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ELECTRIC VEHICLE REVOLUTION IN INDIA NEEDS TO BE DRIVEN FROM BEYOND METROS

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Abstract:

The worldwide electric vehicle (EV) market is creating at a quick speed. As per EV volumes, generally speaking electric vehicle arrived at a worldwide portion of 8.3% (remembering battery electric vehicles [BEVs] and Plug-for crossover electric vehicles [PHEVs]) in 2021 from 4.2% in 2020 with 6.75 million vehicles out and about. This is an increment of 108% starting around 2020. EVs are acquiring consideration across the globe as they assist with decreasing outflows and exhaustion of regular assets. The Indian EV market is likewise developing quick as near 0.32 million vehicles were sold in 2021, up 168% YoY. Continuous electric vehicle reception in India depends on the Paris consent to lessen fossil fuel byproducts, to further develop the air quality in metropolitan regions and diminish oil imports

The government's first move in lowering emissions is to put more and more electric vehicles on the road. By 2030, India wants ten crore electric vehicles, or 30% of all vehicles on the road, to be hybrid-electric or electric. PLI for ACC, PLI for auto parts, and the FAME Scheme will allow India to progress to an Electric Vehicles (EV)-based system that is more efficient .By 2030, the market for electric vehicles is expected to have an impact on the need for more than one crore jobs, according to the Ministry of Skill Development and Entrepreneurship Power generation in India should be surplus beyond the domestic requirement. If the power is supplied for use in the power generation sector then we will be able to fulfill the target

1. Introduction

The worldwide electric vehicle (EV) market is creating at a quick speed. As per EV volumes, generally speaking electric vehicle arrived at a worldwide portion of 8.3% (remembering battery electric vehicles [BEVs] and Plug-for crossover electric vehicles [PHEVs]) in 2021 from 4.2% in 2020 with 6.75 million vehicles out and about. This is an increment of 108% starting around 2020. EVs are acquiring consideration across the globe as they assist with decreasing outflows and exhaustion of regular assets. The Indian EV market is likewise developing quick as near 0.32 million vehicles were sold in 2021, up 168% YoY. Continuous electric vehicle reception in India depends on the Paris consent to lessen fossil fuel byproducts, to further develop the air quality in metropolitan regions and diminish oil imports(1)

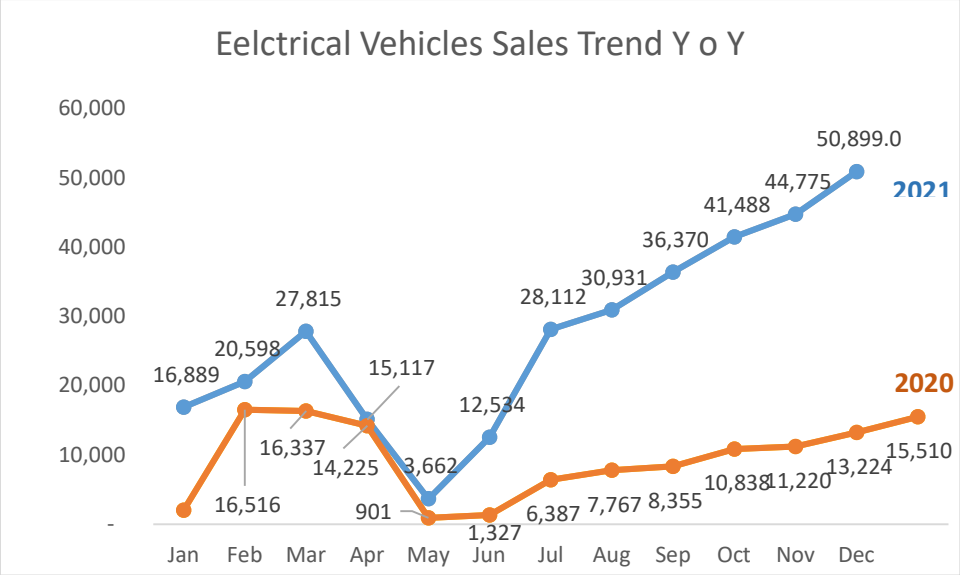
2.EV Market in India

The Indian vehicle industry is the fifth biggest on the planet and is supposed to turn into the third biggest by 2030. According to India Energy Storage Alliance (IESA), the Indian EV industry is supposed to grow at a CAGR of 36%. As populace rises and interest for vehicles develop, reliance on customary energy assets is certainly not a reasonable choice as India imports near 80% of its unrefined petroleum prerequisites. NITI Aayog intends to accomplish EV deals entrance of 70% for every business vehicle, 30% for private vehicles, 40% for transports and 80% for two and three-wheelers by 2030. This is in accordance with the objective to accomplish net zero fossil fuel byproduct by 2070. Throughout recent years, 0.52 million EVs were enrolled in India, as per the Ministry of Heavy Industries. EVs kept powerful development in 2021, upheld by the execution of good strategies and projects by the public authority.

In India, Uttar Pradesh held the most noteworthy offer in EV deals in 2021, (2) with the quantity of units sold across all sections coming to 66,704, trailed by Karnataka with 33,302 units and Tamil Nadu with 30,036 units. Uttar Pradesh overwhelmed the three-wheeler section, while Karnataka and Maharashtra drove the bike portion and four-wheeler fragment, individually.(3)

2.1 Electrical Vehicles are sold in India

In 2021 electrical vehicles are sold 329190 and representing a 168% increase over last year sales of 122607 units (Ref:9)



2.2 What is Electrical Vehicle its benefits.

Electric motors within electric vehicles (EVs) are propelled by energy kept in batteries. Electric motors are used in EVs instead of internal combustion engines (ICE). As an electric vehicle (EV) uses electricity for propulsion, it has no tailpipe emissions and no gasoline-related parts, such as a fuel pump, fuel line, or fuel tank. Adoption of electrical technology is crucial for its affordability, convenience, and improved air quality. EVs

require less maintenance because they have fewer moving components than ICEs. EVs are much quieter because they don't have a mechanical drivetrain or a combustion engine..

2.3 Lower fuel cost and lower operational cost

Compared to ICE vehicles, EVs are more cost-effective due to their higher efficiency, reduced fuel costs, and lower operating costs. Compared to ICE vehicles, EVs produce no tailpipe emissions. Using electric vehicles will assist to reduce local air pollution. By switching to EVs, greenhouse gas (GHG) emissions produced by operating an ICE car will be reduced (4)

2.4 Promote and Adoption of Electrical Vehicles in India

The government's first move in lowering emissions is to put more and more electric vehicles on the road. By 2030, India wants ten crore electric vehicles, or 30% of all vehicles on the road, to be hybrid-electric or electric.

The Indian government has launched numerous measures to encourage the production and use of electric vehicles in India. Electric vehicles have started to enter the Indian market with government help. However, one of the essential conditions for speeding up the adoption of electric vehicles in India is the availability of suitable charging infrastructure. Less than 1% of all car sales in India go toward the electric vehicle sector, which is far behind. Approximately 0.4 million conventional vehicles dominate Indian roadways at the moment.

2.5 Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India

The Ministry of Heavy Industries created the FAME INDIA program—Faster Adoption and Manufacturing of Hybrid and Electric Vehicles in India—in 2015 to encourage the use of xEVs. The FAME India Scheme is currently in its second phase, which will be implemented for a total of five years starting on April 1, 2019, with budgetary support of Rs 10,000 crores ($1.34 USD). This phase seeks to assist the electrification of public and shared transportation as well as give support through subsidies, 7090 electric buses, 5,00000 electric four-wheel passenger cars, and 10,000 electric two-wheelers.

An upfront reduction in the purchase price of the EVs under the FAME- India scheme is an incentive provided to buyers of EVs. The incentive subsidies are linked to the battery capacity, which is Rs 10,000/KWh (US$ 133.04) for e-3W and a cap of 20% of the cost of an e-4W vehicle. Further, the incentives/ subsidies for e-2W are increased to Rs 15,000/ KWh (US$ 199.56) which was previously Rs 10,000/KWh (US $133.04) with an increase in cap from 20% to 40% of the cost of the vehicle with effect from 11th June 2021.

PLI for ACC, PLI for auto parts, and the FAME Scheme will allow India to progress to an Electric Vehicles (EV)-based system that is more efficient, advanced, and ecologically friendly. In comparison to the target estimate of investment of 42,500 crore over a five-year period, the Production Linked Incentive (PLI) Scheme for the Automobile and Auto Component Industry in India has been successful in garnering planned investment of 74,850 crore. Under the Champion OEM Incentive Scheme, approved applicants have suggested an investment of 45,016 crore, and

accepted applicants under the Component Champion Incentive Scheme have proposed an investment of 29,834 crore..(6)

2.6 Top EV Stocks in India 2022

Due to the fact that the Indian EV market is still in its early stages, not all vehicle types have a clear market leader. In the two-wheeler market, there are more than ten significant players. In the electric bus market, there are three to four. The leading manufacturers of electric vehicles (EVs) in India are listed below.

1.Mahindra Electric

In India, Mahindra is credited with being an EV colonist. Being the first major EV patron, Mahindra introduced the Reva as its first EV in 2001. The first electric vehicle in India was the Mahindra Reva. Mahindra established a specialised R&D installation in Bengaluru over the times. The Mahindra E20 and eVerito are two of its farther electric vehicle variations. still, Mahindra has expanded its focus to include the product of battery packs and has cooperated with a number of associations to promote EV charging.

2. Tata Motors

The largest automaker in India is Tata. Its machine business includes the product of buses , exchanges, motorcars, military vehicles, and mileage vehicles. Tata Daewoo and Jaguar Land Rover are some of its related businesses. Tata, still, is a freshman as compared to Mahindra in the EV request.

Tata has design and R&D centres in Korea, Italy, the UK, India, and the UK. In cooperation with its attachment, the UK- grounded Tata Motors European Technical Centre(TMETC), Tata Motors aims to have a significant impact on the Indian request for electric vehicles. In terms of EVs, Tata has concentrated on the Indian request for passenger buses and electric motorcars.

3. Hyundai Motors

With the preface of the Hyundai Kona EV in India, Hyundai entered the country's EV request. According to the South Korean automotive assiduity mammoth, Kona was especially created to accommodate the functional conditions in India. The auto's 452 km range on a single charge is one of its unique selling points. This precisely matched Indians'" Kitna Deti hai" hankering for motorcars.

4. Ashok Leyland

In order to meet the country's e-mobility needs, Ashok Leyland creates electric variations acclimatized for Indian conditions and has added battery switching in electric motorcars. It has

introduced a number of electric machine variations, including the Circuit, HYBUS, Electric Euro 6 Truck, and made the I BUS advertisement. The company is presently concentrating on boosting exports as its main precedence.

5. Olectra Greentech

The K6, K7, and K9 E motorcars are a many of the company's performances. Regarding E motorcars, their K9 series is regarded as ground breaking. Regenerative retardation is erected in and uses 30 lower energy when retardation. The motorcars can recharge using its quick charging technology in two to three hours. Eventually, they can go far distances on a single charge thanks to their Iron Phosphate batteries. also, the business is the sole patron of tarmac electric motorcars for airfields in India.

The business lately passed advancements, one of which was the opening of a,000- unit-able plant in Hyderabad. The company held orders for 2000 motorcars worth betweenRs. 3000 and Rs. 3500 crores for the December quarter of 2021.

Since the Indian EV request is still in its early stages, it's seen as a business occasion. The following companies also vend EVs MG Motors, Maruti Suzuki, Renault, Audi, Volvo, Hero, Ather, etc. Other related diligence will start to take off as the EV assiduity grows. The battery and EV dishes are included with this. multitudinous businesses, including Siemens, Schneider, Delta, and others, have expressed interest.

But regrettably, these businesses will not enter the request unless there's a substantial demand in the public 4 wheeler order. Consumer worries about the absence of Fast Dishes in India, on the other hand, have been one of the main reasons for the EV assiduity's failure to grow.
utmost lithium conditions are presently imported from China, South Korea, Vietnam, Singapore, and Japan. Other players who have shown interest in the Lithium battery product business in India include Reliance, Suzuki, Toshiba, Denso Corp, JSW Group, Adani, Mahindra, Hero Electric, Panasonic, Exide Batteries, Amara Raja.

List of Top EV Stocks in India for Investors

S.No	**Company**	**Marketcap (Rs Cr)**	**Industry**
1	Amara Raja Batteries Ltd.	10,767.17 Cr	Batteries
2	Exide Industries Ltd.	14,543.50 Cr	Batteries
3	Hero MotoCorp Ltd.	54,393.98 Cr	Automobile Two & Three Wheelers
4	Himadri Speciality Chemical Ltd.	2,664.62 Cr	Chemicals
5	Vedanta Ltd.	132,425.22 Cr	Metal - Non Ferrous
6	Hindalco Industries Ltd.	118,032.68 Cr	Metal - Non Ferrous

7	Ashok Leyland Ltd.	39,981.88 Cr	Automobiles-Trucks/Lcv
8	Mahindra & Mahindra Ltd.	104,583.57 Cr	Automobiles - Passenger Cars
9	Tata Motors Ltd.	166,212.97 Cr	Automobiles-Trucks/Lcv
10	Tata Chemicals Ltd.	24,391.64 Cr	Chemicals
11	Greaves Cotton Ltd.	4,882.73 Cr	Diesel Engines
12	Graphite India Ltd.	10,533.68 Cr	Electrodes & Welding Equipment
13	Hindustan Copper Ltd.	13,296.58 Cr	Metal - Non Ferrous
14	Maruti Suzuki India Ltd.	258,172.72 Cr	Automobiles - Passenger Cars
15	JBM Auto Ltd.	7,068.58 Cr	Auto Ancillary

2.7 Status of EV Ecosystem and Electric Two-wheelers Production Plan

Many new electric two-wheeler manufacturers have emerged since the FAME scheme's debut, and even the existing ones are now competing. Startup firms have created EV 2/3 wheeler manufacturing capacities and intend to increase them. Examples include Ather Energy, Okinawa, Pure EV, and Ampere Vehicles. Besides setting up production facilities for the electric 2/3 wheelers, companies like Hero Electric and Bajaj Auto have also made ambitious manufacturing plans. (10)

2.7.1 Importance and Prospects of EV Two-wheelers

In terms of different vehicle categories, the two-wheeler market offers the greatest potential for electrification because, in recent years, government initiatives in India have made electric two-wheelers' pricing competitive with those of their counterparts with IC engines. These vehicles can also be charged by relatively low-powered chargers, and the industry's growth trajectory seems promising.

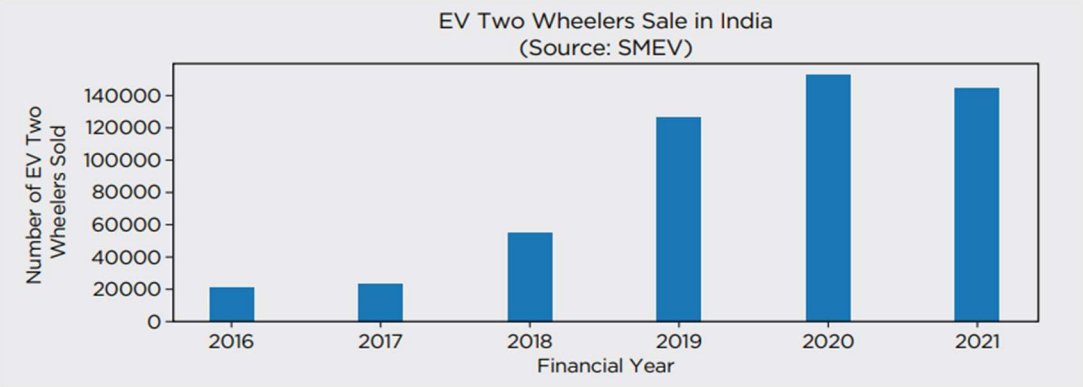


Figure :2 EV- 2 wheelers sasles in India

Projected sale of electric two-wheelers reaches the announced production level in Optimistic, Same Performance and Battery Cost Challenged Scenarios even under Full-Constraint conditions with base level production and infrastructure

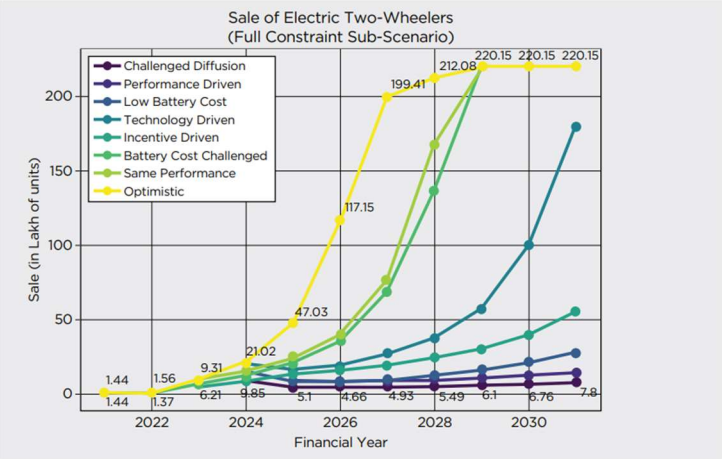


Fig:3 Sale of electric two-wheelers in various scenarios

Battery demand does not have a linear relationship with sale of electric two-wheelers. In scenarios with favourable conditions, some of the buyers opt for vehicles with bigger battery packs.

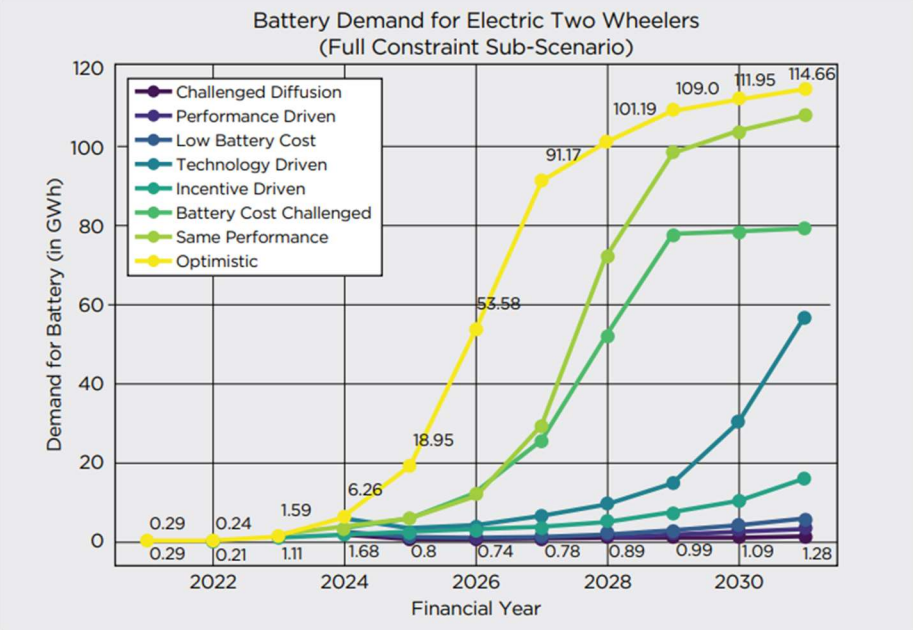


Figure:4 Battery demands in various scenarios

The planned infrastructure for charging light electric vehicles, including electric two-wheelers, is cumulative. With more adoption of electric vehicles, the infrastructure for charging them is also used more frequently.

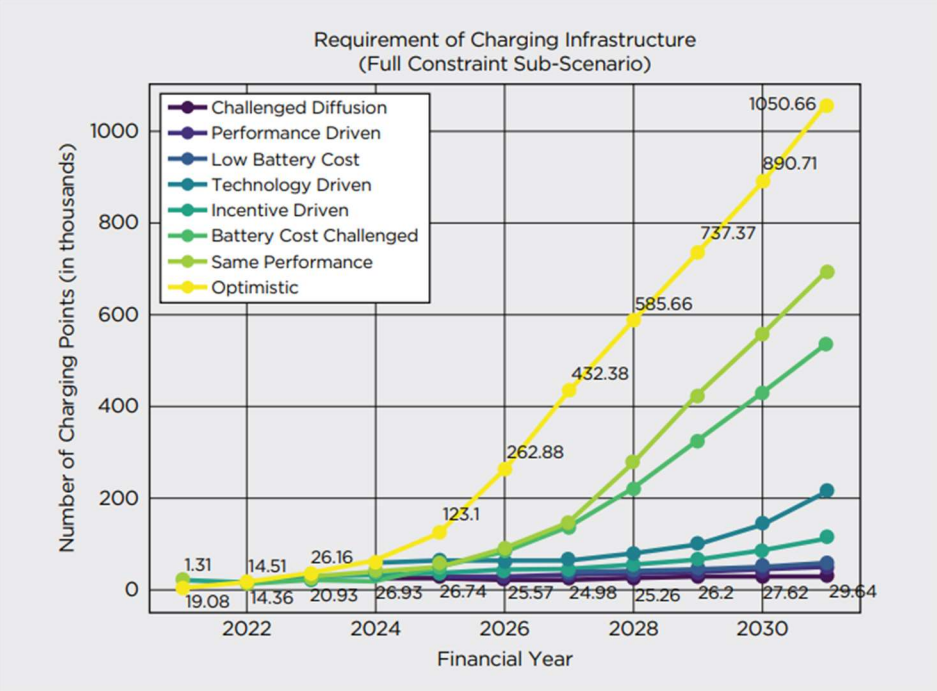


Figure:5 Requirement of Charging points in various scenarios

3. Electric vehicle revolution in India needs to be driven from beyond metros

Despite decades of urbanisation, the bulk of India's population still lives outside of significant urban centres. Electric vehicles (EVs) can't just be a city thing. The vast opportunity is found there. Many peasants in Indian villages have been seen to have to travel considerable distances on foot in order to use public transportation. Their problems and abilities to earn are exacerbated by this inaccessibility. Many of them may benefit from access to a good transit system at an affordable price.

According to estimates, 48% of rural residents must travel 2 to 10 kilometres to get to work, and many of them are unable to pursue alternative career opportunities since there is no effective transportation infrastructure connecting rural areas to the nearby cities and towns. Younger people who are unable to go to schools and colleges are particularly affected by the issue, which makes it difficult for them to pursue further education and pick up new skills.

Women's participation in non-agricultural labour increases with better road conditions and increased bus frequency in a village, which also makes it simpler for them to pursue alternate avenues for obtaining a living. Here, affordable EVs have the potential to transform rural communities and advance the nation's economy. Personal mobility, especially for women, offers up a new opportunity set where there is low infrastructure density. EVs like e-scooters and e-bikes powered by lithium-ion batteries can dramatically improve mobility. Low-cost EVs can offer last-mile connectivity even in areas with public infrastructure.

3.1 E mobility boosting for Rural Unemployment

By 2030, the market for electric vehicles is expected to have an impact on the need for more than one crore jobs, according to the Ministry of Skill Development and Entrepreneurship.

Additionally, every direct job associated with the market for electric vehicles may generate 4-5 indirect jobs. This calculation indicates that in this short period, the need for jobs might reach more than five crores just from the electric mobility business. Understanding EVs and determining what is required are essential if one is to fully capitalise on the segment's possibilities.

The need for fast-charging Li-ion batteries will soar as e-mobility takes off in India. There will be more chargers, a reliable power source, and a steady grid. Electrical infrastructure teams will need to expand operations in order to meet the demand for charging points at charging stations across the nation, which will lead to the creation of new jobs.

Jobs will be plentiful as sectors that must provide energy for EV manufacturing expand their operations. Finding the necessary talents on the market will be the main issue in this situation. The abilities needed to fill market positions will differ from those that have been desired and needed for the ICE Market.

3.2 Create an awareness and Opportunities of E mobility

Spreading awareness on the EV industry and the Government’s focus on it and the opportunities it is bringing forth is mandatory for everything to fall in place. Create an E mobility awareness and opportunities for Rural India. It should be extend to Small towns and Villages. It is important drive to be taken for further expansions E- mobility markets and strengthen of youth force and create employment opportunities. Due to this, the Indian youth will benefit financially and thus the purchasing power will increase and the country's economy will develop.

4. Fulfilment of EV polices in India.

If India wants to fulfil its electric vehicle sector policies, some specific reforms should be implemented in cooperation with state governments in power generation. Apart from this some concessions to the sellers i.e. manufacturers and buyers must be continued. For the expansion of the electric vehicle sector, some reforms should be undertaken on a long-term basis. That's when we reached our goal.

4.1 Incentives

To assist the acceptance of electric vehicles (EVs) in the country, the central government has announced a number of promotional measures not only EV manufacturing companies but also keep in mind reduce of unemployment for the rural area. including tax incentives for electric vehicle owners, public EV charging infrastructure development, and so on.

4.2 Surplus Electricity Productions

Power generation in India should be surplus beyond the domestic requirement. If the power is supplied for use in the power generation sector then we will be able to fulfill the target otherwise it will be very difficult to fulfil. In this modern India power cuts are very high especially in the

villages and my small towns. Whenever electricity is produced in excess of the demand, then there is necessarily a surge in electric vehicle manufacturing industry. India does not have a widespread network of electric vehicle charging stations. On the other hand, EV manufacturers have promised to construct a large charging station network in the future.

4.3 Price stabilization:

Electricity pricing can vary widely by country or by locality within a country. Electricity prices are dependent on many factors, such as the price of power generation, government taxes or subsidies, CO_2 taxes, local weather patterns, transmission and distribution infrastructure, and multi-tiered industry regulation.

4.4 Cost Of Charging

For the majority of EVs in India, the battery capacity typically ranges between 20 and 40 kWh. Let's say you charge your electric car at home. In such case, the price would depend on the energy rate in your state, which normally ranges from Rs 8 to Rs 10 per unit. In Delhi, charging stations typically cost Rs 4 per kWh, although home prices can vary from Rs 2 to Rs 9 per unit. This suggests that charging your EV properly at a charging station will run you anywhere from Rs 100 to Rs 200, whereas charging it at home will run you between Rs 180 and Rs 500. You would spend between Rs 400 and Rs 500 on charging stations in Pune, which cost Rs 114 to Rs 116 per unit.

4.5 Price stabilization policy

A price stabilization policy should be put in place In the future, if the electricity charging prices related to charging for the electric vehicle sector are increased drastically, for example, we have seen a lot of fluctuations in the prices of petrol and diesel, similarly if the electricity rates are also increased, the sales of electric vehicles will be severely affected. So price stabilization policy should be introduced and price control should be done accordingly.

The Central & State governments should make a band of regulatory laws on this.

5. Suggestions

- The manufacturing e-mobility companies should incorporate create awareness programs and training institutes under Corporate social responsibility.
- This program should be part of the National skill Development Centres. E-mobility Technology should also become a curriculum in educational institutions.
- Storage systems should be established according to demand and supply . A national distribution system should also be set up. Environmental awareness should be taken about this mobility waste
- A new scheme like charging infrastructure should be put in place for rural areas by involving the youth of rural India. Interconnectivity should be provided for charging infrastructure for solar systems.
- Banks should provide financial assistance to unemployed youth but at very low-interest rates.

- The Central & State governments should make a Price stabilization policy band of regulatory laws on this.

6. Conclusion

The electric vehicle manufacturing sector along with the economic development of India must not only increase the employment opportunities but also the income of the Indian Rural people . Electrical vehicle manufacturing companies & allied industries sales will increase of this sector, in the same time no doubt, companies income will increase significantly. If India does not depend on imports and trains Indian youth especially the unemployed youth in rural areas with international standards we will soon see India as number one in the world in electric vehicle sector. If training classes in the field of electric vehicles are made a curriculum in the vocational education system, the sector will develop more quickly.

Apart from Government of India, EV Sector companies in this sector should also conduct training classes in small towns/ villages under corporate social responsibility activities. If done in this way, the Indian electricity sector will not only increase its sales but also provide better utility services and increase its revenue significantly.

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