

Policy Analysis Of Electric Vehicle Regulation In India

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Abstract

The global landscape of transportation is undergoing a profound transformation, driven by the imperative to reduce carbon emissions and mitigate the impacts of climate change. Electric Vehicles (EVs) have emerged as a potent and promising solution to the environmental challenges posed by traditional internal combustion engine (ICE) vehicles. With their potential to significantly reduce greenhouse gas emissions, enhance energy efficiency, and diminish reliance on fossil fuels, EVs represent a pivotal element in the transition towards sustainable mobility.

In this era of mobility evolution, India, as one of the world's largest and fastest-growing automotive markets, stands at a crossroads. As a nation grappling with issues of urban congestion, deteriorating air quality, and mounting energy demands, India's embrace of electric vehicles holds immense promise. Yet, the successful integration of EVs into the Indian transportation ecosystem hinges upon a well-structured and adaptable regulatory framework.

This paper embarks on a comprehensive exploration of India's regulatory landscape concerning electric vehicles. It seeks to shed light on the multifaceted dimensions of EV policy, regulation, and implementation within the Indian context. Our analysis will delve into the intricate interplay between government initiatives, industry dynamics, environmental imperatives, and the evolving needs of consumers.

Key objectives of this study include:

- Assessing Current Policy Measures: An examination of the existing policies and incentives at the national, state, and local levels that aim to promote electric vehicle adoption in India.
- Evaluating Infrastructure Development: An analysis of the progress made in developing EV charging infrastructure, including challenges faced and strategies employed.
- Economic Implications: An exploration of the economic impacts of EV adoption on the automotive industry, job creation, and energy security.
- Environmental Benefits: An assessment of the potential environmental benefits, including reductions in carbon emissions and improvements in air quality.

- Consumer Adoption: A review of factors influencing consumer behaviour towards EVs, such as vehicle affordability, range anxiety, and awareness.
- International Comparisons: A comparative analysis of India's regulatory framework with leading EV markets worldwide, drawing lessons and best practices.

Through this analysis, it endeavours to provide stakeholders, policymakers, industry players, and researchers with a nuanced understanding of the current state of EV regulations in India. Furthermore, it aims to identify areas for improvement, policy gaps, and opportunities for innovation that can accelerate India's transition to an electrified, sustainable future. The success of India's journey towards electric mobility hinges on a well-informed, adaptable regulatory framework that aligns economic development with environmental stewardship. By scrutinizing the regulatory landscape, we seek to contribute to the ongoing dialogue on electric vehicles in India, ultimately steering the nation towards a cleaner, more sustainable transportation paradigm.

Introduction

While electric vehicles (EVs) have existed for a long period, the level of innovation and interest in space has grown rapidly over the years past decade. In terms of performance, yes There is no longer the distance that once existed between Electric vehicles and internal combustion engines (ICE) partners. Electric vehicles are performing better than ICE's means of transport across a range of transport policy objectives, including enhancing energy security, reducing dependence on crude oil, better air quality and reducing greenhouse gas emissions. Therefore, electric vehicles seem to be the most popular means of transportation. Clean technology for the future of mobility. Electric vehicle profitability has also improved significantly, while progressive, especially in battery and charging technology, costs should be reduced further. India is taking long strides towards achieving its target of 30% EV market share by 2030. The opportunity for electric vehicles has long been seen as an opportunity game changer for the automotive sector in India.

The desire to reduce pollution levels and dependence on oil imports has increased arguments in favour of using electric vehicles. Post-liberalization India this journey includes rapid urbanization, migration and economic growth. It is also the cause of traffic congestion in the city. Urban areas have large and intense deterioration of air quality. India has had the worst pollution record in 2019, with 21 out of

301 most polluted cities in the world (six cities 10 most polluted cities)¹. The number of electric vehicles so far remains limited due to weak customer base appetite and barriers to infrastructure, among other factors. Many electric vehicles introduced in India have failed customer expectations, with persistent concerns about Upfront cost, range, speed, battery life and battery technology. Consequences of the Coronavirus epidemic and subsequent lockdowns also had dire consequences for the auto industry, continuing to hinder the transition to electric vehicles, as well many projects were postponed while electric vehicles represent less than 1 per cent of global market money, the downside is that there is a lot of room for growth. Furthermore, India is one of the world's leaders in the field of unitary electric vehicles. sales; Therefore, any change in the number of electric vehicles is likely to have a significant impact on the global penetration of electric vehicles. Government Research Institute NITI Aayog clarifies that adoption is faster and Production of hybrid and electric vehicles (FAMEII) and other policies supporting electric mobility are expected to push electric vehicle sales penetration rate to 30% in passenger cars, 70% for commercial vehicles, 40% for buses and 80% for two-wheelers (2W) and three-wheeled (3W) by 2030².

Existing Regulatory Framework of EVs in India

The regulatory framework for electric vehicles (EVs) in India is primarily aimed at promoting the adoption of electric vehicles and supporting the development of charging infrastructure. India's National Electric Mobility Mission Plan (NEMMP) and Faster Manufacturing and Adoption of Hybrid and Electric Vehicles (FAME) program are key policies driving this effort, to achieve a target of 6 to 7 million electric vehicles on Indian roads by 2020. Additionally, the Central Motor Vehicle Rules (CMVR) have been amended to include specifications for electric vehicles, such as battery performance and safety norms³. The Goods and Services Tax (GST) on electric vehicles has also been reduced to make it more affordable for buyers.

The core differences between the operation of cars and electric vehicles make it difficult to have the same set of laws for both. In this section, we will discuss some of the differences between the two and briefly understand why electric vehicles require a different regulatory regime. Motor vehicles run on internal combustion engines, while most electric vehicles run on batteries; therefore the standards required to permit the operation of electric vehicles are different from those of motor vehicles.

¹ [Livemint](#)

² [Niti.gov.in](#)

³ [India Law Journal](#)

Although the Motor Vehicles Act, 1988 (MV Act) does not provide legislation for electric cars and buses, there is legislation applicable to e-rickshaws and e-trolleys.

E-rickshaws and electric vehicles are a separate category under the MV Act, but the road to their regulation is as rocky, if not more so. E-rickshaws have been popular in India for a long time but they are very disorganized. As of 2016, e-rickshaws do not require registration or licensing, meaning anyone can drive an e-rickshaw on the streets. E-rickshaw drivers do not even need to take a driving test. This leads to a confusing database of e-rickshaws and drivers, and in case of an accident, it becomes difficult to hold the culprit responsible. Lately, e-rickshaws and e-carts are strictly regulated. The law granting exemption from licensing and registration requirements for e-rickshaws has been repealed and is no longer followed. Different states in the country have different guidelines regarding e-rickshaws with the main objective being customer safety⁴.

The Ministry Of Power issued the clarification to douse speculation over whether the activity of EV charging through batteries falls under the sale and purchase of power, citing provisions of the Electricity Act 2003. Section 2 of the Electricity Act defines a consumer as any person who is supplied with electricity for his use and includes any persons whose premises are for the time being connected to receive electricity whereas trading is defined as procurement of electricity for resale thereof. The charging of a battery essentially involves the utilization of electrical energy for its conversion to chemical energy, which gets stored in the battery. Hence, the charging of the battery at a charging station of an electric vehicle will include a service requiring the consumption of electricity by the charging station and earning revenue for the same purpose from the owner of the vehicle, the ministry said⁵.

The central government also constituted the National Board for Electric Mobility (NBEM) in 2011. The board aims to promote electric mobility and manufacturing of electric and hybrid vehicles and their components in the country⁶. Key functions of the NBEM include exploring and recommending collaborations and tie-ups for technology acquisitions, engaging technical experts and exploring possible agreements with leading research and development centres globally to make technology available to the domestic industry.

On March 18, 2016, the Model Building Bye set was revised. The 2016 Bye Law has been published. Something important. The reason behind updating the Model Building Regulations 2004 is that the

⁴ [Business Standards](#)

⁵ [Ministry Of Power](#)

⁶ [QRIUS](#)

process follows the 2004 Act. Model building orders require obtaining several approvals from various authorities. It is one Main cause of delay in construction and completion of projects. The 2016 Act aims to reduce human interface by providing a single online portal structure window system, following a government initiative of the real estate sector⁷. The 2016 Act may become a boon to developers as it is simple and unified. This process can also help reduce costs effectively. With the distribution of the 2016 regulations, it is visible that the central government aims for sustainable development, developing and protecting the works while at the same time resisting fire, earthquake, noise, and structural damage among other dangers. The goal of the 2016 laws appears to be twofold:

1. Easy to do business
2. Safe and Ecological Construction Methods

Several Indian states have also introduced policies to promote the use of electric vehicles, such as the Maharashtra Electric Vehicle Policy and the Tamil Nadu Electric Vehicle Policy. The Department of Energy has issued guidance for establishing electric vehicle charging infrastructure in public places, including shopping malls, offices and residential areas. The regulatory framework for electric vehicles in India is evolving rapidly, with the government introducing new policies and regulations to promote their adoption. However, there are still challenges ahead, such as high prices of electric vehicles compared to traditional vehicles, limited charging infrastructure, and lack of consumer awareness about electric vehicles.

Government Initiatives Promoting EVs in India

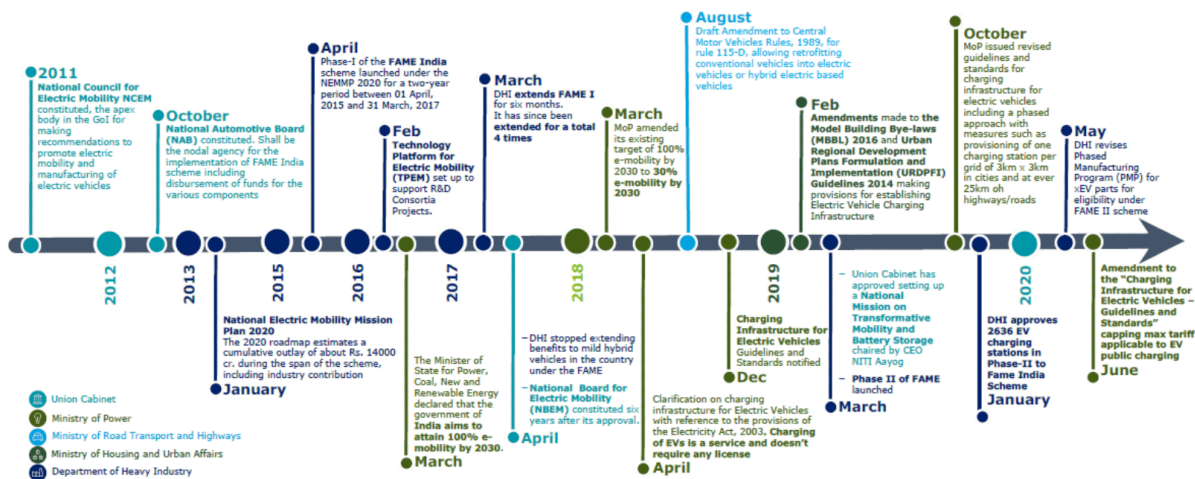
The Indian government has consistently demonstrated its commitment to making India a global leader in the electric vehicle industry by implementing electric vehicle initiatives. The government has developed several programs and incentives to increase demand for electric cars and encourage manufacturers to engage in electric vehicle R&D and related infrastructure. Electric vehicles are accelerating the transition to electric transportation.

The government is introducing cheaper road taxes, scrappage and refurbishment incentives to help meet the government's 30% electric vehicle target by 2030. Rising spending on oil imports, increasing pollution and India's global obligation to fight climate change are the main reasons why India must become a nation. Recent initiatives aim to accelerate the transition to electric mobility. The government is promoting the installation of electric vehicle charging stations by providing funding

⁷ [International Energy Agency](#)

under Phase II of the FAME India program and state-level measures. So far, the Indian government has announced the following incentives.

EV Policy Landscape in India



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➤ FAME- Phase 1 & 2

The Indian government started the FAME India project, to reduce the use of gasoline and diesel vehicles. This project is a critical component of India's electric mobility. The FAME India Plan has four major key areas:

- Demand for technology
- Pilot projects
- Technological development
- Charging infrastructure.

The government notified the second phase of the FAME-2 scheme. It incentivises the purchase of electric buses, and three-wheelers for commercial usage, along with privately owned electric two-wheelers. Approximately 85% of the Rs 10,000 crore outlay is for incentives, while Rs 1,000 crore will be used for creating charging infrastructure.

FAME-2 put forth a quantum of incentives that are supposed to be linked to the cost of advanced batteries (non-lead acid batteries) and the government will be neutral to all types of EV

technologies—hybrid electric vehicles (HEV), plug-in hybrids (PHEV) and battery electric vehicles (BEV). The contours of FAME-2 are inspired by the takeaways from the pilot FAME-1.

★ Concerns with FAME policy:

Multiple EV companies have raised concerns regarding eligibility conditions being too stringent and are demanding their review, as well as for allowing them time to conform to these criteria. Broadly, most scheme conditions are on expected lines. For instance, the precondition of subsidies in the case of cars being provided only for commercial applications (taxi/fleet) and the insistence on localisation reflects political and economic realities. While there may be no major issue for the government in levying a lower GST of 12% and lower road taxes for all EVs, private or commercial, yet it is politically inconceivable to provide subsidies for the purchase of cars to well-off citizens irrespective of environmental benefits.

Currently, in India, most EV parts are imported, and a move towards electric mobility threatens to shift manufacturing and value-addition abroad. Hence, it is unless the government takes corrective policy measures, the auto sector, which accounts for half of India's manufacturing GDP, may go the way of the electronics industry, where huge imports have become a big concern. FAME II's increased focus on public transit could also cause problems. For example, only taxi aggregators operating a commercial fleet of four-wheelers can benefit from auto incentives. While the government needs to encourage the use of electric vehicles to match public transport, paying less attention to private vehicles could slow down the sale of these vehicles.

★ Some of the concerns raised by the Society Of Manufacturers of Electric Vehicle (SMEV) w.r.t FAME policy are as follows:

● 50% localisation requirement:

Under FAME II, companies that produce 50% localized vehicles can only benefit from incentives. This leaves virtually no manufacturers to benefit from the program, as Indian component suppliers are not yet ready to produce components for the current low number of electric vehicles. In addition, the process of safety inspection, monitoring and testing of the vehicles will take at least a year and a half. Therefore, it would be a mistake to tie incentives to location.

● 80 km range:

This requirement would unnecessarily add more battery power, which would not be necessary for nearly 90% of users. The range of 60km is enough for two-wheelers.

- 20% ceiling cap on factory price:

This limitation could harm the affordable bike segment. For example, an e-bike with an ex-showroom price of INR 70,000 will only receive a subsidy of INR 14,000, even though it is eligible for more subsidies under other government schemes.

- Incentives reduction:

Under FAME II, the subsidy has been reduced to INR 12,000-18,000 for 90% of urban speed e-bikes.

➤ PLI SCHEME

PLIs are financial initiatives for electric vehicles to enhance productivity to make it easy to sell EVs at a lesser price to clients. This scheme facilitates multiple benefits to EV producers, including a direct subsidy to EV buyers. This strategy also inculcates the cell battery and vehicle component industries. The amount will be paid over five years when the production plant is functioning. The strict selection criteria disables many small and medium-sized enterprises that produce EV batteries and auto parts to apply for the scheme's advantages.

➤ Battery Switching Policy

The government's initiatives for electric vehicles will unify the specifications of batteries used in electric vehicles across India. This policy will help promote the use of electric vehicles in time-sensitive service sectors such as delivery and intercity transport, as exchanging depleted batteries for fully charged ones is a more viable option than on-site charging, which can take hours. Battery swapping, if done correctly, is expected to gain acceptance in commercial applications such as 2W and 3W automobiles, allowing faster penetration into these segments. Manufacturers will also benefit from a battery replacement policy⁹. As standards are implemented, machine parts will become more available. Additionally, by taking advantage of economies of scale, this strategy will help battery manufacturers reduce prices. Small businesses are key to addressing the industry's supply-demand imbalance.

➤ Special Electric Mobility Zone

The government intends to create mobility zones for electric cars. Only electric cars or equivalent vehicles are allowed in government-designated areas. Similar policies are common in several European countries as well as China. The unspoken benefit of designated electric mobility zones is that they will help reduce overcrowding caused by private cars. People travelling in these areas must drive their electric vehicles or use public electric vehicles, thereby increasing the market share of electric vehicles.

⁹ [Times Of India](#)

Comparative Analysis of State EV Policies of Uttar Pradesh and Tamil Nadu:

The Uttar Pradesh government has launched the 'Uttar Pradesh Electric Vehicle Manufacturing and Mobility (EVMM) Policy 2022'. The EVMM policy was first launched in 2019. However, the Uttar Pradesh government has decided to implement a new electric vehicle mobility and production policy in 2022, adapting to the current trend.

★ The core objectives include:

- Creating UP a global platform for the development and production of electric mobility
- Facilitating the transition to ecological transport systems, especially in cities.
- Allowing investment in developing battery charging/swapping infrastructure.

Tamil Nadu's new 'electric vehicle policy 2023' applies to manufacturing units engaged in the production of electric vehicles, electric vehicle components, Electric Vehicle Supply Equipment (EVSE) and electric vehicle charging infrastructure, charging station/charge point operators and electric vehicle customers in Tamil Nadu. Electric vehicles promoted under this policy will have to comply with the FAME II guidelines issued by the Ministry of Heavy Industries, Government of India. Similarly, charging stations must comply with Electric Vehicle Charging Infrastructure - Guidelines and Standards issued by the Ministry of Power, Government of India.

★ The core objectives include:

- Making Tamil Nadu the preferred destination for electric vehicle manufacturing in Southeast Asia
- Accelerate the adoption of electric vehicles in Tamil Nadu
- Strengthen the development of the electric vehicle ecosystem in Tamil Nadu

★ Attracting Investments in the EV Sector:

- Uttar Pradesh:

Uttar Pradesh Government provides special incentives and concessions to attract investment in the production and assembly of batteries for electric vehicles and electric vehicles manufacturing, development of charging infrastructure in the state, along with Government policy on industrial investment and employment promotion (IIPE), 2017. Such incentives act as magnets to attract potential investors and create favourable conditions for greater investment in this field. Additionally, higher investment rates will lead to higher industry growth rates.

- Tamil Nadu model:

The Tamil Nadu government offers lucrative incentives to channel investments in the electric vehicle manufacturing industry, manufacturing/assembling electric vehicle batteries and electric vehicles charging infrastructure and equipment manufacturing companies. Eligible units will benefit from further incentives from the state government. 100% SGST Refund (Refund will be paid on advance sales Manufacturer valid until December 31, 2030). 15% capital allowance on qualifying investments for a period of 10 years (in case Intermediate products are not eligible for SGST tax refund). 100% exemption from electricity tax and 100% registration tax Refund of employer contribution to EPF for any new jobs created (up to 2025) 20% capital allowance on qualifying investments over a 20-year period for electric vehicles. Battery manufacturing units and special offers for MSME manufacturing units.

★ EV Manufacturing clusters/ zones:

- Uttar Pradesh:

Considering the need for quality infrastructure and equipment for the electric vehicles manufacturing industry, the State regulates the allocation of industrial land especially to develop electric vehicle production zones/parks. The government will adopt a cluster approach to provide the necessary resources for industrial installation.

- Tamil Nadu:

The Tamil Nadu government admits that most of the investments are made by electric vehicles Original Equipment Manufacturers (OEMs) can only be attracted if there is a well-developed infrastructure and a mature supplier ecosystem. To facilitate this, Tamil Nadu's electric vehicle policy must develop an exclusive electric vehicle fleet in key areas Automobile manufacturing centres and areas with the potential to attract electric vehicle investment. This fleet of electric vehicles will enable the formation of an

ecosystem of suppliers serving equipment manufacturers. Common facilities will be provided to industries providing prototypes, testing, training, etc. in these tram parks. Incentives under various schemes applicable to the MSME sector and key industries will be extended to these industries, depending on their eligibility. The government will also promote free trade logistics and warehousing zones. for better inventory management.

★ Environment Protection Initiatives

- Uttar Pradesh:

The Uttar Pradesh government will provide incentives for the establishment of an Effluent Treatment Plant (ETP) in private electric vehicle (PEV) production/assemble the parks. Incentives will be applied in the form of a 50% interest refund on borrowed loans. To set up a general purpose ETP for a period of 7 years, with a maximum ceiling of INR 5 crore per project. Similarly, individual industrial units generating ETPs will also benefit from the incentives. The incentive to offer will be in the form of a certain percentage pay interest on the loan used to create the ETP

- Tamil Nadu:

The policy encourages the reuse of electric vehicle batteries that are no longer usable and proposal to establish a recycling company associated with EVs and Batteries Manufacturers will focus on “urban mining” of rare materials from the battery. These materials can be used more efficiently to produce batteries. Charging station operators should be encouraged to operate the battery at the end of their life recycling agencies. Electric vehicle owners can take their batteries for recycling. The Tamil Nadu government, through its electric vehicle policy, is encouraging companies to recycle. Establish its own units in the country. Appropriate subsidies will be provided to these units.

Prevalent Issues and Challenges

Despite the effectiveness of electric vehicles, their adoption has always been challenging due to battery defects, range anxiety of the EV driver, auxiliary loads such as AC, battery cost, lack of charging

infrastructure, etc This section highlights the challenges associated with the widespread adoption of EVs.

➤ Range anxiety

Range anxiety describes the fear experienced by drivers that the electric vehicle may not have sufficient charge to reach the final destination. Range anxiety and recharging time are the main barriers that prevent electric vehicles from becoming a part of mainstream transportation fleets.

➤ Auxiliary loads

Auxiliary loads directly affect the energy consumption of electric vehicles, thereby reducing their range. First, in city driving conditions high auxiliary loads cause battery drain, which leads to a reduced EV driving range. In summer, when the AC is used, the driving range drops by 17.2–37.1% (under simulation conditions). Similarly, due to heating requirements. In winter, the range varies from 17.1 to 54.1%¹⁰.

➤ Battery cost

The high cost of batteries is another EV issue, that prevents it from becoming a market success. Limited driving range, high battery cost, high battery charging time, uncertain battery life, the bulky weight of EV batteries, and battery safety are some of the major limitations of EV battery technology.

➤ Lack of EV charging Infrastructure

Most common EV chargers are unidirectional which makes it difficult to integrate them into the smart grid. A bidirectional EV charger can be a solution to this issue. Lack of charging infrastructure Insufficient recharging stations is another factor related to EV adoption since customers will be frustrated if they cannot find a convenient recharging station when driving.

★ Here are the key hurdles in building charging infrastructure and deploying electric vehicles in India:

- Tariff of Charging EV:

¹⁰ [IEEE Xplore](#)

The State DISCOM will decide the EV charging rate. Therefore, electric vehicle charging rates will vary between states and lack uniformity. To successfully implement Charging Infrastructure (CI) guidelines, rates must be low and uniform.

- Open access and captive consumption:

The CI directive allows power withdrawal from any DISCOM; However, CI's guidance does not provide a pricing policy for the supply of this amount of electricity. In addition, the CI guidelines do not stipulate the scope of internal use in the case of fixed consumer use or internal use of the company's own fleet or chartered fleet.

- Additional Electricity Load:

India is the third largest electricity producer in the world. However, complex electricity tariffs lead to higher unit electricity prices. Therefore, to successfully implement CI's policy, how the government will manage to provide cheap electricity and manage additional electricity load is a matter of great concern.

- Service Provider Network:

According to CI guidelines, there is a network of service providers through which the public charging station operator will provide information to customers about the availability of charging points and customers can then book an online place to charge their electric vehicle. It is also important to note that customer data is stored on the service provider's network and data leaks can occur. The CI Guidance may therefore also include provisions relating to data protection.

- Battery Swapping:

The CI manual does not provide a method for battery exchange. Battery swapping is one of the elegant concepts to save EV battery charging time. However, it is necessary to take a proper approach during battery exchange, taking into account the quality of the battery, its depreciation and cost.

➤ The high price of electric vehicles

Due to the high cost of EV batteries and the lack of an EV charging infrastructure, electric vehicles are expensive at the moment. Consequently, the high upfront cost of EVs is one of the significant economic barriers preventing their large-scale adoption.

➤ Lack of Standardisation

Every other electric vehicle company has its charging port, which becomes an obstacle to establishing a proper charging ecosystem. Additionally, many electric vehicle users have complained that they face ethical issues regarding charging their vehicles at charging stations of various electric vehicle companies, which could affect the development of the electric vehicle industry. Lack of standardization reduces the adoption rate of electric vehicles in the social community.

➤ Environmental Dangers

The EV revolution is primarily required for the most populated and polluted cities of India such as Delhi, Mumbai, etc. but in such cities the major chunk of electricity is generated through burning fossil fuels which is equivalent to spreading the pollution through the ICE vehicle smoke, even most of the charging stations are seemingly operating upon diesel-driven electricity generator. Shifting to renewable energy sources is equally important as shifting to electric mobility (Like Solar power, wind energy, tidal power, etc).

Lessons from best models practised around the world

➤ UK's Zero Emission Vehicle (ZEV) mandate

The UK has set a target to ban the sale of new petrol and diesel cars and vans by 2030, with hybrid vehicles to follow in 2035. To achieve this goal, the government has introduced a Zero Emission Vehicle (ZEV) mandate, which requires automakers to sell a certain percentage of zero-emission vehicles each year. The ZEV mandate is similar to those in California and other US states, where automakers are required to sell a certain percentage of electric or other zero-emission vehicles each year¹¹.

➤ Norwegian EV tax policy

The Norwegian government has come up with a national goal that all new cars sold by 2025 should be zero-emission (electric or hydrogen). By the end of 2022, more than 20 per cent of registered cars in Norway were battery electric (BEV). The purchasing tax for all new cars with emissions is calculated by considering a combination of weight, CO₂ and NO_x emissions. The tax is progressive, making big cars with high emissions very expensive. The regulations on the purchase tax have been adjusted to have greater emphasis on emissions and less on weight¹².

¹¹ [Bird & Bird](#)

¹² [Norsk elbilforening](#)

➤ Chile Energy Roadmap

Chile has implemented a series of policies to promote the adoption of electric vehicles (EVs). The country has set a target of having 100% of public transport and 40% of private vehicles be electric by 2050. To achieve this goal, the Chilean government has implemented several measures, including tax incentives for EV purchases, subsidies for the installation of charging infrastructure, and exemptions from road tolls and parking fees. The Chilean legislature in October 2022 passed a law exempting EVs from paying annual road taxes for two years. The exemption covers 75per cent of road taxes in years three and four, 50per cent in years five and six and 25per cent in years seven and eight. (On the other hand, tax incentives for EV buyers is applicable to individual taxpayers and offers a tax deduction of up to ₹ 1.5 lakhs on the interest component of a car loan taken to buy an EV.) Chile has also launched a program to replace diesel-powered buses with electric buses in major cities, intending to have 1,500 electric buses on the roads by 2022.¹³These policies have helped to make Chile one of the leading countries in Latin America for EV adoption. As of 2020, there were over 10,000 EVs on the roads in Chile, which is expected to continue to grow in the coming years.

➤ China's Subsidiary Model

China has set a goal of having 40 per cent of the vehicles sold in the country be EVs by 2030, which means a lot more vehicles will need to be charged. By 2025, the government aims to have in place charging infrastructure to meet the needs of more than 20 million cars. Right now, of China's 810,000 public charging points, more than 70 per cent are in heavily populated coastal areas, such as Guangdong and Shanghai¹⁴. Not only does China produce the majority of the world's EV batteries, but it's also forging ahead with the development and manufacturing of EVs—and selling them to the world. The government has also substantially subsidized all aspects of the industry, especially battery manufacturing. For example, from 2015 to 2019 automakers that manufacture cars in China were required to use batteries from a handful of white-listed domestic companies to be eligible for government subsidies.¹⁵

China's national NEV policies focus more on improving technology, and industry capacity, and encouraging innovative business and operational models. The Indian government need to begin emphasizing on battery range, instead of focusing on electric power ratios, as one of the major eligibility thresholds/

¹³ [CMS Law Tax](#)

¹⁴ [China Briefing](#)

¹⁵ [Reuters](#)

Another lesson from Chinese EV adoption is that the government focuses on implementing a more comprehensive policy package, including promoting charging infrastructure, improving related technologies like battery recycling, and strengthening technical standards on charging and batteries. Local governments were involved in implementing demand-side policies, such as service fee reductions for public charging stations and parking fee discounts.

In 2017, China issued a new 'Dual Credit System' that combines fuel efficiency standards and NEV mandates that require manufacturers to achieve fuel economy and NEV targets. It gives vehicle manufacturers credits based on the number of NEVs produced and the fuel economy of their internal combustion engine vehicles and the companies that can't meet certain targets with their own credits, can trade with one another to avoid penalties.

Policy Recommendation

➤ Setting out a national EV Ambition

A national target and commitment will act as the cornerstone of the EV adoption strategy. To keep the country's auto sector competitive and reduce emissions, India must invest in electrification. Businesses look to governments to provide consistent, ambitious targets and clear timelines to give them clarity and confidence on the way forward. While recent Indian EV policy advancements are encouraging electrification, the absence of ambition and mandates leaves ambiguity. India already has a goal i.e. by 2030 the government plans to have EV sales penetration of 40% for buses, 30% for private cars, 70% for commercial vehicles, and 80% for two- and three-wheelers. The Road Transport and Highways Minister pointed out that NITI Aayog has inspired 25 States to develop EV policies, out of which 15 have already announced State EV policies in the EV mission. It would be beneficial if there were narrow city-tier-wise goals set:

- ➔ Tier 1: 40% of total vehicles can be EVs by 2040
- ➔ Tier 2: 30% of total vehicles can be EVs by 2040
- ➔ Tier 3: 20% of total vehicles can be EVs by 2040
- ➔ Tier 4: 10% of total vehicles can be EVs by 2040

➤ Linking ICE vehicle scrapping incentives to EV adoption

One of the key hindrances in the adoption of EVs worldwide is the transition from ICE vehicles (Internal Combustion Engine) to EVs. Hence incentivising the scrapping of ICE will encourage the

adoption of EVs as it will divert the bearing cost at micro and macro level. This will also ensure scrapping in a framework that will be environmentally friendly.

➤ Institutionalising Low Emission Zones (LEZ).

A Low Emission Zone (LEZ) is an area, typically in an urban environment, where specific restrictions are placed on vehicles to reduce air pollution and improve air quality. The primary goal of an LEZ is to encourage the use of cars that produce fewer emissions, such as electric vehicles (EVs), and to discourage the use of high-emission cars, particularly those with diesel engines. The implementation of LEZs should be phased in to have a smooth transition in the existing infrastructure.

In order to adopt LEZ, the government can promote Zero Emission Vehicle (ZEV) in India, as it will ensure manufacturers to produce and sell one specified minimum amount of ZEV as a percentage of their total annual revenue in the market. This will act as a procurement mandate for the auto industry for production and electric vehicle (EV) sales are likely to grow over time. This strategy is necessary in addition to the current practice of offering purchasing incentives for consumers for market promotion. With the responsibilities of both the supply side and the demand side together, it will help India achieve scale within a limited time frame. Global studies have shown that ZEV authorization can generate higher ZEV sales than a financial incentive just for procurement, with much lower government spending. The mandate will be a revenue-neutral strategy for the Indian government. This will allow market competition to be leveraged to promote ZEVs. This also has the potential to free up government capital to promote and charge electric vehicles in the infrastructure. This can increase employment and investment.

In order to adopt a national-level ZEV production mandate, there has to be involvement of the vehicle industry which will adhere to stratified targets. The government will have to adopt credit trading mechanisms to support the implementation of ZEV. The Union government may take up the responsibility of developing a comprehensive ZEV market development and transition plan in collaboration with all the stakeholders and concerned ministries. India will have to come up with supportive strategies in states to ensure faster adoption in personal vehicle segments of cars and two-wheelers.

➤ Subsidising tax regime for EV Adoption:

Offer financial incentives, such as tax credits, rebates, or subsidies, to reduce the upfront cost of EVs for consumers. Implement incentives for automakers to produce a diverse range of affordable EV models.

The Indian tax regime can adopt such a progressive tax strategy. It can be done by key taxing new sales of at least the most polluting car models and using this money to subsidize EVs. This will help implement climate policies as it is aimed at people buying a new car, rather than an indiscriminate use tax at the gas pump. Consumers will have an option when buying a new car; they can choose a model with lower emissions like a plug-in hybrid, which is not taxed, or even an EV that is subsidized. Although, the tax policies on purchase alone won't get us where we need to be fast enough, there can be provisions for incentives in place such as lower road tolls, partial access to bus lanes and cheaper public parking for EV drivers.

India can also come upon a 'Credit System' that combines fuel efficiency standards and EV mandates that require manufacturers to achieve fuel economy and EV targets. It can give vehicle manufacturers credits based on the number of EVs produced and the fuel economy of their Internal Combustion Engine (ICE) vehicles and the companies that can't meet certain targets with their own credits, can trade with one another to avoid penalties.

The credit score can be calculated by a product of the difference between the 'standard value' and 'actual value' of the fuel consumption of all vehicles manufactured in or imported, and the production or import volume. This can be the formula:

$$\text{Credit score} = (\text{standard value} - \text{actual value}) \times \text{production or import volume}$$

As for the 'standard value' we can regard it as the desired fuel consumption allowed by the Indian government. The 'actual value' can refer to the weighted average of fuel consumption of all vehicle models that the manufacturer manufactures or imports

In case, manufactured and imported volumes of fuel-consumption vehicles of two manufacturers are the equal, then the manufacturer with a higher output of green energy vehicles will obtain a higher credit score. Meanwhile, if the output and import volumes of green energy vehicles of two manufacturers are the equal, then the manufacturer with a higher output of fuel-consumption vehicles and higher overall fuel consumption will obtain a lower credit score.

➤ Charging Infrastructure:

Invest in a comprehensive and well-distributed charging infrastructure, including fast-charging stations along highways and public charging points in urban areas. Encourage private-sector investment in charging infrastructure through incentives or partnerships. This can be done by setting the following:

1. Public EV Charging Stations (EVCSs): Charging points with unrestricted and unfettered access for the public. Public charging stations can be publicly or privately owned. In order to use public land for charging infrastructure installation, one need to consider various station ownership models, ranging from the ‘owner-operator model’ to leasing arrangements. In an owner-operator model, the property owner covers all costs of the charger installation and operation and retains all revenues. In an ‘external operator model’, a third party, who shares part of the risk and revenues with the property owner, handles the operation of the charging station. In a ‘lease model’, the property owner’s involvement is minimal as they only rent the space. The ‘concession model’ resembles a lease arrangement, but the property owner is responsible for ensuring the necessary groundworks and electrical connections at the site, which allows them to retain ownership of the connection point. The choice of model determines the level of risk, but also of revenue and investment, assumed by the property owner.
2. Semi-public EV charging stations: Charging points in spaces with restricted access for the public which may include commercial buildings such as workplaces, malls and theatres, and institutional buildings such as government offices and hospitals.
3. Private EV charging station: Charging points in spaces with no access for the public and where charging is reserved for an individual or a household (e.g., single-dwelling houses, parking spots in group housing societies, etc.)
4. Battery Swapping Facility (BSF): Charging station where a discharged or partially charged battery of an EV (primarily two- and three-wheelers) can be swapped for a fully charged battery.

➤ Regulatory Standards:

Establish clear and consistent regulations and standards for EVs, including safety, emissions, and charging infrastructure. Ensure interoperability and standardization of charging connectors and payment systems.

- Safety requirements for power batteries for electric vehicles:

This can focus on strengthening the battery system's thermal safety, mechanical safety, electrical safety and functional safety requirements. In particular, the standard must add a battery system thermal diffusion test, which requires that the battery system will not fire or explode within five minutes after the battery cell thermally loses control, and reserves a safe escape time for the vehicle occupants.

Battery durability is somewhat unaddressed by present standards, the exceptions being partial coverage (PHEVs). Setting specific requirements will not only address battery lifecycle determination, but the impact of partially deteriorated batteries on CO₂ emissions / fuel economy. Battery recycling is partially addressed, but through largely country-specific protocols and with therefore little standardization from a global perspective. These requirements are also generally non-battery-specific and tend to take the form of general end-of-life vehicle recycling guidelines. The guidelines can stipulate battery-specific requirements pertaining to permissible quantities of hazardous materials as well as specific required recycling procedures.

- Vehicle Range & Efficiency Testing:

It is recognized that EV range is affected substantively by vehicle speed and driving behavior, ambient temperature, and the operation of climate control systems. It is recommended that testing procedures for EVs include cold ambient temperature testing with cabin heating in operation. It is recommended that information developed through this upcoming battery durability requirement be leveraged to develop correction factors that can be used to project range and energy efficiency over the operating lifecycle of the corresponding electric vehicles that receive these batteries

The following general provisions are recommended:

- Heating be set to achieve (as quickly as possible) and subsequently maintain a specified, standard cabin temperature
- Requirements flexible enough to accommodate both resistive heating element and heat pump systems

- Requirements flexible and extensible enough to accommodate future radiant heating solutions such as infra-red panels and foot wells
- Requirements flexible enough to factor in additional luxury features that accomplish passenger heating – heated seats, heated steering wheel
- Air conditioning to be set to achieve (as quickly as possible) and subsequently maintain a specified, standard cabin temperature
- Requirements flexible enough to accommodate both electric air-conditioner systems as well as heat pumps
- Requirements flexible and extensible enough to accommodate future advanced solutions featuring smart materials

- Safety Requirements for Electric Vehicles:

This will mainly stipulates the electrical safety and functional safety requirements of EVs. This can be ensured by adding the alarm signal requirements for thermal events of the battery system, which can give the driver and passengers a safety reminder for the first time; strengthens the waterproofing, insulation resistance and monitoring of the whole vehicle; requirements to reduce vehicle safety risks under normal use, etc. Test methods, like insulation resistance and capacitive coupling, can be optimized to improve test accuracy and ensure the safety of high-voltage vehicles.

- Safety requirements for electric buses:

This can address the high number of passengers in electric buses and battery capacity with regard to collision safety, the charging system and the tightness of the batteries and the vehicle. High-voltage components needs to be particularly resistant to fire, and specifications needs to be specified for the thermal continuity of the cells. Based on the “Safety Requirements for Electric Vehicles” standard, the test conditions for the collision, charging system and waterproofing of the battery compartment of electric buses are more stringent. There needs to be increased flame retardant requirements for high-voltage components and thermal runaway assessment requirements for the minimum management unit of the battery system.

- Fleet Electrification:

Promote the electrification of public and private fleets, including government vehicles, public transportation, and commercial fleets. Implement incentives for businesses to transition their fleets to EVs.

Just like Chile, India has ambitious goals for electrifying public transportation. The country has a vision of increasing the share of electric vehicle (EV) sales to 30% in private cars, 70% in commercial vehicles, 40% in buses, and 80% in two-wheelers and three-wheelers by 2030. The low bankability of electric bus leasing contracts has come up as a challenge in India's plan to electrify its public transportation. This is because of the poor financial health of most State Transport Undertakings (STUs), the viable long-term solution is to reform them. Just like Chile, India can introduce a payment security mechanism. The government can introduce a private payment security fund to cop up resources from global climate funds and development institutions. Bus leasing companies can utilise this fund by paying a small fee.

A functional carbon trading market is a medium-term measure that can improve the economics of electric buses as the share of green electricity continues to increase in the Indian energy context. California's transportation carbon cap-and-trade program is one such example of the beneficiaries of a carbon trading market for transportation electrification. Over the long term, the government can develop an incentive provision for STUs to improve their financial health through better operational efficiency, asset monetisation, and exploring innovative revenue-earning opportunities, such as venturing into providing first-mile/last-mile connectivity, on-demand mobility, electric taxi fleet, etc.

➤ Grid Integration:

Develop strategies to manage the impact of increased EV charging on the electrical grid, including smart charging solutions and demand response programs. Encourage the use of renewable energy sources for charging infrastructure.

Vehicle-to-grid (V2G) is an emerging technology that allows two-way power flows between the electric vehicles and the power grid. In short, V2G will allow an electric car to temporarily provide power back into the grid, allowing it to act as a storage system that helps even out peaks in demand. This technology might not be widely available currently but this technology holds much promise.

As grid operators can leverage these bi-directional flows to manage rising power demand and prevent overloads. This energy system can benefit from the massive storage potential of electric vehicles; aggregated EV fleets could turn their batteries into virtual power plants that can avail power when needed or store renewable energy. Timely government regulations will be crucial in guiding V2G rollout and ensuring smart charging stations meet adequate specifications for V2G capability.

➤ Consumer Education:

Launch public awareness campaigns to educate consumers about the benefits of EVs, including cost savings, environmental advantages, and available incentives. Provide information on charging options and locations.

➤ Incentives for Charging at Off-Peak Times:

Implement pricing incentives to encourage EV owners to charge during off-peak hours to reduce strain on the grid and take advantage of excess renewable energy generation.

➤ Regulatory Support for Innovation:

Create a regulatory environment that supports innovation in EV technology, such as battery research and development, to drive down costs and improve performance. Streamline permitting processes for research and development projects related to EVs. This can be done by the following measures:

1. Promote EV Clusters:

The government through the policy aims to attract big-ticket private investments to develop EV Clusters with global standard infrastructure. The cluster shall cater to EV & EV Battery and related component manufacturing. Such clusters shall have an anchor effect in the region where they are developed. India has a huge MSME base across the value chain in automobile manufacturing and battery manufacturing, thereby providing vast opportunities for the OEMs to set up anchor projects and reduce the cost of manufacturing EVs . Common facilities for design, prototyping, and testing to all units in the same cluster shall be promoted. Also, the Government shall ensure external infrastructure like roads, power, water and drainage, waste management etc. for the industry in these parks.

2. Higher initial impetus on battery manufacturing:

Unlocking the advantage in the battery manufacturing value chain, the Government shall rigorously attract mega investments in EV Battery manufacturing at the initial stage. This will reduce the cost of manufacturing EVs and also create a volume of job opportunities . For this, higher subsidies shall be provided to premium investments in battery manufacturing.

3. Tech Assistance :

India needs to be the hub not only for the manufacturing of EVs but also for R&D focusing on the next generation of battery management systems, drivetrain components, battery

chemistries, fuel cell systems and intelligent transportation systems. Therefore, the Government shall encourage the OEMs to develop R&D and testing facilities for EV/ EV batteries.

4. Single Window:

The policy is aimed at creating a conducive business-friendly environment in the country by ensuring simplification of procedures, and timely clearances benchmarked with the best and most responsive facilitation services. Investors in the EV industry shall be facilitated with time-bound single window online clearances/ NoC/ Approvals

➤ Used EV Market Support:

Develop policies that promote the growth of the used EV market, making electric vehicles more accessible to a wider range of consumers. Offer incentives for the purchase of used EVs, as well as incentives for dealerships to sell them.

➤ Environmental Impact:

Implement regulations to reduce the environmental impact of EV production and disposal, including responsible battery recycling and reuse programs. Encourage the use of sustainable materials in EV manufacturing.

➤ Infrastructure for Low-Income Communities:

Ensure that underserved and low-income communities have equitable access to EV charging infrastructure and incentives to address transportation equity issues.

➤ Collaboration and Coordination:

Foster collaboration between government agencies, automakers, utilities, and other stakeholders to create a cohesive strategy for EV adoption. Establish a centralized authority or agency responsible for coordinating EV policies and initiatives.

Conclusion

Electric vehicles (EVs) have been gaining traction in India as the government promotes their use to reduce air pollution and dependence on imported oil. The country has been facing a severe air pollution crisis, with cities like Delhi and Mumbai being among the most polluted in the world. Road

transport is a major contributor to this problem, accounting for around 18% of total greenhouse gas emissions in the country.

To address this concern, the Indian government has been implementing various policies and incentives to encourage the adoption of EVs. In 2015, India signed the historic Paris Climate Agreement with more than 170 nations, embarking on a significant step that held together developing and developed nations in combating global warming by cutting down on greenhouse gas emissions. The Faster Adoption and Manufacturing of Electric Vehicles (FAME) India scheme was launched in 2015 to provide financial incentives for the purchase of EVs. The scheme has been extended several times and is currently in its second phase, which aims to support the deployment of 5 lakhs (500,000) electric two-wheelers, three-wheelers, and four-wheelers by 2022.

In addition to the FAME scheme, the government has reduced the Goods and Services Tax (GST) on EVs from 12% to 5%, provided income tax benefits for buyers, and introduced state-level incentives such as exemption from road tax and registration fees. These measures have made EVs more affordable and attractive to consumers. The NITI Aayog, a government think-tank, has proposed that all new vehicles sold in India should be electric by 2030. This ambitious target has been criticized by some industry experts as being unrealistic, given the current state of infrastructure and technology. However, the government remains committed to promoting EVs and is investing in charging infrastructure to support their adoption.

The National Electric Mobility Mission Plan (NEMMP) aims to achieve 6-7 million sales of hybrid and electric vehicles by 2020. To support this goal, the government has set a target of installing 69,000 charging stations nationwide by 2025. This will require significant investment from both the public and private sectors. Despite these efforts, there are still several challenges that need to be addressed to accelerate the adoption of EVs in India. One of the biggest barriers is the high upfront cost of EVs compared to conventional vehicles. This is partly due to the lack of domestic manufacturing capacity for batteries and other components, which increases the cost of imports. Another challenge is the lack of charging infrastructure, especially in rural areas. While the government has set a target for charging stations, it remains to be seen how quickly these will be deployed and whether they will be accessible to all consumers. The limited range of EVs is also a concern for many consumers, especially those who need to travel long distances. While improvements in battery technology are expected to address this issue in the coming years, it remains a barrier to adoption in the short term.

The Indian government has taken significant steps to promote the adoption of EVs as a way to reduce air pollution and dependence on imported oil. While there are still challenges to be addressed, the

potential benefits of EVs for the environment and public health make them a compelling option for India's transport sector.

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