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EVs acceptability in World Market:- A review

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ABSTRACT

In India, the market for environmentally friendly electric vehicles is growing. New car companies are transforming the automotive industry by developing innovative new models. The market for electric vehicles is rapidly expanding, and with new pricing models, this expansion is expected to accelerate.

All existing car manufacturers are aware of the change and are working to introduce new models of hybrid or electric vehicles Developed countries such as the United Kingdom and France have announced plans to ban diesel and gasoline car sales beginning in 2040, and experts predict that Europe's new car sales will be entirely electric five years before the deadline.

Leading car manufacturers and businesses in the automotive industry are increasing their commitments and competition. Norway, for example, is making rapid progress in the electric vehicle market. In Norway, nearly 30 percent of new car sales in December 2017 were powered by electric batteries.

Energy experts believe that the Chinese and Indian markets will drive vehicle demand, and that electric vehicle development will be high on these countries' political agendas due to lower carbon emission challenges. As the electric vehicle industry grows, many businesses are planning to install charging stations for their vehicles.

Keywords-*Electric vehicles, developing economies, and India are terms.*

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INTRODUCTION

Concerns about fuel conservation and environmental protection are growing around the world, and research and development for electric vehicles has accelerated. Digitization is causing havoc in the automotive industry worldwide. Increasing automation is reshaping the industry in preparation for a new revolution in the twenty-first century. The automobile industry in India is also feeling the effects. The Indian EV market is distinct from others. Global markets are important because the dynamics of the Indian economy, market requirements, and consumer preferences are all changing. Different Understanding and reinventing oneself is essential for managing future changes in this industry. These trends will alter mobility behaviour and open up new opportunities for competition and collaboration. The future growth will be in providing the required services, which are expected to increase. Thirteen cities out of twenty in the world have the highest there is air pollution in India, and it is critical to reduce the rising levels of vehicle pollution. The automotive industry Electrification is having an impact on industry all over the world. By 2030, electric vehicles, including battery-powered vehicles, will be commonplace Electric and plug-in hybrid vehicles are expected to account for up to 50% of new vehicle sales globally, and India will be significantly impacted across the entire automotive value chain, including manufacturers.

DRIVERS OF ELECTRIC VEHICLE ADOPTION

EV sales are relatively low, and experience from other countries suggests that the proper mix of push and pull

factors could determine the rate of Indian EV penetration:

1. Several countries have increased e-mobility usage by offering various incentives, as well as a favourable environment with strict carbon emission regulations.
2. A large component of the EV vehicle cost is due to the high battery price, which has an impact on both Manufacturing and sales, as a result of advanced technology, can lower battery costs and increase mileage, making EVs more accessible and appealing to potential customers.
3. Simple, low-cost charging infrastructure for meeting customers' daily needs.
4. Creating a pull among customers by offering a low-cost proposal will be critical in encouraging customers to invest in EVs.

REVIEW OF LITERATURE

The literature search was primarily focused on topics concerning electric and hybrid vehicles. The review of publications and research work revealed the basic guidelines and expected positive results in favour of society and future demand for saving fossil fuels and reducing pollution in the environment.

For traction, electric vehicles use an electric motor, chemical batteries, fuel cells, ultra-capacitors, and flywheels. The advantages of an electric vehicle include low emissions, high efficiency, and smooth operation (MehrdadEhsani, YiminGao, Stefano Longo, Kambiz M. Ebrahim, 2018).

The energy consumption and emissions for plug-in hybrid electric vehicles in China discovered that there is 37.5 percent less energy consumption and 35 percent less greenhouse gas emissions when compared to gasoline vehicles. Santos and Liu (2015)

The operation of an electric vehicle was compared to that of a conventional internal combustion engine and a hybrid electric vehicle, as well as its advantages, disadvantages, and future technology perspectives.

HOLMS AND COLLEAGUES (2010)

Transportation-related activities have emphasised highly efficient, safe transportation with low emissions. Electric vehicles have been proposed to replace conventional vehicles in the future, and they studied how financial incentives and consumer socioeconomic factors increase electric vehicle adoption in many cases Decision-makers must take a long-term view in order for them to be implemented efficiently (Sierzchula et al 2014, X Zhang et al 2014).

In India's metropolises, hybrid cars are in high demand. Analyzed. Alternative fuel is required for sustainability due to the depletion of fossil fuel reserves, environmental harms, and global warming. According to the study, people with traditional thinking are more concerned about the environment, and Indian consumers are willing to pay more for an environmentally friendly car Debabrata Das et al (2011)

It identified a potential need for the design and development of a globally competitive small electric concept vehicle for India and concluded that EVs are the best solution to reduce city pollution with numerous societal and economic benefits from EV and HEV use. It also outlined the role of the government and global communities played a role in promoting and accelerating the EV programme.

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OBJECTIVES

The following are the study's objectives.

1. To comprehend the trends in Indian automobile production and sales.
2. To Understand India's Emission Standards
3. To comprehend the various types of vehicle standards in various countries
4. To look into the structure of vehicle standards based on light duty vehicle energy consumption.
5. Research Global Warming Emission Reduction under Light Duty Vehicle Standards.
6. Research Electric Vehicle Trends and Sales Goals by Country
7. To comprehend the challenges and opportunities in the Indian electric vehicle market.

RESEARCH METHODOLOGY

Research Methodology: The goal of methodology is to describe the steps involved in research. The descriptive research design was used for this study. Sources of data collection: -Secondary data was used for the study. Secondary Data: Secondary data was gathered from a variety of sources such as the internet, websites, magazines, journal articles, and so on. The study's expected contribution: The study is expected to present information about the Indian automobile market as well as changes and challenges in the electric vehicle industry

THE STUDY'S LIMITATIONS

• Due to practical constraints, this paper is unable to provide an exhaustive review of all vehicles on the market. Only the present and future of electric vehicle scenarios are being studied; thus, other scenarios are being ignored. Automobiles are not included in the study.

• Another potential issue is that the study's scope may be too broad. The scope of this study does not allow for a comprehensive discussion of other aspects of electric vehicles.

DATA ANALYSIS

TABLE :1 Automobile Production Trends

Category	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
PassengerVehicles	32,31,058	30,87,973	32,21,419	34,65,045	38,01,670	4010373
CommercialVehicles	8,32,649	6,99,035	6,98,298	7,86,692	8,10,253	894551
ThreeWheelers	8,39,748	8,30,108	9,49,019	9,34,104	7,83,721	1021911
TwoWheelers	1,57,44,156	1,68,83,049	1,84,89,311	1,88,30,227	1,99,33,739	23147057
Grand Total	2,06,47,611	2,15,00,165	2,33,58,047	2,40,16,068	2,53,29,383	2,90,73,892

Source: SIAM India

Discussion: The Indian automobile market is divided into two-wheelers, commercial passenger cars, and others. Passenger cars and two-wheelers are the most popular vehicles, and this segment will dominate the electric vehicle market. The Indian passenger car division is expected to capture three-fourths of the electric vehicle market share by 2025.

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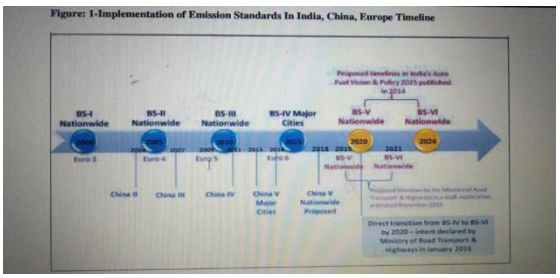
TABLE: 2 AUTOMOBILE DOMESTIC SALES TRENDS

Category	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
PassengerVehicles	26,65,015	25,03,509	26,01,236	27,89,208	30,47,582	32,87,965
CommercialVehicles	7,93,211	6,32,851	6,14,948	6,85,704	7,14,082	8,56,453
ThreeWheelers	5,38,290	4,80,085	5,32,626	5,38,208	5,11,879	6,35,698
TwoWheelers	1,37,97,185	1,48,06,778	1,59,75,561	1,64,55,851	1,75,89,738	2,01,92,672
Grand Total	1,77,93,701	1,84,23,223	1,97,24,371	2,04,68,971	2,18,62,128	2,49,72,788

Source: SIAM India

Discussion: The future of electric vehicle transportation is evolving in response to changes in consumer preferences and environmental sustainability, which are reshaping the automotive industry. A car is a networked device with enhanced intelligence for driving functions. Changing consumer preferences and technological disruptions are reshaping the mobility landscape, compelling automakers to reconsider their plans and strategies

Figure: 1-Implementation of Emission Standards In India, China, Europe Timeline



Discussion: India ranks 155th out of 172 countries in the World Bank's environmental quality survey, and last in air pollution. The Auto Fuel & Vision Policy 2025 of India, published in 2014, proposed a staged implementation of BS-IV, BS-V, and BS-VI (based on Euro 4, Euro 5, and Euro 6) by 2017, 2020, and 2024, respectively. However, as air pollution worsens, India is debating whether to adopt BS-VI or directly transition to BS-VI upgradation. The Indian government issued a notification in November 2015 for the implementation of BS-V and BS-VI by 2019 and 2021, respectively. It is expected that the proposed upgrades will be implemented on a set timeline, it is possible to reduce PM and NOx vehicular emissions by 40% – 80%. Sector experts are requesting a direct transition to BS-VI because the performance of Euro 5 for NOx control in diesel vehicles has been subpar, and Euro 6 is a better performing standard.

INDIA ELECTRIC VEHICLE MARKET: DRIVERS

Despite numerous challenges and difficulties, electric vehicles are gradually increasing in India due to

1. Electric vehicle incentives under FAME India, which was launched by the central government to achieve a production target of 14 million EVs by 2035, and NEMMP 2035 target
2. Electric vehicles have low operating costs.
3. Increasing crude oil prices because 80 percent of crude oil requirements are imported despite the fact that India's EV market is in its infancy, the challenges appear to outweigh the opportunities in India, but the right steps from the government in terms of support dynamics for EVs in India at various levels are expected to transform it as opportunities abound in the future.

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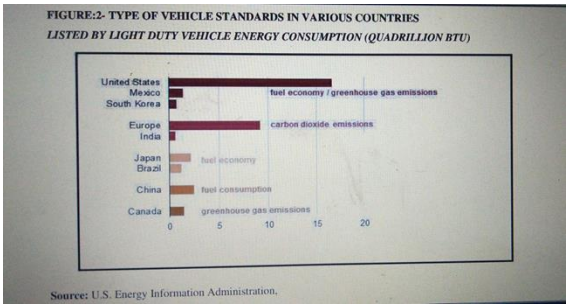
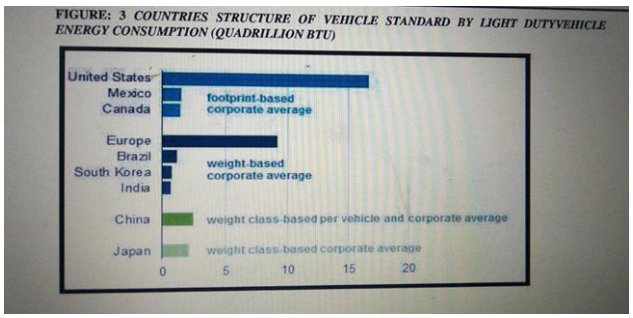


Discussion: The global fuel consumption of light-duty vehicles in nine countries is 75%, and standards for fuel economy and greenhouse gas emissions have been adopted (GHG). Light duty vehicle emissions policies vary by country, and vehicle standards are important components for estimating liquid fuel demand.

Emissions are being reduced. To reduce emissions in the EU, India focuses on CO2 emission standards, whereas Canada has limits on all GHGs.

Economy on gasoline. Brazil and Japan's standards are to improve fuel economy and achieve a specific miles-per-gallon rating.

Consumption of fuel. The Chinese standard is to reduce fuel consumption and achieve gallons per mile, which is inversely proportional to the fuel economy standard. Light-duty vehicles must reduce the number of gallons consumed per mile in order to improve fuel economy. Option or combination The United States and Mexico have fuel-saving and greenhouse-gas-emissions standards, and manufacturers must meet both. Vehicle manufacturers in South Korea can opt for either a fuel economy or a GHG standard.



Discussion: Vehicle standards differ based on the energy consumption structure of light duty vehicles.

Footprint- based on the corporate average. The standard in the United States and Mexico includes GHG emission and fuel-saving targets, while in Canada it is based on vehicle footprint (wheelbase * average track width). GHG emissions in general the manufacturer's targets are obtained by averaging the footprint targets produced Weighted by the corporate average. Weight-based standards are used in Brazil, the EU, India, and South Korea average in the business.

Based on the weight-class corporate per vehicle average this standard is used in China and is more stringent than the weighted corporate average standard. Vehicle manufacturers in China must meet fuel consumption standards for each weight class level, as well as an overall corporate average fuel consumption standard.

Based on a weighted corporate average Japan has a corporate average standard based on weight class and is required to meet the weight class standard relative to the overall manufacture standard.

Light-duty vehicle manufacturers must meet different standards in different countries, and these differences are

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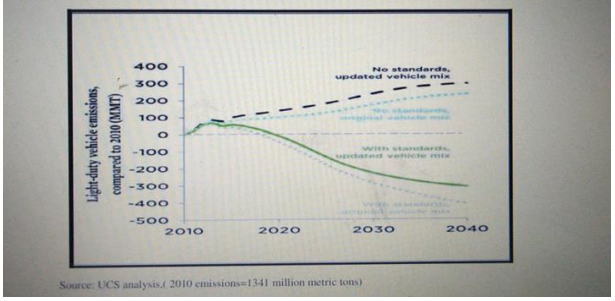
likely to persist due to differences in policy goals and consumer preferences. Vehicle fuel economy and emissions standards must be met if the company wishes to sell its products in that country; for example, vehicles manufactured in the United States must meet European standards if they are to be sold in Europe.

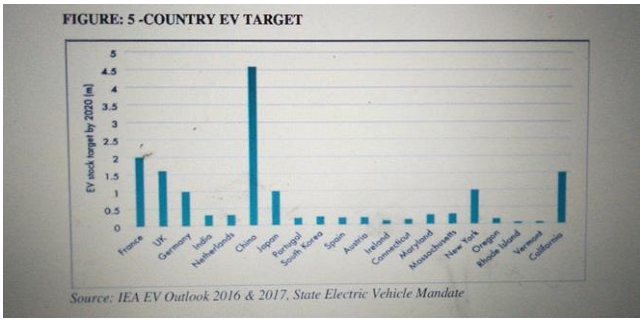
FIGURE:4 GLOBAL WARMING EMISSION REDUCTION UNDER LIGHT DUTY VEHICLE STANDARDS.



Source: UCS analysis.(2010 emissions=1341 million metric tons)

Discussion: Light-duty vehicles (LDVs) over the last decade, global greenhouse gas and fuel economy emission standards have improved significantly. Ten years ago, only four governments had implemented mandatory GHG emission/fuel economy standards (Japan, China, South Korea, and the United States). Currently, ten more governments (Brazil, Canada, India, Japan, Mexico, China, the European Union, Saudi Arabia, South Korea, and the United States) have set GHG emission targets. Nearly 80% of new LDVs sold globally meet GHG emission fuel economy standards, and the aforementioned countries are among the top 15 vehicle markets in the world

FIGURE: 5 -COUNTRY EV TARGET



Source: IEA EV Outlook 2016 & 2017, State Electric Vehicle Mandate

Discussion: By 2035, this region is expected to have 25.2 million EVs. These targets provide policy assurance from major national governments to enact policies regarding the speed of transition to EVs, which will help OEMs invest in and develop new EV models, as well as build future business models. Indian Policymakers should also make a decision on the phase-out of ICEs

TABLE: 3 ELECTRIC VEHICLE TRENDS & DEVELOPMENTS GOALS FOR 2020

Countries with announced targets to 2020 or later	2015 EV stock (thousand vehicles)	2020 EV stock target (million vehicles)
Austria	5.3	0.2
China	312.3	4.6
Denmark	8.1	0.2
France	54.3	2.0
Germany	49.2	1.0
India	6.0	0.3
Ireland	2.0	0.1
Japan	126.4	1.0
Netherlands	87.5	0.3
Portugal	2.0	0.2
South Korea	4.3	0.2
Spain	6.0	0.2
United Kingdom	49.7	1.6
United States	101.0	1.2
Total of all markets listed above	814.1	12.9

Source: IEA Electric Vehicles Initiative, 2016

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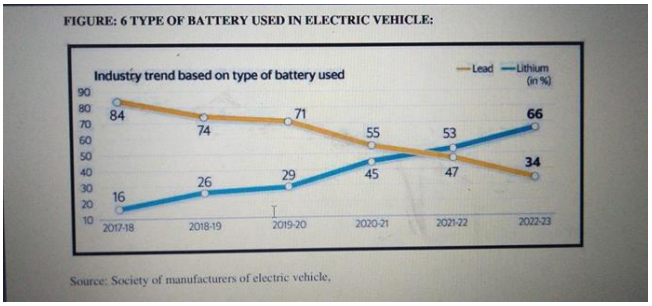
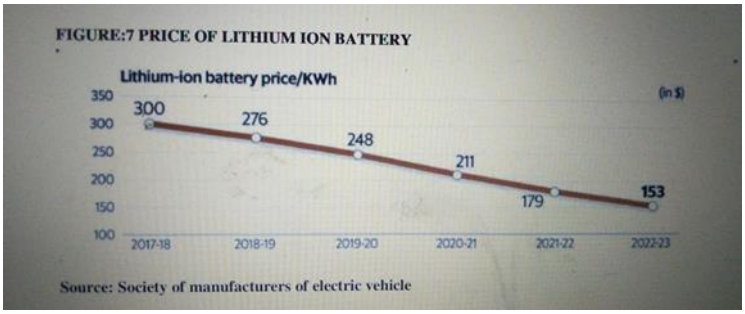
Discussion: To combat climate change, the Paris Declaration has called for the consumption of 110 million electric cars worldwide by 2035. (UNFCCC, 2015). Electric Vehicles (EVs) are a technology that has the potential to significantly reduce CO2 emissions from road transportation around the world. However, EVs are still a developing technology, and there are many questions about the battery, energy capacity (relative to vehicle range), charging speed, robustness, availability, and the environmental impact of materials used. The majority of EV manufacturers serves European, North American, and East Asian markets and manufacture in these regions. There is, however, a significant share of Chinese and Indian automakers, as well as one South African firm Chinese, South American, South Asian (particularly India), and Middle Eastern markets are expected to play a significant role in EV penetration and usage, whereas African, Central American, and Central Asian markets are expected to use EVs less.

FIGURE: 6 TYPE OF BATTERY USED IN ELECTRIC VEHICLE:



Discussion: Improvements in energy sources increase the value of electric vehicles by allowing them to travel farther on a single charge Consumers are concerned about insufficient charging facilities availability and time-consuming charging periods, which are important factors behind low electric vehicle penetration rates. Lithium ion batteries, Lead Acid batteries, Nickel Hydride batteries, and Zebra batteries are among the batteries used in electric vehicles. Leadacid and lithium ion batteries are more commonly used in the automotive industry. Del Duce et al., 2013; Roesky et al., 2015; Tran-Quoc et al., 2017, Moghaddam et al., 2018)

FIGURE:7 PRICE OF LITHIUM ION BATTERY



Discussion: Because of the projected price decrease in Lithium ion battery prices, its usage is expected to increase globally. Cost is inversely related to market growth, and increased production results in lower per unit cost for consumers. Lithium-ion battery technologies still have a few issues to work out before they can improve overall vehicle cost and performance (Tran-Quoc et al 2017, Berckmans G. et al 2017, and Moghaddam et al 2018). In comparison to developed economies, India's per capita affordability income index is low. As a result, medium-range electric vehicles are appropriate for fleet and personal vehicles that require frequent charging 2017 (SIAM)

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INDIA ELECTRIC VEHICLE MARKET: EV vehicles represent a significant opportunity for smart cities to use cleaner fuel technologies in urban mobility. According to a Persistence Market Research report, the India electric vehicle market is expected to grow at a CAGR of 82 percent in value between 2017 and 2035. Forecast by Vehicle Type The India electric vehicle market is expected to grow at a 42 percent CAGR between FY 2018 and FY 2035, owing to increased government initiatives and growing consumer inclination, concerns about the harmful effects of air pollution, and massive investments by various OEMs in developing more affordable premium electric vehicles and passenger cars and two wheelers .According to Technology Forecast Hybrid electric vehicles, plug-in hybrid vehicles, and battery electric vehicles are all part of the technology. Hybrid and battery electric vehicles are expected to dominate the market in India. Two-wheeler sales in India are expected to account for a large market share of battery electric vehicles, accounting for approximately 87 percent in 2035.Forecasted Power Source Power sources include both stored and on-board electricity. The stored electricity is expected to be the most important in India's electric vehicle market, dominating. India's electric vehicle storage market is expected to reach 4.7 GW by 2022.Forecasting Power Trains The electric vehicle market in India is divided into three categories: series hybrid, parallel hybrid, and combined hybrid Parallel hybrid is the most preferred power train type due to its advantages over other power train types, but it is not included in the battery of an electric vehicle because it includes both an internal combustion engine and an electric motor.

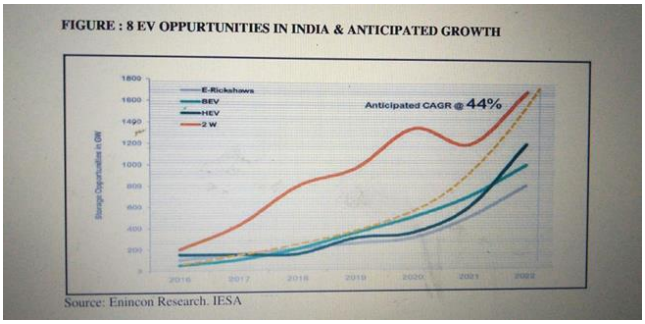

FIGURE : 8 EV OPPURTUNITIES IN INDIA & ANTICIPATED GROWTH
Source: Enincon Research, IESA

Discussion: In the Indian market, a number of companies are producing electric vehicles, including Mahindra Electric Mobility Limited, Tata Motors Limited, Toyota Kirloskar Motor Pvt. Ltd., Volvo India Private Limited, BMW AG, Kinetic Green Energy & Power Solutions Ltd., and Okinawa Attach Pvt. Ltd., but there are fewer charging stations all over India It is inconvenient for EV owners and is mostly used within city limits

INDIA THE WAY AHEAD

Aside from the end-user customer, other key stakeholders in India's transition to EVs include the government, incentives and subsidies, and the automotive value chain industry.

The government contributes by defining regulations for emission standards, fuel efficiency, strategic intent and direction, exploring incentives and subsidies, and developing a supportive ecosystem. According to the Paris Climate Treaty, the Indian government's current CO2 emission target is to maintain 113 g/km by 2025.

2021. In accordance with the Corporate Average Fuel Consumption standard, the average fuel efficiency target for 2035 is 22 km/liter. In addition, the Indian government intends to reduce crude oil imports and indirect reliance on certain trade partners.

The Indian government could concentrate on these areas: The government could also form committees to provide guidance as and when industry stakeholders require assistance in meeting their objectives. The government could

define its level of participation in the means used to meet policies and targets as it drives EV penetration through policy and long-term direction.

Subsidies and incentives: According to an OECD report, India provides few subsidies in comparison to other major markets. Subsidies are provided by various state governments and cities. The government may need to encourage adoption through programmes such as recurring incentives, tax breaks, infrastructure and innovation funding, support for technology localization, and skill development.

The automotive value chain industry: By changing the product mix, developing the right service skill sets, improving battery and electric vehicle performance, and increasing scale, the industry can drive the EV revolution India is experiencing a disruption. Companies that provide fuel and charging infrastructure can: innovate on business models (e.g., leasing of batteries, swapping infrastructure, deploying fast chargers), provide stable power supply and grid stability, and enable easy and rapid charging to increase EV adoption.

4. Charging points: Charging stations are required as the use of electric vehicles grows. Leadacid and lithium ion batteries are used in the automotive industry. Depending on the battery specifications and the charging method, the charging process can take anywhere from 30 minutes (fast charging) to 24 hours charger. There are currently two types of plug-in EV charging stations: AC and DC. An alternating current charging station provides current to the on-board charger and typically provides 8 to 24 km of range per 30 minutes of charging A DC charging station directs current to the vehicle battery and can provide up to 129 km of electric range for every 30 minutes of charge.

FINDINGS,

The automobile industry is critical to the country's economic and industrial development. Electric vehicles are a growth and innovation segment because they enable improvements in various infrastructure transportation facilities as well as ecological sustainability. It has a strong constructive multiplier effect and is very important for national progress due to its forward and backward associations with many industrial segments.

The Indian automobile industry is vital to the country's economy. Increasing Demographic Factors Automobile sales volumes have increased as a result of increased purchasing power, new environmentally friendly vehicle launches, thriving exports, and easy finance accessibility. The various infrastructure developments in road, power, and testing certification facilities, the availability of trained manpower, and the facilitation of government policies The Indian automotive industry has become a popular investment destination for global automakers.

At the moment, India is the world's second largest manufacturer of two-wheelers and the fifth largest manufacturer of commercial vehicles. It is Asia's fourth largest passenger car market and largest motorcycle manufacturer the possibilities for electric vehicles are numerous.

The Indian automobile market is encouraging alternative fuels through advanced technologies such as battery-powered electric vehicles, hybrid vehicles, and so on.

The Indian government has encouraged new initiatives, incentives, and policies to boost the Indian automobile sector. Modernization and phased manufacturing programmes, Auto policy 2002, National Automotive Testing and Research and Development Infrastructure Project (NATRIP) Project, and Automotive Mission Plan 2006-

2016 are just a few examples.

RECOMMENDATIONS

To increase EV penetration, the current study suggests the following recommendations. According to the findings of the study, manufacturers should provide the best and most value-added services with product availability; therefore, businesses should try to attract customers by offering attractive financial incentives and offers. It is also suggested that companies collaborate with the government, banks, and other institutions to increase sales to increase sales, financial institutions should offer low-interest vehicle loans to middle-class customer's usage.

Today's youth are very environmentally conscious, as well as decision makers in their families. As a result, companies should promote and advertise their vehicles in this regard, and companies should provide additional discounts, incentives, or special offers to college students who plan to purchase an electric vehicle. To promote electric vehicles, the government and manufacturers should raise consumer awareness.

In India, consumers are still hesitant to own an electric vehicle due to questions about charging, service stations, and a lack of awareness. Companies can start free awareness campaigns in collaboration with their dealers. Because petrol and diesel prices are constantly rising in the current market, customers are increasingly concerned about fuel-efficient, environmentally sustainable vehicles.

CONCLUSION AND FUTURE SCOPE

Electric vehicles are a globally sustainable mode of transportation, and their use is rapidly increasing. The Indian government has also begun to accelerate the adoption of EVs. However, many obstacles must be overcome before EVs can be widely and easily adopted in India. As a new entrant in the EV transportation market, the most significant barriers identified include state government incentives and consumer characteristics. All consumers are eager to reduce pollution, but the associated costs are prohibitively high (purchase price, minimum operating cost, vehicle cost, payback period, operating cost, maintenance cost, and electricity cost) (Resale) As a result, a low-cost vehicle is required for the Indian markets. Participants at industry meetings organised by the Center for Future Mobility in Delhi and Chennai cited high acquisition costs as the primary impediment to EV adoption. The charging infrastructure, electric vehicle performance safety concerns, and new user anxiety all have a significant impact on EV adoption. According to the researcher, a penetration pricing strategy is more appropriate for the Indian automobile sector, which has a large number of middle-class consumers. This means that Indian automakers must take action in order to capitalise on the sector's rapid growth the use of electric vehicles can save a significant amount of national fuel while also reducing emissions

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