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# Shifting gears: the evolving electric vehicle landscape in India

October 2020

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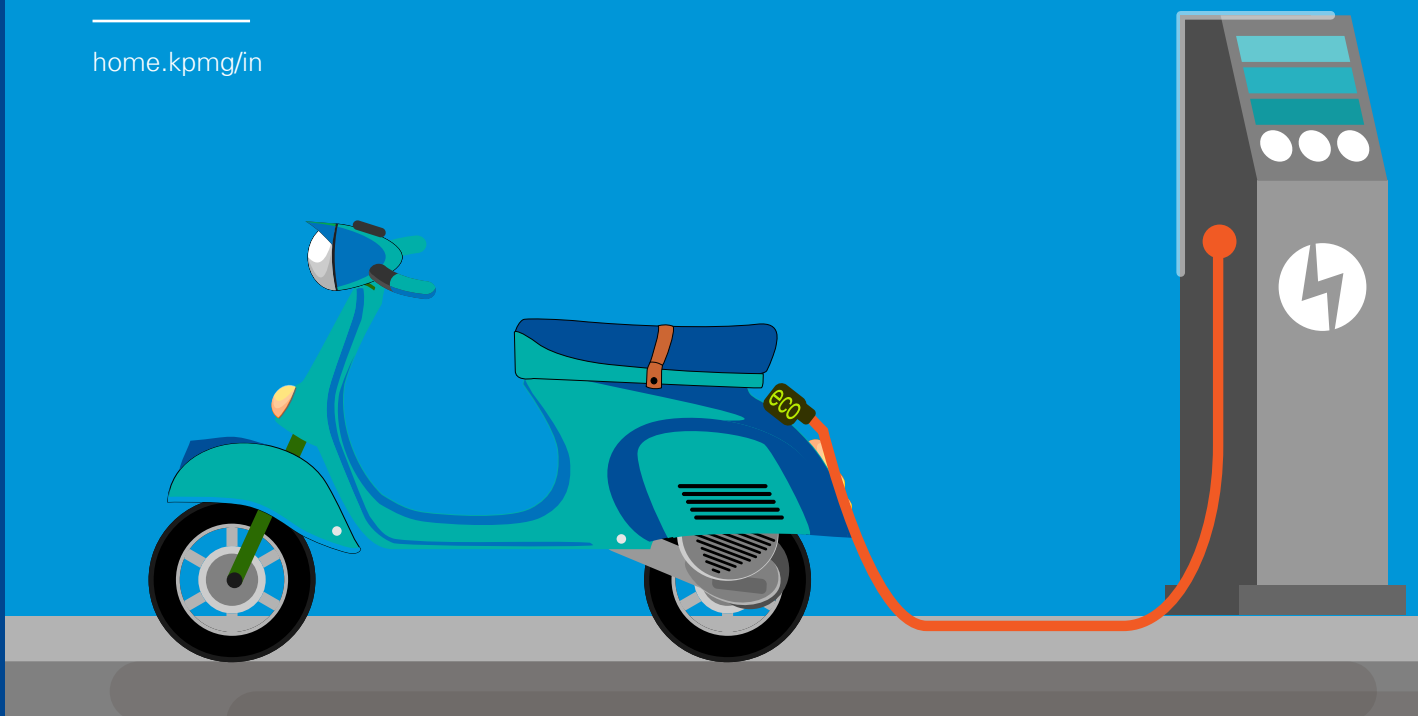

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# 01 Towards an electric future

While electric vehicles (EVs) have been around for a long time, the level of innovation and interest in the space has accelerated over the past decade. In terms of performance, there is no longer the gulf there once existed between EVs and their internal combustion engine (ICE) counterparts. EVs, in fact, fare better than ICE vehicles on a range of transport policy goals, including enhanced energy security, reduced reliance on crude oil, better air quality and lower greenhouse gas emissions.

EVs are, therefore, emerging as the preferred clean technology for the future of mobility. The economics of EVs has also improved significantly, while advancements, especially in battery and charging technologies, are expected to reduce costs further.

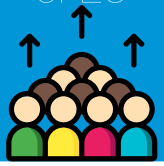
The EV opportunity has long been seen as a game changer for the automotive sector in India. A desire to reduce pollution levels and dependence on oil imports has bolstered the case for EV adoption. India's post-liberalization journey has encompassed rapid urbanization, migration and economic growth—factors that have also led to vehicular congestion in sprawling metropolitan regions and a drastic deterioration in air quality. India held the worst pollution record in 2019, with 21 out of the 30[1] most polluted cities in the world (six out of the 10 most polluted cities). Average air pollution levels in Indian cities were 8-11 times the level permitted by WHO.[1] India has over 2 million pollution-linked deaths annually, the most in the world, and air pollution is an immense drain on resources, costing India the equivalent of 5.4 per cent of gross domestic product (GDP).[2] In addition to vehicular pollution, India is also trying to curb its crude oil import bill, which in FY20 stood at USD102 billion[3] covering just over 80 per cent of the country's oil needs.

**Transport Sector's contribution to GHG emissions**

23 percent


**World's most polluted cities in India**

14 out of 20



**Deaths in India linked to air pollution in 2017**

2.3 million

**The cost of serious health consequences from air pollution**

5.4% of GDP

**Oil import bill for India in 2019-20**

USD102 billion

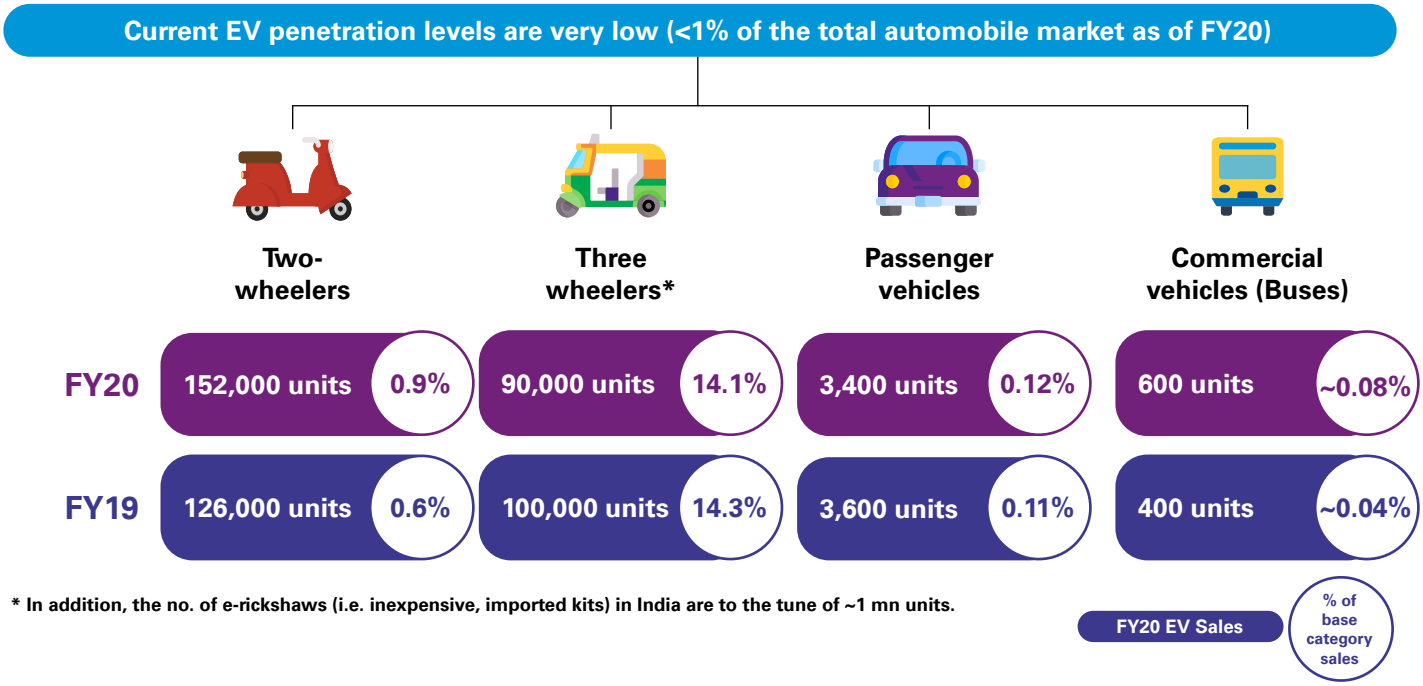
1. IQAir Study, "World's most polluted cities 2019", accessed on 18 September 2020
2. Greenpeace report on "Air pollution from fossil fuels – Feb 2020", accessed on 18 September 2020
3. Economic Times Publication on "India's crude oil import – April 2020", accessed on 18 September 2020

Despite the compelling case for adoption, the success of EVs so far has been constrained by weak customer appetite and infrastructure roadblocks, among other factors. Many EVs introduced in India have fallen short of customer expectations, with concerns lingering on upfront costs, range, speed, battery life and battery technology. The fallout of the coronavirus outbreak and subsequent lockdowns has also taken a harsh toll on the automotive industry, further impeding the shift to EVs as several projects have been deferred. While EVs represent less than 1 per cent[4] of the overall market, the silver lining is that there is considerable headroom for growth. Also, India is one of the leading players globally in unit EV sales; thus, any movement in EV volumes is likely to have a large impact on global EV penetration.

Even though India's automotive industry had been grappling with a slowdown long before the COVID-19 pandemic took hold, it remains one of the largest automotive markets globally in terms of sales volumes. India recorded domestic sales of 21.5 million vehicles in FY20compared with 26.2 million a year earlier.[5]

Policymakers in India have been actively pushing EV adoption in recent years. Government think-tank NITI Aayog has specified that Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME II) and other policies supporting electric mobility are expected to push EV sales penetration to 30 per cent for private cars, 70 per cent for commercial cars, 40 per cent for buses and 80 per cent for two wheelers (2Ws) and three wheelers (3Ws) by 2030.[6]

**Segment wise EV sales – FY19 and FY20 and penetration as a % of ICE Sales[4]**




*** In addition, the no. of e-rickshaws (i.e. inexpensive, imported kits) in India are to the tune of ~1 mn units.**

Light electric mobility is likely to lead the EV growth story in India, with the pace of adoption for 2Ws and 3Ws expected to pick up in the coming years. In India, 2Ws dominate EV sales, given their economic viability, both in terms of price and fuel economy. Parallels can be drawn between India's electric light mobility story and the emergence of China's EV market, where electric bikes and scooters laid the foundation for growth. Intra-city transport buses are also ripe for EV adoption. These segments are likely to be followed by fleet cabs, and then others.

India is predominantly a 2W market with more than 80 per cent of ICE sales coming from 2Ws.[5] The penetration of EVs in four-wheelers (4W) segment has remained extremely low at ~0.1 per cent.[4] Currently, several gaps exist in the 4W EV market such as a limited number of products, high prices, insufficient battery promise, low performance and an underdeveloped charging ecosystem. Given these impediments, the growth of EV 4Ws is expected to lag other segments, with sales picking up once the existing gaps have been plugged.

4. SMEV Publications, accessed on 29 September 2020
5. SIAM Database, accessed on 20 April,2020
6. India's Electric Mobility Transformation by NITI Aayog and RMI, April 2019, accessed on 29 September 2020

## Segment wise propensity to transition to EVs based on key parameters[7]

| | Intra city Buses | Two-wheelers | Three-wheelers | City Cabs (Ola/Uber) | Private Cars | Goods Vehicles (Light) | Goods Vehicles (Heavy) |
|---|---|---|---|---|---|---|---|
| **Comparison based on use-cases** | | | | | | | |
| **Daily Run** | High | Medium | Medium | High | Low to Medium | High | High |
| **Route predictability** | High | Low to Medium | Medium | Low | Low to Medium | Medium to High | Low |
| **Charging infra requirement** | Depots | Home | Home/ Stands | Widespread | Widespread | Parking Lots | Widespread |
| **Economic Viability** | Medium (High at long ranges) | High | High | Medium | Medium | Medium to High | Low |

Attractive ● ● ● ● Unattractive

Source: KPMG Analysis

Based on an analysis of key enablers for EVs, KPMG in India expects 25 to 35 per cent 2W penetration, and 65 to 75 per cent in 3Ws by 2030. However, 4W passenger vehicle (PV) electrification is expected to lag, with 10 to 15 per cent penetration in the personal segment and 20 to 30 per cent in the commercial one by 2030. About 10 to 12 per cent of the overall market for buses is expected to be electrified by 2030.[7]

Innovative business models such as battery swapping have emerged to enable widespread EV adoption. Battery swapping model alleviates issues of long charging time, range anxiety, high upfront cost and battery reliability concerns for the EV owners. To make this model workable, the operator needs to ensure standardization of batteries and operate in a closed loop environment. Recently, various tie-ups/partnerships have been entered between OEMs/Operators and leading Oil Marketing Companies (OMCs) for battery swapping solutions e.g. Kinetic Green – BPCL.[8]

In line with Make-in-India initiatives and global supply chain realignments, the government is strongly pushing the localization of production to achieve the twin objectives of self-reliance and job creation. This will create opportunities for setting up infrastructure across the EV value chain, spanning charging and battery manufacturing. NITI Aayog, in conjunction with other ministries, intends to outline a phased manufacturing programme for a few large-scale export-competitive integrated battery and cell manufacturing gigaplants in India.[9] The government is planning to issue tenders inviting companies to set up a 50-GW battery manufacturing base in India.[10]

As more EVs enter the Indian market, the challenge of sustainable end-of-life practices for battery disposal and recycling also arises. At present, India has very little recycling infrastructure, implying that batteries are discarded or disposed in landfills. Currently, only a few state EV policies provide guidelines and incentives on battery recycling. Given this, a coherent recycling policy is the need of the hour.

To drive EV adoption, Original Equipment Manufacturers (OEMs) and the government, both at state and central levels, need to work collaboratively towards an integrated policy, creating a conducive ecosystem for India's electric mobility vision. A combination of enablers-policy measures, infrastructure development, Total cost of ownership (TCO) parity, and a market buzz-promise to fast-track the shift to electric, heralding the dawn of a new era for the automotive industry.

7. KPMG in India analysis 2020
8. Economic Times article on Kinetic Green partners with BPCL to launch electric 3W on battery swapping tech – Feb 20, accessed on 29 September 2020
9. Business Standard article on 'Cabinet okays 5-year plan for 'phased manufacturing' of EV batteries – March 19', accessed on 29 September 2020
10. Economic Times article on 'Niti Aayog seeks Cabinet nod for battery push – Jan 20, accessed on 29 September 2020

# 02 Creating an enabling policy framework for EV adoption

A combination of central and state-level initiatives is driving the growth for EVs in India. The central government has rolled out the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME-II) policy, while state governments have also introduced a host of EV-specific policies. Based on the type of incentives offered for EV promotion, policy initiatives fall into two broad categories, demand side and supply side.

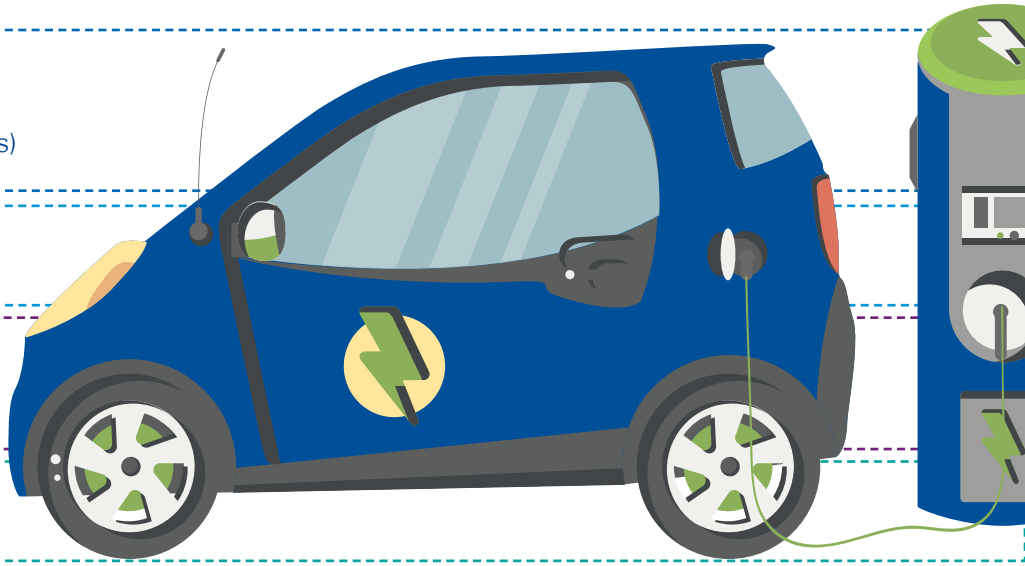
## EV policy initiatives in India

**Demand-side focussed**
(incentives for customers to reduce upfront cost differential for EVs)

**Other state policies**
(primary focus on supply side)

**Supply-side focussed**
(incentives for EV manufacturers to attract investment)

**FAME Policy, Delhi, Gujarat, Bihar etc.**



The central government's FAME policy and the Delhi government's EV policy offer monetary incentives to customers which help reduce the purchase price of EVs and bridge the price differential between EVs and ICE vehicles. A number of state governments, on the other hand, have primarily focused on supply-side incentives to attract investment in the EV sector in their respective states to help generate employment opportunities. The combination of demand incentives from the central FAME-II subsidy and state measures should help bring down the upfront cost differential substantially for EVs.

Aside from the policy initiatives, other measures to promote the EV industry have also been introduced such as a reduction of GST on EVs and EV chargers to 5 per cent. The following section analyses the spectrum of policy initiatives to drive EV growth and identifies gaps that need to be plugged.

## 1. FAME-II: The central government's big EV push

The subsidy scheme was introduced in April 2019 to drive adoption of EVs in India. With a total outlay of INR100 billion spread over FY20-22, the scheme provides demand incentives for electric 2Ws, 3Ws (including e-rickshaws), 4Ws and buses. While the incentives in e-3W, e-4W and e-bus segments will be applicable mainly to vehicles used for public transport or those registered for commercial purposes, for e-2W segment the incentive will be available for privately owned vehicles as well. The incentive is available in the form of an upfront-reduced purchase price to enable wider adoption of EVs. The quantum of incentive is based on the capacity of the battery used in the vehicle. The scheme also envisages establishment of a network of charging stations in the country.

**FAME II Incentives – Investment rollout plan (FY20 to FY22)[11]**

| |  2 Wheelers |  E - rickshaws |  Electric 4W |  Strong hybrid 4W |  E-buses |  Charging Infrastructure |
|---|---|---|---|---|---|---|
| **Number of Vehicles** | 10,00,000 | 5,00,000 | 35,000 | 20,000 | 7,090 | 2,700 charging stations |
| **Incentive per vehicle (INR)** | 20,000 | 50,000 | 1,50,000 | 13,000 | 50,00,000 | - |
| **Total Incentives (INR Cr)** | **2,000** | **2,500** | **525** | **26** | **3,545** | **1,000** |
| **Demand Incentives** | 10,000 per KWh Maximum cap on incentives of 20% of total cost of vehicles | | | | 20,000 per KWh Maximum cap on incentives of 40% of total cost of vehicles | |

Source: Department of Heavy Industries

To ensure development of technology for EVs domestically, the scheme also pre-specifies eligibility criteria for demand incentives in terms of battery technology, localization content and product specifications. Under the scheme, only Lithium battery technology vehicles with a minimum 50 per cent local content are eligible for subsidy. The eligibility criteria for product specifications is defined on the basis of performance and efficiency of the vehicles measured in terms of range, electricity consumption, max speed and acceleration. Additionally, all EVs (except e-rickshaw/ e-cart) need to be equipped with an electric regenerative braking system to be eligible for subsidy

11. Department of Heavy Industries on FAME II Repository, March 19 accessed on 29 September 2020

## 2. State-level policies: supply-side measures remain the focus

Several state governments have introduced EV-specific policies focused on supply-side incentives to attract investment and generate employment in their respective states. States like Andhra Pradesh, Uttar Pradesh, Tamil Nadu and Telangana offer incentives such as capital interest subsidy, stamp duty reimbursements, tax exemptions, SGST reimbursement and provision of interest free loans to incentivize EV manufacturers. Although, a few state governments like Bihar, Maharashtra and Punjab have offered demand-side incentives in the form of monetary incentives, road tax and registration fee exemption etc., the primary focus of these policies have been supply-side incentives. The recently introduced EV policy of the Delhi government has a greater focus on demand-side incentives. The policy offers purchase incentives for EVs as well as scrappage incentives for ICE vehicles.

A brief synopsis of incentives offered under each state's EV policy, along with details of demand side incentives available under the Delhi government EV policy and the FAME 2 scheme for various vehicle types, are provided in the appendix.

## 3. Tax policies: Hikes in custom duties to weigh on demand in the short-term

Custom duty is levied on import of EVs and components (whether completely built unit (CBU)/semi knocked down (SKD)). The customs duties have recently been hiked,[12] effective 1 April 2020. For e.g. duty on EVs imported as CBU has increased from 25 per cent in 2019 to 40 per cent in 2020, duty on electric PVs and 3Ws imported as SKD kit has increased from 15 per cent in 2019 to 30 per cent in 2020 (a detailed summary is provided in the appendix).

The custom duty increases come in the backdrop of import of battery packs whose specifications did not meet standards determined by the government. The government wants to promote manufacturing of EVs in India, with plans to build Tesla-style giga factories and develop a homegrown battery manufacturing ecosystem.

While these measures may help curb the import of components from China, especially the poor-quality ones and benefit long-term domestic manufacturing prospects, they are expected to result in a rise in prices of existing e-buses and passenger vehicles sold in India which may in turn lead to customers putting off EV purchases in the near term.


12. Department of Heavy Industries on FAME II Repository, March 19 accessed on 29 September 2020

## 4. Key gaps in the existing policy ecosystem and our recommendations

- State EV policies could lay a greater focus on demand incentives that shall bring down the upfront cost differential. Other states could introduce demand-side financial incentives on the lines of Delhi, Gujarat and Bihar. Further, the quantum of incentives should be meaningful enough to drive EV adoption
- State EV polices could have certain targets for conversion of EVs, at a segment level or for a particular industry/use case. States such as Delhi, Uttarakhand, Tamil Nadu have already set targets for EV conversion; other states could follow suit. The Delhi EV policy mandates conversion of 2W fleet of delivery service providers to 50 per cent by FY23 and 100 per cent by FY25. Uttarakhand targets 100 per cent electrification of public transport (e-buses) by 2030.
- Setting up of adequate charging infrastructure is key to encourage users to consider EVs. Most EV sales take place in lighter mobility categories, creating demand for charging infrastructure at homes/ residences, parking lots, workplaces or commercial establishments. The state-level EV policies should focus on promoting these models of charging infrastructure. This could include incentivizing the installation of home chargers and charging infrastructure at workplaces, changes in building by-laws to enable charging, as well as mandating installation of charging infrastructure in government offices.
- EVs could be promoted by encouraging users to purchase/use EVs over ICE vehicles with measures such as increasing road tax/registration fees on ICE vehicles, levying cess on the sale of petrol/diesel or surcharge on parking, providing incentives on scrapping and deregistering of ICE vehicles, are some of the measures that could be implemented. Most state EV policies, with the exception of Delhi, do not focus on promoting EVs through these reforms.
- The vehicle scrappage policy has also been in the works for some time now, pending approval from central government stakeholders. While the policy is expected to curb air pollution, reduce fuel consumption and curtail road accident fatalities, it is expected that the policy would also generate demand for new vehicles that may also spur the adoption of EVs
- As more EVs enter the market, there is a need to formulate clear policies on sustainable end-of-life and disposal practices for the industry. The end life of batteries impacts sustainability and the value chain of materials. One of the potential solutions is recycling. A well-defined regulatory and policy framework on battery disposal and recycling needs to be in place. Further, the state EV polices should focus on providing support for battery recycling businesses (currently only a couple of state polices mention on battery recycling)
- Corporate average fuel economy (CAFE) norms have been proposed by the government to realign the country with global auto industries in terms of fuel efficiency, reduction in carbon footprint. The government could mandate automakers to have a certain percentage of their vehicle sales as electric *vide* these norms.

While existing policy measures represent a step in the right direction, there is scope for improvement if India is to create a conducive environment for EV adoption. Incentivization of customers and manufacturers through both supply-side and demand-side incentives will be critical in addressing EV adoption barriers and expediting the transition to EVs.

# 03 Building an ecosystem to supercharge EV growth

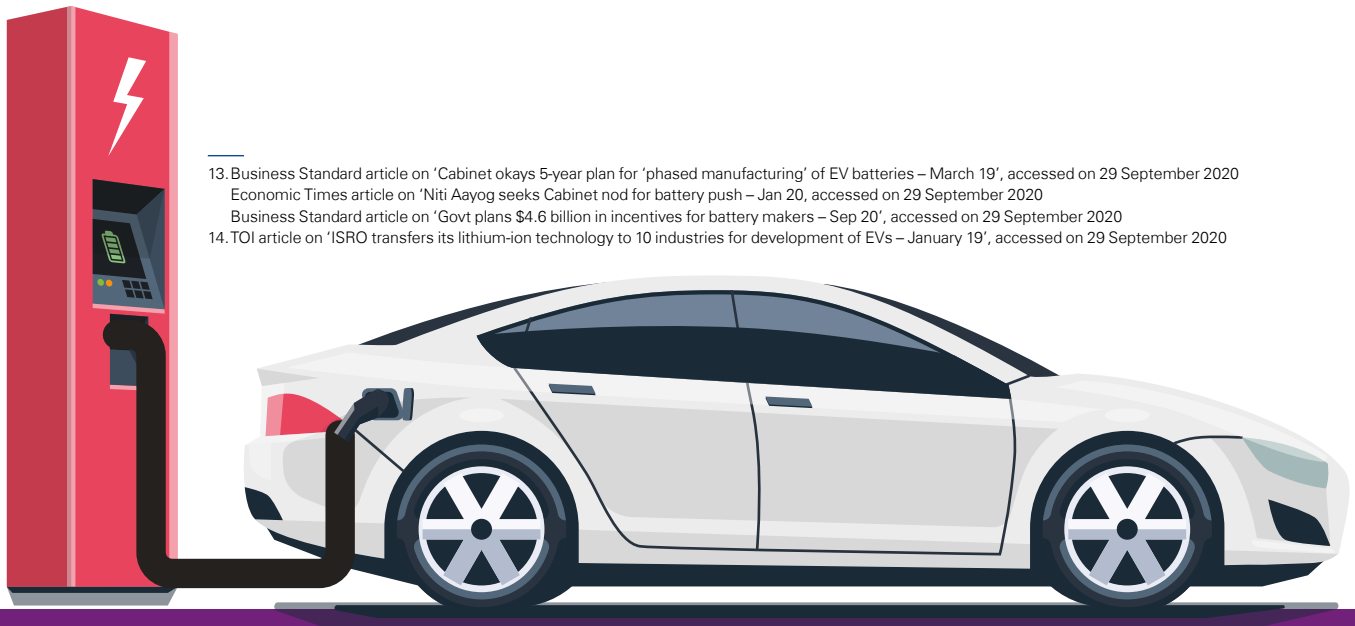
The development of the battery industry, charging infrastructure and local supply chains are critical for EV adoption. With the objective of transforming India into a manufacturing and exports hub, the government has been promoting the localization of production across the EV value chain.

In March 2019,[13] the government outlined the National Mission on Transformative Mobility and Battery Storage, a five-year phased manufacturing programme running till 2024 to support development of few large-scale, export-competitive integrated batteries and cell-manufacturing giga plants in India.

The government is currently weighing up plans to incentivize domestic battery manufacturing. In January 2020,[13] NITI Aayog sought cabinet approval for a proposal to provide subsidies to investors setting up giga-scale manufacturing units for lithium ion batteries used in EVs. NITI Aayog, in a recent proposal that is likely to be reviewed by the PM's cabinet in the coming weeks,[13] recommended incentives of USD4.6 billion by 2030 for companies manufacturing advanced batteries. As per the proposal, cash and infrastructure incentives of USD122 Million shall be provided in FY22 which may then be ratcheted up annually.

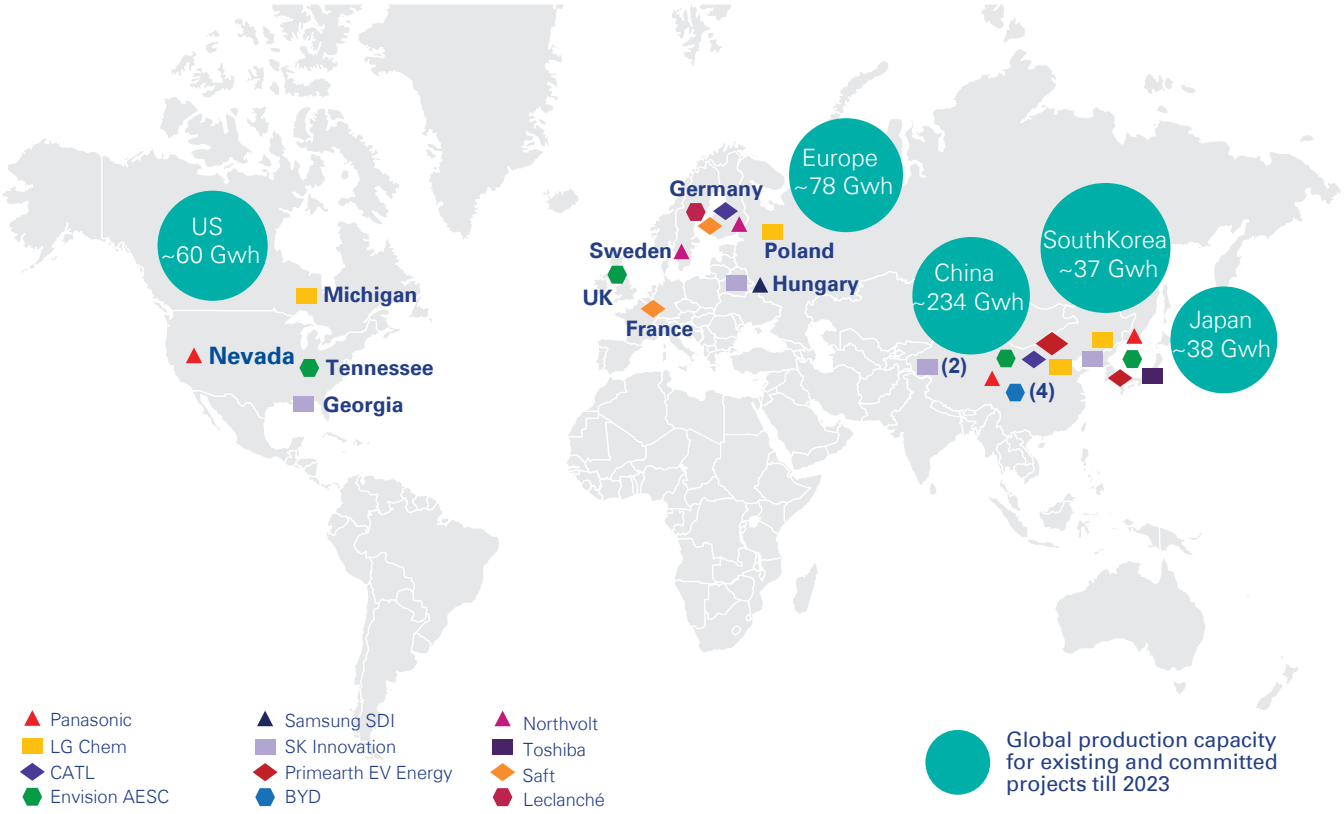
The Indian Space Research Organization (ISRO) has transferred its in-house lithium ion technology at a nominal fee of INR10 Million to 10 Indian industries for commercial production.[14] This move is expected to lead to the establishment of lithium-ion cell production facilities for indigenous EVs. Leading global players have shown interest in establishing cell or battery pack manufacturing facility in India, while major Indian conglomerates have also outlined plans to set up manufacturing facilities.

Currently, lithium ion battery cell production hubs are primarily located in China, US (North America), Europe (Western), Japan and South Korea.



13. Business Standard article on 'Cabinet okays 5-year plan for 'phased manufacturing' of EV batteries – March 19', accessed on 29 September 2020
    Economic Times article on 'Niti Aayog seeks Cabinet nod for battery push – Jan 20, accessed on 29 September 2020
    Business Standard article on 'Govt plans $4.6 billion in incentives for battery makers – Sep 20', accessed on 29 September 2020
14. TOI article on 'ISRO transfers its lithium-ion technology to 10 industries for development of EVs – January 19', accessed on 29 September 2020

## Global battery cell manufacturing – key locations and players




Source: Report by Australian Government on 'The Li ion Battery Value Chain – 2018', accessed on 29 September 2020, Media Reports and company websites of players with locations of battery manufacturing facilities, accessed on 29 September 2020

However, India's phased manufacturing plans are likely to face challenges. India does not have significant reserves of key raw materials such as lithium and cobalt and remains dependent on other countries for their supply.[15]

## Reserves of Li-ion battery raw materials in selected countries

| | South Africa | China | India | Russia | Bolivia | Brazil | Chile | Cuba | Canada | US | Australia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Graphite | | ■ | ■ | | | ■ | | | | | |
| Copper | | ■ | | ■ | | | | | | ■ | ■ |
| Aluminium | | | | | | ■ | | | | | ■ |
| Manganese | ■ | ■ | ■ | | | ■ | | | | | ■ |
| Nickel | | | | ■ | | ■ | | ■ | | | ■ |
| Cobalt | | | | | | | | ■ | | | ■ |
| Lithium | | ■ | | | ■ | | ■ | | | | ■ |

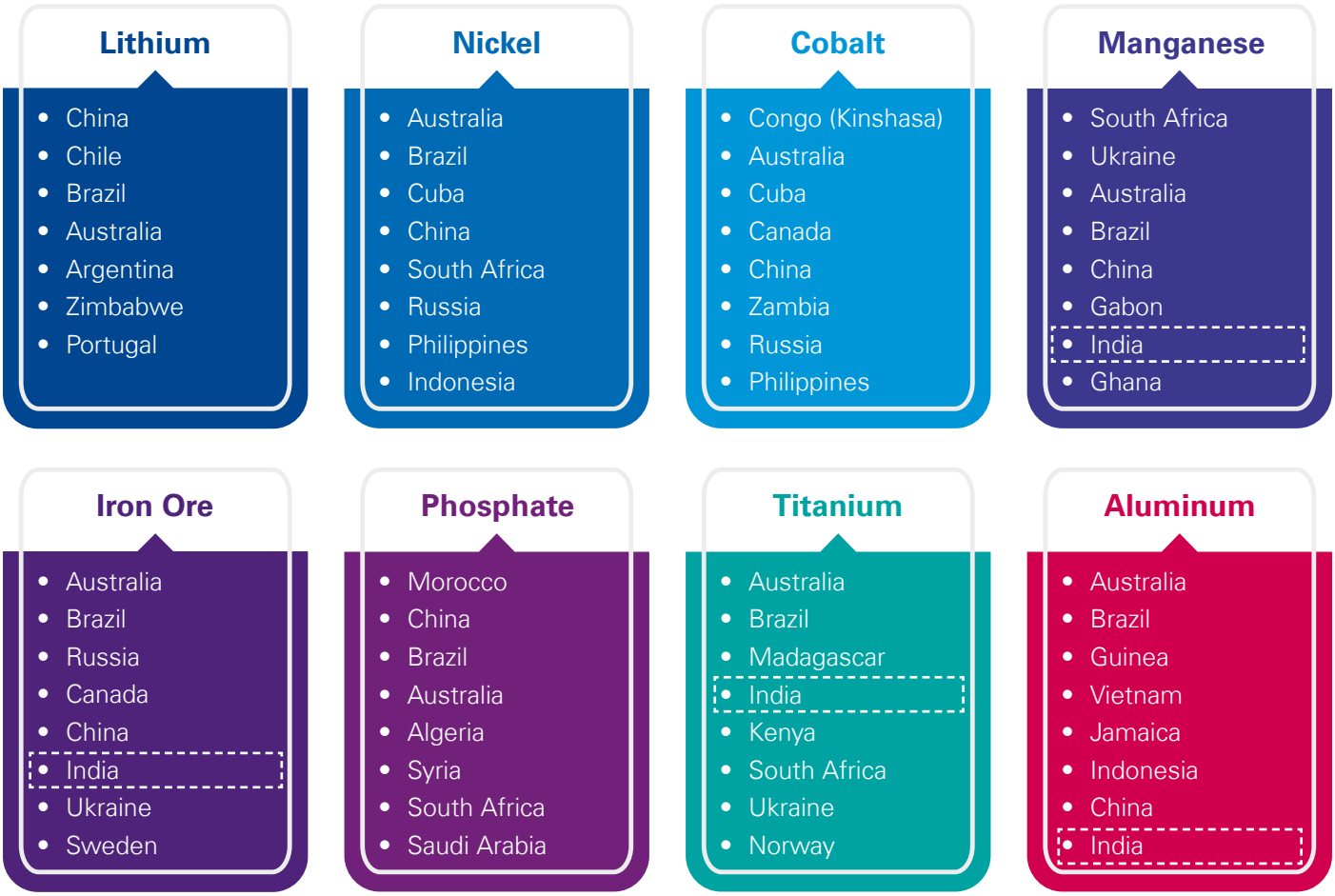
Low proportion as a percent of global known reserves

Significant proportion as a percent of global known reserves

Source: India's energy storage mission, NITI Aayog and RMI, 2017 accessed on 29 September 2020

15. India's energy storage mission, NITI Aayog and RMI, 2017 accessed on 29 September 2020

## Reserves of raw materials by key countries[16]




Other than batteries, India has strong capabilities in certain EV components and can emerge as a hub for manufacturing as well as exports. These include wire harnesses, permanent magnets, BLDC motors, AC induction motors, thermal and cooling management systems, electronics (other than semi-conductors), plastics, etc. Auto component players in India are increasingly seeking to develop the requisite technological capabilities and capacities in these areas.

## Building charging infrastructure

Across the world, electricity distribution companies and oil and gas players are developing solutions and entering into partnerships in the EV charging infrastructure space.

Globally, the number of private chargers (slow) were ~6.5 million in 2019, and public chargers were 0.6 million (slow) and 0.26 million (fast) respectively.[17] While private chargers form a major share in the availability of charging infrastructure, public fast charging is picking up.

In order to enable faster adoption of EVs, the government has issued guidelines and standards for public charging infrastructure wherein it phased out plans for rollout of public charging infrastructure.[18]

Based on proposals received, the Indian government recently sanctioned 2636 (public) charging stations in 62 cities across 24 states/UTs to be installed by 19 public entities.[19] Out of these, 1633 charging stations are expected to be fast charging stations, and 1003 slow charging stations. With this, ~20,000 charging points are expected to be installed across selected cities.

In summary, supportive policy, falling battery prices, charging infrastructure and supply chain localization are among the factors that need to come together to power growth for EVs.

16. Report by Australian Government on 'The Li ion Battery Value Chain – 2018', accessed on 29 September 2020
17. IEA – 2020 EV Outlook Report, accessed on 29 September 2020
18. Charging Infrastructure for EVs – Revised Guidelines and Standards dated 1 October 2019 and 14 December 2018, accessed on 29 September,2020
19. Economic Times article on 'Government approves 2,636 new charging stations in 62 cities', accessed on 29 September 2020

# 04 Tracing the EV growth story across segments

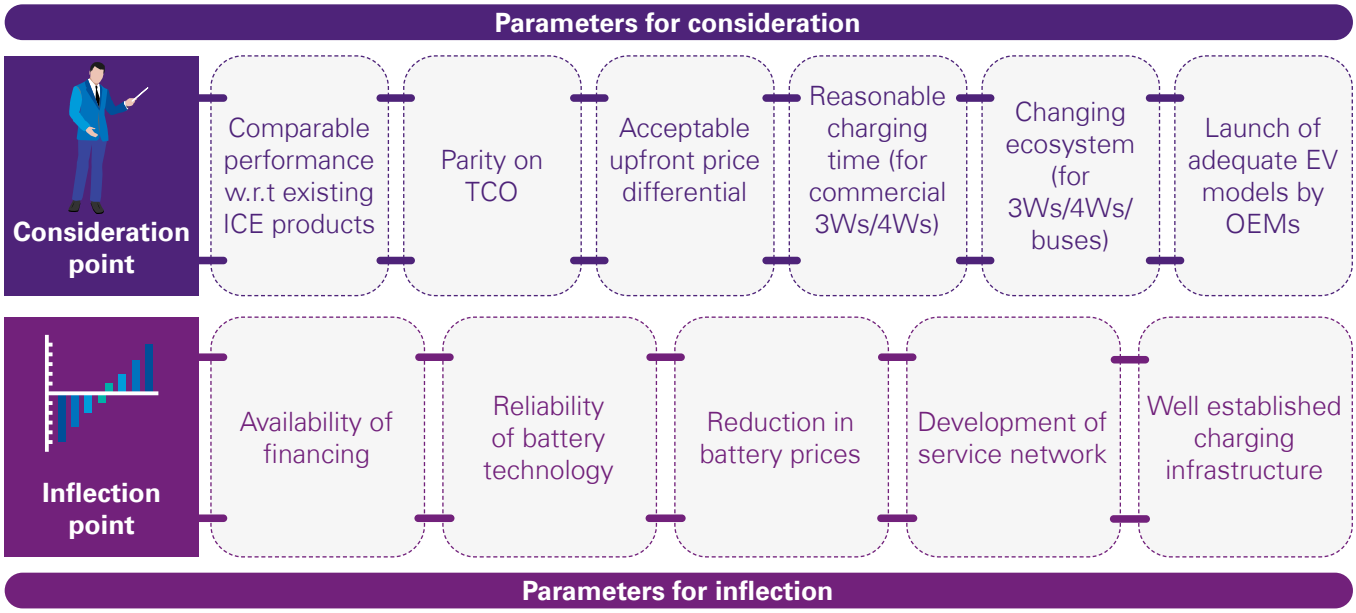
KPMG in India expects a gradual, phased adoption of 2Ws, 3Ws and intra-city buses to power EV growth, followed by commercial cars and then other segments.

## Key considerations for enabling EV adoption and estimates of future EV penetration across segments:

We believe that a few enablers must be in place for the initial conversion of EVs. The consideration point and inflection point are the two most important factors that will drive the adoption of EVs in India.

**Consideration point:** This occurs when customers start considering/evaluating an EV while making purchase decision of a vehicle. The likely penetration may be low in the initial years, but with increased product launches, comparable performance and TCO parity consideration per cent increases.

**Inflection point:** This occurs when various aspects related to EV performance, battery technology and an enabling ecosystem are broadly established. From the inflection point, the market is expected to ramp-up faster.




*In case of any of these enablers are not in place, growth is expected to be slower and inflection point likely to be delayed*[7]

The pace of **segment-wise adoption of electrification is expected to vary depending on the use-cases** and it is likely to gain traction as TCO parity already exists for 2Ws and 3Ws (including subsidies) which is likely to be followed by fleet cabs and other segments. However, for 4Ws, TCO parity is expected to be achieved beyond 2025.

7. KPMG in India analysis 2020

**TCO analysis for different vehicle segments – ICE vs Electric vehicles:**[7]

| | Upfront cost differential | Expected time for TCO parity (with subsidy) | Expected time for TCO parity (without subsidy) |
|---|---|---|---|
| 2W | 1.0 – 1.5x | Already there | Already there |
| 3W | 0.9 – 1.5x | Already there | Already there |
| 4W - Personal | 2 – 2.5x | 2025 | 2030 |
| 4W - Commercial | 2 – 2.5x | 2022 | 2025 |
| SRTUs | 3.0x | 2024 | 2030 |

Based on an analysis of key enablers for consideration and inflection points, KPMG in India has arrived at EV penetration estimates (as a percentage of ICE sales) for different vehicle segments in 2025 and 2030:

**Segment wise analysis - EV Penetration**

| Segment | Sub segment | EV Penetration % | |
|---|---|---|---|
| | | 2025 | 2030 |
| 2W | Scooters | 15 - 25% | 50 - 70% |
| | - B2B | 40 - 60% | 60 - 80% |
| | - B2C | 13 - 18% | 40 - 60% |
| | Motorcycles | 1 - 2% | 10 - 20% |
| | **Overall** | **7 - 10%** | **25 - 35%** |
| **3W** | **Overall** | **35 - 45%** | **65 - 75%** |
| 4W - PV | Personal | 1-3% | 10-15% |
| | Commercial | 5-10% | 20-30% |
| **Buses** | STUs | 15%-25% | 25%-40% |

7. KPMG in India analysis 2020

These adoption numbers depend on factors such as widespread availability of charging infra, a robust financing ecosystem, reduced battery prices leading to limited upfront price differential between EVs and ICE, and most importantly, higher customer awareness leading to increased acceptance of EVs in public consciousness.

## Adoption of electrification across segments:

**Two-wheelers** represent the largest automotive market segment in India, accounting for up to 81 per cent of total automotive sales in FY20.[5] The sheer size of this segment highlights its potential for EV adoption.

Several technology startups have launched products in 2Ws which are being used for personal mobility and for last mile delivery operations. They are also creating an end-to-end ecosystem from manufacturing to setting up charging stations, which will most likely accelerate the adoption of two-wheeler EVs. Key use cases for 2Ws include last mile delivery of light weight goods and last mile transportation of passengers for shorter distances.

## TCO analysis for 2Ws: Key insights[7]

### Scooters (Personal Use):

**Premium:**

- Limited products in the market (5-6)
- TCO parity exists when comparing it to premium ICE models
- High price tag is likely to keep the volumes low in initial years
- Customer segment restricted to high income, tech savvy, upmarket customers who are early adopters.

**Masstige:**

- About 10-15 products in the market
- TCO parity exists and upfront cost is also comparable
- Battery warranty and vehicle sturdiness needs to be improved significantly
- 'Value for money' customer segment

**Mass:**

- Majority of EV products cater to this segment
- TCO of EV is significantly lower than ICE
- 'Price sensitive' customer segment.

### Scooters (Commercial Use):

**Masstige:**

- TCO parity exists, however, battery replacement can reduce the cost advantage
- Useful in commercial purposes due to significant difference in operating costs

**Mass:**

- TCO of EV is lower than ICE
- Not well suited for commercial use-case due to low top speed, long hours of charging and lack of vehicle sturdiness.

| Upfront cost differential | Expected time for TCO parity (with subsidy) | Expected time for TCO parity (without subsidy) |
|---|---|---|
| 1.0 – 1.5 x | Already there | Already there |

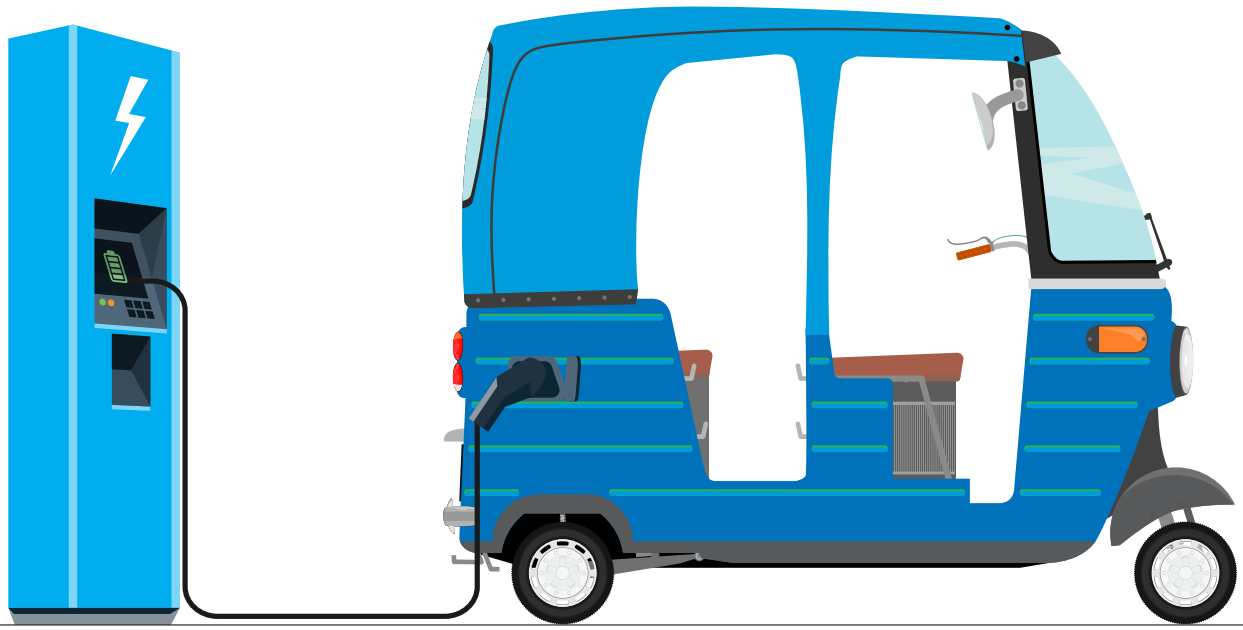
5. SIAM Database, accessed on 20 April,2020
7. KPMG in India analysis 2020

Since scooters have already crossed the consideration point, the sales growth comes mainly from the low-to-medium speed categories for which TCO parity exists and subsidies have bridged upfront cost differentials.

The inflection point for mass adoption should arrive in three to four years once B2C market picks up pace,[7] along with reduced EV prices as a result of falling battery prices and economies of scale.

**Three-wheelers:** this segment is a last-mile segment which caters largely to intra-city travel. Availability of product variants, TCO parity and low cost of ownership are among the factors that bode well for this price-sensitive user segment. e-3Ws, therefore, represent a significant economic opportunity for industry players

| Consideration Point Parameters | EV Willingness index | 3W ICE | 3W Electric Vehicle |
|---|---|---|---|
| Purpose built (use case specific) vehicles | High | Daily travel – 50 – 80 kms<br>Capacity – <600 kgs | Range – 50 – 75 kms<br>Capacity – <500 kgs |
| Upfront cost differential | 0.9x – 1.5x | INR 1.8 – 2.4 lakh | INR 1.5 – 2.5 lakh |
| Total Cost of Ownership (TCO)* | EV has lower cost of operations | Operational cost INR 2.4/km<br>TCO – INR 3.3 – 3.9/Km | Operational cost INR 0.5-0.6/km<br>TCO – INR 2 – 2.5/Km |
| Ease of charging | High | 3W vehicles are used primarily for intra city transport and do not encounter range anxiety. However, charging is currently captive or at home and not through public charging infrastructure | |
| Route Predictability | High | Intra city operations and applications in Municipal Solid Waste Management, Ecommerce provide scheduling of the route in advance | |



## TCO analysis for 3Ws: Key insights[7]

### Commercial – Cargo Usage:

**E3W Cargo vs ICE LCV:**

- TCO for EVs is lower than LCVs (both with and without subsidy)
- The number of products in this space are very limited although players such as GMW present a viable alternative.

**E3W Cargo vs ICE 3W Cargo:**

- TCO for EVs is lower than ICE, only when subsidy is considered
- Diverse product variants available
- Low cost of ownership makes EV cargo an attractive proposition for last mile delivery applications
- Fleet operators/aggregators, as yet, are not comfortable in buying EVs
- Innovative operating and financing models along high product quality is needed for widespread adoption.

### Commercial – Passenger Usage:

**E3W Auto vs ICE 3W Auto:**

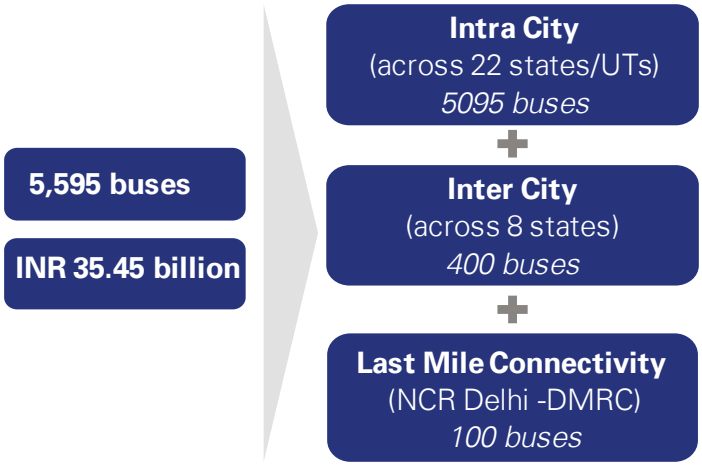
- TCO of EV is lower than ICE, only when subsidy is taken into account
- Very limited products in this segment
- Higher upfront cost is a challenge, especially with the price-sensitive nature of customers along with limited financing for EVs.

**E3W Rickshaw vs ICE 3W Auto:**

- TCO for EVs is lower than ICE, even when subsidy is not considered
- Plethora of products in this segment including imported, low cost lead-acid rickshaws which are used for last mile connectivity
- Better quality lithium-ion E3W rickshaws are emerging as preferred mode of transport for shared mobility (Smart-e model) and short distance trips (last mile connectivity)
- Due to constraints on range and charging infrastructure, these may not replace free floating autos in immediate future.

**Intra-city buses:** The segment offers a compelling use-case for EV adoption owing to favorable economics, higher route predictability and need for limited charging infrastructure.

Buses are a primary form of public transportation in the country, and buses owned and operated by government-operated State Road Transport Undertakings (SRTUs) have taken the lead in the race to electrification.[7]




7. KPMG in India analysis 2020

**Economics of electric mobility depends upon daily run, route predictability and charging infra needs**

**Municipal transport buses followed by private intra city operators having long daily runs, high route predictability and charging facility availability at depots, are most suitable for EV adoption.**

1. **Mobility solutions offering lower total cost of ownership could be adopted faster**
   - City buses running over long ranges are viable
2. **Owing to long charging time, range anxiety is a significant factor**
   - Electric mobility better suited to point-to-point, smaller daily commutes and defined route use-cases. Intra city commute appears to be better suited over inter city commute
3. **Charging infrastructure will get built over time**
   - Use-cases which require widespread charging infra will see slower adoption – battery swapping likely to take off faster than charging stations

**Comparison of electric vehicle use-cases**

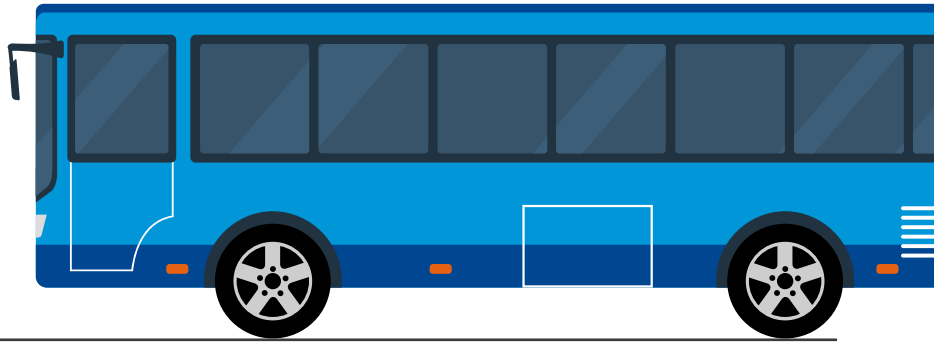
| Aspect | SRTUs (Intercity) | SRTUs (Intra city) | Private operator (Intercity) | Private operator (Intra city) |
|---|---|---|---|---|
| Daily Run | Positive | Positive | Positive | Medium |
| Route Predictability | High | High | High | Medium |
| Charging infra requirement | Negative Widespread across the highway | Positive (Can be installed at Depots) | Negative Widespread across the highway | Positive (Can be installed at Depots or parking lots) |
| Economic viability | Negative | Medium (High at long ranges) | Negative | Medium (High at long ranges) |

Several leading players have launched e-buses and participated in tenders. Trials are taking place in several cities, and EV bus services have been launched on a commercial scale in some places.

### Initiatives under FAME-II:

- Department of heavy industries (DHI) sanctioned the purchase of **5,595 e-buses in 64 cities** under FAME-II, providing a **total subsidy of INR35.45 billion** in August 2019.[20]
- In **Phase 1 of FAME-II,** the tender process has been **completed for 3,135 e-buses across 30+ cities.**[21]

**TCO for SRTUs:** Intra-city segment is expected to achieve TCO parity by 2028 for AC buses and 2030 for non-AC buses. However, for private intra-city segments, it is expected beyond 2030.



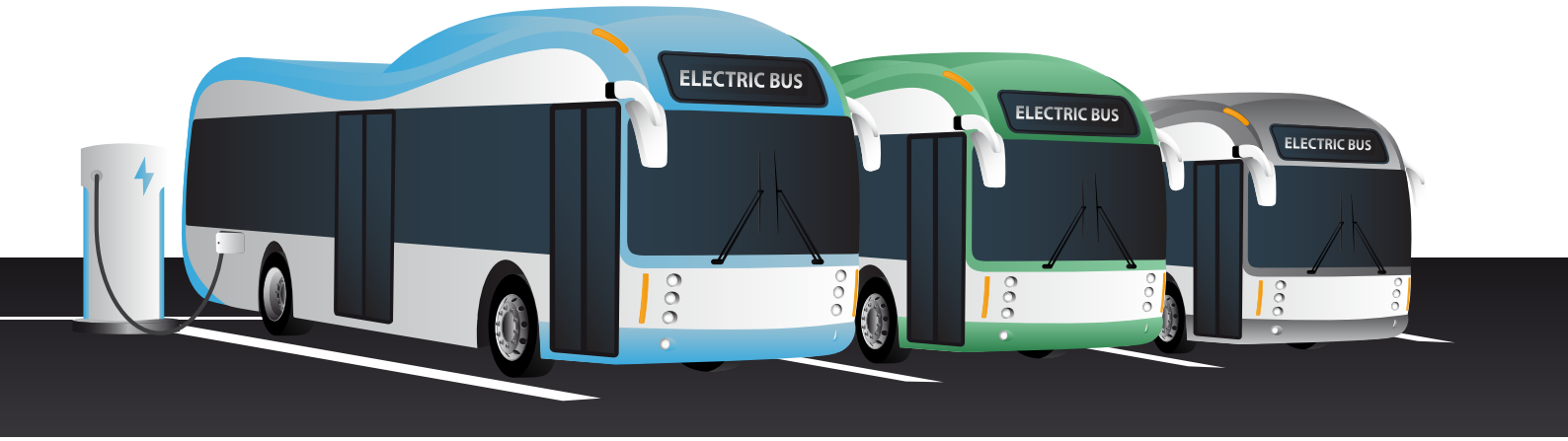
7. KPMG in India analysis 2020
20. Press Information Bureau of Govt of India on Sanction for 5595 Electric Buses under Fame Phase-II – August 19, accessed on 29 September 2020
21. Economic Times article on PMI Electro and BYD-Olectra bag most e-bus orders – Jan 20 and news articles with respect to tender completion, accessed on 29 September 2020, KPMG in India's analysis 2020

## Electric mobility – Propensity to shift (by vehicle type)

| | Segment | TCO parity achieved in (year) | |
|---|---|---|---|
| | | With subsidy | Without subsidy |
| Public and private buses | Inter-city | 2024 | 2028 |
| | Intra-city (AC) | 2024 | 2028 |
| | Intra-city (non-AC) | 2026 | 2030 |

## TCO analysis: Key insights[7]

- Product availability limited to only intra-city segment for now, commercial deployments have been done by a number of SRTUs, driven by government push and subsidy availability. However, uptake in private segment has not yet started
- Penetration in remaining segments would be dependent on product launch timelines, cost of product and availability of associated infrastructure. However, assuming 5% annual reduction in battery prices, TCO parity is expected closer to 2030 for most segments, which is likely to keep uptake of EVs minimal till such time
- Cost of EVs has been estimated (where current product availability is limited) based on the typical range requirement and associated battery cost
- Improvement in battery technology/efficiency has not been considered in this analysis. TCO parity and hence, EV penetration is likely to be preponed in case of that event.




7. KPMG in India analysis 2020

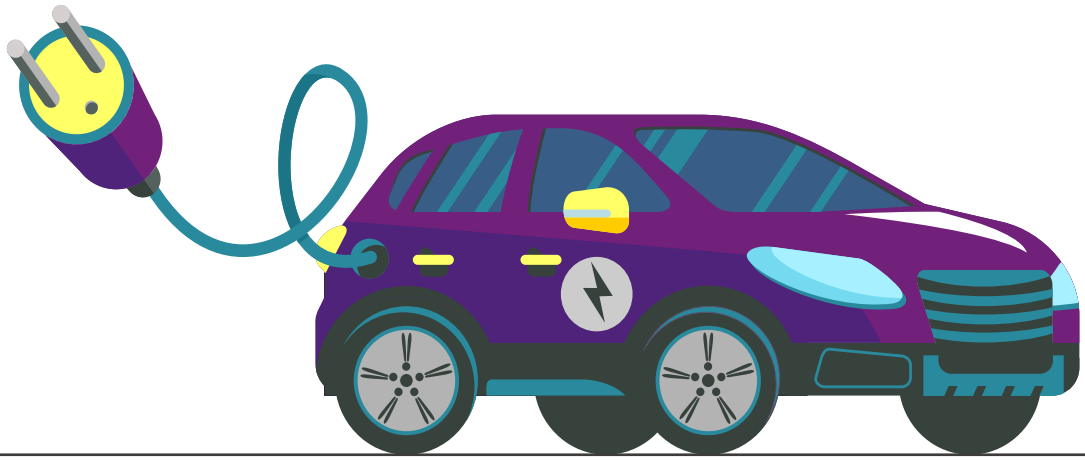
**Four-wheelers:** India is the world's fifth largest PVs market, accounting for about 5 per cent of the global PVs sales of ~3.4 m units in FY19.[7] However, EV car sales are relatively low. Limited number of models, a lack of charging infrastructure and high cost differentials are the major adoption challenges.

India is one of the leading manufacturers of commercial vehicles and these account to ~3-4 per cent[7] of India's total automotive production volume. National Electric Mobility Mission Plan (NEMMP), Make in India and Automotive Mission Plan are enabling the development of India into one of the most important commercial vehicles manufacturing hubs.

In order to drive adoption, Indian and global OEMs have announced several new EV model launches in the coming years. This, however, would be dependent on the addressing of existing barriers and various EV enablers being in place.

## TCO for 4Ws - LCVs[7]

| Consideration Point Parameters | EV Willingness index | 4W LCV | 4W Electric LCV |
|---|---|---|---|
| Purpose built (use case specific) vehicles | Moderate | Daily travel – 80 -150 kms<br>Capacity – 1 – 1.5 tons<br>Pickup efficiency - HIGH | Range – 80 - 100 kms<br>Capacity – 1 ton<br>Pickup efficiency - MODERATE |
| Upfront cost differential | 1.4x – 1.6x | Cost of acquisition – INR ~5 lakh | Cost of acquisition – INR ~6.5 lakh |
| TCO* | EV TCO is lower vis-à-vis ICE | Operational cost INR 3.5 – 4.5/km<br>TCO – INR 6.5/Km | Operational cost INR 0.8 - 1/km<br>TCO – INR 6/Km |
| Ease of charging | Moderate | Typical range of ICE is ~100 kms vs EV for ~80 kms leading to range anxiety. However, charging is currently captive or at home and not through public charging infrastructure | |
| Route Predictability | Moderate | Intra city operations provide moderate predictability for Ecommerce segment however FMCGs distribution routes are scheduled daily | |



7. KPMG in India analysis 2020
22. IBEF report on 'Indian automobile industry – August 2020', accessed on 29 September 2020

## TCO analysis for 4W-PVs: Key insights[7]

### Personal Use:

- EVs with subsidy. are expected to reach TCO parity with petrol cars by 2025. However, if no subsidy is offered, the parity point may be delayed till 2030

**Hatchback, Sedan and SUV:**

- The limited no of EVs launched in India till date have a significantly high upfront cost in comparison to ICE. When these vehicles are used for personal purposes, breakeven with ICE is not expected to be achieved till 2030
- Off late, EV launches in SUV space have enticed the consumers to consider/buy the product, as they compare well in terms of performance, comfort and convenience with ICE. However, wide scale adoption shall only take place when:a) Market witnesses launches of high quality products that have comparable lifetime costsb) Charging infrastructure ecosystem is developed in India.

### Commercial Use:

- EVs with subsidy are expected to reach TCO parity with diesel cars around 2022. In case no subsidy is offered, the parity point may be delayed till 2025
- Commercial use case is expected to drive the adoption for electric 4Ws. Critical success factors for EV conversion involve improved vehicle specs such as high range (>150 km in single charge), battery promise, acceptable upfront cost, TCO parity and vehicle financing

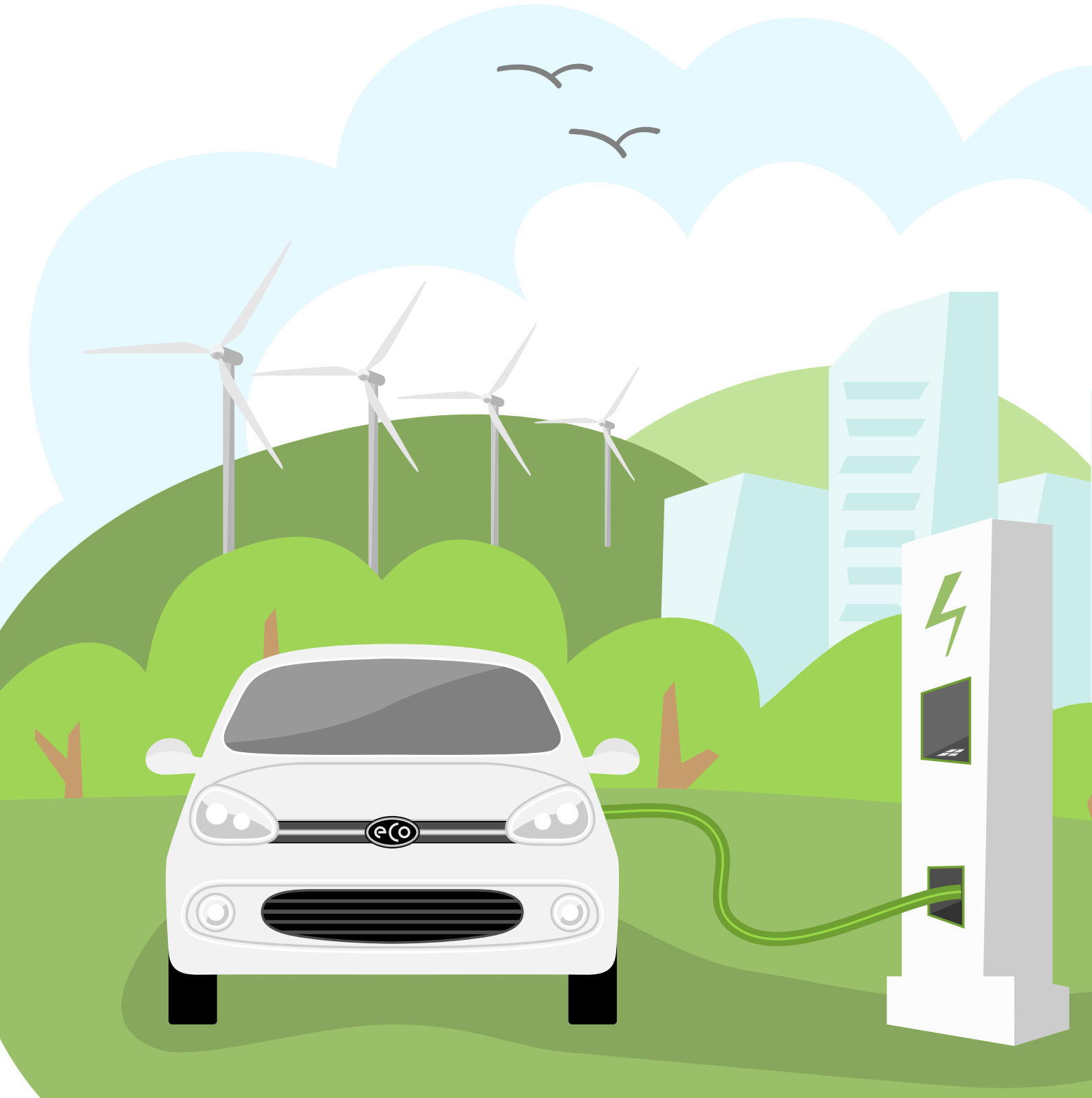
**Sedan**

- Limited number of models suitable for commercial purpose with low range (~100km), insufficient battery promise. Parity with ICE is expected faster, however, the upfront cost differential could be high.
- Commercial vehicles spend 2-3x on servicing as compared to personal cars. Given this, EV servicing becomes an important aspect in the ecosystem. Also, attractive financing, charging infrastructure and resale market are other important aspects for adoption.

**Hatchback**

- Hatchback EVs do not offer acceptable performance, TCO parity may not be attained by 2030 without significant reduction in cost or improvement in battery technology. It needs to be seen what shall be the prices and specifications of newer hatchback EV models to be launched.

7. KPMG in India analysis 2020



# 05 Innovative business models

TCO parity has not provided the expected push towards mass adoption of EVs. Globally, several innovative business models have emerged in order to address the challenges that are inhibiting wide-scale adoption, including range anxiety, upfront cost differential, reliability of battery, and time required for battery charging.

We have analyzed a few of the models that have been introduced in the Indian market to boost the adoption of EVs.

1. **Vehicle subscription/leasing model:**
   Given that vehicle subscription models are widely prevalent across premium cars and motorcycles, many OEMs have also introduced them for EVs. Under this model, the vehicle is sold on a monthly rental basis without any upfront cost. The model aims to reduce up-front costs for customers. Most OEMs also offer extensive maintenance and insurance plans along with the vehicle to subscribers. In addition, battery-related issues are covered by the OEM or the subscription partner, addressing the concerns around battery reliability.

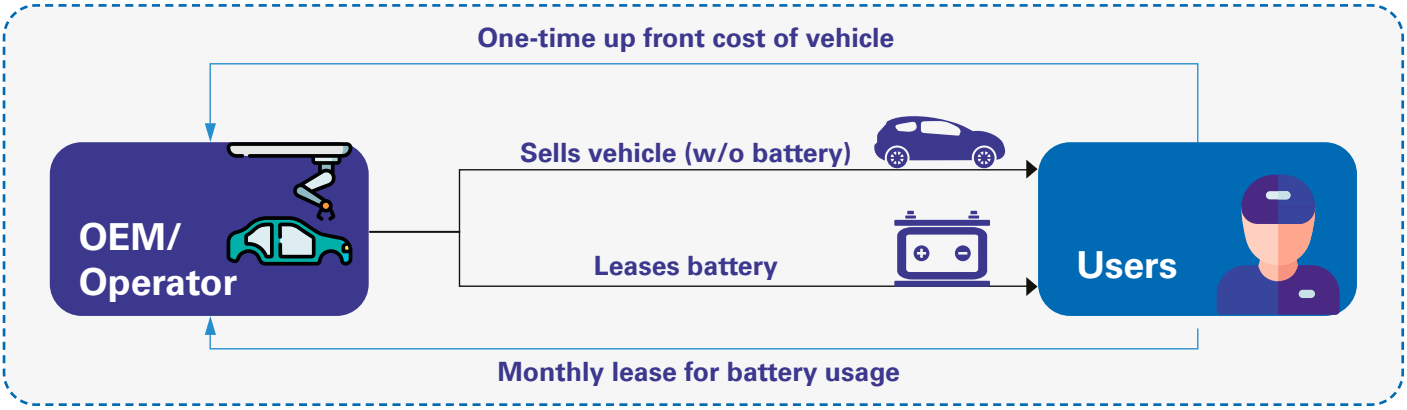
   At the end of subscription tenure, the customers have an option to retain the vehicle after paying a pre-decided amount. Further, some OEMs also provide additional flexibility to customers in terms of subscription tenures with plans ranging from 13 to 36 months.

   The model offers customers the option of trying out EVs without the hassle of ownership. Customers can get first-hand experience of driving an EV without worrying about factors such as battery technology and reliability. The model is especially suitable for commercial segments wherein customers such as delivery boys can pay monthly rentals for their vehicles. Since most commercial users have limited access to financing options, this model also helps to address such financing concerns.

2. **Battery subscription/leasing model:**
   Batteries are one of the most expensive components of an EV, comprising around 50 per cent of the total cost.[23] It is the primary reason for the substantial price differential between an electric and ICE vehicle. Under this model, the vehicle is sold without battery and the batteries are sold separately on monthly subscription/leasing. The model aims to address concerns around upfront cost differentials and reliability of battery.

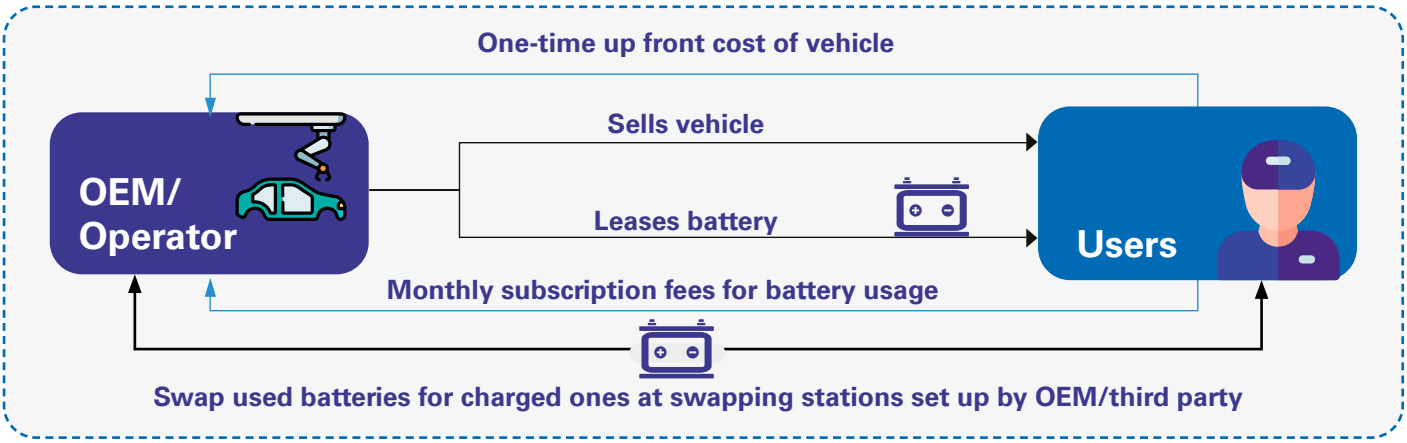
   In a recent notification,[24] the government has allowed the sale of e-2Ws and e-3Ws without batteries in order to further drive adoption. Currently, battery technology is a key differentiator for OEMs, especially car and scooter OEMs. However, sales of vehicles without batteries would require higher levels of battery standardization which might constrain OEM investment in battery technology. On the other hand, this would give impetus to energy operator business models and might help to alleviate consumer concerns on battery reliability/technology, reduce upfront cost differentials and provide easier access to financing options.

23. Exploring cost-reduction strategies for Electric Vehicle (EV) Batteries by Shakti Sustainable Energy Foundation – Dec 2019, accessed on 29 September 2020
24. Notification by Ministry of Road Transport and Highways on 12 August 2020, accessed on 29 September 2020




3 **Battery swapping model:** This is an extension of the battery subscription model wherein the customer has an option to swap the drained battery with a charged battery for a fixed fee. This model primarily addresses concerns on battery charging time and reliability. A widespread network of swapping stations could also help address concerns such as range anxiety for vehicle owners.

The swapping model is better suited for vehicles used in commercial applications such as e-3Ws, e-rickshaws and LCVs, with many OEMs in such categories testing out this model. The model helps to eliminate the downtime related to charging of batteries (typically, 3-4 hours for lithium-ion batteries) and improves the operational efficiency of the fleet. However, the success of the model would largely depend on standardization of batteries along with the formation of a closed network for battery swapping.




4 **Charging as – a – service (CaaS):** Some OEMs have created a charging network to address customer concerns regarding range anxiety. The charging infrastructure provides customers with an option to charge the vehicle on a subscription or pay-per use basis. The government has also specified subsidized energy prices for electricity used exclusively for EV charging. However, the CaaS model currently has limited geographic coverage as the development of a charging network requires substantial capital investment. Deployment of this model across OEMs would require standardization of chargers as well.

5 **Sale of vehicle without the battery:** The government has allowed the sale of e-2Ws and e-3Ws without a pre-fitted battery[24] with an intention to reduce the upfront cost of the EV and make it affordable for the consumers. However, the government needs to provide clarifications on how subsidies under FAME II should be determined, while keeping the industry in confidence.

While these innovative models are focused on driving mass adoption of EVs, most of these models are still at a nascent stage. As the size of the market grows, these models are expected to take shape in the context of evolving customer requirements and market dynamics.

# 06 The EV play – opportunities in B2B

Recent policies and regulations, parity in TCO, new EV ownership models, and technological advancements are among the factors driving the EV proposition. However, infrastructure development remains one of the biggest hurdles for mass B2C adoption. The B2B segment is, therefore, likely to lead EV growth over the next few years, on account of established use cases, fixed/pre-defined routes and cost savings due to higher utilisation.

EVs have the potential to emerge as vital options for last-mile delivery of light weight goods and last-mile transportation of passengers for shorter distances.

The following table identifies segments that widely use 2Ws and 3Ws in last mile operations. Players in these segments are actively considering adding EVs to their fleet and are undertaking pilots to realize operating cost advantages.

| | 2Ws | 3Ws and LCVs |
|---|---|---|
| **1. Last mile delivery of goods** | | |
| Online Food Delivery | ✓ | ✗ |
| Online Grocery Delivery | ✓ | ✓ |
| Ecommerce (logistics), courier | ✓ | ✓ |
| Municipal Solid Waste Management | ✗ | ✓ |
| Distribution (FMCG, Pharma) | ✓ | ✓ |
| **2. Last mile transportation of passengers** | | |
| Bike rentals | ✓ | ✗ |
| Bike taxis | ✓ | ✗ |

Given varied use cases, fleet diversification plans of key industry players and emergence of innovative operating models, the B2B segment is expected to drive the shift to sustainable electric mobility.

However, there are several impediments to the adoption of EVs in the B2B segment, especially in the near term.

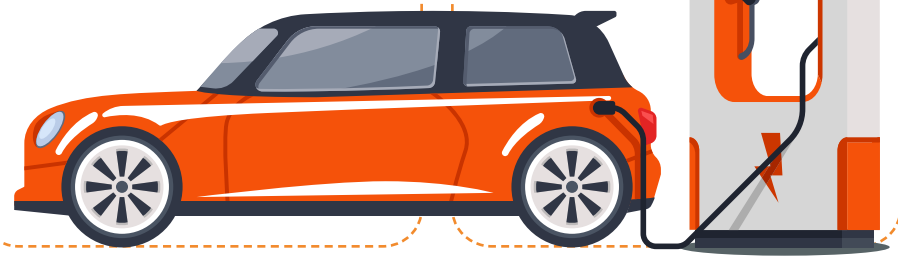
## B2B – Challenges to EV Adoption in 2Ws:

### Ownership constraints

- In case of 2Ws, the delivery boys require the vehicle for dual usage i.e. for last mile delivery and personal use
- However, given their low range, most drivers are apprehensive about suitability of e-2Ws for alternative uses and instead opt for ICE 2Ws
- Drivers don't have job security and are reluctant to invest in e-2Ws
- Current EV variants have low aspirational value among delivery boys/drivers

### Operational issues

- Commercial users require products with higher range, good speed, widespread service network. Owing to road conditions and nature of travel, vehicles are required to be rugged and sturdy.
- Further, due to higher frequency of usage, users require higher battery warranty. The warranty offered on battery is limited to 1-3 years, which is less than average ownership period of a 2W (5-6 years)
- While EV players have recognized shortcomings and are coming up with product launches, shift to EVs may take place once multiple products with performance comparable to existing petrol/diesel variants, for users to choose from, are available in the market



### Lack of ecosystem support

- The resale market for EVs does not exist as of now. On the other hand, traditional ICE products fetch 30-40 per cent of their cost after three years[4] below.
- Most of the B2B players prefer asset-light model and therefore would prefer either the drivers to own EVs or partner with a third-party financing/leasing company.
- Limited players are ready to finance the purchase of EVs.
- Further, such finance is available at a higher rate of interest compared to traditional ICE 2Ws. Given this, the financing/ leasing ecosystem for EVs is at a very nascent stage currently

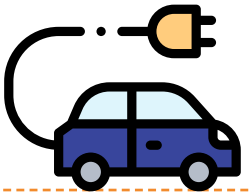
4. SMEV Publications, accessed on 29 September 2020

## B2B – Challenges for EV adoption in 3Ws and LCVs:

In addition to the challenges of operational constraints and lack of ecosystem support, the following factors would need to be addressed for 3Ws

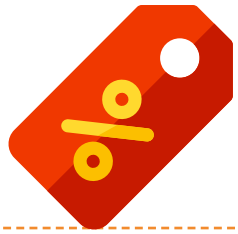
### Limited EV products and use cases

- Currently, the number of EVs in the market for commercial use are limited with few established use cases. Until new products are launched, reliance on a single/few EV suppliers may be risky
- Even in the case of e-LCVs, only a few players have launched products suitable for catering to cargo movement needs of commercial players as of now.



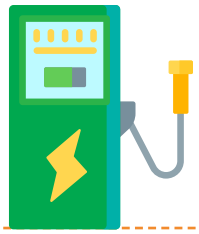
### High upfront price differential

- The price range of e-3Ws is INR0.25 – 0.3 Million. When FAME II subsidy is considered, the price reduces to INR0.2 – 0.25 Million which is comparable to ICE counterparts[25]
- However, in case of LCVs, the models have a larger battery size which may result in higher purchase price

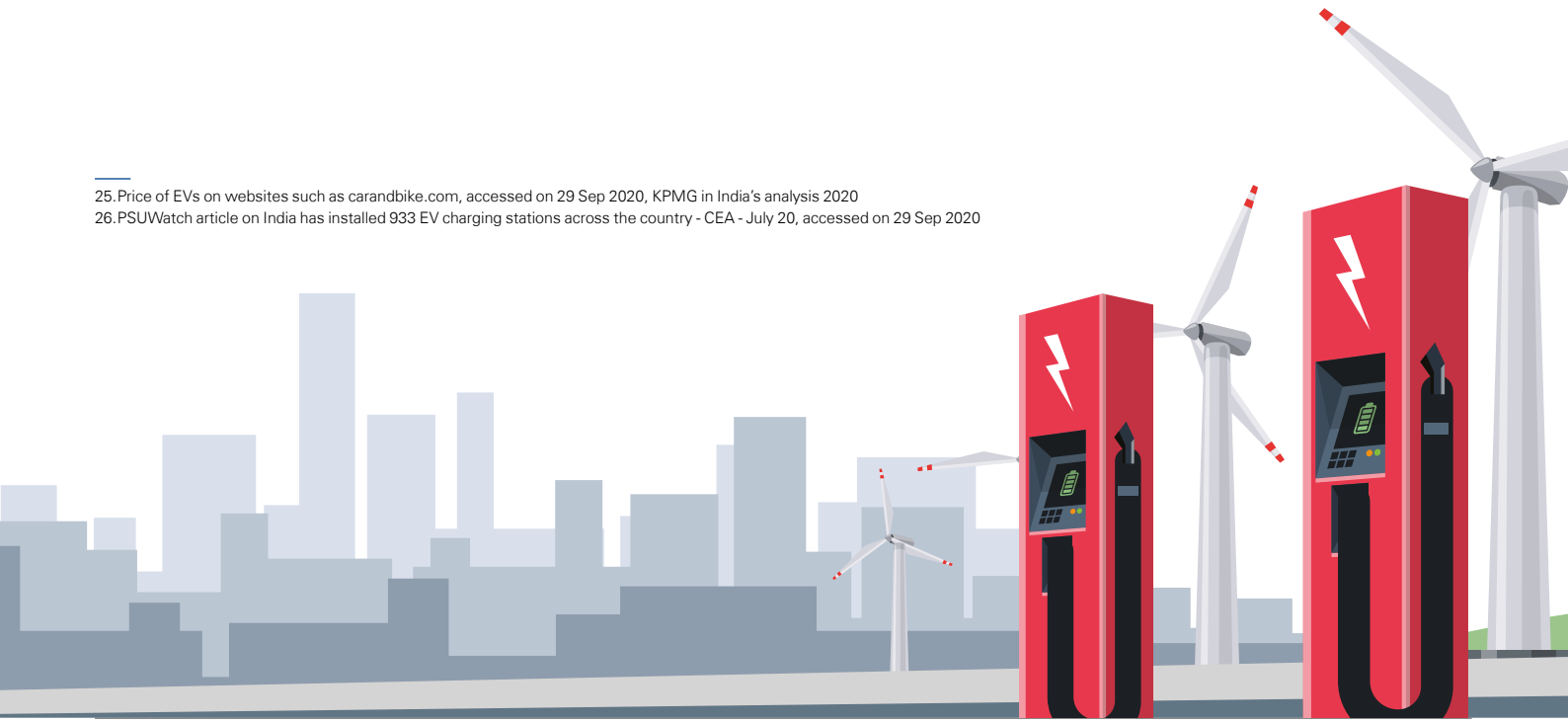


### Availability of charging infrastructure

- India is reported to have only 933 charging stations as of June 2020[26]
- Feasibility of charging models needs to be evaluated i.e. home charging, charging at commercial hubs, OEM/third party charging and battery swapping



25. Price of EVs on websites such as carandbike.com, accessed on 29 Sep 2020, KPMG in India's analysis 2020
26. PSUWatch article on India has installed 933 EV charging stations across the country - CEA - July 20, accessed on 29 Sep 2020



# 07 Full throttle — the transition to EVs

EVs are on course to fulfil their promise as a game changer for the automobile industry, with 2W and 3W auto segments likely to lead the adoption curve followed by e-buses and passenger taxis.

On the flipside, we expect 4W PVs to remain a laggard in EV adoption. There are likely to be limited number of launches by mainstream players in this segment, as the focus will remain on ICE cars for the next few years. This is expected to delay the consideration point for 4Ws.

E-buses could see a reasonable number on the back of government-led buying. The intra-city STU segment, which needs limited charging infrastructure, also offers an attractive use-case for EV adoption owing to the government push, favourable economics, and higher route predictability.

Directionally several factors, including availability of charging infrastructure, robust financing ecosystem, reduced battery prices and increased customer awareness, are paving the way for new era of EV adoption. The government is also pushing EV policy to address some of the adoption barriers.

EV is, thus, emerging as a disruptive force, with several players experimenting with and discovering new innovative business models and use cases. Since the running cost of EVs is much lower than ICE vehicles (one-tenth for 2W and 3W), a strong case emerges for a shift to EVs in B2B.

Many large B2B players in e-commerce, grocery, food, courier delivery have been piloting EVs and some have moved into advanced stages of deployment. New business models are also being established, such as pure-play energy operators entering, owning and managing battery manufacturing. However, the success of such models so far remains limited as EV penetration remains low.

To address the issues of range anxiety and lack of charging stations, governments and utility companies across the world have taken the lead in setting up of charging infrastructure. In India, however, utility companies are yet to enter this space in a major way. Ecosystem creation is the first and most important step in addressing the issue of range anxiety. While a host of players have set up energy operator-cum-battery swapping operations, these have so far been mostly limited to captive needs of a particular use case. A widespread network of charging stations is vital for ensuring the fast adoption of EVs.

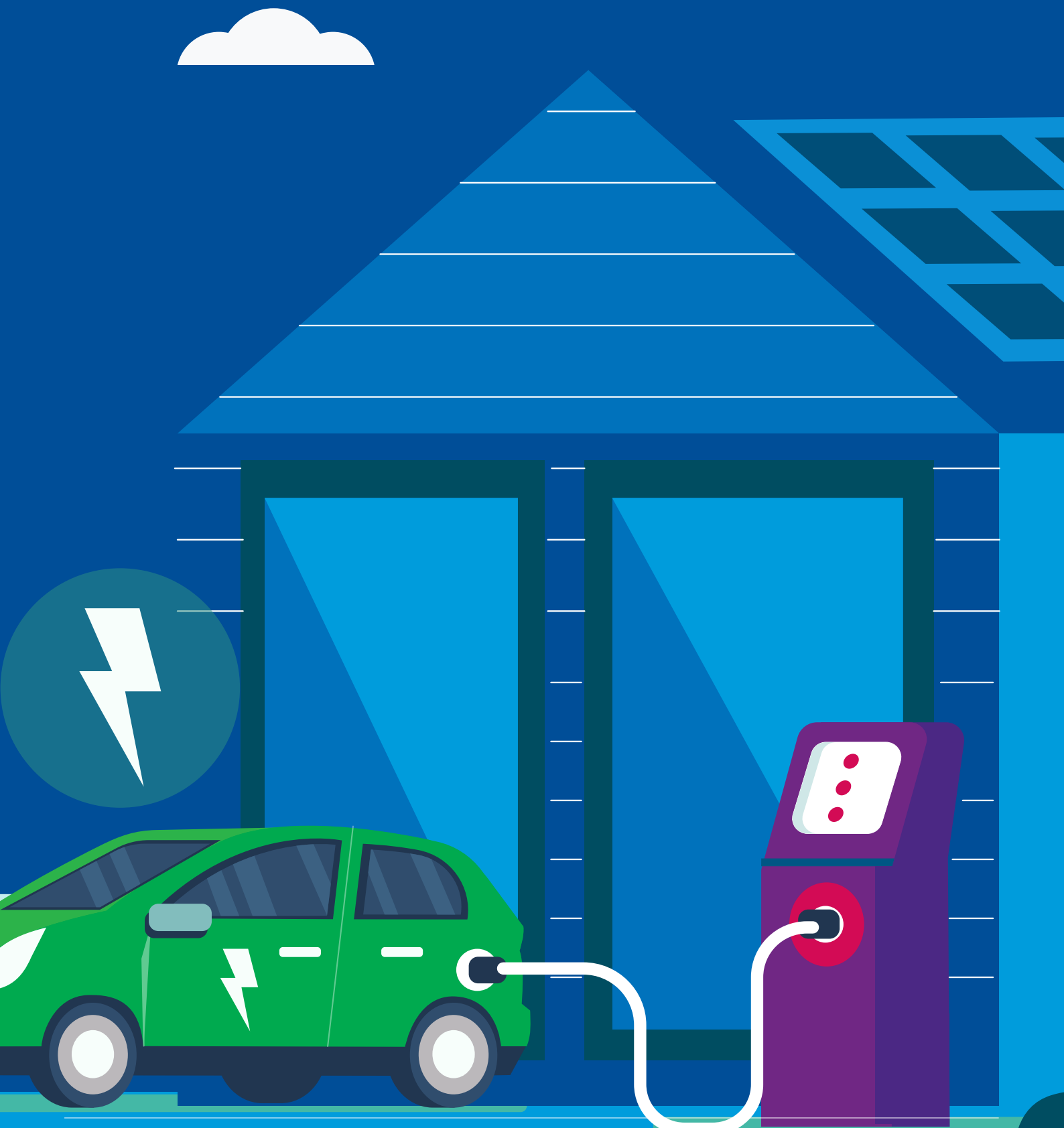
Moreover, in order for EVs to take off, the local component ecosystem needs to be established. With a burgeoning crude oil bill pushing the country's fiscal deficits to alarming levels and creating uncertainties around the currency's stability, policy makers and OEMs need to work together to create a conducive environment for EVs. To this end, the government has launched a Phased Manufacturing Programme (PMP) under its flagship EV programme FAME-II, through which it is pushing the indigenisation of parts like HVAC (Heating, Ventilation, and Air Cooling), wheel rims integrated with hub motors, electronic throttle, vehicle control unit, and electric compressor.

The level of localisation is low primarily due to insignificant volumes of EV sales in the last few years. The government has outlined plans to set up a battery manufacturing plant in India and is expected to court industry giants by offering several crores of Capex and Opex-led incentives. The government is expected to tender a 50 GWh end-to-end battery cell manufacturing facility.[27]

Other than batteries, there are other EV components in which India has the potential to emerge as a hub for manufacturing as well as exports. These include wire harnesses, BLDC motors, AC induction motors, thermal and cooling management systems, electronics (other than semi-conductors), plastics, etc.

In summary, there is great promise in India's EV story, as a host of factors such as policy measures, infrastructure development, TCO parity, and a market buzz, come together to drive long-term growth.

28. Economic Times article on 'Niti Aayog seeks Cabinet nod for battery push – Jan 20, accessed on 29 September 2020



# 08 Appendix

## Summary of EV policies[28] in various states:

| State | EV Incentives |
|---|---|
| **Andhra Pradesh** | • 100 per cent reimbursement on stamp duty on the purchase of land for EV production<br>• Reimbursement of SGST for companies operating in the EV ecosystem<br>• Reimbursement of electricity duty for first 5 years, and provision of dedicated line with special discount for night/nonpeak time usage for testing of EVs;<br>• Financial assistance - 50 per cent of fixed capital investment in building and common infrastructure (up to INR200 million) for manufacturing centres specific to EVs |
| **Bihar** | • Creation of fast charging stations at intervals of 50km on state/national highways, attract on-ground investments of INR25 billion and create direct empowerment opportunities for 10,000 people in the state<br>• Incentives for manufacturers - Reimbursement of stamp duty, registration duty, and SGST, as well as other tax benefits<br>• Special incentive of INR10,000 (USD140) on Lithium-ion battery e-rickshaws, in addition to the end-user subsidy of INR12,000 (USD170). The state has listed a 15 per cent end-user subsidy for all vehicle categories. |
| **Delhi** | • Purchase incentives of 5-10k per Kwh for 2/4W, Interest subvention of 5 per cent on loans, scrappage incentives up to INR7,500 per ICE vehicle<br>• Waiver of road tax and registration fees for EVs<br>• 100 per cent grant for charging equipment up to INR6000/unit for first 30,000 units, development of public charging infrastructure at least every 3kms and special electricity tariff for EV charging |
| **Karnataka** | • Attract investments of INR310 billion and create employment opportunities for 55,000 people on both supply and demand sides<br>• Interest-free loans on the net SGST for EV manufacturing enterprises<br>• State will reimburse 100 per cent of land conversion fees for converting land from agricultural to industrial use for setting up EV/component manufacturing units<br>• Tax exemptions on electricity tariffs and the state will provide an investment subsidy for setting up the first 100 charging stations. |
| **Kerala** | • Incentives in place such as state tax breaks, road-tax exemptions, toll-charge exemption, free permits for fleet drivers and free parking<br>• Viability gap funding for e-buses and government fleets |

28. State EV polices and report of India Smart Grid Forum Study Report Electric Vehicle Policies and Electricity Tariff for EV Charging in India – July 2019, accessed on 29 September 2020

| State | EV Incentives |
|---|---|
| **Maharashtra** | • Invest INR250 billion in EV and its components manufacturing/assembling.<br>• Allowed petrol pumps to install charging infrastructure, subject to safety regulations<br>• EVs are exempted from road tax and registration fees.<br>• Specifies 25 per cent capital subsidy for commercial public charging stations (with a few caps) |
| **Uttar Pradesh** | • Incentives for EV manufacturing units like - Capital interest subsidy, infrastructure interest subsidy, industrial quality subsidy, exemption from stamp duty and electricity duty, SGST reimbursement etc.<br>• Target 2024 - Build 0.2 Million charging stations (fast, slow and swapping)<br>• 50 per cent subsidy on annual interest on loans taken in the form of reimbursement to set up waste treatment plants. |
| **Tamil Nadu** | • Attract investment worth INR500 billion (USD7 billion).<br>• Create pool of skilled workers for EV industry through technical institutions available in the state, create new jobs (~150,000) in the EV industry<br>• Offers 100 per cent reimbursement of SGST paid on the sale of EVs manufactured in the state<br>• 100 per cent electricity tax exemption for manufacturing industries, 100 per cent stamp duty exemption for transactions related to EV manufacturing<br>• 50 per cent land subsidy if the investment is in the southern districts (15 per cent for other regions) |
| **Telangana** | • Will provide government land in Hyderabad on long-term lease at subsidized interest<br>• Two years moratorium period for setting up charging/battery swapping stations<br>• Will also allow private companies to utilize corporate social responsibility (CSR) funds for company buses for employee commute<br>• Attract investments worth INR212.4 billion (USD3 billion) and create employment for 50,000 people by 2022 through EVs<br>• Policy also has a provision for retro fitment of existing ICE vehicles such as passenger cars, 2Ws and auto rickshaws. |
| **Uttarakhand** | • Interest subsidy, electricity subsidy, electricity duty exemption, stamp duty exemption, Employee Provident Fund reimbursement, state GST subvention, and incentivizing the manufacture of lithium batteries with high mileage<br>• Fiscal incentives such as road-tax exemption, registration-fee exemption, SGST subvention to all buyers of EVs and zero-interest loans to state-government employees |
| **Punjab** | • 100 per cent waiver on Motor Vehicle Tax. Additionally, for vehicles manufactured in Punjab, this waiver shall be applicable for a period of 10 years<br>• Fleet and delivery companies will be encouraged to achieve 100 per cent transition towards electric in "target cities" in a phased manner. |

## Demand side incentives available under the Delhi government EV policy[29] and the FAME-II scheme for various vehicle types:

| Vehicle Type | Purchase Incentive (A) | No of units | Scrappage incentive |
|---|---|---|---|
| **2W** | **INR5000/kWh** Cap - Up to INR30,000/ vehicle | No limit | Up to INR5,000/ICE vehicle |
| **3W** (E-autos) | **INR30,000/vehicle** (L5M) | No limit | Up to INR7,500/ICE vehicle |
| **3W** (E-carts, E-ricks) | **INR30,000/vehicle** (including lead acid) | No limit | NA |
| **LCV** | **INR30,000/vehicle** (L5N/N1) | First 10,000 e-LCVs | Up to INR 7.5k/ICE vehicle |
| **Cars** | **INR10,000/kWh** Cap - Up to INR 150,000/ vehicle | First 1,000 cars | NA |
| **Buses** | **NA** | NA | NA |

- *Interest subvention only if loan availed from Delhi finance corporation (DFC) or other finance providers empaneled with DFC

29. Delhi Electric Vehicles Policy, 2020 dated 07.08.2020, accessed on 29th September 2020

| Interest subvention* | FAME 2 incentives (B) | Total Subsidy (A+B) | Other key details |
|---|---|---|---|
| Delivery fleet - financing support from DFC | INR10,000/kWh<br>Up to 20 per cent of vehicle cost | INR15,000/kwh | • FAME 2 criteria - but no limit for minimum range, no requirement of local manufacturing, no requirement of fitting 2W with monitoring devices<br>• Delivery fleet expected to convert 50 per cent of fleet by FY23 & 100 per cent by FY25 |
| 5 per cent on loans | INR10,000/kWh<br>Up to 20 per cent of vehicle cost | INR30,000 + 10k/kwh | • Same eligibility as FAME 2 criteria<br>• Includes swappable models<br>• Open permit system applicable |
| 5 per cent on loans (for advanced batteries) | IINR10,000/kWh<br>Up to 20 per cent of vehicle cost | INR30,000 + 10,000/kwh | • Same eligibility as FAME 2 criteria<br>• Includes Lead acid and swappable model |
| 5 per cent on loans | INR10,000/kWh<br>Up to 20 per cent of vehicle cost | INR30,000 + 10,000/kwh | • Same eligibility as FAME 2 criteria<br>• Includes swappable models |
| NA | INR10,000/kWh<br>Up to 20 per cent of vehicle cost | INR20,000/kwh | • Same eligibility as FAME 2 criteria,<br>• Includes swappable models<br>• All government vehicles to transition to EV in 12 months |
| NA | INR20,000/kWh<br>Up to 40 per cent of vehicle cost | Up to INR4.5/5.5 million per vehicle | • To procure 1,000 e-buses in CY2020<br>• 50 per cent of buses operating within Delhi to be converted to electric by CY2022 |

## Revisions in customs duties:[30]

| Vehicle Type | Purchase Incentive (A) | No of units | Scrappage incentive | Interest subvention* |
|---|---|---|---|---|
| 1 | Electric vehicles imported as *completely built units* | 8702/8704 | **25 per cent** (w.e.f. 30/01/19) | **40 per cent** (w.e.f. 01/04/2020) |
| 2. | Electric vehicles imported as a knocked down kit containing all components for assembling a complete vehicle with **disassembled** Battery Pack, Motor, Motor Controller, Charger etc. *(completely knocked down)* | 8702/8704 | **10 per cent** (w.e.f. 30/01/19) | **15 per cent** (w.e.f. 01/04/2020) |
| 3 | Electric vehicles imported as a knocked down kit containing all components for assembling a complete vehicle with *pre-assembled* Battery Pack, Motor, Motor Controller, Charger etc. *(semi knocked down)* | 8702/8704 | **15 per cent** (w.e.f. 30/01/19) | **25 per cent** w.e.f. 01/04/2020) |
| 4 | Electric passenger vehicles and three wheelers imported as a *semi knocked down kit* | 8703 | 15 per cent (w.e.f. 30/01/19) | 30 per cent (w.e.f. 01/04/2020) |
| 5 | Parts of EVs such as *AC/DC charger*, AC/DC motor, motor controller etc. | 8504 | 0 per cent | **15 per cent** (proposed w.e.f. from Apr 2021) |
| 6 | Battery Chargers | 8504 40 30 | 15 per cent | 15 per cent |

## Type of charging stations in India:[31]

| Type of charging stations | Minimum no. of charging guns | No of EVs to be charged simultaneously | Type of chargers mandatory | Optional chargers |
|---|---|---|---|---|
| Slow | 10 | 10 | Bharat AC 001 10 kW (3.3kw*3) | Bharat DC 001 (15 kW) Type II AC Charger |
| Fast | 6 | 6 | CCS2 & CHAdeMO of >=50 kw | |

30. 1) Notification No. 03/2019-Customs dated 29 January 2019 (relevant change effected from 30 January 2019); 2) Notification No. 01/2020-Customs dated 2 February 2020 (relevant change effected from 1 April 2020); 3) Notification of DHI on Phased Manufacturing Program (PMP) to promote indigenous mfg. of EVs dated 6 March 2019; 4) CBIC – Tariffs updated as on 31.12.2019: Chapter 85, accessed on 29 September 2020

31. Economic Times article on 'Government approves 2,636 new charging stations in 62 cities', accessed on 29 September 2020

# Acknowledgements

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# Notes

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