ROLE OF INCENTIVES IN PROMOTING ELECTRIC VEHICLE AMONG INDIAN CONSUMERS

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Abstract– In recent years, transportation system has played an important role in everyone's life and has become an integral part of their life. Frequent travels related to work and leisure has become a common phenomenon and with growing prosperity this trend is going to continue. As the use of automobiles is increasing, this creates demand pressure for fuel, because of that prices of fuel get also boost up which ultimately affects the environment. Over the past few years, fluctuate price of fossil fuels, technology improvement in motor and battery technology, climate changes have accelerated the need for electrification of transportation. Realizing the potential in Alternate Energy Transport, the Indian Government also launched Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME) scheme to provide incentives for two wheelers and four wheelers. This scheme is part of NEMMP and expected to provide support of Rs. 795 crore for the financial year of 2015-16 and 2016-17. This study attempts to find out the role of such incentives in the promotion of Electric vehicle. It was found that, infusion of capital support and government subsidies can play a key role in acquiring the new customers and establishing the market for electric vehicles in the Indian market. Various subsidies such as exemption from local and state tax, waiving the road tax, exemption from toll taxes and parking charges, access to bus lanes can push the demand for such vehicles.

Keywords – Electric Vehicle, Incentives, Tax Exemptions, Public Policy, Alternate energy transport.

I. INTRODUCTION

There is a growing population in India with the major growth within the urban population in major cities. This rising growth causes pollution concern through an increase in the use of motorized vehicles within the urban environment. The large-scale urban migration of people from rural areas also puts high pressure on the infrastructure of large cities such as New Delhi, Mumbai, and Bangalore. To reduce the pollution levels and the carbon emissions caused by the use of motorized vehicles, the government of India has initiated various programs to support the growth of EV in Indian Market. Compared to the more developed solutions used by EU, US or Japan, Indian companies currently use low-tech solutions for E-mobility. There is a desire to develop a domestic market for design and manufacture of electric/ hybrid cars and sub-system components by the Indian government (Global Opportunities for Electric Mobility: India, 2015).

The growth potential of electric/ hybrid cars is yet to be realized in India, probably because they are considered to be not only expensive to buy, but also to maintain. The Indian Government has also launched NEMMP 2020 to promote electric vehicles in the Indian market. If this plan is implemented successfully, then Indian government will be able to save 9500 million tons of fossil fuel which are worth of Rs. 62,000 crore ("National Electric", 2015). Indian Government has planned to invest approximately Rs. 14,000 crores in next 5 to 6 years with an additional investment of Rs. 8,000 crore, which will be pooled from automakers ("In a Nutshell", 2013).

The Industry is almost ready for a take-off with the support of incentives. It is expected that NEMMP will be implemented within a year and with that, the Industry may witness a quantum leap in volumes and technology. Society of Manufacturers of Electric Vehicles (SMEV) sees a great opportunity with EVs in reducing the Carbon footprint, dependence on Crude oil imports, creating jobs and building a new Technology knowledge hub in India.

The electric vehicles industry is at a nascent stage in India. EVs currently accounting for less than 1% of the total vehicle sales have a potential to grow to more than 5% in few years. At present, there are more than 4, 00,000 electric two wheelers and a few thousand electric cars on Indian roads ("High Vat", 2014). The industry volumes have been fluctuating, mostly depending on the incentives offered by the government. Many serious players (Hero Eco, Mahindra Reva, Electrotherm, Avon, Lohia, Ampere etc) are continuing with the mission and trying to enforce the positive change.

More than 95% of electric vehicles on Indian roads are low-speed electric scooters (less than 25km/hr) that do not require registration and licenses (Bhakta, 2015). Almost all electric scooters run on lead batteries to keep the prices low. Besides government subsidies, battery failures and low life of batteries have become major limiting factors for uptake of low-speed scooters. Mahindra Reva is the only electric car manufacturer in India, and their new model E2O runs on lithium batteries. Manufacturers

like Mahindra Reva and Hero have taken initiatives to install charging stations (Mahindra Reva Electric Vehicles Pvt. Ltd, 2013), but at limited places. Players like Lohia and Electrotherm have developed Electric three wheelers. Ampere and Hero have entered Electric Cycles segment. Large adoption of such vehicles is yet to be adopted in theIndian market.

Mass use of electric vehicles has two major advantages- cut in dependency on imported fuel and cut in pollution level. Use of Thermal power helps in the first point as we have a good reserve of lignite and coal; but, it certainly takes away the benefits of electric cars regarding pollution level. On the other hand, Hydel power does not come without permanent damage to ecology and increasing the risk of natural disaster. Though nuclear power is free from these disadvantages, concerns regarding safety and political opposition will remain major roadblocks. But, India has huge potential in wind and solar energy. We are already among top five or six countries and probably within top three (after USA and China) within this decade. And it is less time consuming to install the wind or solar power projects. So, we can expect the balance will shift towards cleaner sources of electricity in future.

However, Electric or hybrid vehicle has some limitations such as:

- No continuous supply of electricity in India
- No charging points in markets and petrol pumps.
- Govt. will loose tax income on petrol/diesel if these cars get popular in India.
- Expensive electricity.
- General awareness among the public in India about hybrid and electric cars.
- High maintenance cost of these cars, as it cannot be serviced/ repaired by a roadside mechanic.

II. LITERATURE REVIEW

Cao (2004) highlighted that post energy crisis of 1973 in the U.S., the government is putting all efforts to control the energy consumed by the transportation departments and has introduced several policies to reduce the energy use. Some of such initiatives were, “reducing individuals’ dependence on personal vehicles, and promoting higher average vehicle fuel vehicles”. However, these policies were not very effective because there was a mismatch of needs among the policy formulators and the individuals. As a result, the sale of light duty trucks which includes SUVs and minivans were increased post-1988. On the other side, Energy Policy Act of 1992, encouraged the use of alternate energy vehicles to cut the dependence on oil import and preserve it for coming generations (Cao, 2004).

Nixon & Saphores (2011) explained that financial attributes are universally observed in “stated-preference studies” which includes, “Vehicle buying price, fuel cost, and maintenance cost”. There were few other benefits which were discussed such as, “Tax encouragements or sponsorships, free parking,and commute costs, involving access to express lanes”. The purchase price for the vehicle and its on-going costs are the key factors which can drive the growth of EV industry (Nixon & Saphores, 2011).

It was mentioned by authors Gallagher & Muehlegger (2011) in their report that tax incentives provided by states are correlated with the adoption level of hybrid vehicles. Co-efficient related to “income tax credits and sales tax waivers” were examined and it was concluded that incentives are linked to the sale of hybrid vehicles. Based on the various estimations, it was concluded that “sales tax waiver of the mean value ($1,037) is associated with over thrice the effect of an income tax credit of mean value ($2,011)”. Based on the values associated with incentives, it was estimated that waivers related to sales tax can boost the sale of hybrid vehicles by ten times. The authors also found that access related to “single-occupancy” is less correlated with adoption of EVs. However, prices of petrol are significantly correlated with the sale of hybrid vehicles. “For high fuel-economy hybrids, they have estimated that the cross-price elasticity of demand with respect to retail petrol price is 0.86”. (Gallagher & Muehlegger, 2011).

For EV, non-financial attributes such as, “vehicle range between refueling (or recharging’s, in the case of Electric Vehicles), accessibility of fuel or recharging locations, and vehicle performance (e.g., acceleration, top speed)” are the reasons mentioned in most of the literature related to stated preferences. Other non-financial attributes are considered including, “dual-fuel capability, refueling time, boot space limitations” for storage related issues, and the number of existing EVs in the consumer’s geographical region.Findings suggested that for adopting EVs range and kind of fuel availability are key limiting factors, after monetary concerns. Even though consumers understand the environmental benefits of EVs and generally have an optimistic attitude toward them but they are unwilling to give up average features of conventional vehicles (Ewing and Sarigöllü, 1998).Likewise, in the study of EV preferences among Southern California residents, it was noted that the importance of vehicle range, particularly when the EV range is noticeably less than that of a conventional gasoline-powered vehicle (Bunch et al., 1993).

Other incentives such as waiver in sales tax, rebate in income tax etc. were announced in US markets to attract more customers (Gallagher & Muehlegger, 2011). However, upfront incentives are most effective in US markets. (Diamond, 2009). In another research, incentives related to direct monetary benefits, charging infrastructure and in-house availability of

production facilities have a significant impact on the sale of Electric vehicles. (Sierzchula, Bakker, Maat, & van Wee, 2014). In asimilar line, tax credits were introduced in 2009 by thefederal government of U.S. (Skerlos & Winebrake, 2010).

III. OBJECTIVE

This study was conducted to understand the awareness level among young professionals in India related to alternate energy transport (AET) and the role of incentives in thepromotion of electric vehicle.

IV. RESEARCH METHODOLOGY

Data was collected from the students of Babasaheb Bhimrao Ambedkar University, Lucknow through astructured questionnaire. 75 students participated from 3 departments –Department of Management studies, Department of Environmental Science, Department of Education and shared their views on Electric Vehicle. The descriptive analysis was done by using frequency distribution and cross tabulation in the Statistical Package for the Social Sciences (SPSS version 22) software. Frequency tables and cross tabulation were constructed to display results with respect to research objectives.

Demographics Characteristics

In the study, students were targeted to understand their perception on government incentives and how these incentives are controlling the Electric Vehicle market. Data in table 1 highlights that 64% of the total respondents were female and 36% were male. 12% of the respondents were doing bachelor's degree, 73.3% were doing their masters and 14.7% were doing their doctoral studies. 10.7% of the respondents shared that their family income is less than 1 lakh per month, 49.3% were having ayearly bracket of INR I lakh to 3 lakh, 20% were earning between 3 lakh to 5 lakh. 13.3 of the respondents were in the income bracket of 5 lakh to 8 lakh, 6.7% of the respondents were in theincome bracket of 8 lakh to 12 lakh, however, there were not even a single respondent whose family income was more than 12 lakh per annum.

82.7% of the respondents were in the age group of 18-25, 16% were from the age group of 26-30. Only 1 respondent was between theage group of 31-40. The average family size of the respondents was more than 3. If we see the data, it clearly highlights that 54.7% of the respondents had afamily size of between 3 to 5, 44% of the respondents were having afamily size of more than 5 members and only one respondent had 2 members in his family. This clearly shows that those family members whose family size is more than 5 cannot be considered for the Electric Vehicle until and unless the vehicle has more than 5 seats and falls in the segment of multi-purpose vehicle.

Table 1: Socio-Demographic Information of the Respondents

Particulars	Variables	Count	Percent
Gender	Male	27	36.0%
	Female	48	64.0%
Education	Under Bachelor	0	0.0%
	Bachelor	9	12.0%
	Master	55	73.3%
	Other	11	14.7%
Yearly Income Level	Nil - 1 Lakh	8	10.7%
	1 lakh to 3 Lakh	37	49.3%
	3 lakh to 5 Lakh	15	20.0%
	5 lakh to 8 lakh	10	13.3%
	8 lakh to 12 lakh	5	6.7%
	Above 12 lakh	0	0.0%
Age Group	18-25	62	82.7%
	26-30	12	16.0%
	31-40	1	1.3%
Family Members	Upto 2	1	1.3%
	3-5	41	54.7%
	More than 5	33	44.0%

V. RESULTS

Consumer perception on Govt. Incentives

Table 2 highlights thatthe respondents were interested in receiving the direct incentives for electric vehicle market. 82.7% of the respondents were interested in receiving the exemption from emissions testing. 70.67% were interested in getting the Exemption from commercial tax, 68% of the respondents shared that they will not like to give registration fee for electric vehicle. 64% of the respondents were interested in getting the bonus payments for EV buyers, the same number of respondents were interested in getting the exemption from road tax. Respondents also shared that the Electric vehicle should be exempted from toll tax. The percentage of such respondents was 62.67%.

Table 2: Direct incentives

Type of possible Direct incentives	Responses	Count	Percent
Bonus payments to EV buyers	Yes	48	64.00%
	No	27	36.00%
Exemptions in toll tax	Yes	47	62.67%
	No	28	37.33%
Exemption for road tax	Yes	48	64.00%
	No	27	36.00%
Exemption from Registration fees	Yes	51	68.00%
	No	24	32.00%
Exemption from commercial tax	Yes	53	70.67%
	No	22	29.33%
Exemption from emissions testing	Yes	62	82.67%
	No	13	17.33%

Table 3 highlights that respondents were also interested in getting the indirect incentives for Electric Vehicles. Respondents shared that the government should introduce car exchange program for EVs so that the buyers gets assured buyback. 66.67% of such respondents were interested in car exchange program which can be introduced in 10 years of the vehicle purchase date. 66.27% of the respondents were interested in free charging in public space for EVs. Respondents were also concerned for the battery life. More than three-fourth of the respondents were interested in battery buyback guarantee program. Respondents shared that the incentives will push the sale of EVs in near future.

62.67% of the respondents were interested in getting the free parking space for EVs.

Table 3: Indirect Incentives

Type of possible Indirect Incentives	Responses	Count	Column N %
Car exchange program after 10 years	Yes	50	66.67%
	No	25	33.33%
Free charging in public space	Yes	47	62.67%
	No	28	37.33%
Battery buyback guarantee	Yes	57	76.00%
	No	28	37.33%
Free parking space	Yes	47	62.67%
	No	28	37.33%

Government Support for Encouraging the Electric Vehicles

Table 4 highlights that there are many factors by which government can support and encourage the sale of EVs. When the questions were asked related to subsidy, 66.67% of the respondents were in favour of getting the direct subsidy. 66.27% of the respondents were not in favour of providing the subsidy to manufactures to promote the EVs in market. Respondents also shared that government should provide infrastructural support to the consumers by installing charging stations. More than 80% of the respondents shared that government should ensure sufficient supply of electricity for each family and build road network to support the operations of Electric Vehicles.

Table 4: Government support for encouraging the Electric Vehicles

Variables	Responses	Count	Column N %
By providing subsidy to consumers	Yes	50	66.67%
	No	25	33.33%
By providing subsidy to manufacturers	Yes	28	37.33%
	No	47	62.67%
Through infrastructural support by installing charging stations	Yes	53	70.67%
	No	22	29.33%
By building road network to support the Electric Vehicle	Yes	64	85.33%
	No	11	14.67%
Ensuring sufficient supply of electricity for each family	Yes	62	82.67%
	No	13	17.33%

Environmental Issues

In table 5, results of respondents are summarized. Respondents agreed with the statement that by using public transport other than a car can help in preserving the environment. Only 1.3% respondents strongly disagreed with the above mentioned statement. 37.3% of the respondents agreed that they are currently trying their level best to reduce the car use, only 1.3% of the respondents strongly disagreed with the statement. 54.7% of the respondents agreed that automobile is necessity for them, 40% of the respondents are using the car for maintaining their status in society. 44% of the respondents disagreed with the statement that public transport is easy to use. Public transport need to be strengthened to encourage the society for using the public transport.

29.3% respondents agreed with the statement that EVs are expensive in existing market. They also felt that network of charging facilities is a prerequisite for the diffusion of EVs, 52% of the respondents agreed with the above mentioned statement. 32% of the respondents disagreed with the statement that there is no need to reduce car use if they own an EV. The reason for such outcome might be the source of the energy. They are worried about whether the energy source for EV are generated from clean energy or not. 41.3% of the respondents shared that they agree with the statement that in near future, the prices of EV will fall in near future and more than half of vehicle in India will be replaced by EVs in 20 years. This outcome also related to the government vision of creating the Indian automobile market self-sustainable by 2030 by replacing the fossil fuel vehicles with electric vehicle or hybrid vehicle.

Table 5: Views on various environmental issues

Variables	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Using public transportation other than a car helps preserve the environment	44.0%	41.3%	10.7%	2.7%	1.3%
I am currently trying my best to reduce car use	33.3%	37.3%	16.0%	12.0%	1.3%
An automobile is a necessity for me	8.0%	54.7%	17.3%	17.3%	2.7%
Automobiles represent status in society	18.7%	40.0%	13.3%	18.7%	9.3%
Public transport is easy to use	26.7%	13.3%	12.0%	44.0%	4.0%
EVs are expensive in existing market	16.0%	29.3%	26.7%	22.7%	5.3%
A network of charging facilities is a prerequisite for the diffusion of EVs	20.0%	52.0%	21.3%	5.3%	1.3%
There is no need to reduce car use if I own an EV	16.0%	26.7%	17.3%	32.0%	8.0%
There will be a fall in EV prices in the near future	16.0%	41.3%	28.0%	10.7%	4.0%
More than half of vehicles in India will be replaced by EVs in 20 years	18.7%	44.0%	29.3%	8.0%	0.0%
Cells highlighted in green color represents the highest percentage					

Awareness aboutNational Electric Mobility Mission Plan(NEMMP)

When we asked the respondents whether they are aware of the government scheme for promotion of electric vehicles, 17% of the respondents shared that they are not aware of such schemes. 62% of the respondents shared that they have heard about the scheme but require more information about it. Only 21% of the respondents were aware about the NEMMP scheme, even though they are not able to

recall the full name of the scheme. Data shows that there is need to promote the scheme within the city so that the EV market shared can be increased.

Awareness about National Electric Mobility Mission Plan

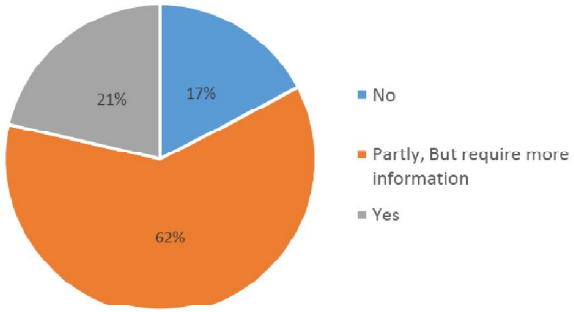

Figure 1: Awareness about National Electric Mobility Mission Plan

Role of State and Central Government

Figure 2 highlighted that the government should encourage the EVs by policy formation. 81% of the respondents were in favour that the government should formulate the policy for public and private sector. 17 % of the respondents shared that the policy should promote the EVs in public transport. Only 2% of the respondents did not find the current policies worth enough which can promote the electric vehicle in the market.

Encouragement for electric vehicles by state and central government

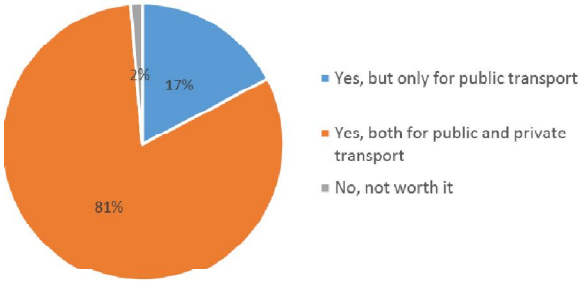

Figure 2: Encouragement for electric vehicles by state and central government

FINDINGS AND CONCLUSION

This study was conducted to understand the awareness level among young professionals in India related to alternate energy transport (AET) and the role of incentives in the promotion of electric vehicle. The literature review section highlights the different type of incentives and how they play a role in developing the market for EV across the world. It also highlights the role of government policies and regulation in promotion of such technologies.

It was found that those family members whose family size is more than 5 cannot be considered for the Electric Vehicle until and unless the vehicle has more than 5 seats and falls in the segment of multi-purpose vehicle. 82.7% of the respondents were interested in receiving the exemption from emissions testing. 70.67% were interested in getting the Exemption from commercial tax, 68% of the respondents shared that they will not like to give registration fee for electric vehicle.

Respondents shared that the government should introduce car exchange program for EVs so that the buyers gets assured buyback. They also highlighted that there is no scope of the resale value of EVs. They are high cost, low distance vehicles. Battery life is a real problem with EVs. The key role is played by the battery. The performance of the battery is always doubtful. The charging time is big. The battery is discarded after a certain period. There should be a system to get the already charged battery from various points from where the commuters can easily exchange their battery. The design and utility of the EVs need to shape and reshaped in a competitive atmosphere so that it can compete with the gasoline vehicles.

More than 80% of the respondents shared that government should ensure sufficient supply of electricity for each family and build road network to support the operations of Electric Vehicles. Data shows that there is need to promote the scheme within the city so that the EV market shared can be increased. 62% of the respondents shared that they have heard about the NEMMP scheme but require more information about it. Respondents also shared that the government should encourage the EVs by policy formation. 81% of the respondents were in favour that the government should formulate the policy for public and private sector.

It was found that, infusion of capital support and government subsidies can play a key role in acquiring the new customers and establishing the market for electric vehicles in the Indian market. Various subsidies such as exemption from local and state tax, waiving the road tax, exemption from toll taxes and parking charges, access to bus lanes can push the demand for such vehicles.

RECOMMENDATIONS

Electrical vehicles are definitely the need of the hour not just due to rising cost of fuel but also due to the fact that natural resources are not expected to last long. Government and manufacturers should think of marketing it as the cheapest mode of transport to attract the consumers. The Government of India in association with the State Governments should encourage and motivate Indian Automobile manufacturers through incentives, tax exemption or reduction and all other modes to innovate and produce electrical vehicles. Environmental pollution can be controlled by introducing the policy and legislation framework. The legislation can include a restriction in the uses of private cars or strengthen the public transport system.

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