

The Automotive Industry Transitioned from the "Traditional to Ev" Path in Support of the Sustainable Cities Program and Explored The Role of Policy In Promoting Electric Vehicle Adoption in India

RASHIKA RAJAN SINGH

Research Scholar, Amity Business School, Amity University
Lucknow, Uttar Pradesh, India
Orcid Id: 0000-0002-9017-7269

Dr. NIMISH GUPTA

Associate Professor, Amity Business School, Amity University
Lucknow, Uttar Pradesh, India
Orcid Id : 0000-0002-0570-2437

Prof. (Dr.) G. R. YADAV

Principal, Rajat Degree College, Lucknow, Uttar Pradesh, India
Orcid Id: 0009-0004-8691-0685

ABSTRACT

About 70% of worldwide greenhouse gas emissions come from urban areas, with the transport sector responsible for about a third. Therefore, decarbonizing urban transportation is essential in the fight against climate change. The worldwide decarbonization of transportation is an issue that electric vehicles (EVs) can help manage. With a quality rating 141, India's air is among the worst in the world. "The government has responded to this alarming statistic by launching several programs and policies." By 2050, experts predict that the global fleet will number 2.5 billion automobiles. The automotive industry has shown a range of advancements in recent years, most notably the widespread adoption of electric cars (EVs) to reduce pollution. Environmental pollution is a major issue all around the world right now. Internal combustion engine pollution is a major source of air pollution. Electric vehicles (EVs) are being actively marketed globally to reduce emissions from fossil fuels and solve environmental concerns (ECs). "Several countries offer financial incentives to citizens who move to EVs. This article also demonstrates the mediating role of government policies between pricing, awareness of EVs, infrastructural requirements, and the desire to adopt EVs."

Keywords: *Automobile, Electric Vehicle (Ev), Adoption Intention, Environment, Sustainability.*

INTRODUCTION

One of the most critical problems nations face today is global warming, which is exacerbated by the emission of carbon dioxide into the atmosphere (Singh and Arneja, 2020). The majority of the warming that humans have caused is due to the combustion of fossil fuels. Despite widespread initiatives to reduce pollution, emissions from vehicles are rising. Cars are the primary source of pollution, accounting for over 80% of all emissions (Creutzig et al., 2015; Sims et al., 2014). Using fossil fuels for transportation is closely linked to increased CO2 emissions. The outcome is an increase in both temperature and pollution levels that are not ideal (Rockstrom et al., 2009). The current generation must share the responsibility of ensuring a comfortable future for the next (Greene, 2009).

There are now 1.38 billion people living in India (Neill, 2021). The World Bank reports that its population is expanding at a rate of 1.1% per year, making it the world's second most populous country. Population expansion is to blame for the environmental damage caused by the increased number of automobiles on the road. The only option to keep pollution levels low is to switch to electric vehicles (EVs) from gas-powered automobiles (PwC, 2018). The auto industry has invested much in developing battery-powered electric cars with enhanced convenience features, increased ranges, and simpler charging infrastructure. The production process is more comprehensive than vehicles for the budget car market. Positive public opinion of EVs has contributed to the industry's growth in recent years (Haustein and Jensen, 2018). Demand and interest in EVs, however, have yet to meet expectations (LaPedus, 2019). Promoting products to consumers is hampered by a need for charging infrastructure (Haustein & Jensen, 2018).

Fossil fuel-powered automobiles have been in use for over a century. Several scholars (Chekima et al., 2016; Malhotra and Singh, 2016; Ozaki and Sevastyanova, 2011; Mau et al., 2008) agree that it is difficult to make the switch from older to newer technology (such as EVs) because of preconceived notions. Producers and authorities alike have been pushing for greater use of EVs. Governments have introduced incentive programs for more citizens to switch to EVs (DeGroot and Schuitema, 2012). Compared to the price of a regular car, electric vehicles are more expensive. When setting prices, the automotive business is no different from any other. Consumers may need help calculating and comparing the overall costs of conventional and EVs (Lieven & Keshav, 2011), even though EVs may have a cheaper total cost of ownership in the long run (Adepetu & Keshav, 2017). However, it is a considerable challenge to inform the public about the benefits of electric cars and persuade them to purchase one (Plotz et al., 2014).

The International Energy Agency predicts that by 2030, transport will account for at least half of global greenhouse gas emissions (IEA, 2018). This analysis suggests that we should abandon our existing approach to transport in favor of one based on green products (Shalendar and Sharma, 2020). "Sustainable or environmentally friendly products have a lower environmental effect but are not widely adopted by consumers (Beise and Rennings, 2005; Bodur et al., 2015; Prothero et al., 2011; McDonald and Oates, 2006)". In order to boost product adoption, it is crucial to learn what motivates customers to buy sustainable products (Testa et al., 2015).

The first electric automobile demonstration in India occurred in 1996 (Etrio, 2021). The Indian government has pledged that by 2030; the nation will run solely on electricity (Energyworld, 2019). Everyone engaged should work to reduce prices or provide financial help from the government to stimulate the demand for electric cars (Paylenko et al., 2019). With these incentives in place, automakers will be more comfortable investing heavily in the development of EVs (Cecere et al., 2018). EVs' economic, social, and technological effects have been the subject of much research. However, the government's and other regulatory agencies' roles in the Indian context have been the subject of some study. Therefore, this research aims to generate significant interest among all stakeholders in EV manufacturing and provide.

LITERATURE REVIEW

- **PRICE (PR)**

The price a product or service costs is a significant factor in consumers' buying choices. A significant motivation for shopping is saving money (Ballé, 2019). The cost of fuel and electricity is a significant factor in determining whether or not someone will decide to buy an electric vehicle (Vergis & Chen, 2015). However, the high purchase price does act as a barrier to purchase (Lieven et al., 2011), even though the cheap operating cost supports EVs. Promoting electric vehicles (EVs) and the long-term

savings of acquiring an EV should be the primary emphasis of energy conservation education. Although there are long-term cost benefits, shoppers often prioritize avoiding even higher prices in the short term. Cost is a significant factor for people to consider when picking between an electric vehicle and a regular car. The maintenance expenses of EVs must also be cheap if the public embraces them (Milad & Shariat-Mohaymany, 2021). Singh and Arneja's (2020) research confirms this to be the case; they discovered that customers' desire to adopt an EV decreased as the total cost of ownership increased. For this reason, it stands to reason that reducing the price of EVs will raise customer demand for the technology (Tamor et al., 2013).

- **ENVIRONMENTAL CONCERN (EC)**

"environmental concern" (Khurana et al., 2020) describes a person's knowledge of and engagement with environmental concerns. It is not simply people's responsiveness that matters when it comes to solving these problems, but also their desire to offer extra contributions (Dunlap and Jones, 2003; 2002). Studies on consumer behavior (Rotaris et al., 2021; Kang and Park, 2011) have consistently shown that people who are more concerned about the environment are more likely to seek out environmentally friendly products, recycle their newspapers, and discuss the issue openly. Several national governments have shown their concern for the environment by revising their policies on a regular basis (OECD, 2007). "There is a positive and large relationship between environmental concern and efforts to advocate environmental laws, as shown by both Sajjad et al (2020) and the prior research by Poortinga et al (2004)". People who take environmental issues seriously are less likely to buy cars that run on fossil fuels. Due to their environmental concerns, they are more likely to choose alternatives like electric cars (Dutschke & Peters, 2014; Bockarjova & Steg, 2014) or public transport (Kahn, 2007). According to McDermott et al. (2015), concern for the environment should be a primary selling factor. Although environmental concerns may affect customers' propensity to purchase EVs, Graham- Rowe et al. (2012) pointed out that this may not be the sole factor. Potential consumers also worry about the EVs' batteries. Chemical emissions are at risk during battery production and disposal (Axsen et al., 2012). Increasing the market share of electric vehicles requires making them more energy efficient and ecologically benign, as Khurana et al. (2019) stated.

- **KNOWLEDGE OF EV (KE)**

The effect of available knowledge on a person's behavior varies. Factors such as these, together with demography, have been shown to have a significant impact on consumer behavior (Guerzoni, 2010; Kerstetter & Cho, 2004; Goldsmith & Flynn, 1992; Von Hippel & Flynn, 1986; Bettman & Park, 1980). The sum of a person's knowledge develops in tandem with their characteristics. The youth may see things differently than the older generation does. As with the other aspects, one's familiarity with the EV will determine how much weight it is given (Egbue and Long, 2012). Asadi et al. (2021) observed that people's interest in EV adoption was significantly influenced by their familiarity with the technology. Policies should be implemented to reduce energy use, foster the creation of more sustainable products like electric automobiles, and promote their widespread adoption. The degree of EV awareness among Chinese consumers has to be raised because of a need for more broad information. According to research (Yan et al., 2019), If this is true even in a nation as technologically sophisticated as China, we need to take note.

- **INFRASTRUCTURE REQUIREMENT (IR)**

In addition, India needs more infrastructure to support the widespread adoption of electric cars. Customers lose trust in EVs because of their expensive price tags and the absence of critical support systems, such as charging stations and extra batteries (Li et al., 2017). These problems may be resolved by installing advanced batteries and updating the country's infrastructure (Silvia and Krause

2016, Egbue and Long 2012, Graham-Rowe et al. "The lack of public charging facilities acts as a psychological barrier, even while the car may be charged at the owner's home or place of work (Feigenbaum and Kolbenstvedt, 2016; Morrissey et al., 2016; Lieven, 2015). "

- **GOVERNMENT POLICIES (GP)**

There are many factors to consider, and purchasing an automobile is a big financial commitment. Therefore, consumers monitor government initiatives and projects. Regional strategies may aid in changing consumers' routines (Steg & Vlek, 1997). These rules may include advancing alternative energy or implementing new pollution limits. Incentivizing customers to take the necessary action has increased sales (De Groot and Schuitema, 2012). Governments all across the globe have created incentives for people to buy electric cars. The indirect costs of owning an EV are reduced by government tax incentives (Ghosh, 2020). These incentives could be anything from free parking in certain areas to free charge to free usage of toll highways. These incentives help bring some people closer to realizing their ambitions and dreams. "It is difficult for any government to develop an incentive system that would be accepted by all citizens (Schuitema et al., 2010; DeGroot and Steg, 2009; Schade and Schlag, 2003)." Much more challenging (Eriksson et al., 2006; Bamberg and Rolle, 2003) is determining which incentive schemes have the most or most minor influence on customers' buying behavior. The available public and private funds need to be increased. People are willing to invest in EV-related personal infrastructure if the government offers good policies, most likely in the form of subsidies, according to research by Skippon and Garwood (2011). Consumers' willingness to purchase EVs is also proven to be affected by their level of acquaintance with government regulations about EVs. New data suggests that the government has to do more to encourage EV education and comprehension (Sovacool et al., 2019).

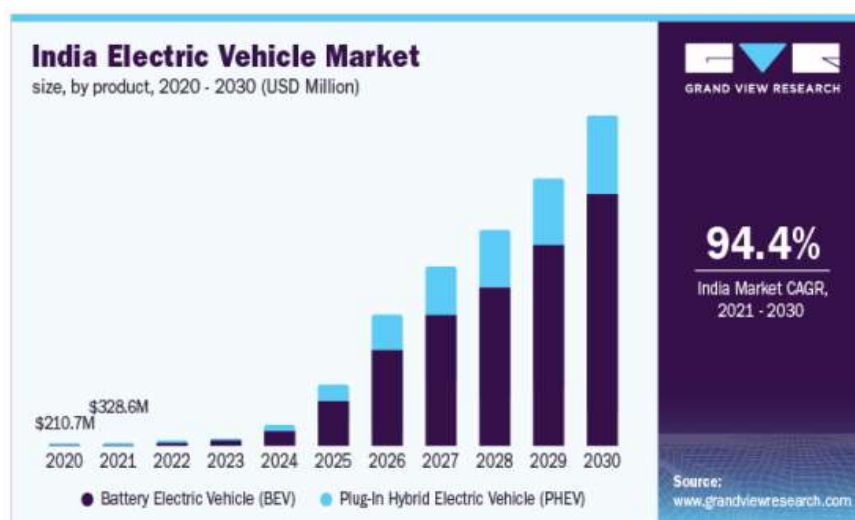
1. PRESENT STATUS OF ELECTRIC VEHICLES IN INDIA

Currently ranked fourth worldwide, India's auto industry is expected to surge to third position by 2021. India's vehicle exports increased by 15.54 percent in the 2018 fiscal year. Allowing entire foreign direct investment (FDI) through the automotive channel is only one of several measures the Indian government has taken to guarantee that the country's automotive sector can continue to fulfill future global mobility standards. Due to legislative changes, shifts in consumer preferences, and technological developments, auto OEMs are pressured to forsake their traditional business model. Because of government regulations about emission safety, OEM has been compelled to develop environmentally friendly and secure automobiles. The union ministry of road transport and Highways has already taken the first step in this approach by announcing that the BSVI emission standard will be imposed starting in April 2020. This is in response to the nationwide implementation of BSVI emission regulations in 2017. By 2020, all petrol and diesel passenger cars will be required to comply with the BSVI norm, which will have replaced the 1991 stage regulation. Diesel cars must have 38% lower NOx emissions and 87% lower PM emissions than BSVI rules. Petrol, however, is what most vehicles use.

Timely in this respect is the government's decision to bypass BSIV in favor of BSVI by satisfying BSV standards. The Bharat Stage emission standard is based on the Europe Stage standard with several modifications. The remainder of the nation will catch up by April 2020. However, several localities have already embraced BSVI norms. Sales of diesel automobiles have decreased steadily from 47% of the market in 2012–13 to less than 25% in 2017–2018. One possible explanation for diesel's dwindling market share in India is the emergence of green technologies such as hybrids and electric cars, which have reduced the price gap between petrol and diesel vehicles and provide a significant opportunity to reduce total exhaust emissions. The introduction of the electric automobile has made it possible to switch to a form of transportation that is less harmful to the environment and cleaner and quieter. India has a massive market for electric vehicles. Electric mobility is widely regarded as a tool to improve

quality of life and solve environmental issues, despite the fact that the transition to an all-electric vehicle fleet by 2030 poses both challenges and possibilities. The public's enthusiasm for EVs might need a boost, and governments should work towards that end. By working with other countries, the government can show that it cares about the environment and is committed to this new transportation while saving money. India has committed to reducing its emission intensity by 2030 as part of the Paris Agreement 2015. However, this would be a difficult task unless India fully embraces decreased carbon emissions, especially in the automotive sector. A new white paper has been published by the Society of Indian Automobile Manufacturers (SIAM). It was predicted that by 2047, all cars would be electric, and by 2030, 40% of vehicle sales would be of electric models.

India's automobile industry is now ranked number four worldwide, but experts predict it could move to third place by 2021. Specifically, the Indian government hopes to: This rate is anticipated to reach 12%. By 2026, the Indian car market is estimated to be valued between INR 251.4 and 282.8 billion (INR 16.18 and 188 billion), thanks to a yearly growth rate of 5.9%. The government has established the clear and ambitious goal of adopting 100% electric automobiles by 2030, and the country's leading think-tank, NITI Aayog, has designed a long-term global mobility strategy to achieve this goal. Public transport systems like buses and trains are becoming more critical in India. "The 2016 study Key Indicators of household expenditure on services and durable items by the Ministry of Statistics and Programme Implementation found that buses are the most common mode of travel in urban and rural regions." According to the results, bus travel received the most significant funding from nearly 66% of rural households and 62% of urban households, respectively. Because of this, the transport sector has undergone a dramatic shift. "However, in the long run, the country needs an effective public transportation system with vehicles that operate on electricity or other fuels, making this transportation economical, convenient, pleasurable, and safe and encouraging people to use it." The development of electric vehicles in India has come a long way. To reach its target of seven million hybrid and electric cars by 2020, the Indian government launched the National Mission Plan for Electric Mobility (NEMMP) 2020 in 2013. The Indian government also supports this movement by enacting a program called FAME (Fast Adoption and Manufacture of Hybrid and Electric Vehicles in India). Private manufacturers have erected state-of-the-art R&D centers and production units to accommodate the growing demand for EVs. Large international automobile companies spend heavily on research and development for energy technologies, and the government has vowed to cover up to 60% of the expenses associated with creating low-cost indigenous electric technologies. Change is coming to India's electric car market. It will come down to how well automakers meet the needs of specific groups of buyers with specialized products while maintaining respectable levels of innovation, quality, and safety. Some companies will thrive, while others will fail due to this.



1. OPPORTUNITIES OF ELECTRIC VEHICLE

A. Scope of Electric Vehicle

We are switching to renewable energy to reduce our environmental impact. Switching to an electric vehicle is practical since automobiles produce so much carbon dioxide. It is estimated that vehicular traffic is responsible for around a quarter of all worldwide greenhouse gas emissions, mainly urban air pollution. The cumulative impact of gasoline emissions has an effect on two different approaches. Millions of people worldwide are at risk due to poor air quality in their cities, and this problem is only likely to worsen as the number of people who own automobiles increases.

Sales of automobiles like this have the potential to increase future oil consumption and carbon dioxide emissions, both of which are significant contributors to global warming. Therefore, it is critical to reduce both mineral oil use and emissions of greenhouse gases. Due to the environmental and economic advantages, many developing countries rapidly use renewable energy sources for automobiles and other applications. As global power generation increases, the United States has a better chance of reducing its transportation-related contributions to global warming. The environment and the economy benefit from the increased usage of electric vehicles. Comparative analyses show that the cost of energy comparable to petrol is much lower than that of conventional cars. Electric vehicles (EVs) aid the environment in a wide variety of other ways. The rising demand for EVs may now be understood. It is expected that automakers will have to invest considerably to keep up with the growing demand for EVs, which will significantly affect the EV market's development. "Companies like Tesla, Volkswagen, Mahindra & Mahindra, Ford, Nissan, BMW, and General Motors invest heavily in EV R&D."

B. GOVERNMENT POLICIES

Many countries are wary of doing business with China after the pandemic. "However, the government is confident that India will overtake China as the world's electric vehicle manufacturing superpower within the next five years." If Indian manufacturers are serious about making their country the world's next big producer of electric cars, they need to find a viable substitute for lithium-ion batteries. In the next five years, India will surpass China as the global leader in electric vehicle manufacturing. The fact that many countries are losing interest in doing business with China is a mixed blessing, but it does open doors for India. India introduced NEMMP 2020' in 2013 to address issues of energy security, pollution, and the possibility of expanded domestic manufacturing capacities. The Indian government has announced plans for a significant shift to electric automobiles by 2030, demonstrating its continued commitment to the Paris Agreement.

1. CENTRAL GOVERNMENT INITIATIVES:

To encourage domestic production of such vehicles, the government has initiated a two-pronged strategy, including consumer subsidies of \$1.4 billion and taxes on fundamental regulations. "Since the government prioritizes electrifying public transportation, most subsidies are given to two-wheelers, three-wheelers, and buses." The initiative also budgeted \$ 140 million to improve India's charging infrastructure, which would help the country's burgeoning EV market. On the 14th of December, 2018, documents were released establishing the government's standards and criteria for EV charging infrastructure. Charging stations are required every 25 km and the guidelines detail how they should be built. The government rents and buys 10,000 electric cars from Energy Efficiency Services Limited (EESL). If an offer of 10,000 electric vehicles is approved, the unit price per vehicle may be reduced.

2. NATIONAL ELECTRIC MOBILITY MISSION PLAN 2020:

The Indian government has launched the NEMMP 2020. Increasing petrol station availability throughout the nation by promoting EVs. "The Federal government has created the Faster Adoption and

Manufacturing of Hybrid and Electric Vehicles (FAME) project to encourage the widespread use of electric vehicles.” The first phase of the project lasted from 2015 to 2019, while the subsequent second phase is scheduled to last from 2019 to 2022.

C. BENIFITS OF ELETRIC VEHCILES

Electric vehicles are three to five times more efficient in using energy than conventional vehicles with internal combustion engines. This is true even if cars are powered by energy produced from fossil fuels.

- Electric vehicles with regenerative braking can save more power. The energy needed for propulsion may be recovered at a rate of 30-70%, with the higher percentages applicable to urban travel including frequent pauses.
- The bad air quality detected in several Indian cities is primarily attributable to pollution.
- Carbon monoxide emissions from vehicles should be reduced since they exacerbate global warming. Using energy from clean, non-polluting sources like hydro, solar, wind, tidal, and nuclear power is the only way for EVs to produce zero emissions.

D. IMPACT OF ELECTRIC VEHICLE ON EMPLOYMENT OPPORTUNITY

Young Indians are leaving rural regions in search of urban jobs and improved living conditions. More people living in urban areas means more people needing to go out and about. This has the obvious consequence of raising the global demand for imported crude oil and the resulting greenhouse gas emissions. In contrast, as part of the Paris Agreement, India committed to reducing its carbon footprint by 33–35% from 2005 levels by 2030.

- Sales of EVs have soared ever since manufacturers began prioritizing them. Markets for electric cars are created by the world's top autos.
- Service for internal combustion engines (ICE) and electric vehicles (EV) cannot be compared. The electric motor and invertors are the only moving parts in an EV, which is all the service facility must focus on.
- There are several potential financial benefits to installing a charging station for electric cars. Electric car charging stations may be created and placed anywhere nationwide, provided they conform to local building codes.
- Residential charging stations, including those in people's homes, offer great potential as a business model for the growing electric vehicle market.
- As the global fleet of electric vehicles continues to grow, more and more countries will install charging infrastructure.
- The arrival of the electric car may also benefit the painting and electrical industries. The workshop's central topic is whether or not electric vehicles can become more widely accessible.
- Installing and maintaining EV charging stations may be a lucrative business venture. As the number of charging stations increases, it becomes more practical to begin comprehensive administration.
- Charging stations with onsite maintenance could be the best choice.
- Electric vehicle maintenance and selling related electrical components might be lucrative enterprises. Electrical motor auxiliary circuits are the topic of this meeting. Providing charging infrastructure for private residences is a potential entry point into the consumer goods and services market.
- As a company owner, he may start making the remaining parts for sale and distribution to meet the needs of the Indian vehicle industry, and after that need has been fulfilled, he can think about exporting these potential parts. Costs for leisure goods will go down, and imports will be reduced.

- The lithium-ion battery in a plug-in hybrid or electric car may need to be replaced after five to 10 years. Battery stores will become more critical as the number of electric cars on the road and in consumers' hands grows. Another potential clientele might be reached by opening a car wash that uses only renewable energy. The increasing popularity of electric vehicles bodes well for the resale value of used vehicles and the electric car franchise. The world's largest carmaker has started making electric cars. A depleted battery may be purchased or sold and used again. Establishing a battery drain facility allows correct recycling of battery components and waste disposal.

E. IMPACT OF EVs ON ECONOMIC GROWTH

Battery charging, recycling, installation, resale, and scrap metal trade are just a few of the emerging companies that will benefit from the transportation sector's change. Indian power athletes rely on the automotive industry, and charging infrastructure has been a priority for India's power companies. Automated diesel/petrol companies must address the problem of transforming and improving the infrastructure of small and medium-sized vehicle components companies. "They provide many different kinds of help, Since the electric vehicle will replace the petrol/diesel vehicle, the current technician and mechanics will face a survival challenge, such as a lack of knowledge of EV technology and a few issues of repairs to the electric car". In order to keep the economy expanding, it is crucial to have a thorough training strategy to ensure the long-term health of the nation's present technicians. The increasing prevalence of IC-powered transport boats harms the economy and its passengers' health. In addition to adding to the already significant import debt, the ever-changing price of crude oil also requires significant investment in oil refineries and associated distribution infrastructure. Several studies have shown that introducing electric vehicles has a more positive impact on GDP than using fuel vehicles. It is expected that higher tariffs on other areas of the Indian economy will eventually replace the oil business. However, the battery industry alone may provide more revenue for the government than the oil company ever did.

CHALLENGES OF ELECTRIC VEHICLE

A. HIGH COST OF BATTERY TECHNOLOGY:

The lithium-ion batteries in an electric vehicle account for the bulk of the total cost. Producing reliable li-on batteries is one of the biggest challenges in the development of EVs.

- The expense of Li-ion cells is a significant contributor to the cost of EVs. Since the battery packs must be imported, they cost around \$275/KWh in India. Because of this, as well as the 28% GST and the lack of lithium in India, battery prices are artificially inflated.
- According to Bloomberg New Energy Finance, lithium-ion batteries have dropped from over \$1,200 per kWh in 2010 to roughly \$175 per kWh in 2018.
- Due to advances in battery technology and mass production, lithium-ion battery packs are now more inexpensive and efficient than before. By 2020, experts anticipate that the price of Li-ion battery packs will have dropped to about \$135 USD per kWh. By 2025, the global market for lithium-ion batteries is expected to have almost quadrupled, reaching about \$71 billion. This reveals a shocking need for energy storage on a global scale, which may be linked to the proliferation of electric vehicles and the shift towards a renewable energy-based economy.

B. Impact of Charging of Electric Vehicles on Power Grid

Interest in battery-powered cars is rising worldwide as a long-term replacement for the typical 70% of the fuel product now utilized in personal mobility. Since the transport industry in India is the primary driver of GDP development, the government must import petroleum to fulfill the growing demand in the sector. Since the popularity of EVs is expected to rise in the following years, the charging infrastructure

will have to change accordingly. “The negative impact of EV charging stations is imposed onto the power distribution system since the results of the fast-charging station grow with demand, and the limit of energy efficiency declines with time, like in India, where massive amounts of heat are generated when coal is burned to create electricity.” The adoption of EVs and charging infrastructure would significantly increase the power demand; yet, if all of this energy were generated by burning coal, the aim of adopting EVs, which is to reduce GHG emissions, would be undermined. Because of their massive debt loads, India’s distribution companies cannot meet the demand for power throughout the nation. If EVs adopt this figure, it might cause an abrupt spike in power consumption, putting further strain on these companies. Because its power usage is about double that of a regular home load, fast charging significantly impacts the grid distribution network. Plugging an electric car into the power grid has its risks. Harmonic distortion, transformer failure, line resistance, line temperature rise, and adequate power consumption are all rising. On the other hand, it might damage parts of the electrical grid and consumer gadgets. Such problems might cause power outages, or even whole network collapses.

CONCLUSION

To avert this, petrol cars should be outlawed in India by 2045–50 since the National Green Tribunal (NGT), New Delhi, issued a notice to restrict diesel emissions and petrol vehicles. However, it is important to consider the state of the power grid and transmission lines and the location of the source of energy production to ensure that constant and quick charging is feasible.

To encourage more widespread use of electric cars, battery costs should be reduced to the level of a typical automotive purchase. This can only be achieved if Li-ion batteries are produced in India rather than imported from China or elsewhere. “While the market for EVs is large and growing in India, the country has a severe challenge of switching from internal combustion engine (ICE) vehicles to electric vehicle (EV) infrastructure, which requires heavy investment in research and development”. Government initiatives like FAME and NEMMP, etc., need to be revitalized by worldwide development. The adoption of EVs in India is a long-awaited and challenging endeavor toward the GOI’s 2030 goal of lowering greenhouse gas emissions and oil costs. Availability and localization of lithium-ion batteries will reduce EV prices.

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