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IMPACT OF ELECTRICAL VEHICLE (EVs) ON ECONOMIC GROWTH, EMPLOYMENT AND FUTURE SCOPE

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ABSTRACT

The global pollution is on rise and every effort made, being to reduce the CO_2 emission and save the planet. One such effort is to introduce electric vehicles (EVS). The transport sector is one of the biggest emitters of CO2 all over the globe and hence it is very important to convert the transportation sector to a green sector. Indian Government has come up with ambitious plans of introducing the National Electric Mobility Mission Plan 2020 (NEMMP 2020). In this paper, we discuss the scope and opportunities of Electric. In India we also discuss about charging station required of impact of EVs on economic growth employment.
Keywords *Electric vehicles, Electric charging stations, Battery technologies.*

INTRODUCTION

History of EV :

Electric vehicles are nothing new. At the start of the automotive revolution in the late 1890s a defining battle, similar to that of VHS vs. Betamax or HD vs. Blu-ray, tool place. Electric cars fought side by side against internal combustion engine (petrol) vehicles to become the first choice to power the way forward for mankind. In fact, at that time there were roughly twice as many electric vehicles at there were petrol.

Electric Vehicles notable successes including being the first vehicle to achieve a speed of over 62 mph (100 kmph) in 1899 driven by Belgian race car driver Camille Jenatzy. However, overriding factors still similar today meant that fossil-fuel won the overall battle for adoption. The reason was that electric car were limit by their range which in 1890 was just a few miles.

Driven by powerful environmental macro-economic and technological factor, the global transportation sector is in a period of historic transition. New business models such as mobility as a service and the increasing economic viability of technologies such as electric vehicles will soon change the way we travel.

According to research by the International Energy Agency (IEA). The global fleet of electric vehicles has increased from just five thousand vehicles to two million from 2008 to 2016. This is due to fundamental trend including growing environmental concerns, a decrease in battery price & the growing availability of charging infrastructure. All of this has let experts to predict rapid growth in EV we over the next decade growth forecasts for the current year range from 27% to 33% until 2030

According to many indicators China is at the head of the global revolution of electric vehicles. China's share of the global electric vehicle fleet reached 32% in 2016 surpassing the United States for the first time. Its share was only 11% in 2011. On the other hand. India's history of EV has been disappointing so far lack of loading infrastructure inconsistent government support & early product failures have all led to the stagnant growth in recent years. However, the government has electric vehicles by 2030 and the country's leading think tank NITJ Aayog outlined the outline of a long-term global mobility strategy. This has already led to concrete measures to help stimulate the growth of electric vehicle. Energy efficiency services limited (EESL) has launched a tender for 10000 four-wheeler electric vehicle in 2017. The largest purchase in the world so far in the three-wheeler vehicle and bus segments, the government plans to introduce battery replacement to separate battery waste from vehicle costs and facilities the charging process. Standards for the first generation of public charges for electric vehicle have been defined and second generation is in preparation.

The government's 2030 target are expected to be ambitious and may not be met due to lack of industry of consumer preparedness, given the relative economic situation growth forecasts suggest that electric vehicle will account for less than 2% of total vehicle sales by 2023. The government's target of 100% penetration by 2030. Therefore, seems far from clear to be achievable even if India achieves its ambition by 2030. This would not necessarily result in a significant reduction oil imports for the automotive industry from 2017 to 2015 in the business as usual are expected to rise to 40 lac cores INR India would still have an import bill of 15 lac crore INR for lithium-ion batteries and 17 lac cores INR for oil in case, he

completes his transition to electric vehicles. This translates into an economy of 8 lac crore INR.

Although India still has a long way to go to achieve its ambitions in electric vehicles. It is clear that electric vehicles offer a high growth opportunity in the short term in key segments and will undoubtedly be an inevitable break long term strategy that requires a concert strategy at the level of government and companies.

Battery Technologies

The electric motor is powered by a controller that retrieves it from a rechargeable battery. The electric vehicle operates on an electric current principle he uses a battery to power the electric motor. The engine then uses power (voltage) received from the battery to rotate the transmission system thereby timing the wheels. A potentiometer to accelerator pedal that tells the controller how a lot of power has to be delivered.

Over the past 15 years lithium ion has grown dramatically and has become widely used for portable electrical product. The most used batter in batteries have been tested on the road all over the world and are the most suitable for electric vehicles application.

Lithium ion are inserted or extracted from the interstitial velocity between the atomic layers within the active material of the li-ion battery during a typical charge discharge cycle. In other words, the Li-ion is exchanged between anode cathode through a lithium electrolyte.

The operation of a Li-ion battery depends on the intercalation mechanism (i.e., inclusion of a molecule in material with a stratified structure): This process includes the inclusion of Li-ions in the crystal lattice of the host electrode without affecting its quality crystal structure. The electrodes involved in Li-ion batteries have two essential properties.

1. They have an open crystalline structure that allows the insertion / extraction of Li-ions
2. Electrodes have the ability to accept compensating electrons at the same point of time.

The efficiency of Li-ion batteries has a typical range of 95 to 98% in its life cycle

Charging infrastructure & Charging Methods

At present India needs to provide adequate charging infrastructures to boost the adoption of EVs by Indian customers. The lack of charging infrastructure will put the customers under range anxiety as the vehicle may not run long without charging infrastructure at the regular intervals on the roadway.

There are efficient methods for charging of battery in the vehicle. As the efficiency of the power electronics used to convert the main AC power supply to a regulated DC voltage across the battery terminals. The efficiency of the battery charger according to current technologies available worldwide various in percentage from low to high go. Existing technology supports mainly three types of charging methods.

1 Alternating current and an onboard charger (normal charger) -

In this charging method the vehicle is connected to an AC power source (normal 16A plug-domestic load) from which the alternating current is transmitted to an on-board station charger. The function of the charger is to convert the AC power to DC power to provide the resulting current to the Li- ion battery. Therefore take 6-8 hours (In the Indian context) fully charge an electronic vehicle by this method of loading which can be carried out according to the domestic consumption of electrical units per month. It is charging source a little cheaper than charging method.

2 DC power and external charger (Fast charge) -

This method of the load involves on external charger or fast charging equipment that directly converts the alternating current supplied by the network into direct current supplied by the network into direct current for the battery. The fast charge. This method takes about 90 to 110 min. (Indian context) to fully charge an electronic vehicle. This billing method requires a larger initial investment and represents a higher cost charging method.

3 Wireless charging method -

This charging method user coupled systems magnetic field to transmit power without any physical connection. There are three types of wireless charging techniques using the principle of electromagnetic induction, electromagnetic resonance & radio frequency waves to transmit power.

Comparison among internal combustion engine, Hybrid & electric vehicles.

Parameters	ICE Vehicles	Hybrid Vehicles	Electric Vehicles
Efficiency	Converts 20% of the energy stored in gasoline to power the vehicle	Converts 40% of the energy stored in gasoline to power the vehicle	Converts 75% of the chemical energy from the batteries to power the vehicle.
Speed (Average Top Speed)	199.5 km per hour (kmph)	177 km per hour (kmph)	48-153 km per hour (kmph)
Acceleration (average)	0-96.5 kmph in 8.4 seconds	0-96.5 kmph in 6-7 seconds	0-96.5 kmph in 4-6 seconds
Maintenance	High maintenance owing to more number of moving parts	Same as an ICE vehicle	Maintenance is minimal due to lesser number of moving parts.
Mileage (average)	Can go over 480-500 kms before refuelling. Typically achieves 10-12 kmpl	Typical achieves 20-25 kmpl	Can travel 120-200 kms before recharging.
Cost (average)	INR 0.7-1.1 million	INR 1.2-2 million	INR 0.9-6 million

Impact of EVs on Economic growth & Employment

Economic growth

Shifting modes of mobility could launch new business opportunities. There would emerge in areas such as charging & swapping infrastructures, service or integrated transport. In India energy players have entered the mobility industry while same traditional power companies are exploring possibilities in charging infrastructure and infrastructure companies are seen entering the battery business. An important task that needs attention is transforming & up-scaling small & medium sub-systems and auto component industries. A large number of such mini-micro industries are auto- ancillary companies for diesel / petrol vehicle. They provide large number of jobs.

Many of them will not such industries & help them during the transition to EV components manufacturing is required. Expansion of transport fleets based on IC engine negatively impact the economy considerably a part from their negative health contribution, crude oil price volatility adds uncertainty to an already burgeoning import bill, while also needs huge investment in oil refineries and related distribution infrastructure.

There are several studies that suggest overall positive impact on GDP in another study net privately and social benefits are estimated between 300 and 400 per EV, coupled with generation of renewable power, the battery manufacturing industry in India can become bigger than the total amount spent on import of crude oil. This would provide a huge boost to

the Indian economy. The revenue loss for government from the taxes on the oil sector is expected to be replaced by high tax revenues in another economic sector.

Impact on Employment

their political entry at the age of 35 – 45 i.e 36.67%. Least of the respondents i.e 20%belonging to 21-25 age as per the above table. But it is suggested that if women will enter to politics at 20-30 age the impact will be more and their leadership skills helps countries policy making.

TABLE-II

EDUCATIONAL BACKGROUND OF RESPONDENTS

European clime foundation has estimated that through reducing oil demand by more efficient electric cars, employment will increase by 500000 to 850000 by 230.

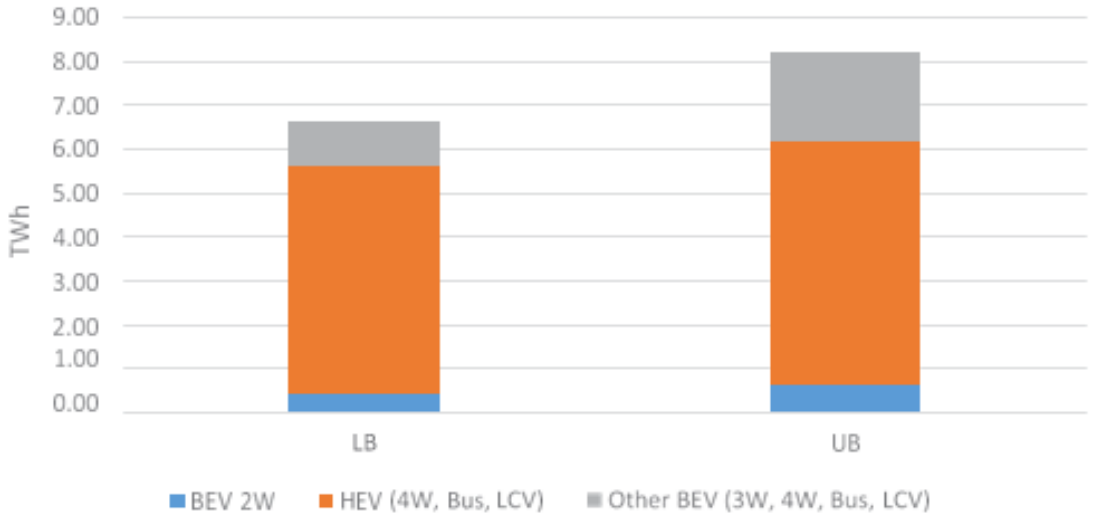
Another report estimates that about 2 million additional jobs will be created by EVs by 2050. The report further adds that oil production and distribution has very low employment intensity of just four jobs per million Euros value added compared to 24 jobs per million Euros in the general economy. Therefore, any shift in expenditure from buying imported oil to other expenditure from buying imported oil to other expenditure choices would generate additional employment further, as imported oil is replaced by electricity and batteries, large employment replaced by electricity and batteries, large employment is possible in enhancing power-generation & distribution and in battery manufacturing, including battery recycling.

As far as the automotive sector is concerned, a large part of the supply chain will get transformed in the power train segment. Traditional suppliers will more from supplying parts such as exhaust pipe and ICEs to perhaps batter materials, electric motors and regenerative braking system EVs will create opportunities in durable and light weight thermoplastic, higher demand for electricity, storage and many others. The net impact on employment would perhaps be balanced out. In addition, EV battery charging of swapping would create a large number of jobs throughout the country.

Future requirement for EVs

Electricity demand

Based on the EV stock, annual VKMs per vehicle in 2030 and performance of EVs (km/kwh) the electricity demand from EVs in 2030 is derived as shown in figure.



Total electricity demand for EVs may therefore vary between 37 and 97 Twhs under 33 percent & 100 percent penetration of EVs in sales by 2030 considering only intra city (urban) passengers travel, buses & private cars constitute more than half the demand, followed by three-wheelers, two-wheelers & taxis. This constitutes a less than 4 percent share under all scenarios of aggregate end-use demand projected in 2030 in another bookings India study. It is therefore clear that meeting the energy (Bus) demanded under the ambitious target should not be a challenge for the Indian electricity sector in aggregate.

Aggregate charging capacity

	Slow Charging			Medium Charging			Fast Charging		
Charging Capacity (GW)	Input (kW)	2030 LB	2030 UB	Input (kW)	2030 LB	2030 UB	Input (kW)	2030 LB	2030 UB
Cars	3	42	126	6	84	253	8	112	337
Taxis	8	21	55	17	45	116	20	53	137
Buses	40	35	91	76	66	173	100	87	227
2W	3	198	594	3	224	673	5	330	989
3W	3	38	74	4	50	99	5	63	124
Total/ WtdAvg	3.5	334	940	4.9	470	1313	6.7	645	1814

End use aggregate charging capacities of Evs by type.

CONCLUSION

India has a huge challenge in shifting the transportation sector from ICE engines to EV s. This requires a lot of planning, research & development. Government policies like NEMMP and few other policies needs to be updated on regular basis to keep in pace with the development throughout the world. India should focus on improving the energy efficiency of Evs. The power electronics, electric motors should plan for Indian conditions. A battery eco-system needs to be developed which can support many companies & stunt-ups developing battery pack up & cell manufacturing charging infrastructure needs to be adequately build to address range anxiety. The options of swapping also be explored. It is also very important to create demand generation by making all government buses electric & offering tax exemptions for private EV owners.

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