

Electric Vehicles: The Green Transport for Future

Suman

Asstt. Prof.

Electrical and Electronics Engg.

Panjab University SSG Regional Campus, Hoshiarpur, India

Abstract: The world wide automobile market offers more buying options in 2017-18 than in any year before, due to different styles, sizes, quality and luxury levels etc. and thus, they are becoming the main source of air pollution. Polluted air causes many problems like: (1) It increases the emission of harmful gases in the environment, thus enchasing the green house effect. (2) It increases the health relating problems such as cancer, respiratory, heart disease and other serious ailments due to poor environment. According to literature survey, this vehicular emission increased 84% by 2030. Thus, the growing threat of global warming, ever increases prices of fossil fuels (petrol, diesel etc.) and driving trends compel us to develop electricity based driven vehicles called electric vehicles. Electric vehicles causes zero emissions. So, it is a nice gesture from environmental perspective to choose for an eco-friendly driving machine. Aim of this paper is to give scope of the electric vehicles in present and future market, government initiatives to promote electric vehicles, its benefits and challenges. The main objective is to save nation and world from vehicular pollution.

IndexTerms – EVs (Electric Vehicles), Faster Adoption and Manufacturing of Electric Vehicles (FAME), ICE (Internal Combustion Engine), National Electric Mobility Mission (NEMM), Society of Manufacturers of Electric Vehicles (SMEV), VAT (Value added tax)

I. INTRODUCTION:

Transportation is back-bone of every nation. Today, the transport sectors represent a critical percentage of green house gas emissions and this emission increased 84% by 2030. Therefore, it is necessary to develop and search alternative energy source to the fossil fuels. Key technologies such as electric vehicles, hydrogen fuel cells and bio-fuels are expected to reduce the CO₂ emissions in the long run. The first electric vehicle was developed around 1832 by the British inventor, Robert Anderson. Electric Vehicles (EVs) are based on electric drive system. Electric vehicle has an electric motor and a large battery, whereas in conventional (ICE) type of vehicle has piston engine and piston tank. Recently, there has been massive development and research work carried on in both academic and industry level. To promote electric vehicles, many countries provide incentives to users like free parking; free charging facilities, lower tax or tax exemption etc [1][2]. The economic survey report indicates that switching from current vehicles (based on petrol, diesel etc.) to an entirely electric vehicles help to reduce 1gigatonne of CO₂ emissions by 2030 and can save billion of money by not purchasing fossil fuels.

The objective of this paper is to provide an overview of the current development of electric vehicle and suggest the future development in this field. Further, it guides many consumers to buy an electric vehicle by giving necessary information about its benefits over conventional one.

II. SCOPE AND RECENT DEVELOPMENT OF ELECTRIC VEHICLES:

The world-wide automobile market offers more buying options than in 2017-18 any year before, due to different styles, sizes, quality and luxury levels etc. While picking up vehicles on the market, the EVs are more in the game than ever before. Globally, the number of electric vehicles sold each year increases rapidly from 45,000 units in 2011 to more than 3,00,000 units in 2014. The United States of America held the largest share with more than 404 EVs in the world. China occupied second position with slightly 312 EVs and Japan held third position with about 126 EVs. Other significant e-mobility countries are Norway, France, United Kingdom and Germany etc. According to Global Automotive executive survey 2015, done by KPMG international, it is expected that one vehicle out of 20 will be electric vehicle by 2020. Globally 3,50,000 electric cars were registered last year, out of which 1,17,000 cars were registers in United States of America and 5600 in China [3]. The electric vehicle market in India is far behind. In India, roads are dominated by conventional vehicles (ICE). There are approximately 0.4 million two wheelers out of which a few thousands are electric only. At present, out of 35 polluted cities in the world, 19 cities are in India. For the last two years, New Delhi is the most polluted city in the world. According to Green peace India report, approximately 60-90% of the pollution is due to vehicles only. A market intelligence firm BIS indicates, the slow rate of adoption of EVs in India is high cost of batteries and cars, lack of infrastructure, government support and incentives etc. Due to explosive economic growth in the last few decades in India, The EVs market shows some good remark [4]. According to the latest data obtained from Society of Manufacturers of Electric Vehicles (SMEV), 56,000 units of EVs were sold in India till April 2018. In 2015, the government had launched a scheme named Faster Adoption and Manufacturing of Electric Vehicles (FAME) under the National Electric Mobility Mission (NEMM). Through this scheme, the government had planned to assign grant up to \$16 million to cities with more than a million populations for purchasing electric vehicles in FY 2018. Meanwhile, the Centre government has extended the period for the FAME-I India scheme to March 31, 2019 or till a notification of FAME-II.

In August 2017, the minister of state for Power and Renewable energy, Piyush Goyal had indicated that, the Niti Aayog was co-coordinating with various government ministers to

create a plan to ensure the only EVs should be on sale in India by 2030. Many manufactures companies such as Honda, Hyundai, Mahindra and Mahindra, Nisan, Maruti, Tata and Toyota are also showing an interest in e-vehicles market. Honda planned to invest \$1.2 Bn to set up an EV factory in Gujarat. The company managing Director Vinod k. Dasari indicated , that the first electric vehicle plant manufactured by Hinduja Group flagship, Ashok Leyland is ready in Chennai and it will run in Gujarat during “ Vibrant Gujarat “ (Global summit) in January 2019.

MG Motor India planned to rollout a locally manufactured electric SUV by the first half of 2020 at its Halol plant in Gujarat. Allianz Technology India is the first mover to operate an e-car fleet [5]. They have added five electric vehicles to its employee cab fleet at Techno Park in Thiruvananthapuram. Moreover, Kerala government planned to have 100% electric vehicles on its road by 2030. The above discussion reveals that, the government is working towards encouraging the adoption of EVs in the Indian market.

III. BENEFITS OF ELECTRIC VEHICLES:

The government and manufacturers of different countries are providing many benefits, in form of subventions and incentives, to promote the sale of electric vehicles and replace the conventional vehicles system to reduce dependence on oil imports [6][7].

- 1) **Direct subsidies:** The word direct subsidy means onetime bonus given upon the purchase of a new EV. This subsidy is still not widespread and only few buyers in some countries are taking the advantage of such subsidy. Like:
 - Europe, France gives onetime bonus of 7.00 EUR to their residents for vehicles emitting less than 20 g/Km of CO₂ and 5.00 EUR for the vehicles producing CO₂ between 21- 50 g/Km respectively.
 - Japan gives incentive of 850.00(about 6.30 EUR) on the purchase of EVs.
 - China gives incentives between 35.00 to 60.00 RMB (about 4.20 to 7.20 EUR) to their citizens on buying only EVs.
 - Under the scheme FAME-I, Indian government is planning to assign grant up to \$16 million to their citizens with a population of more than a million for purchasing EVs.
- 2) **Fuel cost savings:** Fuel cost savings is another type of benefit which is not directly granted by the governments. The electricity prices required to power EVs are significantly less as compared to that of fossil fuels. Moreover, electric vehicles have higher efficiency as compared to conventional one. In European countries, a 100Km trip performed by an EVs roughly save 20-25% fuel cost as travelled by a conventional cars.
- 3) **Free parking and free charging facilities:** To promote the sale of electric vehicles many countries provide free parking and free charging facilities to their citizens.
- 4) **Fiscal incentives:** Fiscal incentives include some or total exemption from annual tax and/or reduced purchase cost. There are mainly 3 categories of these tax as:
 - The first type of fiscal incentive is VAT (Value added tax), which globally differ roughly from 5 to 25 % of the base price on any newly bought EVs.
 - Second tax is one time purchase or registration tax, which is charged in many markets on top of the VAT on the purchase price of the vehicle.
 - In some countries, the local government charge annual circulation owner ship tax on a yearly basis from their vehicles owners. Some markets are getting benefits of incentives by putting exemptions on such type of tax in case of EVs. Like Germany granting a 10 years annual circulation tax break for their citizens , on purchase of electric vehicles.

IV. ADVANTAGES OF ELECTRIC VEHICLES OVER CONVENTIONAL TYPE:

Followings are the advantages of EVs over conventional type:

- 1) **Zero emission:** The main advantage of any electric vehicle over combustion engine is its zero pipe emissions. According to economic survey conducted report indicates that switching from current vehicles (based on petrol, diesel etc.) to an entirely electric vehicles help to reduce 1gigatonne of CO₂ emissions by 2030 and can save billion of money by not purchasing fossil fuels. Another fact is the reduction of noise caused by the traffic, as the EVs are easier to start, quieter and less smelly than petrol/diesel cars.
- 2) **Less fuel cost:** The fully electrically powered vehicles have low fuel cost .Moreover, the price and consumption of KWh of EV's is very less as compared to petrol/diesel driven vehicles.
- 3) **Higher efficiency:** The average efficiency of today's combustion engines lies between 25-35 % because conventional engines include friction, fuel pumping, accessory loads, thermodynamics energy losses etc. On the other hand, electric vehicles have higher efficiency at least 90% as compared to conventional one.
- 4) **Maintenance and repair costs:** The maintenance and repair costs of EVs are very less as compared to conventional type.

V. BARRIERS AND CHALLENGES FOR ELECTRIC VEHICLES:

- 1) **Range and batteries:** The major barrier for buying any EV is the distance covered by fully charged car, which is much lower than for any fully tanked conventional automobile. The EV is only able to travel approximately 80-160 KM on a single charge. It means, for shorter like journey to the work place, school, stores and grocery, the e-car range is sufficient. Moreover, EV battery is very costly, short life (less than 3-4 years), large in size, complex and rechargeable. Thus, the limited range and high cost of batteries are the major obstacles for the consumers to purchase EVs.
- 2) **Charging Facilities:** When someone buys an electric car, his/her basic need is to have the possibility to charge it conveniently. Majority of the people usually charge their car batteries during night. Most of the people park their cars in the street and they do not have public charging point in their living area. Although the numbers of charging stations are increasing, still it is less as compared to the petrol/diesel stations. The charging time is another issue, so there is a need of developing rapid chargers, which charges the battery within less than an hour.
- 3) **Purchase cost:** The purchasing cost of electric car is much higher than any other conventional type. The reason for electric car being so expensive is mainly its battery price. For example the selling price of fully electric Chevrolet Bolt car with battery capacity 60KWh is around 37.495USD in the United State. In India a typical electric car cost is around INR 0.5-0.6million which is approximately 2.5 times higher than a conventional car.

Thus, the above said facts are hindrance the developments of EVs markets. But, the government should work on the challenges to increase electric vehicles.

VI. CONCLUSION: Electric Vehicles are one of the best options for transportation. In this field, U.S. has maximum percentage of electric vehicles as compare to other country. Central government should encourage international market players to make case studies on potential locations, parking space requirements, charging facilities, energy production, transmission and distribution scheme requirements. Instead of direct involvement of government body, private players, innovators, entrepreneurs, manufacturer and regulators must work together to maintain the new business models for successful adoption of electric vehicles in the whole world.

REFERENCES

- [1] Harish , M.2012.A study on air pollution by automobiles in Bangalore city. Management Research and Practice, 4(3):25-36
- [2] S.K.V.Muralidhar , K. Manoj , G.P.Veerendra and N.Karthik .2016.Trends and Challenges in Electric Vehicles. International Journal of Innovative Research in science , Engineering and Technology.5(5):8589-8596
- [3] Ranbir, S. and Yogende.2012. A study of Vehicular pollution. International Journal of Latest Research in Science and Technology.1(2), 231-235
- [4] CHENG.K.W.E.2009.IEEE International conference on Power Electronics Systems and Applications.
- [5] Level of RSPM in city air above permissible limit, News article published in Indian Express on June 5, 2017.
- [6] Anumita,R .Ruchita and B.Vivek,C.2014. Workshop on clean air and sustainable mobility. A joint initiative of Chandigarh Administration and Centre for Science and Environment, Chandigarh
- [7] Thamizh Arasan and V. Dhivya, G. Measuring Heterogeneous Traffic Density. World Academy of Science, Engineering and Technology, 4-6