International Journal of Advanced Research in Engineering Technology & Science
ISSN: 2349-2819
Email: editor@ijarets.org Volume-10, Issue-11 November – 2023 www.ijarets.org

FINANCIAL IMPACT OF INDIA'S TRANSITION TO ELECTRIC MOBILITY

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Abstract

Concerns regarding energy security, climate change, and local air pollution are driving the shift toward electric transportation that is now under process on a global scale. Despite the fact that India is looking more and more at electric mobility as a feasible means of transportation, the transition to e-mobility has not set about in a full-fledged way in the country. In 2017, electric vehicles constituted below 0.1% of the 21 million total vehicles sold. Several obstacles, such as high initial prices, a dearth of charging infrastructure, and the absence of a well-defined EV policy, have been mentioned as impediments to the expansive acquirement of electric vehicles. There is still a significant amount of uncertainty around key topics, essentially the long-term effects of shifting to electric transportation, such as how the economy will be affected. When authorities in India seek to devise strategies to indigenize the electricity powered vehicle sector, it would be vital for them to have a clear knowledge of if EVs constitute a winning business for the country. The goal of the research being conducted under this initiative is to gain an understanding of the financial impact of transition to e-mobility in India and also its effect on climate change.

1.INTRODUCTION

The automobile sector in India is responsible for 7–8 percent of the country's yearly GDP and might potentially see a paradigm shift in the possibility that the whole economy transitions to electricity based vehicles (Invest India 2020). This potential transition is a reflection of the worldwide trend toward electric mobility, which is being motivated by the recognized need to improve air quality, lessen the dependency on import of oil, take action on climate change, and decarbonize end-use industries (World Economic Forum and Ola Mobility Institute 2019). All of these issues are high on India's list of priorities, and latest policy shifts point to an increased commitment to a future in which electric mobility and transportation predominate. This mobility change is being supported by a number of ministries of the government and agencies on the national and state levels alike. As an outcome of the vital nature and complexity of a shift like this, there are a substantial number of stakeholders engaged. Only the central government's Ministry of Road Transport and Highways, Ministry of Finance, Ministry of Power, Ministry of Housing and Urban Affairs, and Ministry of New and Renewable Energy are responsible for this. In addition, organisations such as the Department of Heavy Industry, the Department of Industrial Policy and Promotion, the Department of Science and Technology, and the National Institution for Transforming India (NITI Aayog) have issued measures to support, and directives to guide the transition to alternative modes of transportation easier. In addition, over 15 states and union territories (including draught and notified) have made electric vehicle (EV) policies and regulatory support pathways to expedite the adoption of electric mobility in the country, and many other states are in the process of developing such policies. Several other union territories have also produced such policies (EESL 2020).
Therefore, within the central government only, about ten distinct agencies have developed policies to assist the promotion of electric mobility; yet, there is no apparent single institution that is responsible for coordinating these policies. There are several different support mechanisms and policy signals that are being launched in the market; yet, there is no clear national aim for electric mobility. It is strange that it is absent, especially in light of the accomplishment of the clean energy deployment goals that the Indian Government

first declared in 2010 with regard to the National Solar Mission. These targets were considerably raised in 2015 to 175 GW of renewable energy by 2022, and further increased in 2019 to 450 GW capacity of installed renewable energy. These substantial goals have assisted to convey the breadth and consistency of the Indian government's policy back up and ambition with respect to the market for renewable energy. However, a strategy comparable to this one has not yet been implemented by the government so as to hasten the transition to EVs. There might be a number of reasons behind this, but research conducted by the Rocky Mountain Institute and the NITI Aayog indicates that if India adopts policies that are favourable toward electric vehicles, the country could increase the total number of sales of electric vehicles to attribute 70 percent of gross commercial cars, 30 percent of private cars, 40 percent of buses, and 80 percent of two-wheelers and three-wheelers by the year 2030. (NITI Aayog and Rocky Mountain Institute 2019). This serves as a signal of the aspirational mobility transition aim for India, which we employ because there is lack of an explicit legislative target.

Status of the market

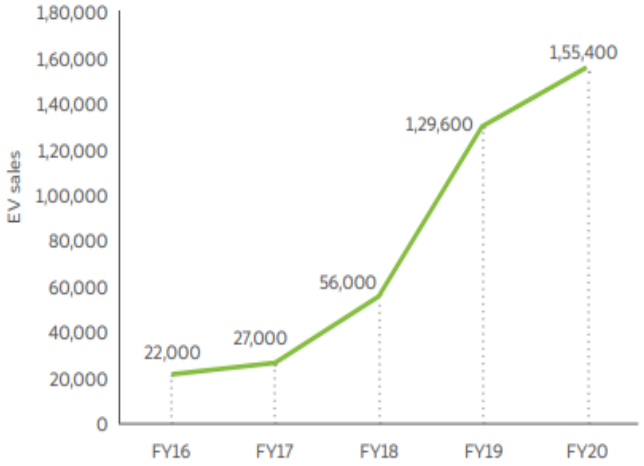
The aggregate number of those battery-powered electric three-wheelers or e-rickshaws that were not registered with the government at he end of March 2020 was not included in the 530,560 electric vehicles that were registered on the VAHAN portal of the government (CEEW-CEF 2020a). Only in the fiscal year 2019–20 (FY20), a total of 246,000 new cars were added to the stock, with two-wheelers accounting for more than 60 percent of the toral recent electric vehicle stock. This is the closest thing to half of the entire number of vehicles that have been invreased (CEEW-CEF 2020a). On the other side, making the switch to electric transportation in the coming years won't be without its challenges. The high initial cost of purchasing an electric vehicle is the biggest impediment to the widespread adoption of these vehicles. When comparing the purchase price, electric cars (EVs) in this nation are around one and a half to three times more expensive than vehicles powered by internal combustion engines (ICE) (World Economic Forum 2019). Additionally, customer worries regarding charging procedures, the accessibility of suitable charging points, and range apprehensions are acting as obstacles to the widespread switch to electric vehicles. The automotive industry in India experienced its worst descent in 2019, which was characterised by falling sales and growing inventories. This was followed by a slowdown related to COVID-19, which caused further disturbance to the automotive value chain, including a shortage of financing and a demand compression in the brief term. For instance, in comparison to the previous fiscal year, sales of passenger cars in the domestic market fell by 18% to 2.78 million units in FY20 (ET Auto 2020a).

The fall in sales can be attributed to a number of factors, one of them is the liquidity issues that have been perturbing non-banking financial companies (NBFCs), which are responsible for one third of total automobile loans. As a consequence of this, NBFCs have been unable to lend on the same level as in previous years, which has affected their lending ability. The market demand prognosis for electric vehicles (EVs) continues to be dismal and falls far short of the NITI Aayog-identified goal for the year 2030 owing to the high initial costs involved and the lack of a distinct market hunger among financial institutions to offer financing for EVs. As a direct outcome of COVID-19, sales have continued to decline across the board throughout the present FY21 fiscal year. Not just in India, but all around the world, the epidemic has caused serious disruptions in supply chains, workforce cutbacks, and even potentially the worst economic downturn after the Great Depression. We expect that this occurrence will have a considerable influence, both in areas of the speed and the scope of the mobility transformation. Although the market view on electric vehicles seems to be bleak at the moment, some vehicle segments, such as electric two-wheelers (which include scooters and bikes), may witness an increase in first-time ownership as consumers desire transportation options that follow the social distancing norms (Financial Express 2020). During the most recent few months, sales of two wheelers and cars have shown a favourable turn when compared to sales throughout the same period last year. Some industry specialists have an opinion that the automobile sector may have a recovery sooner rather than later, particularly in certain categories. Consequently the period after the pandemic may also provide an opportunity to evolve to a more EV-dense mobility future if the appropriate support system in terms of policy, regulation, business models, and financial structures are put into place.

This could be the case if the pandemic was caused by a virus that was transmitted by mosquitoes. For this purpose, it is very necessary to do thorough research to have an understanding of the scope of the probability and the amount of both public and private investments - that will be necessary to bring
about the desired mobility change. We analyse electric vehicle (EV) sales on a segment-by-segment basis in this report, as well as battery requirements, the public charging structures that will be needed to assist the transition, and the monetary investment that will be required until 2030. We quantify these factors by applying the stated assumptions and methods. The paper also consists of analysing the obstacles that stand in the way of the investment and discusses some of the prospective solutions that may be used to seize this rare opportunity.The initial research that we carried out with a variety of industry stakeholders, such as original equipment manufacturers (OEMs), relevant industry associations, such as the Society of Manufacturers of Electric Vehicles (SMEV), and the Automotive Component Manufacturers Association of India (ACMA), functioning charging infrastructure operators, fleet operators, and interested industry players, such as electricity usrs and Energy Efficiency Services Limited (EESL), forms the base for the majority of the presumptions that we make in our report. Interviews with key informants and questionnaires were the primary means through which we gathered data. Since it is known that the automotive sector is currently at a pivotal crossroads, we have utilised three case studies to assist in evaluating the prospective investment requirements and related costs linked with the various development trajectories. We hope that with the help of the scenario exercise, we will be able to reduce the amount of ambiguity that exists and provide manufacturing units, decision-makers, and investors access to data that will enable them to make better educated choices on the future of electric mobility.

Electric mobility in Indian market

A total of 5,30,560 electric vehicles (EVs) were purchased in India. These include electric two-wheelers [e-2W], electric three-wheelers [e-3W], electric rickshaws [e-rickshaws], electric automobiles [e-cars], and electric buses [e-buses] (CEEW - Centre for Energy Finance 2020). The National Electric Mobility Mission Plan (NEMMP) has set an aim for the year 2020 of selling 6-7 million electrical automobiles and hybrids. This number is still quite far from that goal. However, as shown in Figure 3, a consistent rise in the number of sales of electric vehicles has been seen since 2017. Tata Altroz EV, Mahindra eKUV100, and MG Marvel X are some examples of the high-voltage electric vehicles that were introduced around the end months of 2019, and many more models that were displayed at the Auto-Expo 2020 were being prepped for introduction around the time of the expo (Carandbike 2020). The sudden appearance of the COVID-19 epidemic and the subsequent repercussions from it have caused disruptions in the worldwide supply chains for components used in electric vehicles (EV), most notably power electronics, batteries, and the minerals that are utilised in the production of these components (Wood Mackenzie 2020). The interruption in the supply chain has put a shadow not just on the electric vehicle sector but on the whole automotive industry (ETAuto 2020). The blossoming electric vehicle industry in India is staring into an uncertain future because experts are divided on how the electric vehicle sector will eventually emerge out of the current situation: some have predicted stagnation, while others see a possibility of the Indian electric vehicle sector becoming a strong contender in the global electric vehicles manufacturing space (Panday and Ghosh 2020; Inc42 2020). With the goal of making the shift to electric vehicles firmly in mind, policy directives such as the Faster Adoption and Manufacturing of (Hybrid and Electric Vehicles) Phase II (FAME II scheme) and the Phased Manufacturing Plan have been released. However, the effects that a switch to EVs would have on the whole economy and the positive effects it would have on the environment have not been studied in sufficient depth. The administration has not provided a detailed
road map as of yet, excluding a few policy pronouncements. There is not a defined legislative plan and sales objective for electricity run vehicles running till the year 2030.



When making our forecasts regarding the year 2030, we consider three different "marker" scenarios and compare them to a "business as usual" (BAU) state. Assuming the following about these three scenarios: I a high share of public transportation; (ii) a high share of private vehicles; and (iii) a high share of shared mobility. In our models, we believe that a shift in mode share is mostly the result of interventions in mobility policy and changes in people's behaviours; this is in spite of the fact that a change in mode share is somewhat impacted by economic development (and the paradigms that go along with it). In order to define these marker scenarios, we have ensured that the total demand for passenger travel and the gross domestic product (GDP) remain unchanged from one scenario to the next. Although maintaining these two constants is a restriction of our research, we have got a hint from a few researches that investigate akin settings and used their findings as a guide. We constructed a car stock model so that we could exercise control over the combination of underlying assumptions and so that we could build the scenarios that were discussed before. We further estimate the amount of gasoline that would be consumed in each of these three scenarios by using the results from our vehicle batch model . Using the expected vehicle stock in 2030, we predict the total number of passenger and vehicle kilometer travelled (PKM and VKT) in India under a few different potential future scenarios involving mobility. The contrast between a business as usual scenario and a scenario in which 30 percent of sales are made up of electric vehicles (EV30), with mode shares remaining equal in the BAU scenario but with a different fuel mix, is where our primary attention resides. We also compare the BAU to alternative futures in which electric vehicle (EV) adoption reaches 30 percent in a variety of mode-shares while still meeting the expected demand for passenger travel. In the absence of reliable data, we assume that the occupancy ratio, the vehicle ownership to usage ratio, along with average trip length will remain unchanged. Another weakness of the study is only considering three probable outcomes, which implies that all of its estimations are cautious.

INDIA'S ELECTRIC MOBILITY OPPORTUNITY

The usage of EVs (electric vehicles) is receiving significant support in India. 1 The acceleration of this transition in this nation may be credited to three factors: 1) increased demand; 2) governmental legislation regarding EVs; and 3) increased production inside the country. Simultaneously, the market for electric mobility in India is expanding, which is made achievable by legislation, appealing and increasing economics, the creation of new business models, and prospects for investment.

1. DEMAND CREATION

In 2015, Ministry of Heavy Industries, Govt. of India, introduced its flagship incentive programme, the FAME India Scheme, with the intention of accelerating the adoption of electric vehicles.
With demand incentives of roughly INR970 crore (USD130 million), FAME I was able to assist 2.8 lakh electric and hybrid cars, which led to a savings of almost 7 crorelitres of gasoline and a reduction of over 17.2 crore kg of CO_2 emissions.
FAME II was launched in April 2019, and an expenditure of INR10,000 crore was made (USD1.4 billion). Its purpose is to facilitate the extensive adoption of electric vehicles (EVs) and charging infrastructure and to

foster the development of a vibrant local EV ecosystem. Electric vehicles that qualify for the FAME II programmed can collectively avoid the emission of 74 million tones of carbon dioxide (MtCO2) over the course of their lifetimes.

Table 1: CUMULATIVE LIFETIME OIL AND NET CO2 SAVINGS OF VEHICLES ELIGIBLE UNDER FAME II

	2W	3W	4W	BUS	TOTAL
VEHICLES	1 MN	0.5 MN	55,000	7,000	1.56 MN
OIL SAVINGS (INR '000 CRORE)	3.0	7.2	2.5	4.5	17.2
NET CO_2 EMISSIONS SAVING (MILLION METRIC TONNES)	2.6	3.2	0.1	1.5	7.4

Multiple interventions are being made at the central level so as to encourage the formation of demand. For instance, the Goods and Services Tax (GST) on electric vehicles (EVs) sold along with batteries was cut from 12 percent to 5 percent. EVs are now exempted from having to get permits, and the Ministry of Road Transport and Highways has suggested that states either lower or eliminate road fees for EVs. In addition, the Ministry of Housing and Urban Affairs updated the Model Building ByeLaws, 2016, in order to mandate the installation of charging infrastructure in both private and public setting.

2. STATE EV POLICIES

At the state level, ten states have established electric vehicle (EV) policies that are curently being implemented, while six additional states are currently making their own EV rules

Table 2 : STATUS OF STATE EV POLICIES AS OF JANUARY 2021

S. NO.	STATE	DAY	MONTH	YEAR	TIME SINCE (MONTHS)
NOTIFIED					
1	KARNATAKA	25th	SEPTEMBER	2017	39
2	MAHARASHTRA	14th	FEBRUARY	2018	34
3	ANDHRA PRADESH	8th	JUNE	2018	31
4	KERALA	10th	MARCH	2019	21
5	UTTAR PRADESH	7th	AUGUST	2019	17
6	TAMIL NADU	16th	SEPTEMBER	2019	15
7	MADHYA PRADESH	1st	NOVEMBER	2019	14
8	UTTARAKHAND	2nd	DECEMBER	2019	13
9	TELANGANA	6th	AUGUST	2020	5
10	DELHI	7th	AUGUST	2020	5
DRAFT					
1	ASSAM	8th	SEPTEMBER	2018	28
2	BIHAR	14th	JUNE	2019	16
3	GUJARAT	23rd	SEPTEMBER	2019	15
4	PUNJAB	15th	NOVEMBER	2019	14
5	GOA	16th	MARCH	2020	10
6	HARYANA	11th	DECEMBER	2020	1

Domestic Manufacturing

Only electric vehicles that meet a certain criteria for localization are entitled for financial incentives under the FAME II standards. The purpose of this is to encourage the manufacture of indigenous components. In the last year, original equipment manufacturers (OEMs) have released a wide variety of new electric vehicle (EV) products, that is a promising sign for the sector. Several governments, like Karnataka and Maharashtra, have also made manufacturing the primary focus of their state electric vehicle (EV) policies by providing monetary incentives to encourage the formation of EV clusters. Additionally, in March of 2019, the National Mission on Transformative Mobility and Battery Storage was given the green light for implementation. Its purpose is to expand local battery manufacture and hasten the shift to e-mobility as a mode of transportation. Its primary objectives include the construction of roadmaps for producing Advanced Chemistry Cell (ACC) batteries, the creation of phased manufacturing programmes (PMP) for battery production, the establishment of Corporate Average Fuel Economy (CAFE) standards, and promoting the Make in India initiative. The PLI programme to boost ACC manufacturing by investint INR18,100 crore was recently approved by the Central Government cabinet.

Economics of Electrification

The financial case with respect to electric vehicles (EVs) is getting stronger on an annual basis because to falling battery prices and rising fuel economy standards. According the total cost of ownership, many different markets and applications are already demonstrating some kind of competitiveness with internal combustion engine (ICE) cars (TCO).

Two-wheeled electric vehicles: The last-mile delivery is an interesting use case since there is potential for considerable reductions in the cost of gasoline. There are state subsidies (such as INR5,000/kWh under the Delhi EV policy, with a top-up of INR7,500/kWh regarding first one lakh EVs registered in Delhi), in addition to national subsidies (such as INR20,000 under FAME II).

However, even without incentives, if electric two-wheelers for goods delivery were to obtain the same interest rate as internal combustion engine vehicles (ICEVs), they could approach TCO parity with similar gasoline models by the time year 2020 comes to an end (at roughly INR 2/km).

In the ride-hailing use case, electric auto-rickshaws are near to cost parity based on total cost of ownership (TCO). This is especially true in Tier-2 and Tier-3 cities, where shorter journey durations demand smaller batteries. Electric three-wheelers: (i.e., less than 3 kWh).

7 In the use case of final-mile delivery, electric three-wheelers are already cheaper than their CNG equivalents on a total cost of ownership basis (at roughly INR2.5/km) in some geographic locations such as Delhi. This is vitally the result of national and state incentives, the most notable of which is the subvention of interest rates. It is currently not cost effective to electrify most private vehicles, including four-wheelers powered by electric vehicles. Evidence from electric vehicle fleets, such as BluSmart's, shows, however, that electric ride-hailing cars are already cost-effective in situations where daily vehicle utilisation is between 150 and 220 kilometres, according to the specifics of the situation.

Electric buses: An analysis indicates that the overall cost of ownership (TCO) of an intra-city electric bus, often known as an e-bus, is cheaper than the TCO of an equivalent diesel bus when compared in a bus-to-bus scenario (at INR47/km for a 12-meter AC bus with a daily usage of 200 km). 10 On the flip side, this might be different for fleet conversion depending upon the expenses and requirements of the service in the area. As there are some limits of the first generation of electric buses in case of range, studies have shown that it may be necessary to employ more than one e-bus in order to replace one conventional bus. In another view, this replacement ratio may be decreased with careful planning and charging procedures.

Conclusion

This model is drawn from expert interviews and the therein identified influencing factors influencing market development. This is supported by data drawn from scientific studies and publicly available data sources. Additionally, the findings have been verified in close collaboration with an automobile manufacturer. In addition, over 15 states and union territories (including draught and notified) have built electric vehicle (EV) policies and regulatory supportive pathways to fasten the transition to electric mobility in the country, and a few other states are in the process of making and adopting such policies. Many other union territories have also developed such policies (EESL 2020).

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