the effect on eco-friendliness comparable to moving obstruction coefficient and vehicle weight. Despite the fact that the model isn't intended for ideal motor activity, the outcomes demonstrate that lower moving opposition coefficient and lower vehicle weight prompts diminished fuel utilization. Proposed upgrades to the reproduction configuration are introduced in the report.

Keywords: Charging foundations, Economies of scale, Electric vehicles, Market entrance, Renewable energy.

INTRODUCTION

To decrease ozone depleting substance outflows and improve security of vitality flexibly the European Union focused on a replacement of 10% of the traditional powers (ordinary diesel and gas) in the street transport area before the year 2020 (VROM, 2007). Likewise a decrease of 20% nursery gasses in 2020 contrasted with the degrees of 1990 was proposed by the European Union in 2007. The vehicle part represents about 31% of European vitality use (EEA, 2008) and 25% of the European CO2 outflows. A huge piece of the CO2 outflow decrease can be accomplished by presenting elective fills and drive trains, similar to hydrogen, energy component innovation and electric fueled vehicles. These options likewise can help lessen the reliance on oil from temperamental districts in the Middle-East. The issues elective drive prepares and fills are confronting right presently are the significant expenses and the absence of a decent framework for elective energizes. Additionally on account of battery controlled vehicles an issue is the scope of the vehicle. The current batteries are not proficient yet to control a light obligation vehicle for more than a few hundred kilometers (Van Mierlo, 2006). Anyway the eventual fate of battery fueled vehicles can be brilliant. The battery innovation has improved essentially the most recent decades for the most part through the advancement of cell phones and workstations. Lithium-particle batteries are the standard batteries in cell phones and PCs at the present time. Those batteries are additionally being utilized in the new battery electric vehicles going ahead the market the following barely any years and are probably going to be the norm for electric vehicles the following decade (Kennedy et al. 2000). The principle issues electric vehicles are confronting are the batteries, costs and charging offices. Due as far as possible in scope of BEVs the vehicles that going to be brought into the market no doubt will be little city vehicles. Nissan, Mitsubishi and Smart are instances of vehicle producers who will present the electric city vehicle the coming years. In this exploration a chain examination is performed for battery controlled city vehicles on costs, effectiveness, mileage and discharges. Those outcomes will be contrasted and customary inside ignition motor vehicles controlled by non-renewable energy sources. The exploration additionally centers around the improvement of the battery innovation. As the battery is an essential part in the electric vehicle the accomplishment of the vehicle is predominantly reliant on the battery advancement. This exploration attempts to plan whether the battery can meet the necessary focuses for the utilization in electric vehicles thinking about costs, lifetime, explicit vitality and explicit force.

1.1Electricity as vehicle fuel

Power is a focal yet dubious vitality transporter. The European Union (EU) perceives power as a fundamental measure to accomplish a reasonable street transport framework (EC, 2009a) however despite the fact that the power advertise takes after different markets, certain hypothetical objectives encompass CO2 outflow bookkeeping. As the customary vehicle discharge characterization framework depends on tail-pipe emanations, which for a vehicle with an electric motor is zero, the ecological effect must be considered in some other structure. Today, a predominant CO2 outflow bookkeeping method is to consider most pessimistic scenario power creation for a module electric vehicle and to contrast that with tail-pipe emanations of a regular vehicle. Despite the fact that this strategy doesn't give an exact examination, it is as yet famous. To widen the point of view, three normal standards for CO2 outflow bookkeeping of power will be introduced. The main rule is to respect the details of the particular force flexibly. The likelihood to join a green power contract and in this manner charge sustainable power has been demonstrated to be an appealing mix and contention for buying a module electric vehicle (Axsen and Kurani, 2013). Sustainable power age suggests the use of inexhaustible sources, for example no CO2 discharges. The subsequent guideline is to think about normal power, for example to respect the whole force age arrangement of the power advertise and acquire a normal CO2 outflows esteem for the power blend. Sweden is a piece of a Nordic power showcase, whose power blend represents roughly 85 g. CO2/kWh (Swedenergy, 2012). The third guideline is negligible power, for example to consider the last dispatched unit utilized for creating the power. This rule infers that utilizing Nordic power in Sweden to charge a module electric vehicle diminishes the fare of power to more fossil-overwhelming power markets, and that Swedish module electric vehicles (that is, their proprietors) should represent that impact. Coal-consolidate power plants right now have the most elevated minimal expense and the power age represents around 900 g. CO2/kWh (Connolly et al, 2014). Any of these three CO2 discharge bookkeeping standards works, as long as it is orchestrated to involve all vehicle fills. Nonetheless, peripheral petroleum is never utilized for any car correlations and thusly not either for this situation. On this premise, this theory will thusly consider power as an improvement to the street transport framework contrasted with the oil elective.

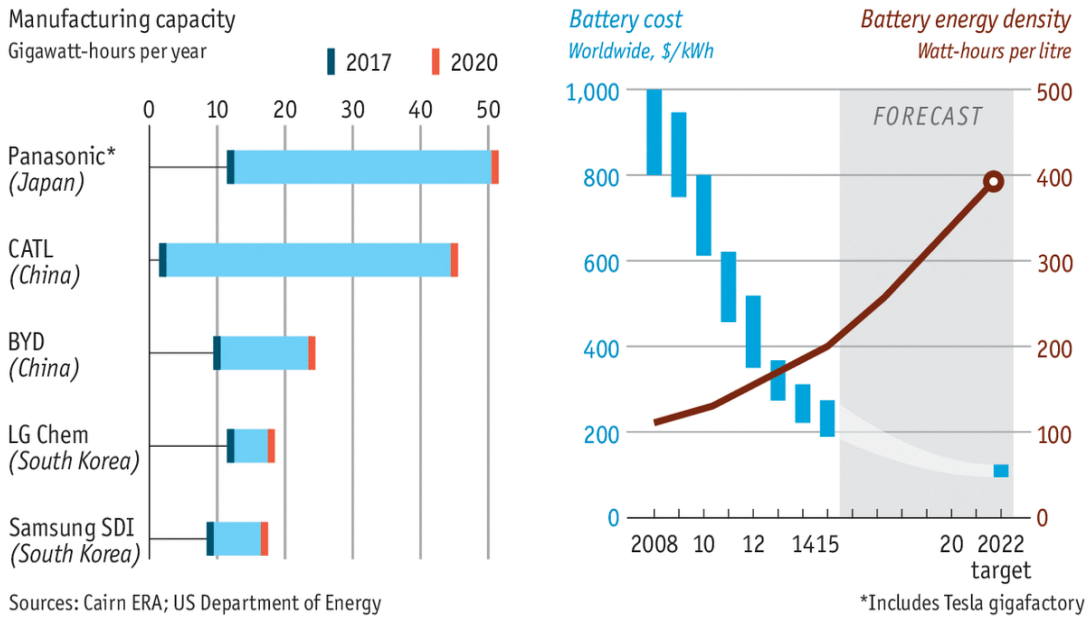

Figure 1.1: Cumulative global sales of EVs from year 2013 to 2020.

Although EVs are now growing in the industry, hurdles including high purchasing cost, limited driving range, lack of charging infrastructure and long charging time are holding back its market penetration. Energy storage system (ESS) of EVs also faced challenges regarding to its safety, cost and management system in efficiently storing and providing energy. The advancement of energy storage for EVs is currently influenced by the challenges mentioned [14]. This paper reviews and discusses the challenges and factors that affects the market growth and penetration of EVs. Objectives of this paper are as follow: to identify the factors of the challenges from different aspects, to predict the future trend of EVs in the Although EVs are now growing in the industry, hurdles including high purchasing cost, limited driving range, lack of charging infrastructure and long charging time are holding back its market penetration. Energy storage system (ESS) of EVs also faced challenges regarding to its safety, cost and management system in efficiently storing and providing energy. The advancement of energy storage for EVs is currently influenced by the challenges mentioned [14]. This paper reviews and discusses the challenges and factors that affects the market growth and penetration of EVs. Objectives of this paper are as follow: to identify the factors of the challenges from different aspects, to predict the future trend of EVs in the automotive industry, and to provide recommendations for effective diffusion of EVs in the market. 2. ECONOMIC Economic challenge is one of the major challenges holding back the growth of EVs in the world. Even in developed countries, there are difficulties in the popularization and mass adoption of EVs. In general, economic challenges can be further categorized into 3 different aspects. 2.1 Electric Vehicle The EV itself exhibits a lot of economic challenge. The underdeveloped EV has caused various issues and it is very difficult to compete with cheaper conventional vehicles which operate on ICEs. To promote EVs, it requires help from many parties especially the government. The policies of a country will greatly influence the market of EVs, however it comes with a lot of economic impacts as well. For example, China, as the second largest economy in the world, plays an important role in promoting EVs to the world [15]. However, as one of the largest oil-producer in the world, the development of EVs will greatly impact the petroleum industry in China, thus indirectly affect their economy [16]. Even though gasoline and diesel are more expensive than electricity, the immaturity of electric vehicle systems has caused the price of EVs to be higher due to high initial investment [17]. Since the systems of EV is not matured enough and most of the assembly process are to be done manually, mass production of the expensive parts of EV are still not economically justified, causing the selling price to be expensive in order for the company to maintain a healthy profit margin [18]. To promote EVs for the mass market, the price needs to be reduced and the development of EV technologies must be done in quicker pace. The high EV selling price is the major barrier for it to penetrate the existing market [19]. A group researchers found that even a slightest reduction in the retail price of EV would greatly increase its competitiveness with ICE vehicles [20]. He also found that the sales of EV would improve by 4% with just 1% drop in retail price. In short, the retail prices of EVs are currently still considered very high as compared to conventional ICE vehicles. Therefore, it is hard to promote EVs unless more efforts are taken to develop the technologies in order to generalize the usage of EVs. 2.2 Battery Cost of batteries has always been the concerned issue disregards its applications. In recent years, battery prices have been significantly reduced while its energy density has been increasing gradually . This has facilitated the growth of EVs in the market and it can be observed from Figure 1 above. Although battery costs have been reduced, manufacturing batteries in mass scale economically is still one of the challenges, as expensive materials and advanced processes used have resulted in high cost of the batteries for EV applications. Current technologies are not capable of producing a high-performance battery using conventional materials. Batteries used in EVs are required to hold high capacity of energy charge to enable longer range. Thus, the materials used in constructing the batteries in such application have to be of certain quality, resulting in higher cost [21]. The lithium-ion (Li-ion) batteries used in EVs present a very concerning supply chain issue. It has been reported that the extraction of cobalt, the essential component of the rechargeable Li-ion batteries, is linked to child labor [22]. The price of cobalt has been quadrupled since the demand for the minerals has been rising rapidly in recent years. Two third of the world's cobalt are mined by

Democratic Republic of Congo, (DRC) and with children often working alongside with the adults in artisanal mines, it raises ethical dilemma as well as economic challenges for multinationals [23].

II BATTERY CHARGING

In low power applications the power conditioning which includes the AC to DC conversion, the power control unit which delivers a variable DC voltage to the battery, and various filtering functions are all carried out within the charger and can be implemented at a relatively low cost. The Battery Management System (BMS) is tightly integrated with the battery. It monitors the key battery operating parameters of voltage, current and temperature and controls the charging rate to provide the required constant current / constant voltage (CC/CV) charging profile and it triggers the protection circuits if the battery's operating limits are exceeded, isolating the battery if needed. Battery charging scheme is shown in the figure below.

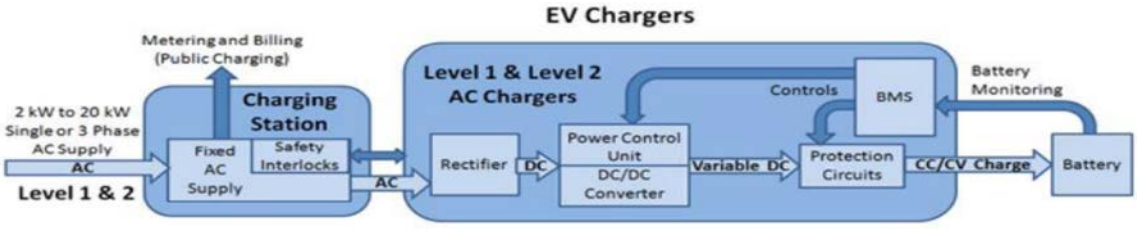

Figure 2.1: EV chargers system.

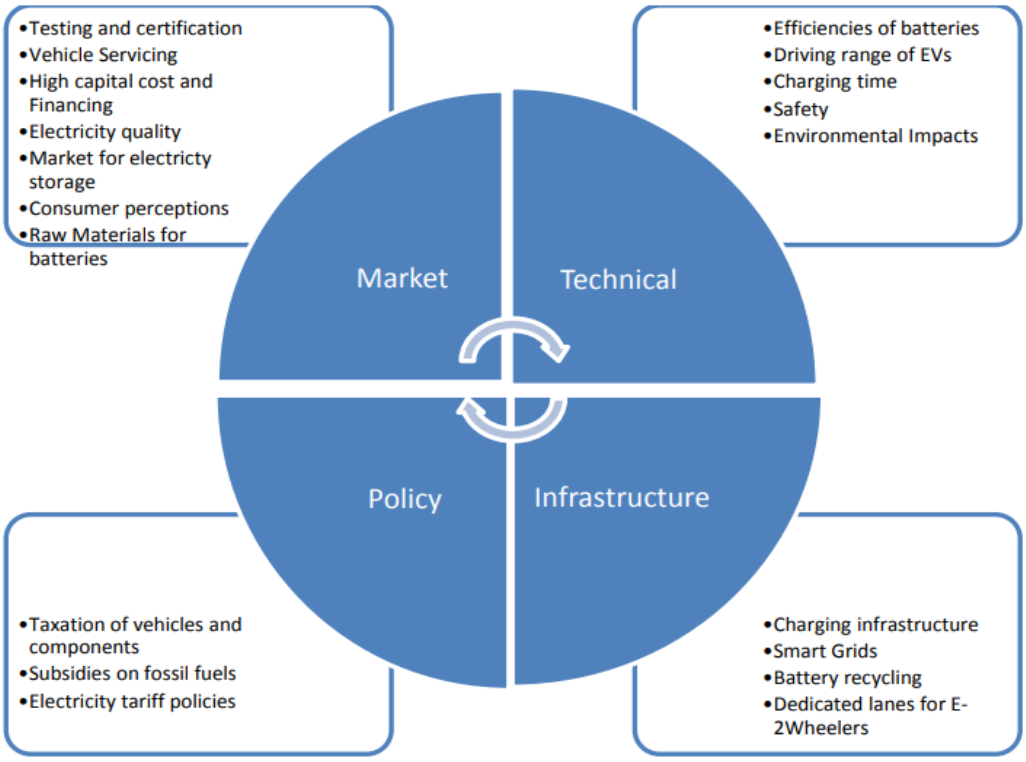

Figure 2.2: Eco system for electric vehicles.

III TECHNOLOGY

Electric Vehicle According to innovative perspective, there are a few factors that may prevent the utilization of electric vehicles. The vitality stockpiling framework which is required by each electric vehicle has gotten one of the significant worries towards the current electric vehicle innovation. The vitality stockpiling framework is a fundamental part inside an electric vehicle as it stores and conveys capacity to the vehicle. The assembling and advancement procedure of the vitality stockpiling framework is one of the numerous difficulties experienced. Assembling and improvement of vitality stockpiling frameworks for electric vehicle has become an issue because of accessibility of crude materials. This is on the grounds that the vitality stockpiling framework in an electric vehicle uses high evaluation materials to guarantee superior and give safe activity without erosion and blast [14]. Other than that, another test that is looked by the vitality stockpiling framework in an electric vehicle is its vitality the executives. EVs can work on power acquired from batteries, which are a piece of their vitality stockpiling framework. After every life pattern of the vitality stockpiling framework has been exhausted, it will at that point should be energized with the utilization of brief vitality assets. The vitality stockpiling framework can be revived by different vitality assets. A cutting edge electric vehicle framework is intended to have the option to deal with the entirety of the conceivable vitality assets successfully given the accessibility of the vitality [14].

IV INFRASTRUCTURE

As referenced, perhaps the greatest test for EV to enter the current market is the absence of open charging frameworks [9]. Since EVs are controlled by vitality stockpiling like batteries rather than fuel, they must be energized. This consequently requires additional vitality to be conveyed from the current force framework and force stations. Along these lines, sustainable options in producing vitality like breeze and sun based vitality should be used. This implies the charging cost could be affected by the advances utilized in the force frameworks and the charging foundation itself. Meanwhile, charging innovation could influence the charging time and along these lines the quantity of EVs in the market . As indicated by charging settings, charging frameworks can likewise be ordered into moderate charging units (SCUs) and quick charging units (FCUs). SCUs energize utilizing rotating current (AC) level 1 (< 3.7 kW) and AC level 2 (>3.7 kW and < 22 kW) [8]. FCUs incorporate units that revive with three stage AC (43 kW), direct current (DC) charging units (< 200 kW) and inductive charging units . FCUs are as of now considered as the productive and powerful technique to diminish extend nervousness of EV clients by reviving the battery in a brief timeframe. The greater part of the EVs in the market accompany lithium-particle (Li-particle) batteries, which the charging pace of Li-particle batteries is affected by their ecological conditions, strikingly temperature. To maintain a strategic distance from negative impacts on the battery cells, the charging rate is constrained by the charging framework under low temperature conditions . This represent another test for EV clients in cool areas or during cold seasons.

V SOCIAL

The social part of EVs assume a significant job in the monetary development as it covers the aberrant factors that shield possible buyers from receiving EVs. These elements for the most part incorporate the mechanical improvement of EVs, mental components, arrangements and client practices [9]. As expressed, the achievement of EVs is a socio-specialized test which relies upon both the customers' mentalities and the presentation of the EVs at the same time. Mental components remember the purchasers' discernment for the cost, benefits just as their demeanor towards new innovations and social impact [9]. One of the mental variables that effect with EV drivers is go uneasiness. Range tension is where EV drivers are in a constant condition of agonizing over the chance of being abandoned with a released battery because of its restricted range . A gathering analysts completed an investigation on EV reception hindrances which located

information assembled from a review with very nearly 5000 respondents, semi-organized meetings with specialists from around 200 foundations and 8 center gatherings across 17 Nordic urban areas

VI GLOBAL CASE STUDY

Singapore Singapore will launch an electric vehicle (EV) car-sharing programme in collaboration with Bolloré Group by mid-2017. a nation-wide car-sharing programme with a fleet of 1,000 EVs. Bolloré Group is the world's largest EV car-sharing operator, with operations in Paris, Bordeaux and Lyon in France, Indianapolis in the US and Turin in Italy. Bolloré Group was selected out of 13 participants in a Request for Information (RFI) exercise in December 2014, Under the agreement, BlueSG Pte Ltd will operate the programme for ten years and install an islandwide EV charging infrastructure of 2,000 charging points, of which up to 20 per cent will be available for public use. These charging points will form the foundation for Singapore's future EV charging infrastructure to support the use of EVs in Singapore. Compared to privately-owned EVs, EV sharedcar fleets have the potential of reaping economies of scale with higher daily mileage and potentially lower running costs. Fleet-based trials involving e-taxis and e-buses will also be conducted. Singapore will adopt the Type 2 AC and Combo 2 charging systems according to the IEC 61851 series and 62196 series, for new charging stations installed in publicly-accessible premises starting from 1 August 2016. All 2,000 charging points will comply with this standard. The Type 2 charging standard, which is a European charging interface, is compatible with both single-phase and three-phase power supplies, which allows for normal and semi-fast charging of EVs. For example, when connected to a charging station with three-phase power supply, an EV can be charged in as fast as one to two hours. This standard will therefore strengthen the charging eco-system for EVs. Singapore's value proposition to businesses not just to help them improve their bottom line, but also to help them grow their top line through establishing and deepening strategic activities in Singapore to drive their business, innovation and talent objectives in Asia and globally.

VII INDIAN EV SCENARIO

7.1 National Electric Mobility Mission Plan (NEMMP) 2020

- Target of deploying 5 to 7 million electric vehicles in the country by 2020
- Emphasizes 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 CO_2
- Lowering of vehicular emissions by 1.3 percent by 2020
- Total investment required –INR 20,000 – 23,000 cr (approx 3 billion USD)

7.2 E-Rikshaw:-

- The Government of India announced the Deen-Dayal scheme in June 2014, which would help in the financing and procurement of the battery rickshaws in the country
- In March 2015 the Motor Vehicles (Amendment) Bill was cleared establishing battery-powered erickshaws as a valid form of commercial transport
- 3 wheeled vehicles run by battery power of no more than 4,000 Watts
- 4 passengers, luggage of 50 kg and with a single trip under 25 kilometers
- The number of battery operated e-rickshaws in Delhi has risen from 4,000 in 2010 to more than 1,00,000 in 2014, and is now an integral part of the transport eco-system in the state.
- In January 2014, Tripura became the first state in India to regulate the functioning of the erickshaws, and they came up with the Tripura Battery Operated Rickshaw Rules 2014 for the purpose.

- Tripura Battery Operated Rickshaw Rules 2014 consists norms / guidelines such as driver age limits, license fee, renewal fee, Road Tax, provision for vehicle fitness certificate, insurance for e-rickshaw and identification of routes for operation of these vehicles.
- 22,000 licenses granted

7.3 Drivers for growth of electric vehicles in India:-

Thirteen out of 20 cities in the world with highest air pollution are in India. It is envisaged that Low carbon scenario with 'highest' EV penetration shows 50 percent drop in PM 2.5 by 2035 (UNEP, DTU and IIM-A) . Master plans for most cities in India target 60-80 per cent public transport ridership by 2025-2030 (Center for Science and Environment) With the Government of India targeting 100 GW of solar by 2022, electric vehicles can improve reliability and utilization of renewable by acting as storage However, there needs to be proper planning with reference to monitoring and control of charging infrastructure as unplanned increase in penetration of EVs in an area can lead to increase in peak load of already stressed distribution network. Large scale penetration of EVs will require both demand side incentives (e.g., tax incentives) and improved charging infrastructures as well as integrated planning for distribution Grid management. EVs offer the opportunity to act as a distributed storage in the urban energy system which could help in better integration of intermittent renewable like wind and solar and can feed the grid at peak timings if price incentives are designed in terms of dynamic tariff as part of Smart Grid implementation.(V2G).

VIII CONCLUSION

By breaking down the political and handy requirements, this theory talks about the conceivable outcomes offered by electric vehicles in Swedish open vehicle and open vehicle armadas. The reason for the conversations is discoveries gotten from genuine tasks and the examination has been completed utilizing an interdisciplinary methodology so as to comprehend the encompassing variables that build the use of the innovation. The outcomes will be talked about as indicated by three exploration themes. The principal subject is the innovation obtainment– The Swedish National Procurement of Electric Vehicles and Plug-in Hybrids – a broad show venture, where the material incorporates specialized just as client points of view to portray the use of module electric vehicles in various armadas. The second examination point is a showing venture of arrangement crossover ethanol transports, introducing a conversation of the potential for jolt of open vehicle transports. The last exploration theme is an investigation of strategy practice in Stockholm and a conversation with respect to the neighborhood political conditions for module electric vehicles. Utilizing an interdisciplinary exploration plan while dissecting electric vehicles in real life (regardless of whether it is genuine vehicles or real arrangement practice) has produced non-prescriptive discoveries that, notwithstanding customary discoveries, likewise give more prominent comprehension of the social drivers and new practices included and audited the difficulties and chances of electric vehicles (EVs) in mass market sending. The difficulties can be partitioned into four significant classes as indicated by different angles, to be specific monetary, innovation, social, ecological viewpoint. Monetary difficulties are the significant difficulties looked into, where high selling cost of EVs have discouraged the mass selection of EVs. Because of low EV reception rate, high beginning speculation and low productivity of open charging foundation have downturned its financial exhibition and supportability of its plan of action. For innovative difficulties, the assembling of vitality stockpiling framework in EVs are as yet not monetarily defended, while warm precariousness of Li-particle batteries under extraordinary natural conditions is yet to be tended to. Additionally, vitality thickness of current battery advancements is still a lot of lower than fuel, bringing about restricted driving extent. Sustainable power source age utilizing trend setting innovations is additionally required to flexibly enough power to the force lattice to cook for expanding charging load. Also, from social viewpoint, run uneasiness has raised negative impression of the general public towards EVs, given that EVs have constrained range, long charging time and lacking charging foundation. Despite the fact that EVs produce zero tailpipe emanation, natural difficulties of EVs incorporate.

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