



India Business Guide to EV Adoption



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Executive summary

Economic growth and urbanization are fueling India's growing demand for mobility.

While the country is investing in public transport and infrastructure, the demand for personal mobility using two, three and four-wheelers is growing at a rapid pace – often faster than the speed at which public infrastructure and mass-transport is deployed. Urban commuting has become one of the most energy- and pollution-intensive activities in India.

India is home to 22 of the world's 30 most polluted cities,¹ and road transport is one of the fastest growing sources of carbon emissions. For the world to stay within a 1.5°C increase in average temperature as set out in the Paris Agreement, the transport sector must be rapidly decarbonized. The speed of adopting zero-emission vehicles and renewable energy in a large country like India can have a meaningful impact on global decarbonization efforts.

Indians bought 26 million new vehicles (including 3.4 million passenger cars) in the period between April 2018 - March 2019². These sales were almost completely dominated by internal combustion engines (ICE). The World Business Council for Sustainable Development (WBCSD) is working with India's mobility value chain to help accelerate the adoption of electric vehicles so that businesses can be a part of the solution to India's urban pollution and emissions challenges.

The good news is that, on a total cost of ownership basis, EVs are already economically viable today if the utilization of vehicles is high. Business and commercial fleet operators often have high vehicle utilization, making them ideal candidates for early adoption. Apart from savings in operational cost, companies adopting EVs can also benefit by reducing measurable emissions, improving employee and customer value and meeting regulatory compliance.

This Business Guide to Adopting EVs in India has been co-created with companies from India's EV value chain, including business fleet operators. Together, we have identified three of the most scalable use cases for business and fleet EV adoption in India. These are: employee transport, platform-based ride-hailing and last-mile urban freight and deliveries.

The use-case of employee transport in India is disproportionately larger than the global average due to the limited availability of public transport in large Indian cities. Businesses often need to offer commute services to attract and retain employees, and demand for clean transport in this segment is driving the use of EVs in India. Companies such as Accenture, Adobe, E&Y, TESCO and Wipro have deployed EVs for their employee transport requirement across major Indian cities.

Shared mobility and ride-hailing services provide easy access to affordable and convenient rides using two, three and four-wheelers. App-based ride-hailing services have witnessed a rapid growth in the past five to seven years. While most ride-hailing services in India started with four-wheelers, recent growth in affordable two and three-wheeler-based ride-hailing has gained considerable speed and scale.

EVs have also been deployed or are being evaluated across several locations by established ride-sharing services such as Ola and Uber, as well as the new EV-only ride-hailing platforms such as BluSmart and Smart-E.

EV adoption for urban freight distribution and e-commerce/food deliveries is also gaining traction. For instance, IKEA (an EV100 signatory) aims to run 60% of its home delivery fleet using EVs within three years of operation. Swiggy, a food delivery company, is piloting the use of EVs across 10 cities in India.

Transitioning your fleet to EVs requires operational changes in fleet management. It requires planning to ensure your money is spent wisely and that implementation is as seamless as possible. In this emerging market, a few missteps could give the EV transition a rocky start.

This guide brings together practical experiences and specific expertise in EV fleet transition, from a wide range of industry and global perspectives. It aims to be a ready reckoner for procurement managers, fleet managers and sustainability and strategy teams looking to adopt EVs.

This guide is designed to provide your company with:

- The most up-to-date and geographically relevant information on EV adoption
- The clear steps to take in planning and adopting an EV fleet
- An overview of best practices and learnings provided by companies who have already made the transition.

It's time to get your fleet on the path towards lower costs, lower GHG emissions, and better health and welfare of your employees and customers.

डॉ. ए. आर. सिहाग
सचिव
Dr. A. R. SIHAG
SECRETARY



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Dated : 25th November, 2019

Foreword

Mobility is central to urbanization, as well as India's next frontier in its fight against climate change. India aspires to a better mobility paradigm for its citizens that is safe, accessible, efficient, clean and helps improve quality of life.

As one of the fastest growing economies of the world that is also home to a predominantly young population of more than 1.3 billion aspiring people and as world's fourth largest automobile market, India holds a significant stake in the global transition towards a more sustainable mobility.

Electric mobility powered by renewable energy can help improve our environment, reduce pollution in our cities, lower India's oil import bill and make mobility more cost-effective and accessible over the years. The transition also provides an opportunity to set up new manufacturing based on cutting-edge technologies in the country.

Government of India is championing the idea of 'clean kilometres' through its support for shared and electric mobility. Under the second phase of our Faster Adoption and Manufacturing of Electric Vehicles in India (FAME), India will provide incentives totalling INR 100 billion (USD 1.4 billion) to promote adoption of electric vehicles through demand incentives, creation of charging infrastructure and to spread awareness.

Several other measures, including a reduction in Goods & Services Tax and benefits on income tax for EV buyers have been announced to increase the uptake of electric vehicles in the country. Several state governments have formulated progressive policies to attract manufacturing and adoption of electric vehicles.

Businesses have a critical role to play in the realization of India's transition to sustainable mobility. At Department of Heavy Industry, we recognize the leading role of the private sector in contributing to a successful shift towards sustainable mobility.

It is a matter of satisfaction for us that the World Business Council for Sustainable Development (WBCSD) and companies working with them have taken proactive steps towards accelerating adoption of electric vehicles in India.

I congratulate WBCSD on putting together a business-to-business guide for adoption of electric vehicles by way of experience – sharing by the companies that are members of WBCSD.


(Dr.A.R. Sihag)

Foreword

Mobility is at the center of modern life. With many urban transport systems already under strain and mobility demand predicted to grow significantly in the future, mobility needs to change to meet our future needs. It's more than a matter of congestion – we must reduce our emissions and clean the air we breathe.

We need to adopt new pathways towards clean, cost-effective and efficient mobility. Rapidly evolving technologies and business models offer a way to decarbonize the system.

While governments help to create an enabling policy landscape, businesses are well placed to address rising global transportation requirements as well as improve local environments for their stakeholders.

Forward-thinking businesses in India are already playing a leading role in electrifying transport for employee mobility, ride-hailing and urban freight. These 'use cases' often result in high utilization of vehicle fleets, making EV adoption cost-effective, reducing GHG emissions, contributing to better air quality and enhancing the ability of companies to attract and retain employees and customers.

Creating any new and sustainable system, including the one required for an electric mobility transition, requires a collaborative approach. Suppliers and service providers require demand signals, while adoption requires a choice of vehicles and the availability of suitable infrastructure.

This report and related work that is being carried out both through the World Business Council for Sustainable Development (WBCSD) and through leading companies, is helping to accelerate adoption of electric vehicles in India.

It does this by outlining the technologies and business models that are viable today and highlighting the current and emerging policy environment. Faster corporate adoption of electric vehicles, in turn, is expected to stimulate the path towards a robust system and regulatory environment.

As businesses, we need to innovate and create value in business models that provide our employees, customers and other stakeholders with clean, affordable transport that lowers emissions and supports healthy and smart cities.

With technology costs fast declining, now is the time to seize the benefits of leading the transition towards clean mobility.



A stylized, handwritten signature in black ink.

Dr. Pawan Goenka
Managing Director, Mahindra & Mahindra



A stylized, handwritten signature in black ink.

Peter Betzel
CEO, IKEA India

Foreword

India is at the center of the global challenge of creating a sustainable world that works for everyone. Already a USD \$2.7 trillion economy, India plans to grow its economy to USD \$5 trillion by 2025. It will also be the world's most populous country by 2030.

The race is on to achieve the sustainable transition of India's economy, to meet the needs of its young and fast-growing population.

Mobility is one area where the opportunity for business growth and sustainable benefits are huge. For example, car ownership is expected to grow by an enormous 775% over the next two decades. While this growth will provide mobility solutions, it will also present significant challenges.

The government has identified electrification of mobility as a necessary part of transforming to a clean, affordable and connected mobility system, with big benefits for a more efficient energy system too.

But government action alone will not shift adoption of electric vehicles fast enough.

WBCSD members are working together to accelerate the adoption of electric vehicles today, as a way to secure India's electric mobility transition.

Commercial fleets – for employee transport, ride-hailing, home deliveries and other commercial and industrial use cases - represent the fastest growing segment of vehicles on Indian roads. Electric vehicle options are already viable for many business-led use cases, and the economics are improving quickly.

Under WBCSD's REMobility project, 50 companies have been working together since the start of 2018. Together, these companies represent 6 billion kms/year in mobility demand, and they include most of the major companies from India's electric vehicle value chain.

The companies have been sharing knowledge on the practicalities of acquiring and adopting electric fleets in India, as well as interacting constructively with policy makers, demonstrating the viability of electric fleets and seizing the opportunities therein.

This Business Guide for EV Adoption in India is an important step forward in consolidating knowledge on the best ways for companies to begin making the switch to electric mobility today.

We hope it will guide and inspire widespread corporate adoption in India and encourage action in other countries too.



A handwritten signature in black ink, appearing to read 'Maria Mendiluce'.

Dr. Maria Mendiluce
Managing Director, Climate & Energy, Cities & Mobility and Circular Economy



A handwritten signature in black ink, appearing to read 'Joe Phelan'.

Joe Phelan
Director, WBCSD India

Introduction: a paradigm shift towards sustainable mobility in India

Urban mobility is at the core of urban life and economic activity. It provides people with access to work, health, education, goods, services and leisure. Mobility systems are essential to the modern economy, but for most large cities, mobility systems are already at their limits.³

Transport is a rapidly growing contributor to climate change, with emissions increasing by 2.5% per year.⁴ Transport is also a significant and growing contributor to particulate air pollution. The total contribution to particulate air pollution can vary widely, from 12%-70% of the total pollution mix but low- and middle- income countries, including India, suffer disproportionately from transport-generated pollution.⁵

The good news is that urban mobility is undergoing a massive transformation driven by a new set of solutions across electric, shared and connected mobility.

This presents a global economic opportunity worth trillions of dollars, as well as the potential to improve the livelihoods of billions of people, their quality of life, their health, and the environment.⁶ Electrification of vehicles is an important element of decarbonizing mobility and tackling worsening air quality and associated health impacts. The reduction in technology costs and stricter emission regulation are accelerating the transition.

However, the switch to electric is not yet happening fast enough to fulfil the goals of the Paris Agreement.

By focusing on India, WBCSD is addressing the needs of a country which will be highly representative of the future of developing countries. The acceleration of EV adoption in India between 2020 – 2030 is critically necessary in order to catch up with demographic growth. A slow transition could mean tens of millions of additional ICE vehicles on Indian roads.

Fleet adoption is expected to form a significant share of overall EV adoption in India until 2023-24 (which is when mass adoption by individual consumers is likely to begin in the Indian context), and this is what WBCSD's work in India seeks to accelerate.

WBCSD has been working with India's EV value chain under its REmobility workstream. This work engages most of the prominent companies from the EV supply ecosystem as well as business and fleet customers that represent a mobility demand of over six billion kilometers a year.

An early EV adoption by businesses and fleets will pave the way for an accelerated mass EV adoption in the country, which, in turn, will set an example that other developing markets can follow.



①

EV market overview

As EV adoption in India catches up, businesses and fleet operators can be the catalysts - their scale means they can immediately benefit commercially from adopting EVs. Businesses and fleet operators can take advantage of available policy incentives and optimize vehicle use to enable a cost-effective transition today.

Companies are under increasing pressure to reduce costs and improve efficiency while delivering new initiatives that meet organizational sustainability objectives to achieve social, customer and employee value.

In this context, energy and mobility are no longer merely costs for businesses to manage. They are climbing up the corporate agenda due to sweeping environmental, social, business and technology trends.

Global EV adoption continues to grow rapidly. In 2018, the global electric car fleet exceeded 5.1 million, up 2 million from the previous year. The global stock of electric two-wheelers was 260 million and there were 460,000 electric buses. In freight transport, EVs were mostly deployed as small / light-commercial vehicles (SCV/LCVs), which reached 250,000 units in 2018, while medium electric truck sales were in the range of 1,000-2,000 in 2018.

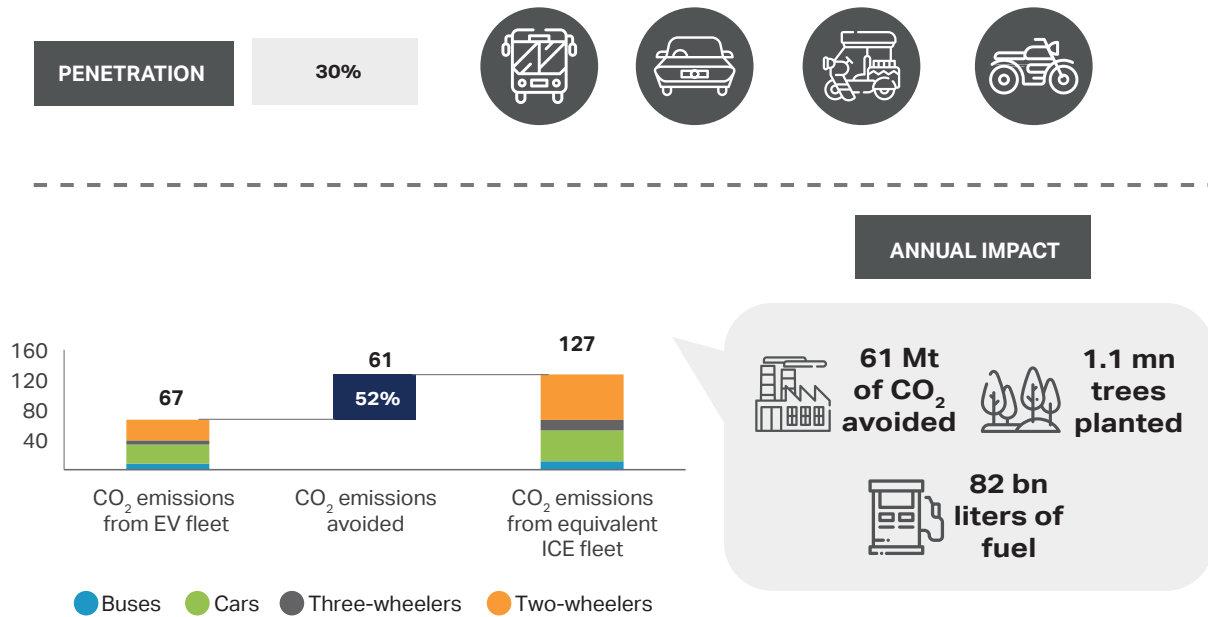
Globally, EVs on the road in 2018 saved 36 million tonnes of CO₂, compared to an equivalent ICE fleet.⁷

Due to their lower running cost, most EVs are already economically viable at current market prices (which include recent subsidies and reduction in GST) for certain business applications. EVs achieve a TCO-parity to their ICE counterpart when their utilization per day is high enough, i.e., at about 100-120 kms for two wheelers, 100-120 kms for three wheelers, 200-220 kms for cars, 210-220 kms for buses and 250-260 kms for SCV/LCVs.⁸ Also, these parity thresholds are expected to incline in favour of EVs with plummeting costs and improving technology.

For businesses, EVs can also reduce GHG emissions, directly and measurably. The emission reduction potential can be further enhanced if businesses and fleet operators use renewable energy to power their EVs. Analysis shows that an average 30% EV sales adoption during 2019-2030 period would avoid consumption of 82 billion litres of fuel per year – equating to a reduction of early 61 Mt CO₂ emissions per year, which is equivalent to planting 1.1 million trees per year in 2030.⁹ Other benefits include zero tail pipe emissions, a silent powertrain and ease of driving, with fewer maintenance requirements and breakdowns.



Figure 1: CO₂ emissions avoided by EVs compared to equivalent ICE fleet by mode per year - 2030



There are already several specialized mobility service providers that use informatics and analytics to optimize EV routes and charging strategy, to seamlessly solve most challenges around range anxiety and limited availability of public charging infrastructure. Businesses operating large fleets can build this capability in-house.

In India, employee transport is a USD \$3.5 billion market.¹⁰ As most large Indian cities lack effective public transport, companies often provide transport services to their employees. In this respect, the business demand for clean mobility is already driving the use of EVs for employee transport. Companies such as Amex, Accenture, Adobe, American Express, EY and Google have deployed EVs for their employee transport requirements. This in turn is supporting the creation of an independent electric mobility ecosystem, with business investments in electric fleets,

charging infrastructure and emergence of new mobility business models.

Ride-sharing and hailing has grown rapidly in India, with significant new growth coming from two/ three-wheeler ride-hailing for last-mile connectivity. Given that vehicles deployed on ride-hailing platforms often have the highest utilization rates, ride-hailing is an interesting use case for EV adoption. India-based ride-hailing leader Ola's experiment in Nagpur city,¹¹ its creation of a dedicated company for EV adoption, Uber's deployment of EVs in Hyderabad in April 2019¹² and its plan to expand adoption of EVs for the last mile showcase the early enthusiasm of ride-hailing platforms for EVs.

Another important use case for EV adoption is in urban freight distribution and in e-commerce/food deliveries. Several companies and delivery platforms have already initiated trials with EV-based deliveries. For instance, IKEA aims to run 60% of its home delivery fleet on electric within three years of operation.¹³ Swiggy, a food delivery company, is planning to pilot the use of EVs in 10 cities in India and Walmart-owned Flipkart has announced a plan to electrify 40% of its delivery fleet.¹⁴

An accelerated adoption of EVs across business and its fleets can provide the scale and experience required for mass adoption in India. Business leadership can provide the demand signal to manufacturers and infrastructure investment companies, helping solve problems to early adoption such as lack of vehicle models or charging infrastructure.

②

Evaluating electric vehicles

The current capital cost of an EV is high as compared to an ICE vehicle but its operating cost is low - so the more you drive an EV, the more cost effective it becomes.

Most fleet operators have limited or no experience in procuring and operating EVs in India. The good news is that EVs are not very complicated. Simply put, an ICE has been replaced by an electric motor and the fuel tank by a battery bank.

The fundamental parameters for evaluating electric vehicles are as follows:

Procurement cost: the procurement cost for EVs is currently higher than ICE vehicles, primarily because of the high share of the lithium ion battery as a part of the total vehicle cost. The battery pack makes up close to 35-40% of the retail price of a medium-size car.¹⁵ Nevertheless, lithium-ion battery pack prices have fallen from USD \$1,000 per kWh in 2010 to USD \$176 per kWh in 2018, a drop of 84% over eight years. Prices below USD \$100 per kWh are expected in the next few years.¹⁶

Operational cost: operational costs, which are based on running and maintaining of vehicles, are lower for EVs¹⁷ chiefly because:

- Electricity costs are lower and less volatile than gasoline prices
- Electric motors are much more efficient than combustion engines (efficiency of e-motors: 85-90% against 20-25% in ICE)

Incentives: government incentives can help to reduce the procurement and operational cost of EVs. Goods and Services Tax (GST) for EVs is 5%, against the 18% - 50% (with cess) for various ICE vehicle categories. This difference in taxation is a key incentive for EVs. Further, phase II of the scheme for Faster Adoption and Manufacturing of EVs (FAME II) provides demand-side incentives (i.e., upfront incentive on purchase price) of INR 86 billion (USD \$1.24 billion) for a three-year period starting April 2019.¹⁸ A list of EV models available in India applicable for incentives under FAME-II scheme can be accessed here: <https://www.fame-india.gov.in/ModelUnderFame.aspx>

Maintenance cost: maintenance costs for EVs are lower than for combustion vehicles, as EVs have fewer moving parts. The drivetrain in an ICE vehicle typically contains over two thousand moving parts, whereas the drivetrain in an EV contains around 20;¹⁹ and, there are usually fewer fluids (like oil and transmission fluid). All of this means significantly lower maintenance costs.

Sustainability: EVs are more sustainable because electric motors are more efficient than combustion engines at converting energy to motion. EVs already produce far less climate pollution than their gas-powered counterparts, and they're getting cleaner. Optimizing EV

production and the disposal or reuse of batteries could further increase their environmental benefits. And as grid electricity becomes cleaner, the difference in carbon footprint between electric cars and gasoline cars will continue to grow.²⁰

Total cost of ownership (TCO): given the current capital and operating costs of EVs and ICE vehicles, TCO parity is being achieved at various utilization levels (in km/day) considering current market prices.²¹ Annual ownership costs for e-vehicles fall against their ICE counterparts when the vehicle is driven more than certain thresholds (kms in a year).

The more you drive an EV, the more cost effective it becomes.

TCO analysis⁸ for major vehicle segments and use cases considers the cost of vehicle, charging cost, maintenance cost, cost of secondary and tertiary battery, and subsidy available (applicable) to manufacturers. However, it does not consider ancillary costs to charging infrastructure (for operators), insurance of vehicles and other auxiliary costs which may or may not be common to both ICE and EVs. These assumptions have been part of all analyses conducted for this guide.

Figure 2: Operational cost comparison between an EV and an ICE vehicle



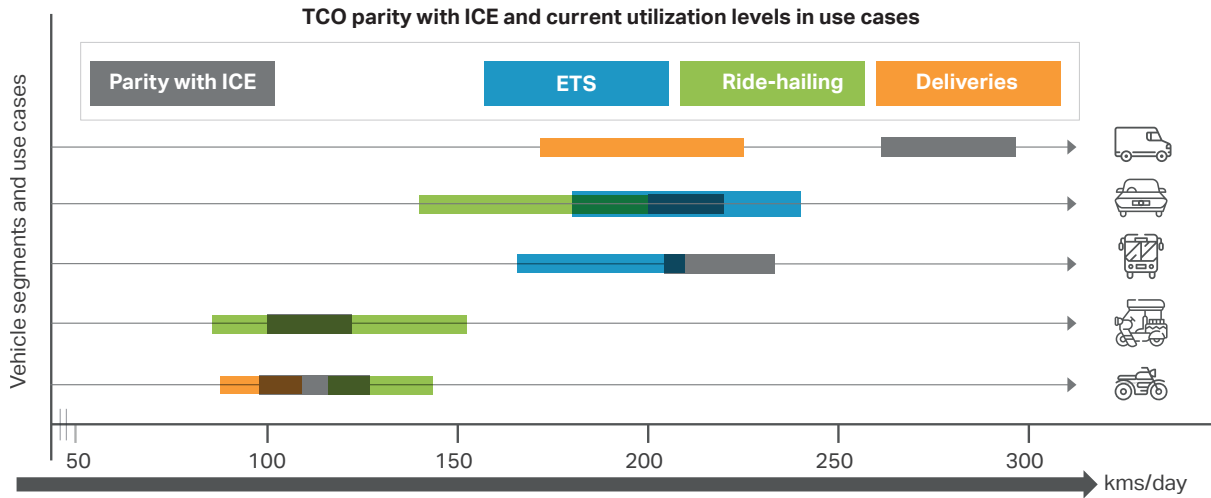
	 Battery electric vehicles	 Conventional vehicles (ICE - Diesel)
Cost of usage per unit of electricity/litre of fuel	INR 6-8/kWh	INR 65-70/litre
Fuel cost (INR/km)	INR 0.9 - 1.2/km	INR 3.2 - 3.8/km

Figure 3: Total cost of ownership (TCO) parity comparison for vehicle segments and utilization levels for use cases²²



Vehicle range: vehicle range is directly linked to battery cost and technology improvements such as increasing battery energy density. As battery costs reduce and battery efficiency improves, vehicle range is likely to increase. In India, the range of four-wheeler variants typically ranges from 180-452kms per full charge. The manufacturers include Mahindra, Tata and Hyundai. EV models in the two-wheeler segments have ranges above 80 kms per full charge, from manufacturers such as Okinawa and Avera. For three-wheelers, on-road range of 60-70 kms per full charge is typical in the new Kinetic Green models. Buses manufactured by BYD

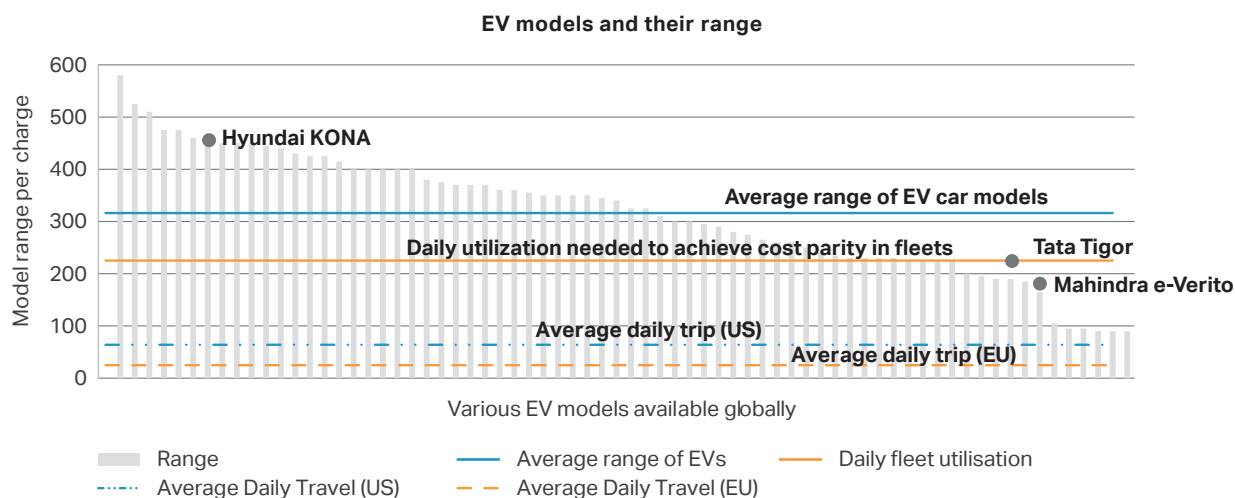
for city usage (30ft/9m buses) typically range between 200-230 kms per full charge. Globally, there are nearly 70 popular EV models being manufactured by Tesla, Volkswagen, Nissan, BMW, Chevrolet, Renault and more. The average range of EVs today is around 315 km.²³

100% of EVs today can travel more than the average daily trip; ~70% of EVs can travel more than daily use thresholds for fleets.

Charging time: the time it takes to charge a vehicle has been a challenge for fleet operations. The time to charge an EV (2W, 3W, 4W and buses) depends on the size of the battery (or range) and the output power of the charging point. The range of vehicle is a product of the vehicle's battery size and efficiency. This can be a key concern for any fleet operator trying to maximize vehicle use, and for use cases such as ride-hailing, the revenue potential of driver time must always be considered. Intelligent algorithms, informatics and proper vehicle and charging point-level planning are necessary to viably operate a fleet.



Figure 4: Range of globally available EV car models



Charging standards - there are three key global charging standards: CCS (prominent in US & Europe), GBT (in China) and CHAdeMO (Japan). Currently, the Indian automotive market is dominated by Japanese car makers (Suzuki, Toyota, Honda) who may want to support CHAdeMO. However, large European and US-based automakers prefer CCS standards, and new Chinese entrants prefer GBT. Consequently, fleet operators must future-proof their charging investments.

Most major OEMs in Europe and the US, with a few in Japan and South Korea (Hyundai, KIA, Honda), have opted for CCS charging standards over CHAdeMO in their upcoming and new EV models.²⁴

A list of charging solution providers in India can be accessed here: <https://evreporter.com/ev-charging-solution-providers-in-india/>

While the dominance of any one standard over others is yet to be established, multi-standard chargers are increasingly common.

Table 1: Average charging time across various vehicle segments available in India

Vehicle segment	Battery*	Usual range*	Fast charging**	Slow charging**
2 wheelers	3-5 kWh	60-100 kms	0.5 hrs	1.5-2 hrs
3 wheelers	3-5 kWh	60-80 kms	0.5 hrs	1.5-2 hrs
4 wheelers	15-25 kWh	120-160 kms	1.5 hrs	6-7 hrs
Buses	180-300 kWh	180-220 kms	4-6 hrs	-

③

Prioritized use cases for business EV adoption in India

Large-scale adoption of EVs needs to be accompanied by system-wide changes: across customer acceptance, emergence of supporting business models and policies, manufacturing, availability of various vehicle types, awareness of technology, pricing, and set-up of both private and public charging infrastructure. Early adoption by government, businesses and fleets can provide the scale to create micro-systems which can grow, replicate and eventually combine, to form larger ones.

For this guide, we have identified three high-priority use cases for business EV adoption in India:

- employee and customer transport;
- platform-based ride-hailing; and
- last-mile urban freight and deliveries.

These use-cases exhibit the highest potential for early adoption. This has been established through consultation with the industry and the vehicle utilization potential of each use-case. Higher potentials for utilization will lead to ownership cost parity of EVs with ICE counterparts in each of these use-cases, making the transition easier and more viable.²⁵

The following chapters cover the barriers, recommendations and adoption processes for each of the three use-cases.

An overarching recommendation has emerged across all use-cases, which indicates the merits of players forming partnerships with city-governments and other participants in the mobility system. Participants were able to leverage funding, demand aggregation tools, charging networks and more, to make their transition to EV adoption easier and faster.

Table 2: Identifying prioritized use cases for business EV adoption in India

Identifying prioritized use cases for business EV adoption in India				
Transport use case	Business influence on electrification	Early adoption potential	Popular vehicle type used	Prioritised used cases
People movement				
Self-driven				
Personal vehicle (self-owned)				
Vehicle as a service				
Leased vehicle				
Rental vehicle				
Ride as a service				
Employee and customer transport				✓
Platform based ride-hailing				✓
Conventional taxi service (intracity & outstation)				
Mass transit				
Goods movement				
Long distance road freight				
Last mile deliveries				✓

High
 Medium
 Low

3a

Electrifying employee transport



OVERVIEW OF EMPLOYEE TRANSPORT IN INDIA

As Indian cities grow, the lack of reliable public transport combined with passenger safety concerns has given birth to a burgeoning corporate employee transport system. The large outsourcing services industry in India has been a major contributor towards the growth in employee transport services. The ease of accessibility, late night availability, safety and comfort offered by the employee transportation makes it a preferable alternative when compared to the public transport counterpart such as a metro.

Definition: in the context of this guide, employee transportation is defined as transportation services provided to the employees by a company. It could be in the form of (refer to figure 5 for more insight)

WHY ELECTRIFY EMPLOYEE TRANSPORT?

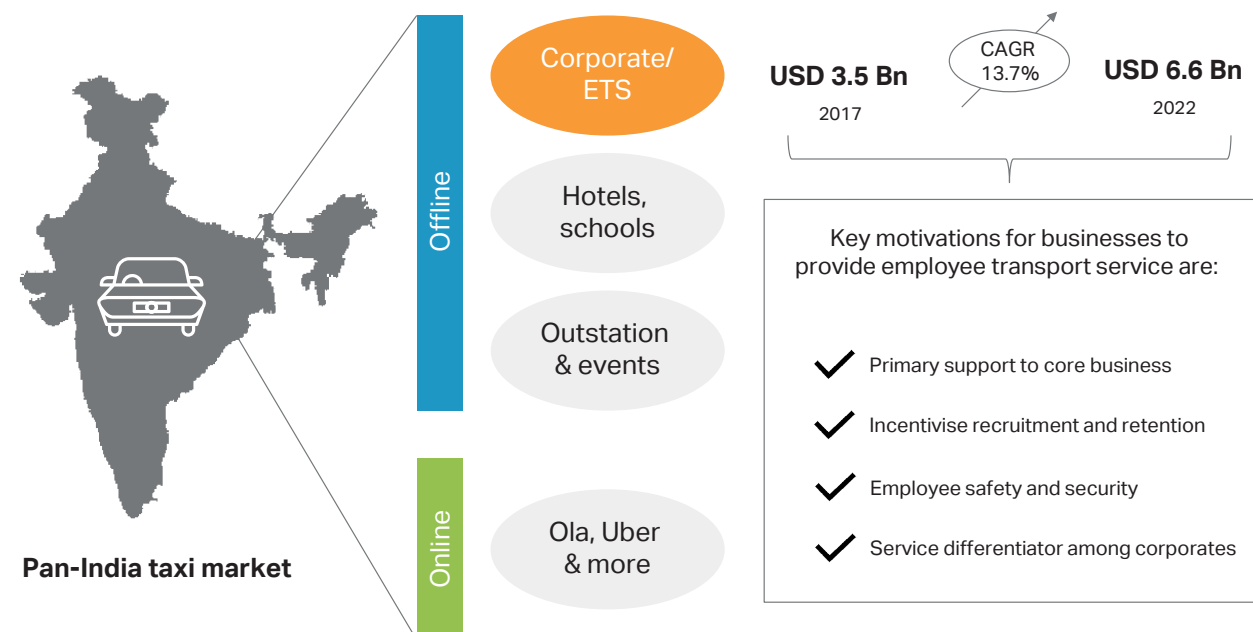
- **Higher utilization rates and defined routes make this segment well placed for EV adoption:** EVs at high utilization rates, can compete with conventional vehicles. This positions companies and employees to derive economic value. In addition, the employee transport

segment generally has well-defined and fixed routes, so it is possible to guarantee utilization via planning and setting up charging stations, leading to business viability.

- **Size of the market:** As of 2017, the corporate or ETS forms 23% of the pan India taxi-market, i.e., estimated to be USD 3.5 Bn.²⁶ This market is projected to grow at CAGR 13.7% until 2022²⁷ (refer to figure 5 for more insight).
- **The unidirectional flow of traffic towards corporate centers is contributing to the heat island effect:** the issue has become prominent in Indian cities, where areas near corporate offices are up to 3-5 degrees Celsius warmer than the surrounding area.

Category	Description
Company-owned fleet	Where a company owns and operates a fleet of vehicles
Mobility-as-a-service	Where a company enters into vehicle lease contracts with third party transport vendors to help employees commute from their homes to the workplace and back. Also used for office operations
Employee-owned	Creating and operating workplace infrastructure facilities (charging infrastructure in case of EVs) or incentivizing employees to purchase/use the vehicles

Figure 5: Overview of Indian taxi market



VARIATIONS IN USE-CASES

There are three popular ownership models in corporate employee transport: company-owned, mobility-as-a-service and employee-owned.

Company-owned vehicles:

This involves the company owning both the vehicles and the chargers. It involves costs to train staff, set up infrastructure and operate the fleet. Most companies who are used to conventional ICE vehicles face difficulty switching to EVs primarily because of high costs and a lack of operational experience.

Mobility-as-a-Service: This ownership model involves companies contracting third-party vendors to provide EVs. It is the most widely adopted model for employee transport. From a corporate customer perspective, it is difficult to own and maintain EVs and/or charging infrastructure; the company also incurs various overheads such as training staff/drivers, managing off-duty accommodation, catering for meals and more.

With these ownership models come the various modalities of operation: charging-cycles, duty-cycles, locations, ownership and partnerships, software platforms, analytical tools and more. Consequently, leasing out to expert EV vendors over usual third-party vendors is necessary to reduce the ownership costs of “traditional” substitutes or EV deployment.

Certain practices that are proposed under this ownership model are as follows:




- **Charging network:** partnerships with existing networks in cities to manage operations
- **Location of captive chargers:** either at company or service-provider sites
- **Chargers:** deployment of fast (DC) and slow (AC) chargers at company premises.
- **Technology:** employing route optimization software to ensure fleet utilization and efficiency

- **Utilization:** EVs can be used for additional services, apart from employee transportation, to ensure fleet utilization; for example, EVs being deployed as part of ride-hailing fleets (Uber, Ola et al) when not providing employee transport services.

Transitioning to an electric vehicle from a fossil-fueled vehicle for my daily work commute gives me a sense of responsibility towards society and pride in spreading the word across by being an ambassador of change.

Sushovan Bej,
Passenger –
EY Employee

Figure 6: Ownership models and costs for employee transport

Key features		Ownership models for Employee Transport		
		Company-owned	Mobility-as-a-Service	Employee-owned
1	Procurement, operation and maintenance of chargers	●	◐	●
2	Economics of operation	●	◐	◑
3	Suitable vehicle segment			
4	Infrastructure augmentation	●	◐	◑
5	Training staff	●	◐	◑
6	Miscellaneous overheads	●	◐	

Cost ● High ◐ Medium ○ Low

Employee-owned vehicles: this involves the company setting up charging infrastructure and dedicating EV parking spaces for their employees. In this model, companies bear the cost of setting up infrastructure and power. Staff and overhead costs become optional. This model proves beneficial to both employees and business customers (with marginal expenses). Companies can support employee ownership by offering charging for employees; it can also lease vehicles to employees in some models.

ECONOMIC VIABILITY AND POTENTIAL TO SHIFT

Despite the lower operating cost of EVs, there is a significant TCO gap that exists between EVs and ICEs for the four-wheeler and bus segments. The TCO gap can be bridged only if an EV is used extensively.

In the Indian context, with current vehicle models and subsidies available, an electric four-wheeler and an electric bus will achieve TCO parity with their ICE counterparts when the vehicles are used more for than ~200kms/day and ~210kms/day respectively.²⁸

In the four-wheeler vehicle segment, employee transport fleets would need to take up four shifts per day to cross the parity threshold. At the same time, businesses can also consider three-wheelers for short (10-15 kms) trips catering to employees living close by. While three-wheelers do provide lower parity thresholds, three-wheelers also present lower occupancy, safety and comfort for riders, which are important considerations.

The lack of subsidy support for private e-buses makes it difficult to adopt buses for employee transport. With current vehicle costs, models such as Shuttll (driving around 120-180kms a day) will not be able to economically shift to EVs. Lack of clarity around duration of validity of e-bus permits also hurts the investment in e-buses.

With current mobility and utilization trends in employee transport, four-wheelers promise higher potential for transitioning to electric mobility as compared to buses.

STAKEHOLDERS INVOLVED IN THE ADOPTION PROCESS

Who are the decision-makers within a business (customer)?

Considering that the functions and organizational structure of every business customer is different, the decision makers for EV adoption within companies will also be different. These departments may include HR, Finance, Procurement or Legal; the transportation vertical may be housed under any of these departments, or across businesses.

Figure 7: Evaluating economic viability for employee transport

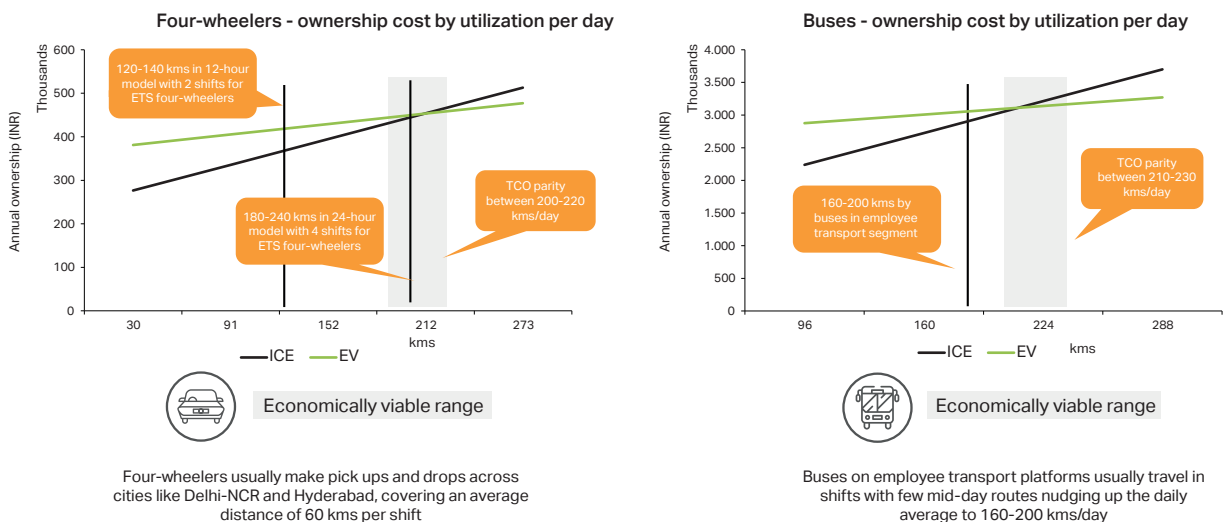
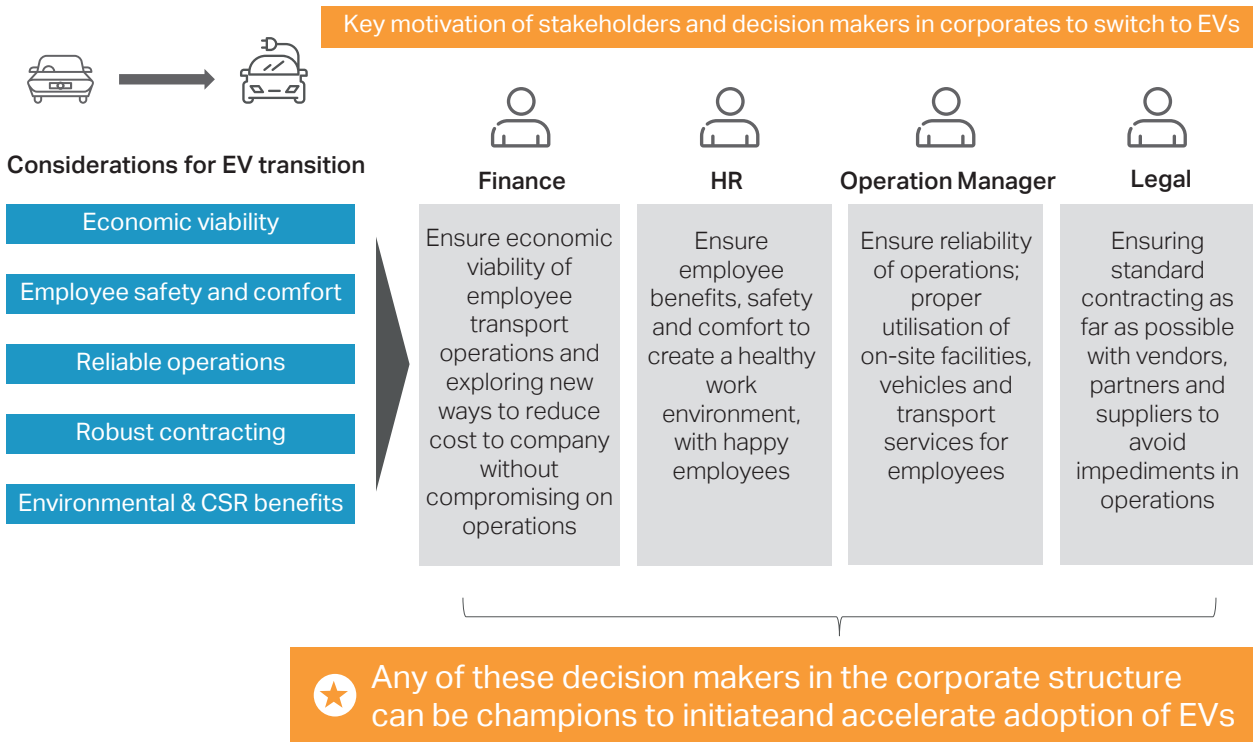


Figure 8: Key motivations for internal stakeholders within corporate structures



BARRIERS AND SOLUTIONS TO ADOPTION

Stakeholder	Barriers	Description and solutions
Businesses	Limited vehicle options, with low range and reliability, and high cost	<ul style="list-style-type: none"> Limited options in the market and their apparent performance constraints discourage businesses to switch to EVs <p>Solution: businesses should begin with easier segments in fleets: replace vehicles with fixed routes – this can be done with low-range, low-cost vehicles. It is easier to adopt EVs if the utilization is high: businesses should initially deploy EVs for 24-hour operation models to mitigate cost-disparities for higher-cost, higher-range vehicles.</p>
	Lack of awareness of technology and best practices	<ul style="list-style-type: none"> Lack of awareness and technical know-how to operate EVs can be a significant impediment in adoption <p>Solution: special emphasis should be given to enlisting expert e-mobility vendors who come equipped with technology enablers and best practices. Additionally, businesses should remain flexible to technology constraints at the outset. This will enable businesses to offer their employees reliable EV services and at a reasonable cost.</p>
e-mobility service provider (vendor)	Rapidly changing technology, unfavored operational conditions and high cost	<ul style="list-style-type: none"> Vendors might be discouraged to commit to vehicles which might have higher performing upgrades soon; temperatures in the field of operation hampers vehicle range, and charging time <p>Solution: vendors can diversify their operations with considerable ease, considering their typical breadth of deployment: short-range vehicles can be dedicated to short mid-day drops while newer versions with longer range can be deployed for employee drop shifts; vendors can partner with business customers to deploy chargers on-site (e.g. in parking basements) to reduce wait time and shelter charging activities from outdoor weather conditions.</p>



The key plan for employee transport service providers should be to identify champions within the organization who could get an internal buy-in and can push EV adoption forward.

Vikash Mishra,
Head of External Relations, Lithium Urban Technology



EV ADOPTION PROCESS

Once initiated, the deployment process can often take between four and eight months, the bulk of which is spent in evaluation. One of the objectives of this guide is to compress this timeline and accelerate the adoption process.

Currently, there are several inefficiencies in the process of adoption, such as:

- Protracted time socializing the concept within the corporate structure

- Operational reservations towards the reliability of EV technology, and consequently the safety of employees
- Lack of convincing EV options in vehicle segments of choice (buses, vans and more)
- Untrained drivers and staff

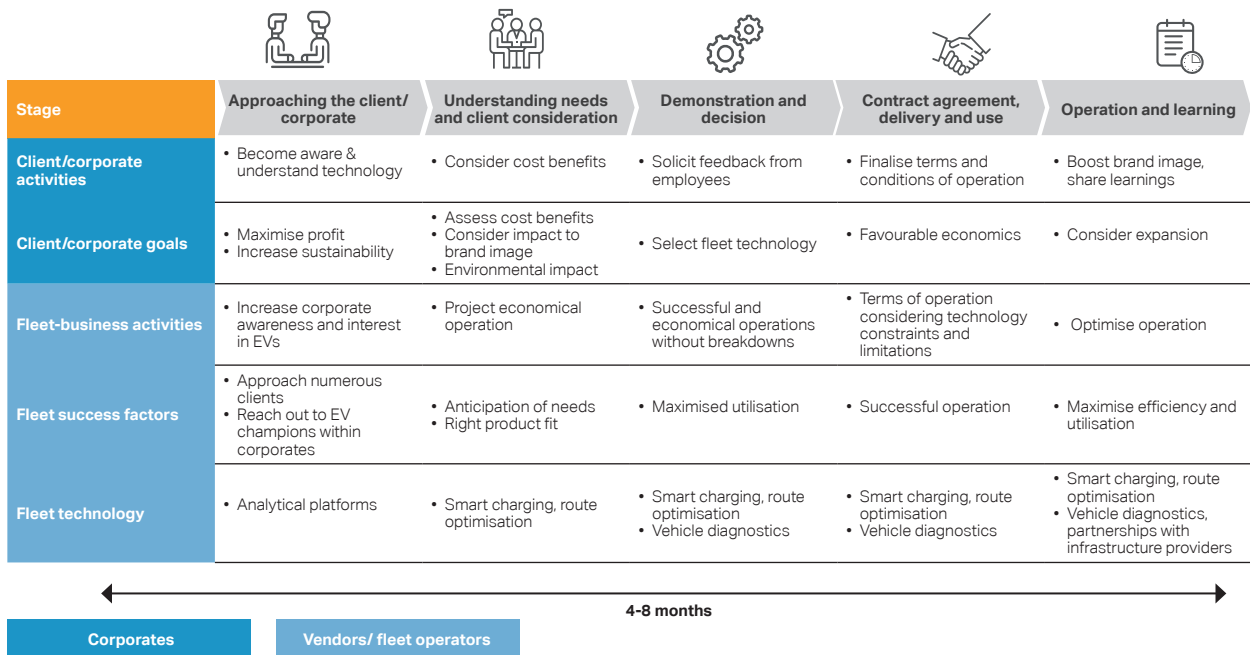
Some of these inefficiencies are due to a lack of understanding and can be addressed through knowledge-sharing and myth-busting. Other issues are likely to be resolved as the market evolves and EVs achieve parity on their upfront costs as well as operational costs.

Business should consider preparing conversation starters and pre-emptive data that can answer questions such as 'Why EVs?' and 'How to Adopt?'. This can help speed up decision-making and adoption.

For the business customer, the adoption process will involve the following considerations:

- **Accept that being an early mover demands flexibility:** businesses need to acknowledge that being an early adopter means that they need to be somewhat flexible and try to find solutions that work for all stakeholders. This will include supporting vendors to deploy chargers on-site, bear overheads on staff training and more.
- **Choose the right service provider/vendor:** select expert vendors with valid experience in electric mobility, rather than existing mobility providers offering EV options. Vendors can provide technology expertise to:
 - Optimize routes for dropping off and picking up employees
 - Deliver "smart" charging" to maintain and extend EV and battery life; minimize grid augmentation; schedule charging according to duty cycles (with minimal chargers); and reduce power expenses

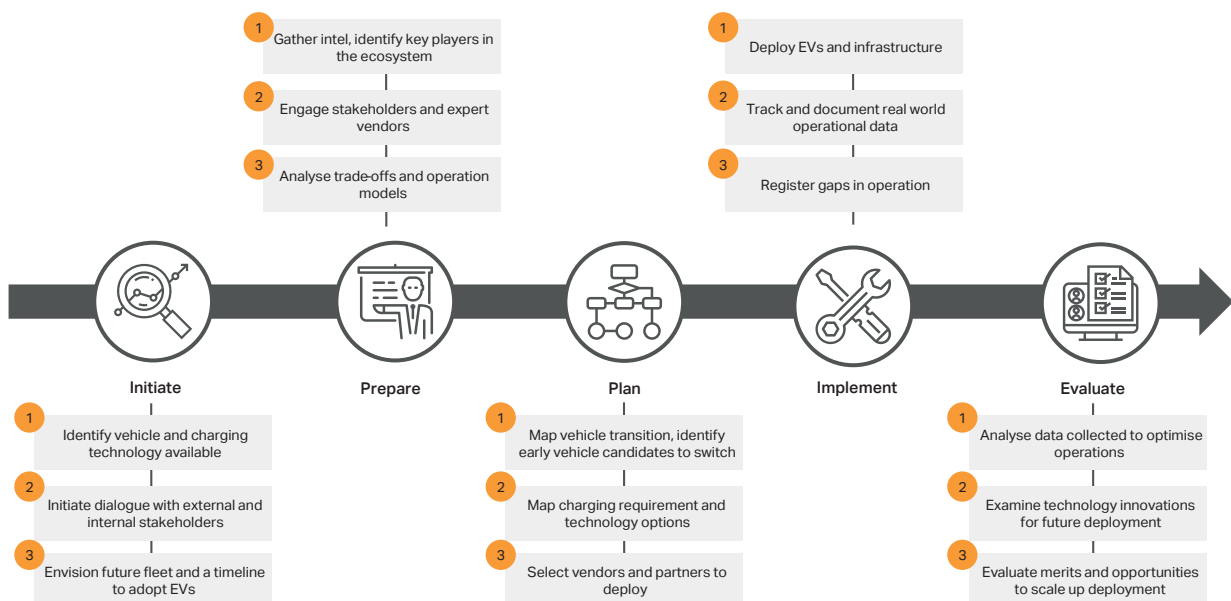
Figure 9: Motivation and objectives of companies and vendors at different stages of the adoption timeline



- Ensure utilization of EV fleet and chargers, enabling EVs to attain parity with ICE vehicles
- Train staff to efficiently operate EVs and chargers, disseminating best practices to increase hardware life
- **Choose the right contract:** with the dynamics of operation switching, contracts with e-mobility providers can accommodate constraints on both the business customer and the vendor. Popular practices include payment on per day basis (independent of kms travelled per day) and payment on a kms/month basis. Vendors equipped with technology solutions such as smart chargers and route optimizing platforms are best placed to achieve payment terms closer to normal ICE fleets.
- **Choose the right charging strategy:** charging infrastructure can mean a high cost both in terms of capital as well as the daily power requirements. It is imperative to have the right charging strategy paired with the right operation model. Some existing models are:
 - **Captive charging at the site of business operations:** the vendor can set up charging at business sites for off-peak charging during the day (between 2/4 shifts in the day) or night. Some businesses also elect to set up the chargers at their sites for the vendor to utilize.
 - **Captive charging at the vendor site:** this strategy involves the vendor setting up chargers at their own site or depot. Fully charged vehicles (>80% state of charge) are sent in for pick-up and drop-off in the morning/evening. Interval charging is done at captive sites or public charging stations in between shifts.
- **Partner charging networks:** the vendor can link to public charging networks in cities (commercial sites, fuel stations, malls); along with digital platforms that show where charging opportunities exist, and routes can be planned according to charging locations. This strategy is suitable if a fleet is being utilized for ride-hailing services when it is not completing employee transportation shifts.

Setting up of charging infrastructure means high capital cost - operations should be optimized to ensure high utilization of both fleet and infrastructure assets

Figure 10: EV adoption process for companies in the ETS sector



3b

Electrifying ride-hailing



OVERVIEW OF RIDE-HAILING IN INDIA

India is increasingly young, urban, well-connected to the internet and enjoying higher incomes. In its search for convenient, accessible and affordable mobility, India looks ready to adopt new mobility options.

Shared mobility and ride-hailing services provide easy access to affordable and convenient journeys using two, three and four-wheel vehicles. App-based ride hailing-services have grown rapidly over the past five to seven years. Most app-based ride-hailing services in India started with four-wheelers but there has been recent growth in formalized two and three-wheeler ride-hailing.

Definition: for the purposes of this guide, ride-hailing has been defined as an app-based method of booking personal transport, where a customer hires a driver along with a vehicle (2W/3W/4W) for their commute to a destination.

Other popular variations have also been considered, including on-the-road ride hailing for branded and aggregated shared

last-mile mobility and “vehicle as a service” models where customers can pick up and drive the vehicles themselves (typically two 2-wheelers and micro-mobility options) using an app-based service.

The guide does not focus on electrifying traditional off-line intracity and intercity taxi services as they are limited.

The target audiences for this section of the guide are strategy and business teams of various mobility platforms, potential investors and strategic partners that can deploy electric vehicles and charging infrastructure for running EV operations on these platforms.

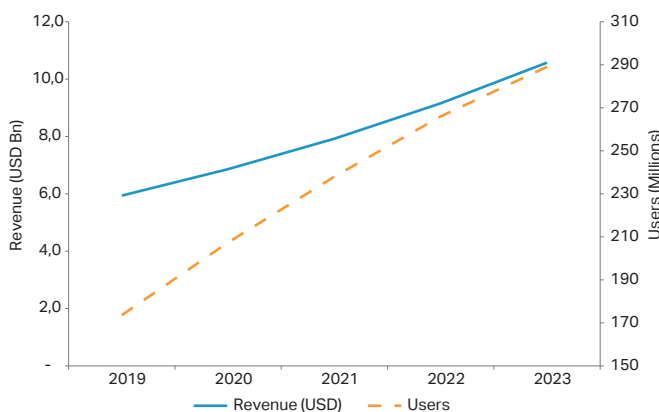
WHY ELECTRIFY RIDE-HAILING?

- **Higher utilization rates position this segment well for EV adoption** - the average coverage of a ride-hailing vehicle is between 150 - 400 kms a day, which is the most of any of the use cases. Those vehicles with high driving miles realize shorter payback periods from going electric than private car owners.

- **The app-based ride hailing industry is evolving into one of the preferred forms of personalized commute in India:** India is known for having the lowest car ownership levels among all emerging countries. As of 2018, ride-hailing services forms 13% of the Indian taxi-market, estimated to be USD \$6 billion.²⁹ The app-based online ride hailing market has grown significantly in the last three years and is expected to grow to USD \$10 billion by 2023. This includes addition of the relatively newer vehicles segments of two and three-wheelers.

For the purpose of this guide, the app-based ride-hailing market excludes the offline last-mile ride-hailing services such as cycle rickshaws, offline three-wheelers and standalone e-rickshaws.

Figure 11: Overview of Indian ride-hailing market



Source: EY Analysis; QZ; Ola; News Articles

15% CAGR for online ride-hailing market in India to 2023

80% revenue is generated from Tier 1 cities/metros

48% of commutes in major cities are for work purposes

20-25% fleet utilization in Tier 2/3 cities

Vehicle segments employed by major players



- **The expansion of these services in Tier 2/3 cities at cheaper costs has led to increased demand for bikes/autos:** as of 2019, the concentration of the online ride-hailing market across popular vehicle segments (2/3/4 wheelers) has largely been in Tier 1/2 cities. With the expansion of these services to Tier 3 cities and towards a lower cost of mobility, the demand for smaller form factor vehicles (bikes/autos) on ride-hailing platforms is expected to increase. There is a higher economic viability for two and three wheelers at smaller trips and commutes, when compared to four-wheelers.

VARIATIONS IN USE CASE

1. Ride-as-a-service (RaaS)

- a) **Investor-owned:** this model involves investors placing vehicles in platform fleets. For the short to medium-term, until the purchase prices of ICEs are higher than EVs, investor-owned models are likely to drive adoption. Platforms will need to demonstrate promising metrics to investors/partners across increased visibility, higher utilization and operational savings.
- b) **Platform-owned:** for platform-based aggregators, whose operations promise high vehicle use, platform-owned models are achievable. The lower operation cost will allow for quicker recovery of cost (three-five years) across all vehicle segments. This model usually involves platforms leasing vehicles to drivers.

- c) **Driver-owned:** the current cost disparity governs this ownership model in fleets. As the cost of electric two and three-wheelers is closer to the cost of their ICE counterparts, driver-owned models can be suitably considered in two and three-wheeler segments.

2. Vehicle-as-a-service (VaaS)

- a) **Investor-owned:** will have a higher adoption potential in the current use case, as it reduces upfront costs for platforms by having investors place vehicles in fleets.
- b) **Platform-owned:** sustainable platform-fleet ownership is only possible when fleets are utilized to their potential. VaaS may not deliver the high daily kilometers that fleet aggregators do, resulting in a lower adoption potential.
- c) **Driver-owned:** this ownership model has a significantly lower adoption potential, owing to the high upfront costs.

In the current model, driver-ownership of ICE vehicles on ride hailing platforms is the norm. However, early adoption of EVs for ride-hailing is likely to be led by mid-sized investors owning and operating fleets at a scale that allows them to manage charging, driver training and optimization of fleet operations. It is expected that individual drivers may be wary of owning new technology in early stages of the market. We expect driver-owned vehicle models to make a comeback once the business models and technology are proven and a public charging infrastructure has been built out.

Vehicle segments	Ownership models and their adoption potential		
	Investor-owned	Platform-owned	Driver-owned
I Ride as a service			
	●	●	◐
	●	●	◐
	●	●	○
II Vehicle as a service			
	●	◐	○
	●	◐	○

Adoption potential ● High ◐ Medium ○ Low

ECONOMIC VIABILITY AND SHIFT POTENTIAL

Considering the price sensitivity of the market in India, most riders would be reluctant to pay a higher cost for riding EVs over ICE vehicle. As vehicles on ride-hailing platforms have higher utilization, this threshold should not be very hard to cross. Based on the total cost of ownership, electrification of two-wheeler and three-wheeler fleets are most viable, eventually followed by four-wheelers.

Four-wheelers in ride-hailing fleets in Tier 1 cities are close to parity, while Tier 2/3 cities with shorter trips seem more apt for two and three-wheeler EV adoption.

The subsidies announced under FAME – II have made adoption increasingly attractive across the 2/3-W EV segments. A capital subsidy of approximately INR 10,000/kWh³⁰ is being provided. Vehicles acquired using this subsidy will enjoy closer TCOs to ICE/CNG counterparts, translating to lesser daily utilization levels to break even. For charging infrastructure, which contributes greatly in certain ownership models for fleets, aggregators can avail up to 50%³¹ of the cost of EVSE.

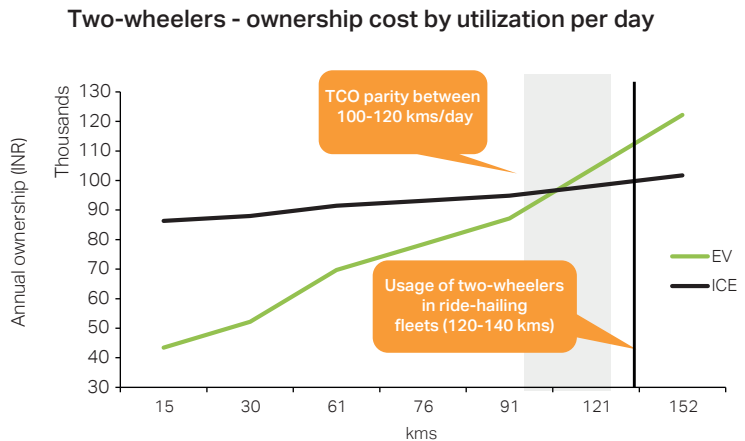


Vehicle segment prioritization, with an eye on TCO viability, is at the heart of the EV adoption drive across the country

Carson Dalton,
Senior Director, Ola
Mobility Institute



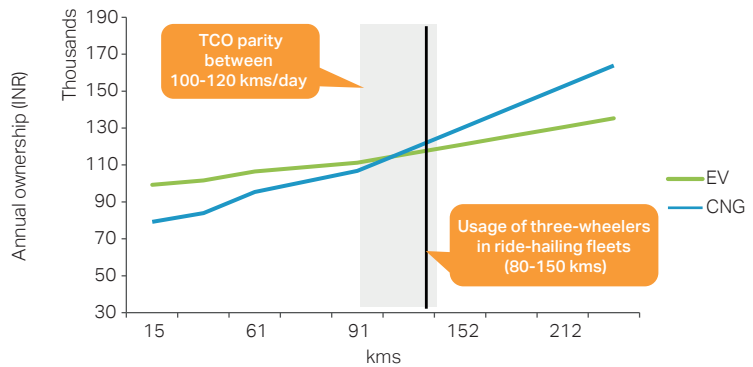
Figure 13: Evaluating economic viability for ride-hailing use case



Economically viable range

Two-wheelers usually make 20-25 trips a day, with an average trip length between 4-5 kms for Tier 1 cities and 3-4 kms for Tier 2/3 cities

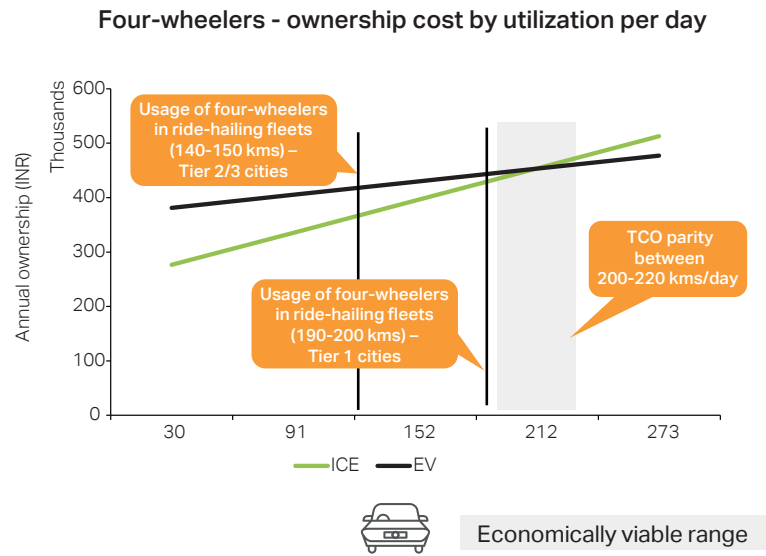
Three-wheelers - ownership cost by utilization per day



Economically viable range

Three-wheelers usually make 25-30 trips a day, with an average trip length between 5-6 kms for Tier 1 cities and 4-5 kms for Tier 2/3 cities

Figure 13: Ownership models ride-hailing fleets and their adoption potential³²



Four-wheelers usually make 20-22 trips a day, with an average trip length between 11-12 kms for Tier 1 cities, and 6-7 kms for Tier 2 and 3 cities

STAKEHOLDERS IN THE ADOPTION PROCESS

Figure 14: Benefits to stakeholders involved in the ride-hailing adoption process

		Benefits
	Platforms/aggregators	<ul style="list-style-type: none"> • Reduced operation costs for ride-hailing fleets • Reduced CO2 emissions of enterprise and operations • Leadership in low-carbon space and market
	Drivers	<ul style="list-style-type: none"> • Drivers with captive-residential chargers, get no-cost credit charging (two-month electricity bill cycle) • Improved credit profile, a part of a fleet aggregator; attractive financial products can be introduced
	Users/riders	<ul style="list-style-type: none"> • Noiseless and seamless commute for riders • Contribution to environment by commuting in zero emission vehicles

BARRIERS AND SOLUTIONS TO ADOPTION

Stakeholder	Barriers	Description and solutions
Ride-hailing platforms	High auxiliary costs for charging infrastructure translates to higher cost of charging	<p>Commercial tariffs are still being imposed in states where EV tariffs have been proposed; there is a delay between policy and implementation</p> <p>Land leasing costs for charging infrastructure on private/public lands are high</p> <p>Solution: fleets and other private players can form coalitions to leverage benefits from aggregation; they can:</p> <ol style="list-style-type: none"> 1. negotiate with DISCOMs to expedite on applicable EV tariffs, and 2. collaborate with city governments to avail of “smart-city” funds to set up public infrastructure. <p>Land lease agreements can have lock-in periods to inhibit high increments in cost; and rooftop solar can be explored to reduce power expenses.</p>
EV drivers	Long waiting times for charging and high opportunity costs are discouraging drivers from making the switch to EVs	<p>Lack of a robust charging network often means more waiting time and less revenue earning kms for drivers</p> <p>Solution: platforms can develop driver interfaces with partner charging networks to optimize routes and locate chargers. At certain states of charge, platforms can explore offering drivers rebates for high charging costs until EV tariffs come into effect.</p> <p>Battery swapping should be considered by two and three-wheeler fleets in the ride-hailing sector. Many cases indicate high utilization of fleets (low down-time) and the consequent rise in revenue-generating kms. These benefits are particularly popular with drivers.</p>
Customer/Rider	Range anxiety and hesitancy in subscribing for EVs	<p>Range anxiety often discourages riders to use EVs</p> <p>Solution: through the platform, drivers can show their customer feedback on data such as successful trips and reviews received. This can help resolve any reservations riders might have about the capacity of the EV to travel the distance required.</p> <p>Moreover, app based ride hailing platforms can help drivers and riders to prioritize effective utilization of electric vehicles and charging infrastructure through use of informatics and algorithms.</p>

EV ADOPTION PROCESS

Best practices for EV adoption on ride-hailing platforms are:

- **Right ownership model:** Most existing platforms are taking the initiative to deploy EVs on their platform. Several are trying to work with strategic partners/ investors that can deploy multiple vehicles,

create charging infrastructure and operate their fleets at or above the minimum size and scale for viable investment. Others are investing in pilot schemes that can demonstrate their viability. In any scenario, platforms will continue to seek to be “asset-light”, and partnerships will be crucial. It is the partners will

end up owning and operating most assets (both vehicles and charging infrastructure). Some platforms who wish to continue with current ICE ownership models are hoping for a shift to driver-owned electric vehicles and widespread public charging infrastructure, however, this is unlikely to happen soon.

- **Right partners:** the right partner should have the technical know-how to operate EVs and/or charging infrastructure. As partners are expected to own their assets, ride-hailing platforms can in turn provide demand certainty and can also consider providing short-term guarantees on utilization/ backstop losses, to support availability of public charging of their fleets in the early deployment stage.
- **Right technology:** Platforms need to adapt their algorithms to enable deployment of EVs. In order to allocate rides, these algorithms need to consider charging availability, range and EV-specific cost optimization; while still providing enough demand to ensure high utilization of partner vehicles and charging assets.

- **Right charging/ swapping strategy:** For a ride-hailing platform, a robust charging strategy is imperative to address the following:
 - Potential loss of earnings due to long charging time
 - Unscheduled and “dumb” charging of fleets at captive sites, causing longer waiting times for customers
 - Better planning to avoiding ancillary expenses such as land lease, grid augmentation and others
 - Low utilization of any captive or contracted chargers

While charging is cheaper from an operational perspective, higher on-road time and revenue-generating hours make battery-swap an attractive option for select use cases.

For fleet based two and three-wheelers, battery-swap may be an attractive solution that allows drivers to make more trips per day. Electric rickshaws that opted for swap have been able to improve daily utilization of their EVs from 100-120 to about 200 kms a day, as charging down-time is significantly reduced. In several cases, the extra investment in swapping infrastructure can be justified through this increase in utilization.

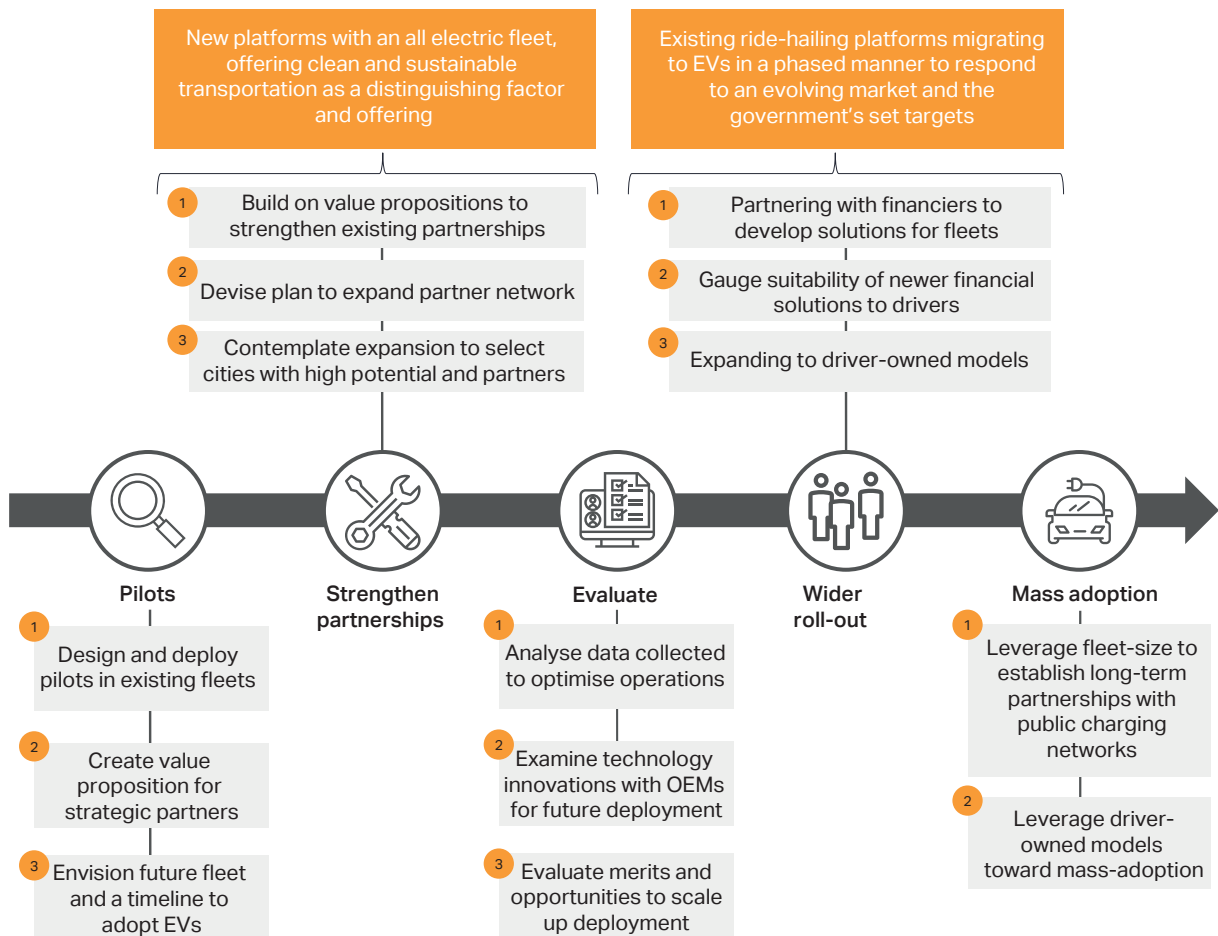


- **Right approach:** the right approach is instrumental to overcome most challenges arising in the switch to electric vehicles. The approach for platforms will differ in terms of adoption strategy and timelines. New platforms with all electric fleets as a value proposition to users, will assume a different strategy.



For existing ride-hailing and ride-sharing platforms (ICE-based) the following approach can be adopted:

Figure 16: EV adoption process for ride-hailing fleets in India



3c

Electrifying deliveries



Credits by: IKEA

OVERVIEW OF DELIVERIES IN INDIA

Last-mile goods distribution is an increasingly important part of modern city life. Globally, urban freight traffic accounts for about 10-15% of kilometers travelled and emits approximately 6% of all transport-related GHG emissions. It accounts for between 2% and 5% of the total workforce employed in urban areas.³³

The advent of e-commerce, food and grocery deliveries is leading to a rapid increase in demand for last-mile deliveries.

Customer preferences are evolving: they want it all and they want it now. This is expected to put immense pressure on the sustainability of the urban delivery system.

Definition: for the purposes of this guide, this includes:

- Vehicles used for traditional commerce (warehouse-to-store and store-to-home), typically furniture, electronics and groceries.

- Vehicles used for e-commerce and delivery of all types of goods.
- Vehicles used for online food and grocery deliveries, typically perishables.

Freight deliveries typically deploy three-wheelers and light commercial vehicles for intra-city logistics. E-commerce and food deliveries typically use two or three-wheelers, as well as e-cycles.

Why electrify the delivery system?

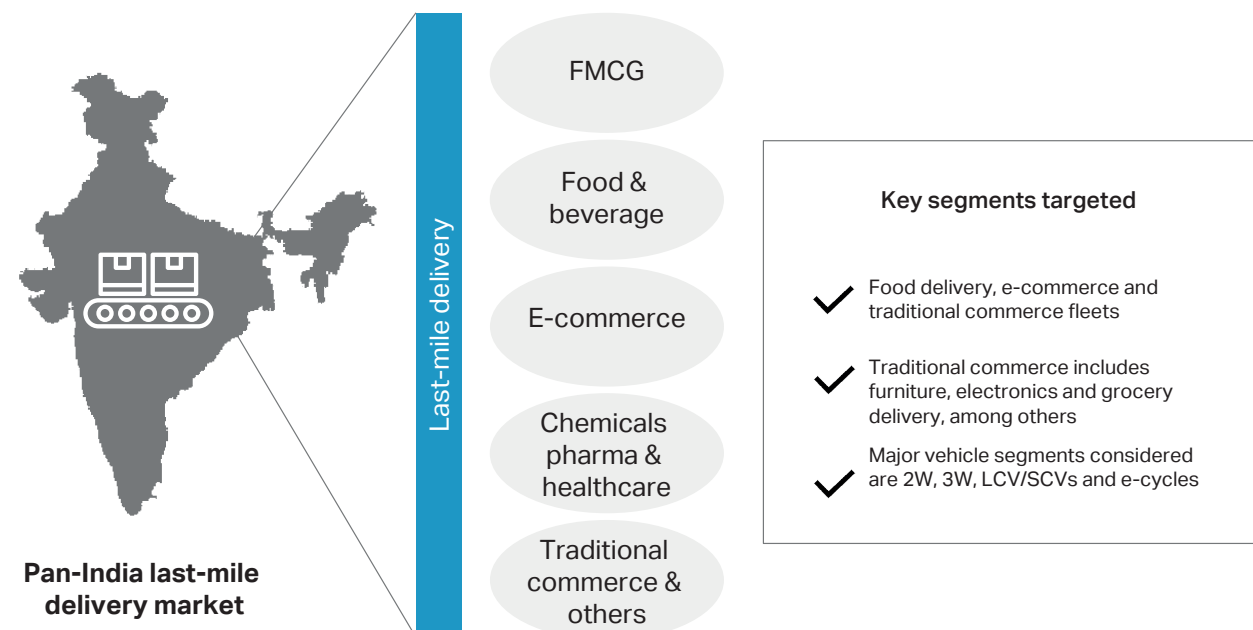
1. **Cost competitiveness of vehicle segments:** electric two and three-wheelers have the least upfront-cost disparity against their ICE counterparts. Electric two-wheelers presently enjoy the greatest number of vehicle options. Electric bicycles and other electric micro-mobility options can also be used for food deliveries and they offer even lower TCO.

2. **Consistent growth in markets and fleets:** the deliveries market has grown rapidly, especially since tech players such as Swiggy and Zomato have entered and become aggregators of two-wheelers for food deliveries. Walmart-Flipkart and Amazon, along with other similar businesses have been deploying two-wheelers and vans for last mile e-commerce deliveries.

3. **Ease of operation through fixed charging hubs:** Popular markets and food and beverage pick-up points are the ideal charging / swapping hubs to keep an EV or fleet ready for both last-mile goods and food deliveries. Battery swapping at hubs would also be an option that reduces charging time.

4. **High utilization rates make this segment ripe for EV adoption** – two-wheelers deliver nearly 88 million orders a month, and for e-commerce fleets, last-mile deliveries in cities constitute nearly 40%³⁴ of all logistics.

Figure 17: Overview of last-mile delivery in India



VARIATIONS IN USE CASE

For the three use cases the following ownership models have been documented:

1. E-commerce delivery

- a) **Platform-owned:** for e-commerce fleets or localized third-party fleets (3PLs) employed by e-commerce companies, operations must promise that EVs will deliver high daily utilization. Since electric two-wheelers are nearly at parity with ICE models (at 100 kms per day), these ownership models are feasible. LCVs however do not promise a higher adoption potential - this can be attributed to both a high cost disparity and a lack of vehicle options in the market.
- b) **Service contracts:** in order for platforms to stay asset-light, service contracts with strategic partners (for EV deployment and charging infrastructure) present a high potential for deployment.
- c) **Driver-owned:** Driver-owned models should only be considered once business models for more attainable ownership models have been proven. However, as two-wheelers are the ubiquitous mode of transport in India, a driver-owned model does show promise compared to other vehicle segments, particularly LCVs.

2. Traditional commerce delivery (groceries, furniture and electronics)

- a) **Platform-owned:** furniture and electronic stores can own electric three-wheelers and LCVs for local deliveries. This model is only viable if store sales allow for regular and high utilization of fleets.
 - b) **Service contracts:** this model is the most viable for store owners, as they don't need to pay upfront for the EVs. Vendors partnered with stores would need to strategize fleet deployment through pilots and studies.
 - c) **Driver-owned:** two and three-wheelers used by grocery stores and platforms can explore driver ownership if the demand from customers and drivers is high enough.
- ### 3. Food delivery
- a) **Platform-owned:** Platforms and restaurants in this model would own a fleet of electric two-wheelers and the supporting infrastructure.
 - b) **Service contracts:** this model could include partnering with 3PLs (third-party) and vendors for delivery service and operations, instead of a captive fleet of electric two-wheelers. This model reduces the costs associated with owning and maintaining a fleet. This model would be highly attractive to those online and asset-light platforms already established in the market.



- c) **Driver-owned:** while driver-owned models in two-wheeler segments do experience an alleviated cost disparity compared to other segments, the adoption potential remains much lower than leasing. Electric bicycles for food deliveries can present an attractive opportunity to test a driver-owned model.

ECONOMIC VIABILITY AND SHIFT POTENTIAL

Online food delivery fleets such as Swiggy or Zomato serve nearly 1 million orders day, with an average trip length of 4.4 kms. This kind of operation pairs well with the operational constraints of an electric two-wheeler.

E-cycles have also gained popularity for hyperlocal delivery. Swiggy, Zomato and other food-tech players have already started including e-cycles into their delivery fleets.



For the early adoption of electric mobility in deliveries (especially for two-wheelers), fleets would need to own / lease the vehicles and operate them before moving on to driver ownership models.

Aparna Khandelwal,
Head of Sustainability and CSR, Jubilant FoodWorks (Domino's Pizza)

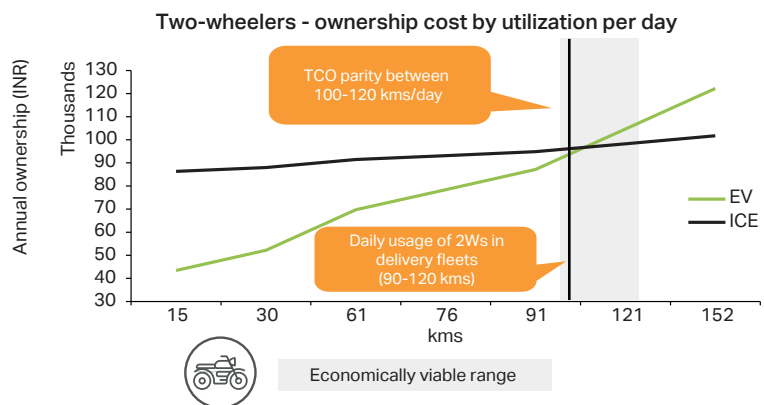


Figure 18: Ownership models and adoption potential for delivery fleets

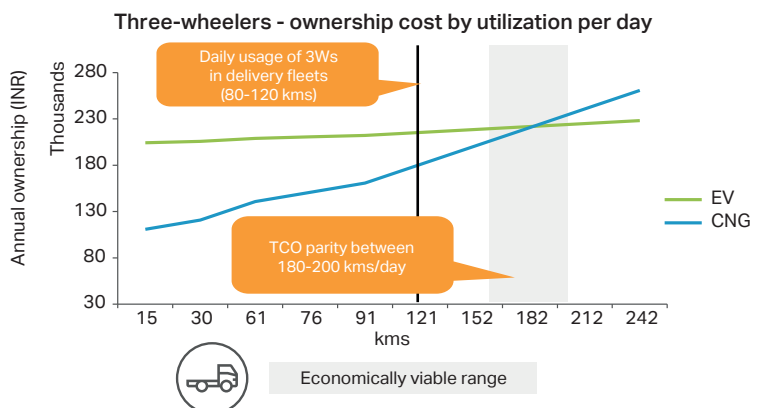
Vehicle segments	Ownership models for last-mile delivery fleets		
	Platform-owned	Service contract	Driver-owned
E-commerce delivery			
I			
	Medium	High	Low
	Medium	Medium	Low
Traditional commerce delivery			
II			
	Medium	High	Low
	Medium	High	Low
	Medium	High	Low
Food delivery			
III			
	Medium	High	Low
	Medium	High	Medium

Adoption potential: High (Solid orange circle), Medium (Half-filled orange circle), Low (Empty orange circle)

Figure 20: Evaluating economic viability for deliveries use case: 2Ws/3Ws³⁵



Two-wheelers in delivery fleets usually make 20-25 trips in a day, with the average trip distance around 4-6 Kms



Three-wheeler cargo in delivery fleets usually make 15-20 trips in a day, with the average trip distance around 4-6 kms

Table 3: Specification and operational economics of e-cycles

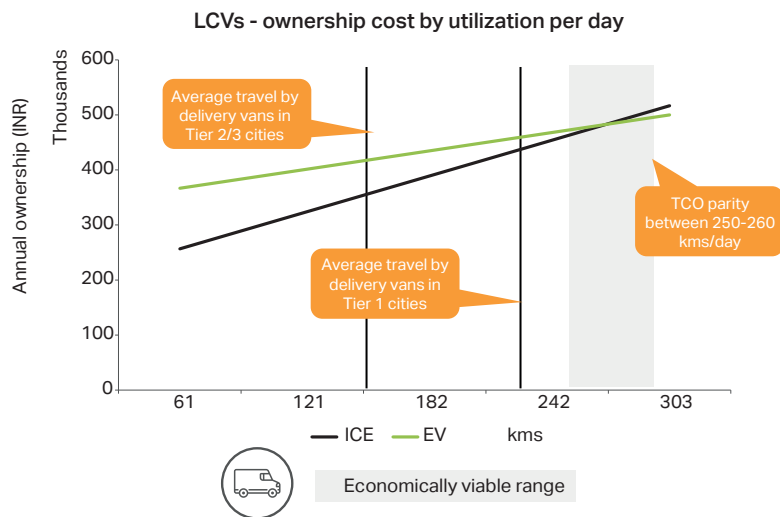
Parameter	Specification
Price	INR 30,000 – 45,000
Battery assisted range	60 kms (plus pedaling)
Charging time	2.5 hrs
Cost of operation	INR 4 per 60 kms ³⁶
Leasing costs	INR 2000-3000 per cycle per month

TCO analysis shows economic viability for two-wheelers at between 100-120 kms/day, at current market prices. Three-wheelers still have a gap to close, with current utilization by grocers, furniture deliveries and traditional commerce at 100-120 kms/day.

Utilization for LCVs (refer graph) differs from city to city. E-commerce delivery vans usually make 30-35 deliveries in a day, with an average trip length of 6-7 kms in Tier 1 cities and 4-5 kms in Tier 2/3 cities. This means vans in Tier 1 cities are closer to achieving parity than in Tier 2/3 cities.

While this guide covers a wide span of vehicle segments for deliveries, four-wheelers can also be considered for e-commerce and traditional-commerce fleets (the parity threshold is 230-240 kms/day).³⁷ However, while four-wheelers present a lower parity threshold when compared to LCVs, payload capacity (volume and weight) of vehicles will be an important consideration in freight delivery.




Figure 20: Evaluating the economic viability of the deliveries use case: LCVs³⁸



For last-mile freight deliveries, both two-wheelers and LCVs are employed by stores and e-commerce companies. LCVs currently break even with ICE vehicles at a daily utilization rate of 250-260 kms/day or above. With a lack of vehicle options (limited options available from Mahindra and Gayam Motors) and localized delivery runs within cities, electric LCVs would require innovative operation strategies to make a viable case for deployment.

STAKEHOLDERS INVOLVED IN THE ADOPTION PROCESS

Figure 21: Benefits to stakeholders involved in the adoption process for delivery fleets

		Benefits
	Platforms/aggregators	<ul style="list-style-type: none"> • Reduced operation costs for delivery fleets • Reduced CO₂ emissions of enterprise and operations • Leadership in low-carbon space and market
	Mobility vendors	<ul style="list-style-type: none"> • Partake in brand leadership in the low-carbon space with partner platforms and e-commerce companies • Reduced operation costs in deliveries • Proven operation model using technology enablers, which can be replicated to other delivery operations of other industry segments
	Drivers	<ul style="list-style-type: none"> • For drivers with captive-residential chargers, no-cost credit charging (two-month electricity bill cycle) • Improved credit profile, a part of a fleet aggregator; attractive financial products can be introduced

BARRIERS AND SOLUTIONS TO ADOPTION

Barriers	Description and solutions
Right partnerships with vendors and third-party e-mobility providers	<p>Delivery companies and platforms face difficulty in finding the right expert mobility partners to provide optimum pricing and performance</p> <p>Solution: mobility partners such as charging networks and expert vendors are imperative to the successful fleet adoption of EVs. The right collaboration will depend on the operation model. Partners can be forged by approaching companies who are already piloting and operating EVs.</p>
Lack of technology enablers for operations	<p>Operations suffer from not achieving the threshold utilization rates for EVs</p> <p>Solution: operating EVs to achieve maximum utilization and low ownership costs can only be done in partnership with technology enablers such as route optimizers, smart chargers and vehicle analytics. Fleets can also explore platforms to operate on blended models: deliveries and ride-hailing, for example. This will enable further utilization of assets and manage the cost.</p>
Lack of vehicle options and substitutes	<p>The market currently holds no viable EV options for LCV segments, which are a significant portion of last-mile delivery fleets</p> <p>Solution: fleets should look at switching to two-wheelers first; pilots can begin the journey to heavier adoption, biding time for better LCV options in the market. Fleets can also explore smaller form factors such as e-bikes for smaller trips – these translate to lower costs (as there is no fee for registration) and no range anxiety (as the rider can always pedal).</p>
Lack of technology awareness and misconceptions	<p>Some companies and users are hesitant to adopt EVs owing to outdated concerns regarding range and reliability</p> <p>Solution: expert vendors can provide the right docket of information with range specifications, charging strategy, operation model and others to make sure companies feel confident in their EV choices. Food delivery platforms, which are governed by rating systems, can introduce incentives for customers who choose EVs for their food delivery.</p>
Inability to achieve utilization thresholds through existing operations	<p>Most delivery fleets (especially 2/3W) operate in designated localities that cannot assure utilization levels that are close to parity thresholds</p> <p>Solution: fleets can look at blended operation models, i.e., delivery fleets can look at switching to ride-hailing in periods of low delivery demand. Where applicable, fleets can leverage relaxations in government permits to allow operations for both delivery and ride-hailing.</p>

EV ADOPTION PROCESS

Best practices gathered from EV adoption in delivery fleets are listed below:

- **Right ownership model:** fleets must choose the right ownership model depending on the utilization potential of their business. Food delivery and e-commerce fleets with variable and frequent demand can consider platform ownership models, while traditional commerce fleets (delivering furniture, electronics and more) can

explore other models such as service contracts on per day/month basis.

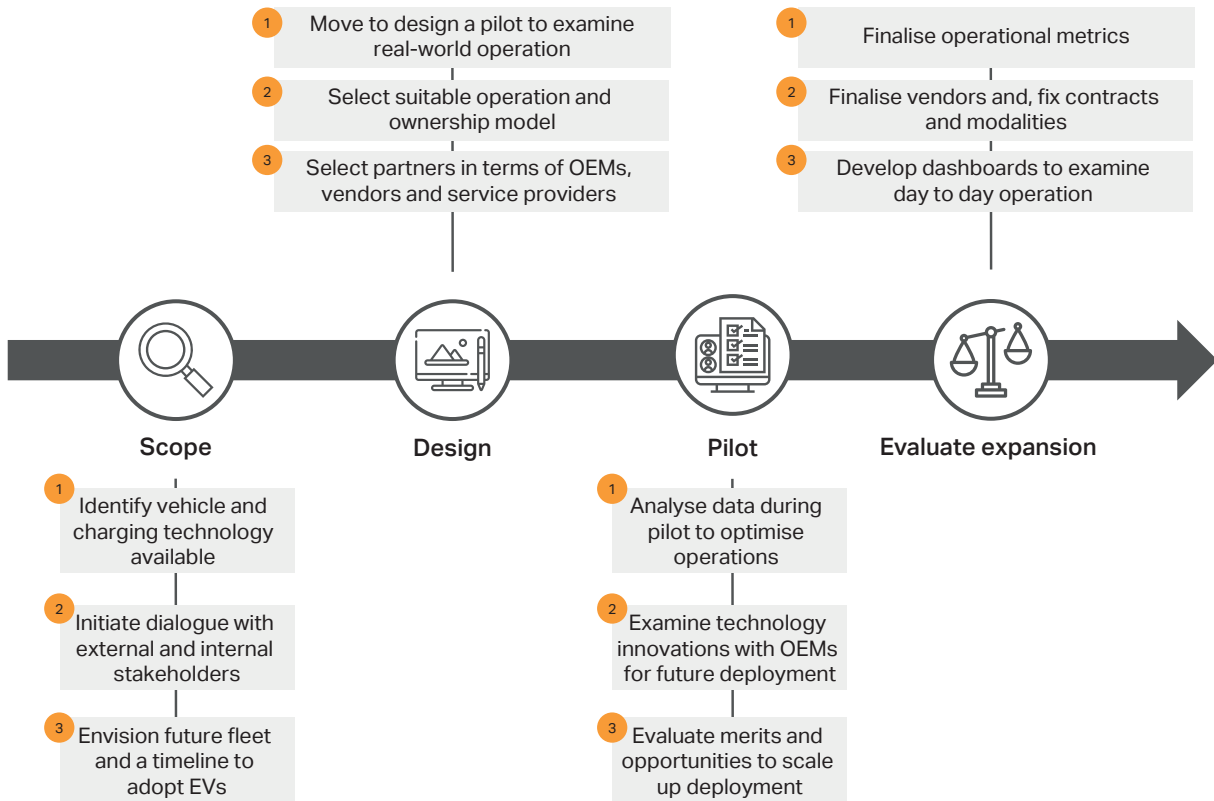
- **Right partners:** blended models, which sees fleets having an alternative utility (e.g. food delivery combined with ride-hailing) can leverage partnerships for:
 - maintaining and operating EV fleets through expert third-party vendors
 - driver training, safety drills and best practices
 - public charging network for fleets (ability to book slots

at points through platform requests, and more)

- **Right charging strategy:** the strategy for delivery fleet operators depends on:
 - Use-cases: food delivery, e-commerce delivery, store-home delivery
 - Ownership model for fleets
 - Operational model (blended models: delivery and ride-hailing, and more)
 - Number of vehicles operating, frequency of delivery, payload and dead kilometers

Fleet Ownership Model	Adoption strategy
E-commerce delivery	
Company-owned	For e-commerce companies and stores owning a captive fleet, fast and slow chargers are usually deployed at captive sites (warehouses, dispatch-centers) Delivery fleets have pre-assigned localities for delivery runs, making it easier to schedule fast-charging across the day; slow charging can take place at night when local deliveries are not being dispatched
Service contract	Enlisting the services of third-party vendors specializing in EV operations usually involves deploying chargers at client-sites (which helps to reduce dead kilometers) or at a vendor's captive sites The vendor can also partner with upcoming public charger networks for mid-duty charging, if operations demand it
Traditional commerce delivery	
Company-owned	For traditional stores owning a captive fleet, fast and slow chargers are usually deployed at captive sites (warehouses, store-site) Delivery fleets have pre-assigned localities for delivery runs, making it easier to schedule charging across the day; charging also takes place at night when local deliveries are not being dispatched
Service contract	Enlisting the services of third-party vendors specializing in EV operations usually involves deploying chargers at store-sites or warehouses (which helps to reduce dead kilometers) or at a vendor's captive sites The vendor can also partner with upcoming public charger networks for mid-duty charging, if operations demand it
Food delivery	
Company-owned	Restaurants and platforms that own two-wheeler fleets usually deploy fast chargers at captive sites: malls, restaurant sites (drive-throughs, parking lots); platforms can deploy chargers at partner-restaurant sites Many chain restaurants have dedicated bikes for each branch, making the restaurant site a hub for all captive vehicles Food deliveries have variable routes and times, but are still confined to a locality; companies exploring merged models with ride-hailing services to ensure utilization would require a public charging network as range extenders
Service contract	Vendors providing delivery services can propose three charging strategies: charger installation at restaurant sites (where possible); installation at captive sites (preferably central to the delivery radius); or partner with public networks In each case, chargers at restaurant sites prove most economical in terms of reduced dead kilometers

Figure 22: EV adoption process for delivery fleets in India



- **Right approach:** the following approach addresses the adoption challenges for EV delivery fleets:

Small-scale pilots can be a good way to collect real-world data that illustrates pain points and benefits in performance and operations. Companies can then build up through strategies which are best suited to their preferred vehicle.



④

Case Studies

Employee transport: Google



Google

Achievements

Use case	Employee transport
Launch year	Oct 2018
Vehicle segments	4W
Number of vehicles	58
Cities	Hyderabad & Delhi NCR
VKT (million kms)	1.9
Emissions avoided (tons of CO₂)	440



Credits by: Lithium Urban Technology

DESCRIPTION

As a part of its sustainability initiatives, Google began the transition to EVs from ICE vehicles for its employee transportation needs. They appointed Lithium (vendor), an EV-only mobility service provider, to roll-out EV services for the Delhi NCR and Hyderabad campuses after a successful pilot implementation at the Gurgaon office.

BARRIERS

The four barriers of adoption were cost, convenience, charging infrastructure and client awareness.

APPROACH

The vendor billing model was inclusive of all services (vehicle, driver, technology, data management, charging, unlimited kms etc.) within the contract period. Google created parking infrastructure, relaxing space, toilets, food facilities and dental / medical camps for drivers. They committed to at least 20% of the drivers being women.

The fleet operation has two models:

1. **12-hour basis:** regular working hours where employees are picked up from their residence, dropped at the Google campus and then go back to their homes at the end of their day;
2. **24-hour basis:** company employees with client engagements can ask for immediate transport as and when required.

The challenges were converted

into opportunities through a combination of technology, business model and operational experience.

- **Cost** – using algorithmic fleet planning and scheduling tools to maximize utilization (to over 200 km per day with an average passenger occupancy of 2.7 per trip) ensured cost savings of 10-15%.
- **Convenience** – establishing a hub at Google's business site ensured ready availability of vehicles, chargers and manpower (driver and on ground support).
- **Charging infrastructure** – Google provided captive charging infrastructure to be used exclusively on campus by Google EVs.
- **Client awareness** – a successful pilot demonstration helped Google gain confidence in the operation. Post pilot, Service Level Agreements (SLAs) and Key Performance Indicators (KPIs) were reviewed, after which a full roll-out plan was phased in.

In Hyderabad, 10 Mahindra e-Verito electric sedans were allocated on 24-hour basis and 15 vehicles on 12-hour basis. In Delhi, 33 e-Verito electric sedans were deployed on 12-hour model.

LESSONS AND RECOMMENDATIONS

- **Hire specialist third party service-providers:** specialist service providers packages mobility as a solution and smoothen the implementation and operation for business customers.
- **Identify 'EV champion(s)':** e-mobility vendors must identify the right 'EV champion(s)' within corporations to drive the agenda of EV adoption and get internal buy-in. Vendors must leverage a top-down approach to expedite migration and deployment timelines.
- **24-hour model for dedicated ETS fleets:** operational viability depends on a high daily utilization. 24-hour models with four shifts of six hours, help both the business customer and the vendor to realize higher savings.
- **Coordinate for efficient utilization:** a coordinated approach and data-sharing would allow for better route/ infrastructure planning and optimum and efficient utilization of EVs.

Employee transport: Wipro



Achievements

Use case	Employee transport
Launch year	2018
Vehicle segments	4W
Number of vehicles	40
Cities	Hyderabad & Delhi
VKT (million kms)	2.9
Emissions avoided (tons of CO₂)	586



Credits by: Lithium Urban Technology

DESCRIPTION

The three primary pillars of Wipro's carbon mitigation program are: enhancing energy efficiency, increasing the share of renewables in their energy mix and reducing emissions from travel. The decision to commit to EVs was natural for Wipro since it involved public health benefits – cleaner air in cities as well as mitigating carbon emissions. To meet ambitious carbon mitigation goals, Wipro decided to begin the transition to EVs from ICE vehicles for its employee transport needs. In 2018, Lithium started operations in Wipro's Hyderabad campus. In the last year they deployed 40 EVs, realizing around 10-15% savings in transportation costs. After successful operations, Wipro now aims to do a pan-India roll out of 200 EVs in the next year, through Lithium.

BARRIERS

Transitioning to EVs for businesses includes the following challenges:

- **High costs:** reluctance among business customers due to high upfront EV costs.
- **Lack of support from business customers:** most businesses are used to working with conventional mobility vendors and may not wish to invest more by setting up infrastructure on company grounds.

- **Lack of technology support:** vendors not equipped with technology support would fail to meet vehicle utilization thresholds to validate investments; in most cases, businesses don't have the daily requirements to meet these thresholds.

APPROACH

Wipro partnered with Lithium to develop a standardized operating model for EVs

- Lithium's integrated offering of an electric fleet with a technology platform rendered the operating model easily replicable.
- The charging infrastructure was expected to be a hurdle to replicability. This was addressed through Wipro enabling Lithium to set up charging stations at its campuses, allowing for easy and convenient charging capability.
- While there were fewer skilled drivers available initially, it was addressed by Lithium devising a training regimen for drivers to operate EVs.
- Wipro employees were asked for feedback. They provided great feedback around Lithium's deployment and they related to the community benefits attached to this.

LESSONS AND RECOMMENDATIONS

Some of the lessons for prospective vendors and business customers could be:

- **Green charging for sustainability:** environmental impact of EVs only reduces compared to ICE vehicles when charging is sourced from renewable energy.
- **Leverage technology enablers:** EVs are operationally cheaper but to ensure proper functioning upfront investment in the vehicle and chargers needs to be made. To fully utilize the vehicle's potential and avoid challenges, technology enablers such as route optimizers and smart chargers could be leveraged.

Employee transport and ride-hailing: Uber, EY and eee-Taxi

Uber



EY

Building a better working world



eee - Taxi

Achievements

Use case	Employee transport and ride-hailing
Launch year	May 2018
Vehicle segments	4W
Number of vehicles	50
Cities	Delhi NCR & Hyderabad
VKT (million kms)	9.8
Emissions avoided (tons of CO ₂)	2330



Credits by: EEE-Taxi

DESCRIPTION

eee-Taxi offers corporate mobility which has now been merged into a model that combines corporate mobility with a ride-hailing service, making it a distinct hybrid operation model that offers optimum asset utilization.

BARRIERS:

Several challenges were faced by the fleet while operating under a merged model:

- **Cost** - reluctance among business customers towards EV transition due to high upfront EV cost.
- **Range** - presently, the highest full-charge range in an EV in India is 180 kms. However, the requirement for fleet operations is usually over 250 kms per vehicle per day.
- **Charging time** – the two-hour long DC charging time leads to downtime of vehicles.
- **Lack of infrastructure** - lack of availability of public chargers prohibits fleet deployment on longer routes.
- **Temperature & terrain** - in summer, the vehicle range is reduced and charging time increases.

APPROACH

eee-Taxi's approach aims for high operation factors through both ride-hailing and employee transport. A dedicated technology toolkit reduces operational cost, increases kms per charge and increases reliability; partnerships with local charging networks (such as EESL/IOCL/HPCL) have been leveraged for range extension and reduced down-time. Being mindful of the effect of temperature on charging times, eee-Taxi has installed dedicated captive sheds for charging to ensure reduced charging time and lower power consumption.

All vehicles run on a 24-hour model. There are three operation models.

- **Dedicated Employee Transport Services (ETS) fleet** in which the vehicles are used by companies for their daily commute. The fleet operations and optimization in routes reduces the number of cars to do the same job, time constraint algorithms reduce average travel time per employee per trip, increasing productive hours at work, and increasing occupancy per car and trips per car through its ETS technology.
- **Dedicated Uber fleet** in which the vehicles are used on for ride-hailing to make every km into a revenue km.
- **Hybrid model** in which eee-Taxi's serving as ETS for companies switch to ride-hailing platform at the end of the trip to maximize revenue and increase efficiency. This also provides flexibility to use e-mobility in a pay per use way rather than in a dedicated model.

LESSONS AND RECOMMENDATIONS

- **Leverage partnerships:** partnerships with metro rail corporations, office real-estate owners, residential societies, malls, restaurants, and with 'Smart City' municipalities for charging sites would support network expansion.
- **Need for strategic alliances and partnerships:** captive chargers can only support operations to a certain extent; but for expansion and operation under a blended model, range extenders and city charging hubs are necessary.
- **Training staff to reduce expenses:** drivers and staff should undergo rigorous training for operations. This will reduce cost of maintenance and dry kilometers in operation.
- **Dedicated operations team for expansion:** while interfaces and digital platforms support drivers during operations, a dedicated operations team will allow the fleet to optimize application with updating roads, charging locations and shifting centers of commute.

Ride-hailing: Glyd – a Mahindra initiative



Achievements

Use case	Ride-hailing
Launch year	February 2019
Vehicle segments	4W
Number of vehicles	20
Cities	Mumbai
VKT (million kms)	0.05
Emissions avoided (tons of CO₂)	5



Credits by: Glyd

DESCRIPTION

Glyd is a premium, electric, fixed-route, shared mobility service. Launched in February 2019 in Mumbai, Glyd has deployed multiple Mahindra e-Verito electric sedans in India, aiming to solving the upwardly mobile professional's daily commute challenges between their home and office. Glyd offers travel on fixed routes between prominent residential areas in Mumbai such as Powai, Jogeshwari- JVLR and Kandivali East to the business hubs of Bandra Kurla Complex and Lower Parel.

The company's proprietary algorithm ensures guests spend minimal time picking up and dropping off other guests, by using quick hyperlocal pickups/drops with zero route-deviations. The signature vehicles are equipped with in-car privacy screens, captain seats with customized handsets, headphone jacks, personalized lighting and air purifiers, thereby emphasizing comfort for employees. EVs operate five days a week.

BARRIERS

- **High commercial electricity tariffs** - the high commercial electricity tariff adversely affected the economic viability of the operations and depleted the low operating-cost benefits of EVs.
- **Consumer perception** - consumers tended to place a greater emphasis on economics than sustainability. Glyd plans to leverage the cheaper operating cost for EV adoption.
- **Charging infrastructure** - an ideal scenario for successful deployment requires mass availability of fast chargers. Glyd expects utilities, start-ups and operators to build up networks in cities, to reduce dependency on captive chargers and range anxiety amongst drivers and riders alike.
- **Business participation** - a lack of detailed understanding from facility managers of the benefits of EVs for employee transport, affected mass adoption and financing options.

APPROACH

To tackle the barriers, the company availed of preferential electricity tariffs for EVs at selected locations, which brought down the TCO. They also partnered with Vodafone-Idea Limited (Wi-Fi partner), Cisco Systems Limited (videoconferencing partner) and other service and content providers. They leveraged system partnerships and linked with multiple charging partners (at the distribution and hardware levels) to ensure adequate availability of chargers. However, with planned expansion, the company is looking to deploy multiple fast and slow chargers in Mumbai, and later, nationally in collaboration with partners.

LESSONS AND RECOMMENDATIONS

- **Targeted fixed routes:** range anxiety reduces and charging infrastructure occupancy increases with focused operations on fixed routes.
- **Awareness around EVs and non-financial benefits:** increased adoption from business customers needs adequate awareness. Business customers must be made aware of government incentives and the impact on TCO when combined with the right technology enablers. Also, businesses should also account for the non-financial benefits of EV adoption, such as company positioning etc.
- **Leveraging support of OMCs and government agencies: oil marketing companies (OMCs)** and government agencies in urban India have under-utilized land parcels at sites which are ideal for setting up charging infrastructure. With Brihanmumbai Electricity Supply and Transport (BEST), in Mumbai, setting up chargers at depots as shared public charging infrastructure can help augment the operational capabilities for EV fleets.

OLA

Ride-hailing: Ola

Promise of e-mobility in India

Achievements

Use case	Ride-hailing
Launch year	May 2017
Vehicle segments	3W/4W
Number of vehicles	100+
Cities	Nagpur
VKT (million kms)	7.5
Emissions avoided (tons of CO₂)	1230



DESCRIPTION

Ola launched India's first multi-modal EV pilot in Nagpur, with a goal of gauging the financial viability of e-mobility projects in cities. Ola's fleet comprised e-cabs and e-rickshaws from Mahindra and Kinetic. Ola's vehicle leasing arm, Ola Fleet Technologies, procured all EVs and offered them on daily lease to driver-partners. Lucrative value propositions were designed for a seamless transition to e-mobility for e-cabs, as riders were offered Ola Play sedan services at fares on par with conventional ICE hatchback services. Driver-partners were also provided with free-of cost-charging in the first month, followed by a 50% rebate in subsequent months. To address concerns regarding their income, time taken for charging, and dry run, the initial lease for vehicles was just 10% of that charged for conventional ICE vehicles. To increase effective on-road hours, Ola deployed multiple fast charging stations in Nagpur and also installed slow charging points at driver-partner residences.

BARRIERS

- **High waiting time:** the limited availability of charging infrastructure increased driver partner's waiting time to around 3-4 hours, with a knock-on effect for revenue.
- **High electricity tariffs:** the electricity tariff of INR 17.7 per kWh adversely affected the economic viability of the operations and constituted more than 30% of total operating costs.

- **Limited exposure to operating EVs:** driver partners required frequent repair, maintenance and hands-on support as a result of their lack of familiarity with EVs, thereby affecting their earnings.
- **Limiting design:** interactions highlighted the need for a better vehicle design to accommodate more luggage. There were also concerns about the effectiveness of air-conditioning and its impact on battery performance.
- **Vehicle segment prioritization:** the TCO differential with ICE counterparts is minimal in the case of electric two and three-wheelers. Bridging the gaps for these vehicle segments should be prioritized.
- **Incentives should be on the use rather than the purchase of EVs:** an emphasis on increasing clean kms travelled through subsidizing higher utilization of EV fleets would be better than subsidizing the upfront purchase cost of the vehicle.

APPROACH

- **Cut electricity bills:** to improve financial viability, Ola installed solar rooftops at two charging stations – Airport and Nandanvan, with a capacity of 16 kWh and 15.12 kWh, reducing their electricity bill by 28%.
- **More charging stations:** setting up more stations reduced the waiting time from 3-4 hour to 15-20 mins.
- **Servicing camps:** periodic vehicle service camps at charging stations.
- **Fiscal incentives should be targeted at batteries:** the high upfront cost of EVs is due to the battery pack, which constitutes 40-50% of the cost of an EV. Therefore, the government should subsidize the batteries and recognize battery swapping as a viable alternative mode of charging for the two-wheeler and three-wheeler vehicle segments. Battery swapping slashes waiting time.
- **Hope for powering India's EV dreams through renewable energy:** charging EVs with renewable energy brings out the dual benefits of not only achieving financial viability but also greening EV use.

LESSONS AND RECOMMENDATIONS

- **The success of e-mobility hinges on leveraging shared mobility:** shared mobility actors, such as app-based aggregators, can accelerate EV penetration with more kms per vehicle.

Ride-hailing: SmartE



Achievements

Use case	Ride-hailing shared mobility
Launch year	2015
Vehicle segments	3W
Number of vehicles	1000
Cities	Delhi NCR
VKT (million kms)	50
Emissions avoided (tons of CO₂)	1230



Credits by Smart-E

DESCRIPTION

SmartE launched in 2015, with the goal of providing Delhi commuters with a safe, economical and pollution-free ride. It was an attempt to systemize the last-mile connectivity sector, which is fraught with unorganized operation and is one of the major causes of pollution and anti-social activities. SmartE has come a long way in not only providing convenience and safety to commuters but also a good quality of life to their drivers. They have served over 50 million commuters to date.

BARRIERS

- **Lack of precedence:** it was the first time that any private entity had tried to regularize the sector.
- **Lack of technology:** the first-generation e-rickshaws used to run on lead batteries and were not eco-friendly. Introducing a new technology with a lot of infrastructure was difficult.
- **Lack of infrastructure:** there was a lack of infrastructure in terms of charging hubs, after sales service of the vehicles and more. Drivers were not confident in the range/reliability of the vehicles.

- **Red tape:** securing government clearance was a big hurdle, as at that time e-rickshaws were a relatively unknown vehicle type.

APPROACH

- SmartE, a subsidiary of Treasure Vase Ventures, started partnering with OEMs, procuring vehicles from Kinetic and Mahindra & Mahindra.
- In addition to adding more vehicles, SmartE concentrated on investing in setting up charging hubs, which have been designed to flexibly accommodate potential changes that are likely over the next 10-15 years.
- SmartE entered into MoUs with multiple state governments around the country to roll out its last-mile connectivity services using shared electric vehicles.
- SmartE became the partner of Delhi Metro Railway Corporation to provide first and last mile connectivity for commuters using the Metro on a day-to-day basis.

LESSONS AND RECOMMENDATIONS

- **Shared mobility:** shared mobility will be one of the key drivers for EV adoption in India, allowing for affordable solutions for all players involved.
- **First and last-mile connectivity:** first and last-mile connectivity has fixed hubs and routes, making it easier to operate EVs and install charging infrastructure.
- **Investment in infrastructure:** investing in infrastructure such as charging hubs will help to drive the change in mobility. Investing in the necessary support infrastructure should precede operations.
- **Investing in people:** drivers will play an important part in this change. Investing time on soft-skill training will result in better interaction between them and commuters – paving the way to a distinguished service offering.

Ride-hailing: Sun Mobility



Achievements

Use case	Ride-hailing
Launch year	Jan 2019
Vehicle segments	3W (e-rickshaw)
Number of vehicles	45
Cities	Delhi NCR
VKT (million kms)	0.85
Emissions avoided (tons of CO₂)	5



DESCRIPTION

SUN Mobility partnered with SmartE (India's largest electric three-wheeler fleet operator) to deploy its universal energy infrastructure, with the goal of accelerating the mass adoption of EVs across Delhi-NCR.

BARRIERS

- **High upfront cost:** India is a price-sensitive market, so the high upfront cost of acquiring an EV poses a significant challenge for consumers. E-rickshaws with fixed lithium-ion batteries are, on average, twice as expensive as e-rickshaws with lead acid batteries. Lithium battery costs account for more than 60% of the vehicle cost.
- **Range anxiety:** E-rickshaws with lead-acid batteries come with limited range per charge (60-80kms). Range anxiety (fear of running out of charge while driving) was commonly noted.
- **Long refueling time:** the e-rickshaws at SmartE typically charge overnight, and need four hours of top-up during the daytime. This is highly inconvenient and leads to potential loss of revenue.

APPROACH

- SUN Mobility's open architecture energy infrastructure solution such as in the Smart Batteries and Quick Interchange Stations (QIS), connected via their Smart Network, allowed multiple OEMs and fleet operators to easily integrate their technology into different vehicles.
- Sun Mobility enabled EVs to be cheaper for drivers by removing the cost of the batteries via a battery-swap regime. The swappable batteries are lighter, reducing weight and improving vehicle efficiency.
- Drivers feel more confident as swapping allows for almost double uptime (and revenue), 40% longer range compared to conventional EVs and 80% more range compared to lead-acid batteries.

LESSONS AND RECOMMENDATIONS

- **Focus on adoption of high usage (shared or commercial) mobility segments:** autorickshaws, buses, taxis, employee transport cabs, delivery vehicles, rental scooters, bike taxis and so on have higher potential for an economic EV value proposition.

- **Fiscal incentives to be offered in a technology agnostic manner:** the government should recognize multiple solutions (fast-charging, flash-charging, battery swap etc), while creating policies around incentivization of EV adoption.
- **Single window and fast-track clearances for charging infrastructure deployment projects and support on providing allied electricity infrastructure:** local government agencies need to play a key role in enabling EV pilots. Activities include quick clearances, permits, real estate and allied electricity infrastructure provisions from utility companies (DISCOMs), municipal corporations, metro authorities, transport authorities, etc.

Deliveries: Jubilant FoodWorks (Domino's Pizza)

On the path to delivering food sustainably



Achievements

Use case	Delivery
Launch year	2018
Vehicle segments	2W motorbikes
Number of vehicles	460
Cities	Delhi NCR and Bengaluru
VKT (million kms)	Data not yet available
Emissions avoided (tons of CO₂)	Data not yet available



Credits by: Jubilant FoodWorks

DESCRIPTION

Jubilant FoodWorks was motivated to start delivering food to customers via electric two-wheel motorbikes as a consequence of growing air pollution due to vehicular emissions and the proliferation of cleaner transport options. Their EV program is in a pilot stage and various options (both vehicle and implementation models) are being explored. Currently, the company has about 360 e-bikes in its fleet, which are owned by the company, and about 100 e-bikes which are on lease. E-bike variants are being tested from multiple suppliers to find the right product which matches the required performance metrics: range and speed. It is also exploring introduction of e-cycles in its fleet, especially for campus deliveries.

BARRIERS

Operating a two-wheeler fleet, which has a comparable TCO with ICE counterparts, presents other barriers to 100% adoption:

- **Unavailability of charging infrastructure:** the unavailability of charging points and parking spots near restaurants increases dead kilometers and reduces operational efficiency. Availability of power connection and charging station away from the restaurant is an issue.

- **Uncertain product performance:** some of the available electric two-wheeler products demonstrate varied operational performance, i.e., inconsistent speed and reduced range (due to reasons of inconsistent battery performance and temperature variation etc.).

APPROACH

Vehicles considered: different models of electric bikes are being piloted, ranging from 48-72V with a battery size of 25-35 Ah. A small pilot with electric cycles is also under consideration.

Ownership models: the company has experimented with both (a) lease model: where service providers supply the bikes, and are responsible for charging and maintaining them, the company is charged on a fixed cost per delivery basis; (b) the capex model: where e-bikes have been purchased by the company for full time use. The common metric aiding comparative analysis between the models is 'cost per delivery'.

Government incentives: an applicable government subsidy for e-bikes was utilized at the time of purchase in a few cases.

LESSONS AND RECOMMENDATIONS

- **Pilots to finalize vehicle option:** platforms or restaurants opting for CapEx models should start with pilots that gauge vehicle performance and constraints. This will allow smarter fleet deployment and migration.

- **TCO differential for the two-wheeler segment is already competitive:** company-owned e-bikes are expected to have a lower TCO owing to savings on fuel and maintenance in comparison to traditional ICE bikes. They are expected to achieve break-even in two to three years. However, bikes / scooters in the low / mid-priced range have issues in delivering consistent performance. Also, the better performing bikes cost upwards of INR 1 lakh and their operational cost dynamics is similar to ICE bikes.

- **Train staff:** EV drivers should be trained on best practices to achieve optimum performance and increase asset-life. E-bikes need more sensitive handling of the electrical circuit, battery, etc. and the drivers need to be trained on the same.

- **Strike win-win partnerships:** partnerships with restaurants, malls, real-estate developers and other commercial hubs should be explored for the potential deployment of charging infrastructure. A shared / public charging infrastructure will work better in places where the bike parking space is away from the restaurant.

- **Making drivers/consumers aware of EV deliveries:** *It will help to make the drivers and consumers aware of the environmental advantages of e-bikes.* An innovative points or badge system could be helpful.

Glossary

2W	Two-wheeler
3W	Three-wheeler
4W	Four-wheeler
AC	Alternating Current
AQI	Air Quality Index
CAGR	Compounded Annual Growth Rate
CNG	Compressed Natural Gas
CO ₂	Carbon dioxide
DC	Direct Current
DISCOM	Distribution Company
DMRC	Delhi Metro Railway Corporation
ETS	Employee Transportation Services
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FAME	Faster Adoption and Manufacturing of EVs
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GST	Goods and Services Tax
HEV	Hybrid Electric Vehicle
HR	Human Resources
ICE	Internal Combustion Engine
INR	Indian National Rupee
IOCL	Indian Oil Corporation Limited
KPI	Key Performance Indicator
LCV	Light Commercial Vehicle
MoU	Memorandum of Understanding
OEM	Original Equipment Manufacturer
OMC	Oil Marketing Company
PHEV	Plug-in Hybrid Electric Vehicle
QIS	Quick Interchange Station
SCV	Small Commercial Vehicle
SLA	Service Level Agreement
SOC	State of Charge
TCO	Total Cost of Operation
USD	US Dollars
VKT	Vehicle Kilometres Travelled
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization

Knowledge Contributors



ABOUT WBCSD'S REMOBILITY PROJECT

The objective of REmobility in India is to support the business adoption of electric vehicles, energy storage and renewable energy. The project will meet these objectives by identifying market barriers, sharing knowledge and collaborations, reviewing regulatory and policy frameworks, innovative business models and setting up scalable demonstration projects. We are working with companies and experts from various parts of the national EV value chain, including original equipment manufacturers, charging infrastructure providers, battery manufacturers, utilities, renewable project developers, ICT providers and corporate end-customers. As of November 2019, over 120 experts and decision-makers from different parts of the EV value chain, including some institutional partners and end-customers, have agreed to share time and expertise to help meet our common objectives.

ACKNOWLEDGEMENTS

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* Companies listed alphabetically

Additionally, WBCSD would like to thank all the participants of the REmobility project in India.

Partners for this report

WE MEAN BUSINESS

WE MEAN BUSINESS

We Mean Business is a global nonprofit coalition working with the world's most influential businesses to take action on climate change. Together we catalyze business leadership to drive policy ambition and accelerate the transition to a low-carbon economy. Our mission is to ensure that the world economy is on track to avoid dangerous climate change by 2020 while delivering sustainable growth and prosperity for all.



WILLIAM AND FLORA HEWLETT FOUNDATION

The William and Flora Hewlett Foundation is a nonpartisan, private charitable foundation that advances ideas and supports institutions to promote a better world. The Hewlett Foundation has been investing for a number of years in various strategies to avoid the worst effects of climate change and spare human suffering by reducing greenhouse gas (GHG) emissions. Our grants focus on cleaning up power production, using less oil, using energy more efficiently, preserving forests, addressing non-CO2 greenhouse gases, and financing climate-friendly investments. Our grantmaking is focused in developed countries with high energy demand and developing countries with fast-growing energy demand.

THE CLIMATE GROUP

THE CLIMATE GROUP

The Climate Group's mission is to accelerate climate action to achieve a world of no more than 1.5°C of global warming and greater prosperity for all. We do this by bringing together powerful networks of business and governments that shift global markets and policies. We focus on the greatest global opportunities for change, take innovation and solutions to scale, and build ambition and pace. We are an international non-profit, founded in 2004, with offices in London, New Delhi and New York.



SHAKTI SUSTAINABLE ENERGY FOUNDATION

Shakti Sustainable Energy Foundation (Shakti) seeks to facilitate India's transition to a cleaner energy future by aiding the design and implementation of policies that promote clean power, energy efficiency, sustainable urban transport and climate action. Working collaboratively with policy makers, civil society, industry, think tanks and academia, Shakti seeks to catalyze transformative solutions to meet India's energy needs in clean and sustainable ways.

Relevant business-focused initiatives in India

EV 100

EV100

EV100 is a global initiative led by The Climate Group bringing together forward looking companies committed to accelerating the transition to electric vehicles (EVs) and making electric transport the new normal by 2030. The Climate Group harnesses the collective purchasing power of EV100 members to build demand for electric vehicles and send a clear signal to the market. Electric transport offers a major solution in cutting millions of tons of greenhouse gas emissions per year, as well as curbing transport related air and noise pollution.



URBAN MOBILITY LAB INITIATIVE

Rocky Mountain Institute India accelerates India's transition to a clean, accessible, and prosperous energy future. It engages government, industry, and civil-society leaders to design innovative policy frameworks and market solutions to support India's clean energy and mobility transformations. At the national level, RMI collaborates with NITI Aayog and Ministries to help establish a vision for the future of electric vehicles and energy storage in India. At the subnational level, RMI India collaborates with state governments, urban local bodies, and the private sector through its Urban Mobility Lab initiative to deploy pilot projects that realize environmental impacts and build confidence towards further action.

Electric Mobility Initiative

ELECTRIC MOBILITY INITIATIVE (EMI)

Electric Mobility Initiative (EMI) is a multi-funder platform mobilizing philanthropic efforts supporting the accelerated adoption of electric mobility in India. The initiative brings together like-minded organizations under a common strategy to drive forward electric mobility policy design and implementation. EMI collaborates with stakeholders across the spectrum including government, regulators and industry, through our grantees and partners who share our vision for a clean and secure energy future for India. EMI is hosted by Shakti Sustainable Energy Foundation.



MOVE – MOVING ONWARDS VEHICLE ELECTRIFICATION

MOVE is India Energy Storage Alliance's new initiative to help India move towards vehicle electrification and build a robust ecosystem for EV manufacturing & adoption. IESA is working with various stakeholders in the mobility sector to address barriers and focus on the aspects related to batteries for EVs and charging infrastructure.

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* Note: The companies for range and battery size assumptions include currently available EV models in India of Ather/Okinawa, Kinetic Green, Mahindra and BYD/ Ashok Leyland for 2-W, 3W, 4W and buses respectively.
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DISCLAIMER

This publication is released in the name of the World Business Council for Sustainable Development (WBCSD). This document is the result of a collaborative effort between WBCSD, The Climate Group, Ernst & Young and representatives from companies participating in web-meetings and one-to-one meetings, under WBCSD's REMobility project. A wide range of WBCSD members reviewed the material, thereby ensuring that the document broadly represents the majority view of major Indian companies of the EV value chain. It does not mean, however, that every company within the group agrees with every word.

The guide has been prepared for general informational purposes only and is not intended to be relied upon as accounting, tax, legal or other professional advice.

ABOUT WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT

WBCSD is a global, CEO led organization of over 200 leading businesses working together to accelerate the transition to a sustainable world. We help make our member companies more successful and sustainable by focusing on the maximum positive impact for shareholders, the environment and societies.

Our member companies come from all business sectors and all major economies, representing a combined revenue of more than USD \$8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. WBCSD is uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability: united by our vision of a world where more than 9 billion people are all living well and within the boundaries of the planet, by 2050.

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