International Journal of Innovations & Research Analysis (IJIRA)
ISSN :2583-0295, Impact Factor: 5.449, Volume 02, No. 02, April- June, 2022, pp 104-108

THE CHALLENGES IN ADOPTION OF ELECTRIC VEHICLES: AN INDIAN PERSPECTIVE

Dr. Paramjeet Singh*
Mr. Anurag Solanki**
Ms. Himadri Srivastava***

ABSTRACT

The main purpose of this study is to examine the future challenges in adoption of Electric Vehicles in India by 2030. This study looks into the research and developments conducted by the Government of India to promote the Electric Vehicle sector. The challenges have been found out by the secondary sources. These data collected and analysed, which gives a comprehensive fact regarding the scenario of electric vehicles at international market as well as in Indian market. The findings from the research are, lack of infrastructure, poor purchasing power and high costs are the main challenges in adoption of electric vehicles in India. The present research assists Government of India and various dealers of Automobile sector in India that they should be focused on the realistic plan rather than overambitious goals. The study ignores the technical hurdles while adopting the electric vehicles, which is the main limitation of this research.

Keywords: *Electric Vehicles, Challenges, Gross Domestic Product, Internal Combustion, Automobile.*

Introduction

In 2015, Paris convention Government of India as a signatory was dedicated to reduce the amount of carbon of the country's GDP (Gross Domestic Product) to 35% by 2030. Transportation sector of India is the third largest greenhouse gas emission sector, with an involvement originated from the road transport. India has around 300+ million vehicles and 30 million vehicles increasing annually. The air pollution is rising due to increasing in the number of vehicles. For controlling the growth of internal combustion (IC) of engine powered vehicles, Government of India has taken many steps such as plug-in electric vehicle. Till 2030, Government of India pledged for only electric vehicles will be used as a transportation purpose by replacing all the petrol and diesel-based vehicles. A road-map has been prepared, according to it only Electric Vehicles will be manufactured. This practice will improve the quality of environment and also will reduce the import of oils in the country. For implementing this plan the Government of India purchased. Government of India is taking many decisions for replacing the vehicles with EVs but adoption by the consumers are very slow in India (World Bank 2018; Indian Express 2018). In 2019, the government of India framed another strategy for EV adoption. They have revised the target percentage 100% to 30% till 2030. In India the Faster Adoption and Manufacturing of Hybrid and Electric

* Associate Professor, IPER College, Bhopal, M.P., India.
** Assistant Professor, Arihant Institute of Management, Indore, M.P., India.
*** Research Scholar, Amity University, Noida, U.P., India.

Vehicles (FAME II) an initiative has been taken with a revised plan which aims to contribute 1.4 billion dollars on establishing the electric vehicles ecosystem with 1 million e-Bikes, e-three wheelers, around 55000 four-wheelers and around 7500 e-transports which will be working on lithium particle batteries. The federal government has decided to send 5000 e-transport of 10-12 meters which is costing up to INR 45 million. Sharing economy is a type of financial model which include step by step activity to grant and share the services and products. In this study economy perspective sharing in the Indian economy has been examined in the context of Electric Vehicles. By sharing economy concept EV adoption can be possible. The study focused on the steps taken by the Indian government for implementation of EV adoption strategy. EV adoption strategy can be boost by the sharing economy. The study is focused on the following research questions.

Q1. What are the challenges which are the hurdles to EV adoption in India?

Q2. How to develop a strategy for discarding the fuel-based vehicles using by the Indians.

Literature Review

In early 90s the concept of electric vehicles has been familiarized but the popularity has not been turned out successfully at the time. Then the concept was reintroduced with the concentration on reuse of the energy (Kotecha,2017). The global drive during the last decade for non-hydrocarbon vehicles which have reached at the dangerous level of pollution. Reducing the pollution level were the main objective (Gupta et al, 2018, Dwivedi et al, 2019,2020). Many countries are using the alternatives of fuel for the transportation (Ayre, 2018). Many researchers have analysed the diffusion of EV technology in the perspective of Government of India's strategy and consumer awareness drive (Ahman,2006). These nations are having an active role for the advancement of EVs and are giving ideas for incorporating the Indian strategy for chieving such results. Some researchers have explored the factors which are affecting the Electric Vehicles like price, charging infrastructure, service facilities, total cost ownership, cost advantages and switching costs. The period from 2013 to 2018 witnessed the rapid speed , with the international purchasing of electric cars around 5 million in the year 2018 with a growth of 64% from the previous years (Alvucci and Tattini, 2019). In the Chinese market the growth of electric vehicle has been seen. An investigational strategy has been recognised by the Chinese researchers, around ten cities were identified to experiment the EV adoption (Chi et al, 2020; Du and Ouyang, 2013). The program has organised for positioning of EVs for the government solicitations. After that the program has extended to 25 cities (Helveston et al,2015). Various subsidies have allowed by the Chinese government for promoting the sale of EVs by the private manufacturers. Some implementations regarding battery leasing, battery swapping and fast charging at some locations are supporting by the Chinese State Grid (Yang 2010, Sharma 2019). All these efforts are making the China a biggest market of electric Vehicles and the producer of electric vehicle batteries. Truman (2015) analysed the environment of China for the utilization of Electric Vehicles and the investment which is required to boost the equivalent technology. USA EV market shown a consistent growth since last one decade in terms of vehicle and the batteries. The US government is also focusing on the infrastructure for establishing the charging stations. In Norway around 60% new EV cars sold in March 2018. (WHO World Bank, 2017).

Indian Perspective

Electric vehicle industry is at an emerging stage in India. Mahindra & Mahindra has launched first electric car in 2010 and company was succeeded to sell all these cars in that time duration. In 2013 company has again launched a new model of the same car but the new model has not been sold successfully. But according to the current situation, around five lakhs electric two wheelers and thousands of electric cars are running on the Indian roads. Sometimes the industry measurements are inconsistent and most of them are encouraged by the government. The EV adoption in India can be analysed by understanding the adoption of e-Vehicles.

Verma (2017) has reported the important points in India's target of all EVs by 2030 as delay in the innovation and technology and lacking in foundation. Verma (2017) studied that of the 1.2 billion population do not have admittance to electricity. The developers are not focused on the charging facilities. Although, Government of India claims that there is no scarcity of electricity but it is in inefficiency to distribute which is causing the apparent deficit. The CEA (Central Electricity Authority) of India has stored the energy and pinnacle power excess at 4.6% and 2.5%, separately in 2019. In the period 2017-18 around 2.1% and the general electricity shortfall has been recorded.

Identification of Challenges in the Adoption of EVs in India

The high purchase cost is the biggest reason for slow adoption of EV in India. India's disposal income is very low, with current per capita income at $ 2010 (World Bank ,2018). Among the salaried class, earning over 100000 per month created a meagre 0.2% of the country's workforce. An Automotive surveyed data shows that two-third of car purchased in 2018 were below 7 lakhs. An average cost of EV in India is around 15 lakhs compared to the normal fuel-based car is just 2 times expensive. And comparatively, there is a high price premium in comparison to the normal fuel-based vehicles. The Range Anxiety and the availability of charging infrastructure are linked with each other. The range is covered by the adequate refuelling facility and the smoothness of the vehicles. Due to unavailability of the conventional refuelling facilities a consumer may stuck in a midway which may affect to be switched towards the electric vehicles. The investors are not willing to pay the electric vehicle charging services companies so the complete expense has to bear by the company itself, there is also the reason to slow development of charging points for the EVs (Naik, 2020).

Table 1

List of Challenges	Description
Range anxiety	The travel range variation of the electric cars in full charging is 181 Km to 242 Km
High Purchase Cost	The price variation in electric cars, started from 10 Lakhs and above.
The charging challenge	In general full charging time is one and a half hours
Lack of Charging infrastructure	There are at present total charging station in India are 250
Battery Technology	India relies on the import of the battery components which is expensive
Service and Maintenance	Lack of availability of service and maintenance accessories in Indian market
Power Management	India is a power deficit country, for 1Mn EVs, assuming an average battery capacity of 30 kWh
Battery manufacturing capacity	EV battery manufacturers in India are having the potential of $ 300 billion by 2030.
Existing huge hydrocarbon-based automobile industry	Already a huge investment in the industry in India in terms of manufacturing, sourcing, service & maintenance etc
Life time cost and disposal cost	Still the uncertainty over the resale value of the EV cars
Green house and green emissions	Transport is the major provider of GHG, and EV technology is the need of the situation,

Source: Author Compilation

Objective of the Research

The prime objective of this research is to comprehend "How the Indian automobile sector can shift to Electric Vehicles by 2030.

Data Collection and Methodology

The data collected from the secondary sources which is analysed on the basis of literature review and further compiled with several reports from world bank and other government agencies. Both internal and external records are used for the results.

Efforts to Mitigate the Challenges for EV Adoption in India

Electric Vehicle industry is growing in India. The Government of India should be focused to fulfil the requirement of electricity in all parts of the country. In India around 250 million people do not have electricity. The Indian government is active towards the adoption of EV across the India but the infrastructural development is very slow. A huge investment is required for the growth of the adoption as well as the charging infrastructure is also highly required. The concept of sharing economy can be accepted for the growth in adoption. And motivate the players to manufacture the common design of the EV. There has to be an additional set up for the battery system.

Sharing Economy as a Measure for Mitigating the Challenges for EV Adoption

For the fast adoption a drive towards the shared vehicles can be useful. Initial adoption, post adoption and its implementation these are the three parameters for adopting the EVs by the consumers. A drive by the government of India and Automotive associations can lead to attitudinal change towards

the social responsibility, overcoming inertia and tackling switching the cost. Shared flexibility ser4vices model permits the operators to use the short-term transport as required. Innovative transport service such as car sharing, bike sharing etc. Another sharing option has been adopted by the Government of India to meet the challenge the higher cost under the FAME India scheme. The EESL organisation acts as a liasing agent to make the deal between the state government and Auto manufacturers. The Indian Space Research Organisation (ISRO)builds the energy efficient and cost-effective batteries for EVs. Further the Indian government is also planning for subsidies for electric battery consumptions.

Results, Findings & Implications

The study focused the leading role of the government agencies in the initial stage of the technology adoption. The study is also focused on the various players which are taking initiatives for the growth in adoption of electric vehicles. In Indian context the EV adoption can be seen in the following ways:

- Implementing proper regulations
- Financing support to the manufacturers
- Tax and subsidies initiatives for both customers and the manufacturers
- Developing the charging stations.
- Growth in power production and grid management
- Solar and non-conventional power production
- Power sharing technology
- Taxing heavily the fuel-based vehicles
- R&D efforts towards the increasing the range and reducing the charging time and the cost of the battery
- Support to the existing manufacturers for shifting to manufacturing of EVs
- Mass campaigning across the world

The GOI and its FAME II policy initiative has given many parameters suggested here still it will take a long time to be developed. The shared transport business model is at its initial phase of EV adoption. In India, a large part of population is not having the capacity to purchase four wheelers and they dependent on the two-wheelers only. The shared vehicle mechanism can be increasing the adoption of EVs in India.

Conclusion

This research is a small effort towards the initiative for the EV adoption in India which is facing many challenges. List of challenges have been identified through the literature review. Shared economy and direction towards the mitigating the challenges have been analysed. EV adoption in India can take a long time because here the basic infrastructure development in the context of electricity, manufacturing capacity, higher costs and the expenses of import of battery, the cost of battery, lower investments by the investors and many more are the big challenge. The government should take a lead role towards the development of the basic infrastructure for the electric vehicle adoption.

References

1. Chhikara, R., Garg, R., Chhabra, S., Karnatak, U., & Agrawal, G. (2021). Factors affecting adoption of electric vehicles in India: An exploratory study. *Transportation Research Part D: Transport and Environment*, *100*, 103084.
2. Digalwar, A. K., & Rastogi, A. (2022). Assessments of social factors responsible for adoption of electric vehicles in India: a case study. *International Journal of Energy Sector Management*, (ahead-of-print).
3. Jain, N. K., Bhaskar, K., & Jain, S. (2022). What drives adoption intention of electric vehicles in India? An integrated UTAUT model with environmental concerns, perceived risk and government support. *Research in Transportation Business & Management*, *42*, 100730.
4. Khurana, A., Kumar, V. R., & Sidhpuria, M. (2020). A study on the adoption of electric vehicles in India: the mediating role of attitude. *Vision*, *24*(1), 23-34.
5. Pandey, A. K., & Das, S. (2020). Exploring adoption of e-vehicles in India: an institutional perspective. *Academy of Strategic Management Journal*, *19*(1), 1-10.

6. Patyal, V. S., Kumar, R., & Kushwah, S. (2021). Modeling barriers to the adoption of electric vehicles: An Indian perspective. *Energy*, *237*, 121554.

7. Prakash, S., Dwivedy, M., Poudel, S. S., & Shrestha, D. R. (2018, April). Modelling the barriers for mass adoption of electric vehicles in Indian automotive sector: An Interpretive Structural Modeling (ISM) approach. In *2018 5th international conference on industrial engineering and applications (ICIEA)* (pp. 458-462). IEEE.

8. Sahoo, D., Harichandan, S., Kar, S. K., & Sreejesh, S. (2022). An empirical study on consumer motives and attitude towards adoption of electric vehicles in India: Policy implications for stakeholders. *Energy Policy*, *165*, 112941.

9. Shalender, K., & Sharma, N. (2021). Using extended theory of planned behaviour (TPB) to predict adoption intention of electric vehicles in India. *Environment, Development and Sustainability*, *23*(1), 665-681.

10. Tarei, P. K., Chand, P., & Gupta, H. (2021). Barriers to the adoption of electric vehicles: Evidence from India. *Journal of Cleaner Production*, *291*, 125847

11. Verma, M., Verma, A., & Khan, M. (2020). Factors influencing the adoption of electric vehicles in Bengaluru. *Transportation in Developing Economies*, *6*(2), 1-10.

12. Vidhi, R., & Shrivastava, P. (2018). A review of electric vehicle lifecycle emissions and policy recommendations to increase EV penetration in India. *Energies*, *11*(3), 483.

❑❍❑