International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 11 | Nov 2020 www.irjet.net p-ISSN: 2395-0072

Review of Electric Vehicle Infrastructure Market Sustainable Growth in Indian Scenario, Needs and Suggestions

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Abstract - *Report by Frost and Sullivan mentions that Indian Electric vehicle market will accelerate by 7% in 2019-20. Honda has announced one electric vehicle model by 2020 and has plans to launch a B segment vehicle in India by 2023. Certainly, Indian Automobile Industry will see many changes and challenges in the near future. Electric Vehicle (EV) technology will have impact on other infrastructure industries like electrical grid, road side electric vehicle charging stations among many others. EV mobility is the new change that the Indian automobile industry is going through. EV mobility will impact the urban as well as the rural landscape in terms of infrastructure. EV charging load will be random and will certainly impact the grid. Promotion of renewable energy at load centre, such as Solar Photo Voltaic or Wind Mill installation will most likely be observed. Electrical infrastructure capacity has to be increased. Such capacity building is an investment and energy is revenue. As vehicle sharing has been well received by Indians; the paratransit options such as Ola, Uber will be equipped with common charging stations. New smart cities will have to be allocated certain space for vehicle parking and charging stations. This paper reads about what infrastructure changes might occur in Indian scenario for sustainable development; by using Multi Criteria Decision Analysis (MCDA) technique to understand how to consolidate the decisions.*

Key Words*: *Charging stations, Electric Vehicles, Electric Mobility, Infrastructure, Multi Criteria Decision Analysis, Renewable Energy

1. INTRODUCTION

With the increasingly severe environmental problems around the world, exploitation of clean and renewable energy has been a crucial topic. As indispensable transportation in modern society, vehicles are ubiquitous but also one of the main sources of pollutants. Because of their status, it is almost impossible to decrease the volume of vehicles. One solution to lowering emissions is the electric vehicle, [3]. Overall, the electric vehicle is more energy efficient, environmentally friendly, and cleaner than the vehicle that relies on fossil fuels [4], especially when smart grids have become omnipresent. By popularizing the electric vehicle, the environmental and economic costs of vehicles can be significantly reduced. Hence, the electric vehicle has attracted the attention of academia as well as industry in the recent decades [8]. With the development of the electric vehicle, the techniques of charging piles- which are an essential component in the electric transportation system- have rapidly progressed as well [9]. Most of the automobile manufacturers around the world have paid a large amount of financial resource to the research of charging piles, since the charging technique is, to some extent, key to the success of the electric vehicle. Charging infrastructure needs standardization for the benefit of society is what the investigation of a study conducted in Spain presented Analysis of fiscal policies has been important due to conflicts of interests between different stake holders such as the government, consumers, oil companies, automakers and environmentalists as is observed.

1.1 Analysis of Electric Vehicle Penetration in Indian Scenario

Electric Vehicle can be availed by many when it has improved technology, reduced prices, extensive marketing and alternatives in use. Biggest concern which shall be taken in consideration while acquiring market in India are battery range, costs, charging infrastructure with reliability and safety. Different States can also adopt EV's if charging infrastructure is adequate due to this purchase decision will be high.

There is no significant relationship between perceived existence of one charging station and PEV interest, however there is a weak yet significant relationship between perceived existence of multiple charging stations and PEV interest. Investigation of whether visibility of public chargers has an impact on PEV demand. Survey analysis on PHEV market penetration to reveal quantitative patterns and correlations.

Advertising up-front incentives may be more effective than advertising longterm fuel savings • Targeting advertising and marketing towards progressive and environmentally concerned citizens may be more effective than those for a general audience. Displaying EV fuel savings in gallons, rather than dollars, may be more persuasive.

1.2 Discussion on ways of analysis of EV in Indian Scenario

Table -1: Different ways to analyse Electric Vehicle penetration in Indian scenario

Theme	Parameter 1	Parameter 2	Parameter 3
Biggest concerns of Electric Vehicles	Is the battery range	Their costs	Their charging infrastructure
Fiscal Benefit is when	Subsidy can be availed	Registration tax is reduced	Value Added Tax can be reduced
Different scenarios can be studied when	No policy implementation is seen	Current policy is better or otherwise	Extended policy betters the sustainability aspects
Electric vehicles can be availed by many when	It has extensive marketing	It has a competitively priced alternative	It has improved technology
Adoption of EV's in India is possible	Charging infrastructure is adequate	Policy implementation are better	User purchase decisions are high

1.3 METHODOLOGY & RESULTS

Chart -1: Name of the chart

Methodology looks to find out the barriers for the EV policy. The step ahead comes to find out the various factors influencing the barriers and drivers for the adoption of the EV technology and last step finds out the various stake holders that are a real support for the EV penetration in India. Financial incentives, urban density, level of education, environmentalism indicator, fuel price, EV price, the presence of production facilities, per capita vehicles, model availability, introduction, date, charging infrastructure, and electricity price have been the key factors selected in the research work as suggested by Sierzchula et al. in 2014, but its application in the Indian scenario can be an area of discussion. Methodology can use logistic regression under the more conservative assumption that the response variables are ordinal. It aims to keep focus on data quality. The methodology plans to observe only the experts with an unbiased approach. Statistical methods can show correlations and relationships between the categorical survey data can be performed. These methodologies can be used to show how EVs can be made more sufferable in Indian scenario. There are many areas of studies for Electric Vehicle and its allied research. Battery Technology, Routing of Charging Infrastructure, Electrical grid and impact of Electric Vehicle on it and many more Electric Vehicle incentives and many more areas can be explored. Indian Transportation market is different and light motor vehicle market can be analysed.

3. CONCLUSIONS

These are the few methodologies that can be applied for the wholesome understanding of how EVs can percolate in Indian markets. Only financial subsidy will not be sufficient for the actual take off for the Electric vehicle market in India. Besides the financial benefits, social benefits also go hand in hand with EV adoption. Overall health of citizens will improve and fossil fuel consumption will be reduced due to EV adoption. Yet, essential parameters need to be considered and a thorough study has to be done to propose precise solutions for EV adoption. As a future scope of research, the current study proposes to analyse scenarios for EV adoption considering that no subsidies would be provided for EV adoption as this may be a challenge in the percolation of EVs in the market.

To achieve the goal of smart city mission, we have to look at smart transportation and smart grid and both are connected to Electric Vehicle adoption in the market. The current paper is useful for giving way to a new thought and new ideas and segregation of methodologies for the same which has been lucidly mentioned.

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