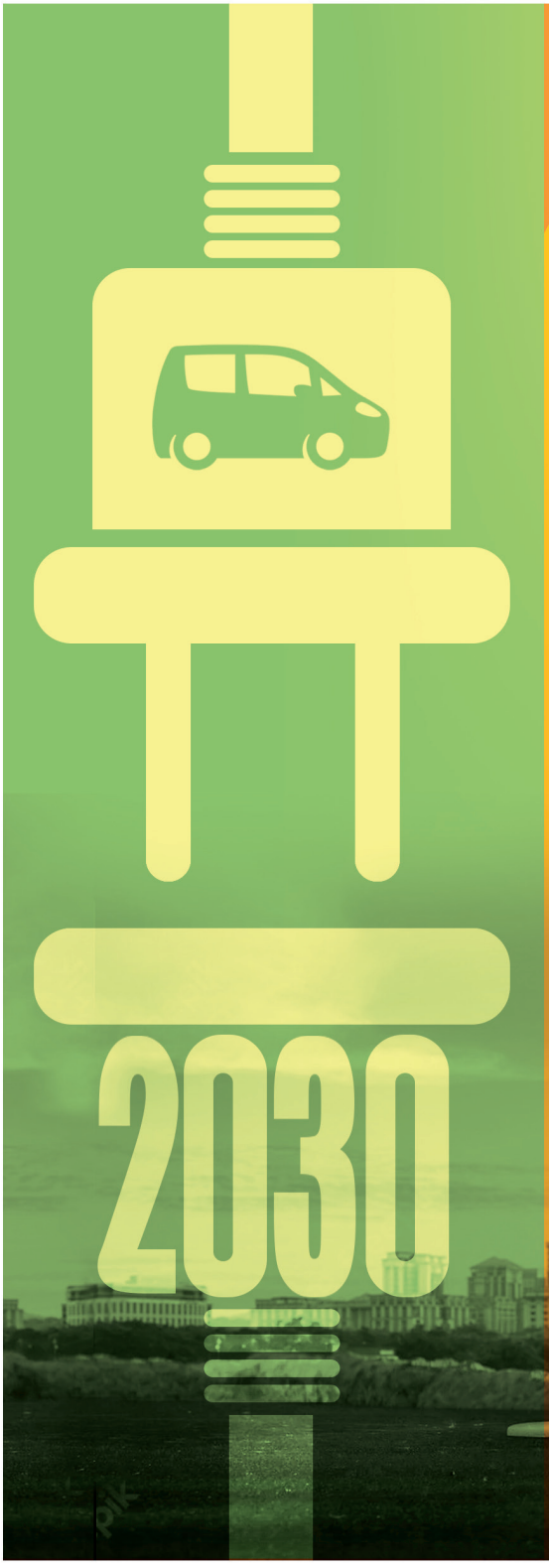
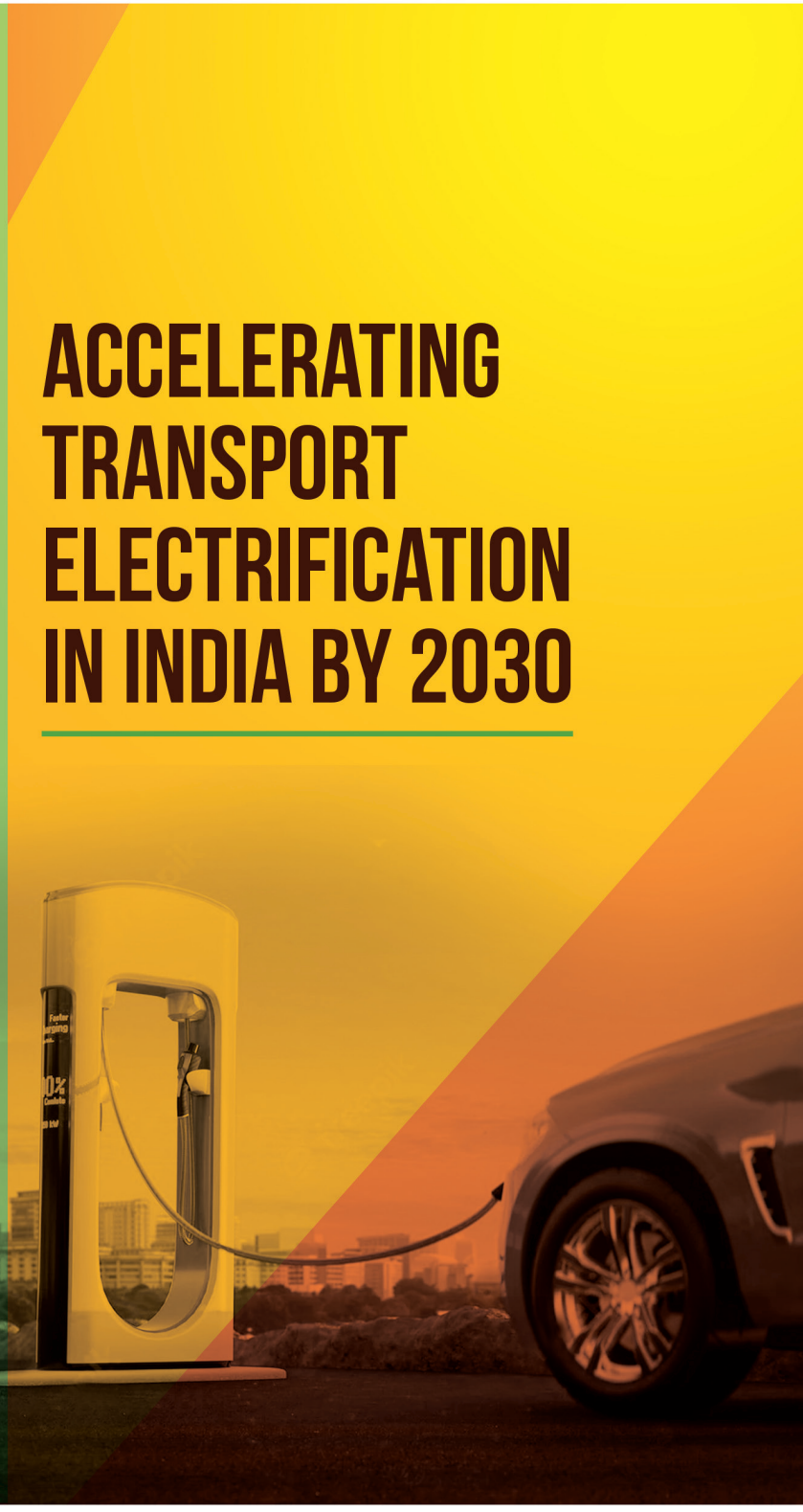
CLIMATE TRENDS

JMK Research & Analytics

ACCELERATING TRANSPORT ELECTRIFICATION IN INDIA BY 2030





Date of publication: July 2022

About Climate Trends

Climate Trends is a research-based consulting and capacity building initiative that aims to bring greater focus on issues of environment, climate change and sustainable development. We specialise in developing comprehensive analyses of complex issues to enable effective decision making in private and public sector.

For more information, please visit: www.climatetrends.in

About JMK Research & Analysis

JMK Research & Analytics is a boutique consulting firm for all kinds of research and advisory services for Indian and International clients focusing on Renewables, Electric mobility, and the Battery storage market.

Based on in-depth sector experience, strong industry network, existing databases in the Indian sustainability market, JMK Research provides key insights and detailed industry information that helps our clients develop successful business models and market strategies.

For more information, please visit: www.jmkresearch.com

CONTENTS

I. EXECUTIVE SUMMARY

India, which overtook Germany to become the fourth largest automotive market in May 2022, is embracing the e-mobility revolution and taking concrete action to electrify its transport sector, particularly road. The flagship scheme Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) II has provided the much-needed impetus to electric vehicle sales in the country. State governments, too, have made noteworthy progress in establishing a supportive policy landscape with close to 25 states having notified or draft EV policies, focusing on demand and supply side incentives to accelerate sales, manufacturing, infrastructure and investments.

These efforts have yielded good results, with EV sales surging 163% in 2021, a three-fold increase from the previous year. While the sales of electric two-wheelers (E2W) in overall two-wheeler sales have already reached more than 3%, the share of registered electric three-wheelers (E3W) in total three-wheeler sales have surpassed 50%. The trend is forecast to keep pace with the current growth with a projected CAGR of 49.79%, leading to annual sales of 191.5 lakh EVs by FY 2030 (as per JMK Estimates). E-two wheelers alone will account for more than 80% of total EV sales by FY 2030. The lowered upfront costs, their uptake in the delivery segment, and the continued national and state-level subsidies are the likely factors contributing to these sales.

While India's initial journey towards e-mobility has been encouraging, the current rate of growth of EV sales shows that India is projected to witness sales of 5 crore EVs by FY 2030. However, a report by Government of India's think tank NITI Aayog, in partnership with Rocky Mountain Initiative (RMI) India, analyses that if FAME II and other measures are successful, India could realize EV sales penetration of 30% of private cars, 70% of commercial cars, 40% of buses and 80% of two and three- wheelers by 2030. These figures have often been quoted by the Minister of Road Transport and Highways of India, and considered synonymous with a national vision. When this is converted to absolute numbers, it amounts to 8 crore EVs by 2030. This shows that at the current growth rates, India may not realise these EV sales penetrations, indicating the need for more policy and industry action. India could be 40% behind this vision. Moreover, the required charging infrastructure, in terms of public and semi-public charging stations, to support 8 crore EVs, is close to 39 lakh. Currently, the number of charging stations are too less, of the order of approximately 32 EVs per charging station in India. There has been little movement on establishing charging stations under the FAME schemes, and there is not enough focus on this for the future. For example, not more than 3 or 4 states in India have announced any defined targets in terms of the number of charging stations to be established by their respective policy periods. The targets for EV adoption under different state EV policies are not well aligned with the sales forecast envisaged by Niti Aayog, they have varying timelines and with different numbers of EVs, some states with percentage of new vehicle registrations to be EVs and others with absolute number of EVs to be added on roads.

In order to improve India's chances of meeting these sales projections by 2030, this report makes the following recommendations:

- Targets and incentives across all the State EV Policies should be consistent with the national EV sales projections and incentives.
- Focus on high-visibility cases of fleet for 100% conversion to electric, such as government fleets and vehicle aggregator fleets.
- Define clear targets for charging stations that pave the way for establishment of charging stations in different places – petrol pumps, malls, highways, workplaces, residential apartments; capping rental costs for public charging stations; and fixing some percentage of home and workplace charging as EV ready.
- Financing by Banks/State Governments/NBFCs should push for inclusion of EVs under priority sector lending, opening of special concessional credit lines for EVs, and tax rebates on EVs.
- Zero-Emission Vehicle (ZEV) adoption to be made mandatory, at least by some percentage, for commercial and government fleets.

It is therefore required that the industry and central and state governments need to bring in key resources, technology, financing, and incentives together to create a self-sustaining EV ecosystem in the country. The future looks promising indeed for the EV sector in India on the back of strong EV sales and accompanying charging infrastructure in the next 7-8 years.

II. ANALYSIS OF INDIA'S SALES FORECAST, NATIONAL AND STATE POLICIES AND TARGETS, AND CHARGING INFRASTRUCTURE NEEDS

TAKEAWAY 1

AT THE CURRENT RATE OF GROWTH OF EVS, INDIA MAY ONLY ACHIEVE 5 CRORE SALES BY 2030, FALLING BEHIND NITI AAYOG'S SALES PENETRATION FORECAST BY 40%

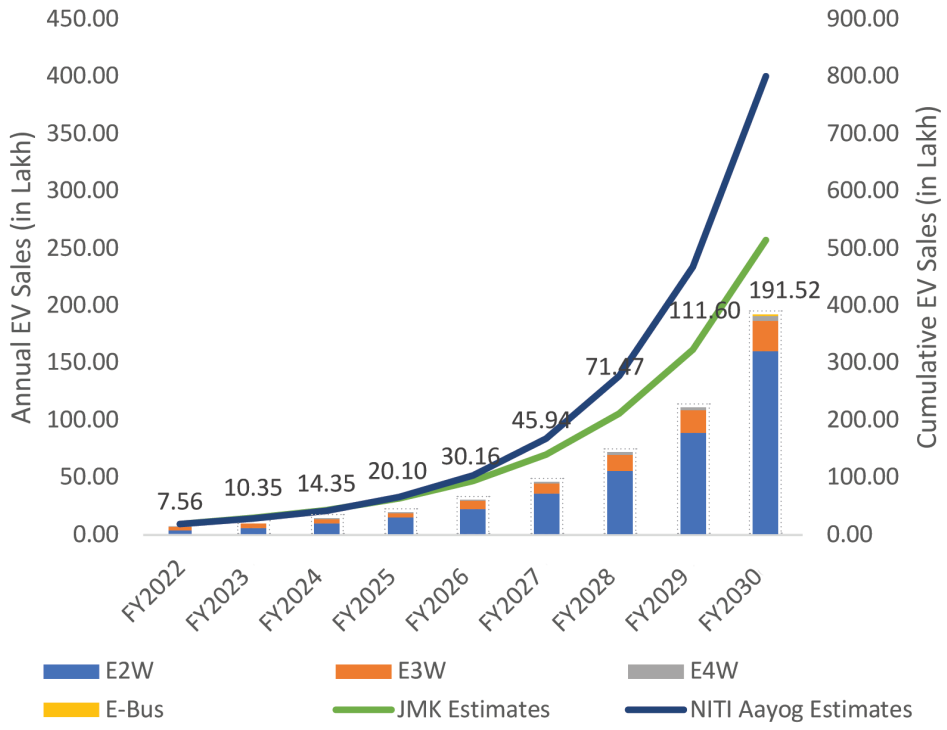
A. EV sales forecast in India by 2030

The growth in India's EV market till now is primarily attributed to progressive state policies and encouraging incentives under FAME-II. Going ahead, however, when FAME-II ends in 2024 and most of the state-driven policies end by 2025, the market will grow on its own on the foundation of a strong EV ecosystem. India's EV adoption will then vary widely based on the type, end-use, and price of the vehicle in the market.

It is expected that the early wave of electric mobility in India (till FY 2025) will be driven by public and shared mobility, including last-mile connectivity services, and not by private cars. It is with this assumption, and the overall development of charging infrastructure, that this report estimates cumulative EV sales to reach approximately five crore by FY 2030.

Government of India's think tank NITI Aayog's analyses of the success of FAME II and other measures shows that India could realize EV sales penetration of 30% of private cars, 70% of commercial cars, 40% of buses and 80% of two and three-wheelers by 2030. Against this, our growth projections indicate that at the current growth rates and projected CAGR of 49.79% in annual sales till FY 2030, India may only achieve 5 crore EV sales. In order to achieve higher sales penetration, more policy, infrastructure and industry support is needed.

Fig. 1.1: Actual and Projected EV Sales (Annual & Cumulative)



Source:
JMK Research, Vahan Dashboard, Rocky Mountain Institute (RMI) and NITI Aayog, Expert Interviews

Assumptions

1. *The market is projected to grow at the rate of ~40% by 2025 owing to rise in battery prices and consumer sentiments across issues like EV fires. Starting FY 2026, however, the market is projected to grow at the rate of 57% y-o-y basis owing to local manufacturing, fall in battery prices again, and prices of EVs achieving parity with that of ICEs.*
2. *At a vehicle category level, while E2Ws will witness a CAGR of 57.86% in the analysis period, it will be E-buses which will witness high growth due to increase in number of tenders being issued by the government and talks of private sector also entering the E-bus domain. E2Ws will account for ~79% of the total EV sales between FY 2022 and FY 2030.*
3. *The E3W market, on the other hand, will witness a swap in sales of registered with unregistered ones (registered to unregistered E3W sales witnessing a ratio of 70:30 against the current ratio of 30:70) till the next 2-3 years.*
4. *The E4W growth in sales will be modest till FY 2025 owing to charging infrastructure still being built up and most of the current product introductions primarily in the premium segment. After FY 2026, the market is expected to grow at a CAGR of 52% given the expected launch of mass segment E-cars, adoption of an increased number of E4Ws for fleet, and private charge point operators and E-Car OEMs taking a lead in setting up semi-public charging stations.*

B. Forecast trends for EV adoption based on vehicle type

The adoption of different vehicle categories will vary in the years to come. While the E2W market, going forward, will witness sales of registered E2Ws primarily (~70%); the sales in E3W market will be driven by cargo E3Ws in the registered category.

E-two wheelers

E2Ws are forecast to witness maximum sales growth in the next eight years in India. They will primarily be used for daily personal commute on intra-city routes with promising use in delivery services such as food deliveries and document shipments, due to very low fuel and maintenance cost. E2Ws are the most affordable of all vehicle categories and are favoured both within and outside urban India for their manoeuvrability in daily traffic and their ease of parking. Purchasing an E2W in the low and medium speed categories makes more sense because they fit within the mass-market price points and compare favourably on total cost of ownership (TCO) as compared to the high-speed segment. Further, FAME-II incentives, along with various state-led incentives, are projected to drive down costs for E2Ws in the future as well, leading to an increase in their adoption.

Key Takeaway:
E-two wheelers will witness maximum sales due to lowered upfront costs with national and state subsidy support, and ease of use among private and commercial consumers.

E-three wheelers

E3Ws are currently being used for public transport primarily with only a small section (~11%) of e-rickshaws and three-wheelers being used for cargo purpose. Going forward, the increased demand of last-mile connectivity for delivery of goods will push the growth of cargo E3Ws. Some case examples already exist. For instance, Blue Dart targets to operate 70% of its local first and last mile services using clean pick-up and delivery solutions, such as bicycles and electric vehicles by 2025. For the same, Blue Dart has already piloted E3Ws in Gurugram for its clean pick-up and last-mile e-tail (online retail) delivery services. In comparison to E2Ws however, the higher costs of E3Ws are a concern for their owners who have low disposable incomes. This could lead to E3Ws' low adoption rate in the coming years.

Key Takeaway:
High upfront cost of E3Ws is concerning for low income consumers, who are the primary buyers of this segment given they are most popular for public transport and cargo.

E-four wheelers

The commercial use case for E4Ws can be a low hanging fruit in the coming years, especially when it comes to their TCO compared to internal combustion engine (ICE). For an average daily use case of 120 km, TCO for an E4W is 12% lower than ICE 4W. Especially in cities with high traffic, the E4W TCO becomes even more attractive as, unlike the ICE, where mileage drops due to engine idling in traffic, an EV is able to conserve energy through regenerative-braking. Add to this, the rising fuel prices which further leads to lesser TCO of E4Ws in comparison to ICE 4W.

Key Takeaway:

Current national and state policies do not offer incentives for private ownership of four wheelers, which are keeping this segment above the average purchasing power. In four wheelers, growth can be expected in commercial use.

However, an electric car with good performance in the price range of INR 10 lakh – which is the core of the current market – is currently not available. This is largely due to high upfront purchase price of E4Ws and lack of product models comparable to ICE vehicles. In addition, the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME II) scheme does not support private ownership of four-wheelers as only E4Ws meant for public use are offered incentives. This, therefore, becomes a major challenge for end-users since four-wheeler ownership is a major aspirational milestone in India.

E-Buses

The central government has already planned to procure at least 50,000 E-buses in the next one year. Add to this, various state governments' targets of having 100% of their bus fleet converted into electric in the next seven to eight years. This speaks volumes of the positive momentum the public transport in India is going to witness by the year 2030. The target will, however, remain unattained till the time supporting infrastructure is not in place. Adequate charging infrastructure, therefore, is the key prerequisite that will define the adoption trends of EVs in India.

Key Takeaway:

India's ambitious targets for increasing e-buses hinges strongly on supporting infrastructure needed to charge these fleets.

TAKEAWAY 2

INDIA NEEDS AT LEAST 20.5 LAKH AND 39 LAKH CHARGING STATIONS TO SUPPORT FIVE CRORE AND EIGHT CRORE EVS ON ROAD BY 2030 RESPECTIVELY

The global average for the number of light-duty EVs per charging station as of 2021 was approximately ten. On the other hand, India's average has been approximately 32[1]. India is increasing focus on improving charging infrastructure as one of the three primary areas of development under FAME-I and II schemes and simultaneously encouraging industry players to develop captive/hub charging stations and charging stations in residential complexes.

The Indian charging infrastructure market currently comprises the following type of charging stations:

1. **Public charging stations (PCS):** These offer 24/7 access to all EV users. They are available in public parking lots, petrol pumps, metro stations, and highways.
2. **Semi-public charging stations (SPCS):** These offer restricted public access to shared charging. Such kind of stations comprise captive charging stations (those set up by OEMs/fleet operators in their own premises), hub charging stations, and charging stations put up at residential complexes, gated communities, shopping malls, hospitals, universities, and government buildings.
3. **Private charging stations:** These include home charging for personal use wherein an individual charges the EV at his/her own home using the AC charger sold along with the vehicle at the time of purchase.

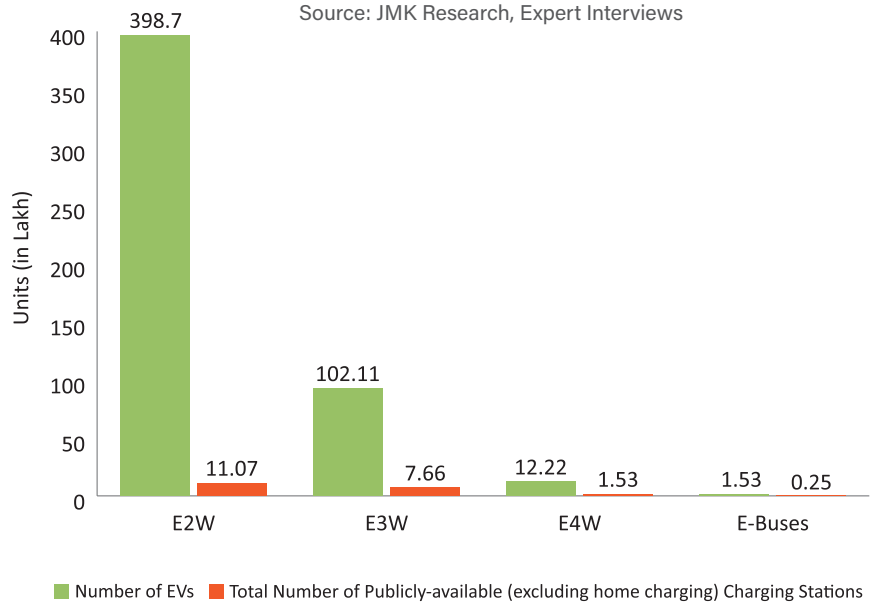
Note: Battery Swapping is another type of EV charging option wherein a drained battery pack is swapped with a charged battery pack at the swap stations. India is yet to finalise and notify its battery swapping policy, which is expected to focus largely on small battery packs, therefore useful for two and three wheeler EVs.

Our analysis for number of charging stations required in India by 2030 includes public and semi public charging stations. It excludes private charging stations.

A graphical representation of the number of charging stations required for each of the vehicle categories has been shared below.

Fig. 2.1: Public and Semi-Public Charging Station Requirement in India (FY 2030)

Source: JMK Research, Expert Interviews



1 EA. Global EV Outlook 2022. May 2022

Assumptions to calculate market size for charging infrastructure:

1. *The number of E2W, E3W, and E4W per charging station in India as of FY 2022 stands at 38, 34, and 24 respectively. This brings the national average to ~32 EVs per charging station.*
2. *By FY 2030, the national average is projected to reach 8 to cater the demand of ~5 crore EVs projected to be on roads by then.*
3. *Almost all the E4Ws plying on Indian roads are charged through captive charging stations and PCS. The E-Cars meant for fleet operations are charged in captives and hubs and they only use PCS for top-up charging.*
4. *Currently, charging through PCS/home chargers accounts for 20% of the total charging in E-rickshaws and E-Autos and the rest through battery swapping. Further, more than 50% of this PCS charging is through hub/captive charging.*
5. *The share of public and semi-public charging in E2W and E3W is projected to increase to 25% and 75% respectively from the current shares of <10% and 50% respectively.*

We estimate the number of EVs on roads by FY 2030 to be approximately five crore, and the required number of charging stations to cater these EVs to be close to 20.5 lakh. The target seems achievable considering that the establishment of five lakh charging stations is already in the pipeline by various charge point operators as well as oil marketing companies.[2,3], However, in order to meet NITI Aayog's sales penetration forecast of eight crore EVs on road by 2030, based on our estimate of eight EVs per charging station, India needs to have at least 39 lakh cumulative charging stations between FY2022 and

In terms of charging requirement, E2Ws will primarily use public charging stations for top-up charging only. E3W drivers will use captive charging stations for their cargo vehicles to a large extent, followed by public charging stations while on the go. The charging of E4Ws by 2030 is expected to be undertaken at charging stations installed at public spaces only, as battery swapping and home charging are not thought of as viable options.

The huge forecast of EV sales by FY 2030 and the setting up of supporting charging infrastructure can only be achieved if central and state governments work together. In addition, the state-level EV policies need to define not just targets but also incentives and tax rebates to achieve these targets.

TAKEAWAY 3

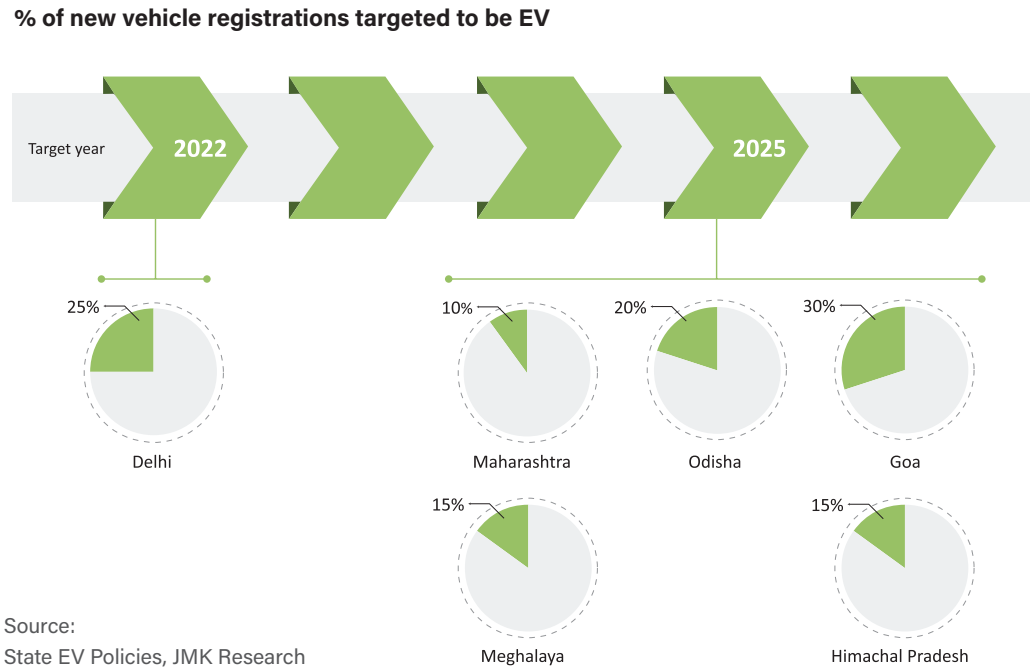
TARGETS DEFINED IN STATE EV POLICIES NEED TO COMPLEMENT INDIA'S SALES FORECAST TO ENABLE COORDINATED EFFORTS

Close to 19 states in India have rolled out their Electric Vehicle policies during the last three to four years, and a few more are in draft stage. They have stated targets for EV adoption in these policies with varying timelines, either as a percentage of new vehicle registrations, or absolute number of EVs to be added on roads. The following charts (Fig. 3.1 and Fig. 3.2) give a sneak peek into the targets of different states.

2 JMK Research. Q1 2022 EV Update. May 2022.

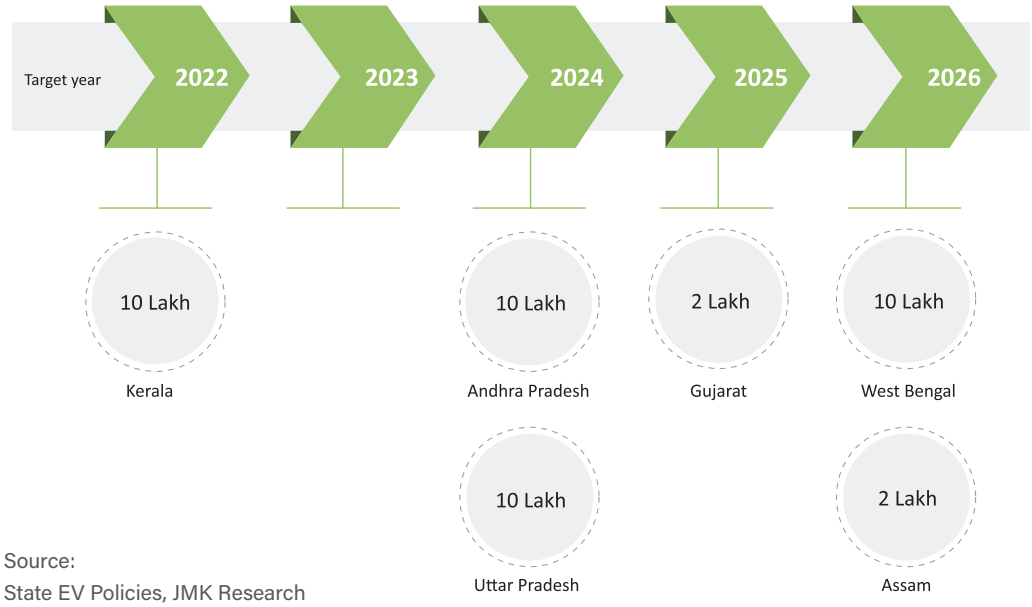
3 JMK Research. Q4 2021 EV Update. February 2022.

Fig. 3.1: States/UTs with EV Targets as Percentage of New Vehicle Registrations



Source:
State EV Policies, JMK Research

Fig. 3.2: States/UTs with EV Targets in Volume Units



Source:
State EV Policies, JMK Research

While the national EV sales projections are in terms of percentages as well as absolute numbers, the target of all the states combined is not homologous. It is either in percentage of all new vehicle registrations or in absolute numbers for respective states as observed from the above two charts. In order for coordinated and concerted efforts, targets defined in state EV policies need to complement India's national EV sales forecast.

Targets by Vehicle Categories

Some states and UTs, including Maharashtra, Chandigarh, Punjab, and Karnataka have set separate targets for each vehicle category including 2Ws, 3Ws, and 4Ws.

Table 3.1: Vehicle category-specific targets

State/UT	E2W	E3W	E4W	Target year
Maharashtra	10%	20%	5%	2025
Chandigarh	100%	Passenger – 100% Goods – 60%	Goods – 60% Personal cars 30% Commercial cars – 60%	2024
Punjab	25%	E-Autos 25% in target cities*	25% target cities*	2024
Karnataka		Auto Rickshaws (Bengaluru) – 100%	Cab Aggregators (Bengaluru) – 100% Corporate fleet (Bengaluru) – 100%	2030

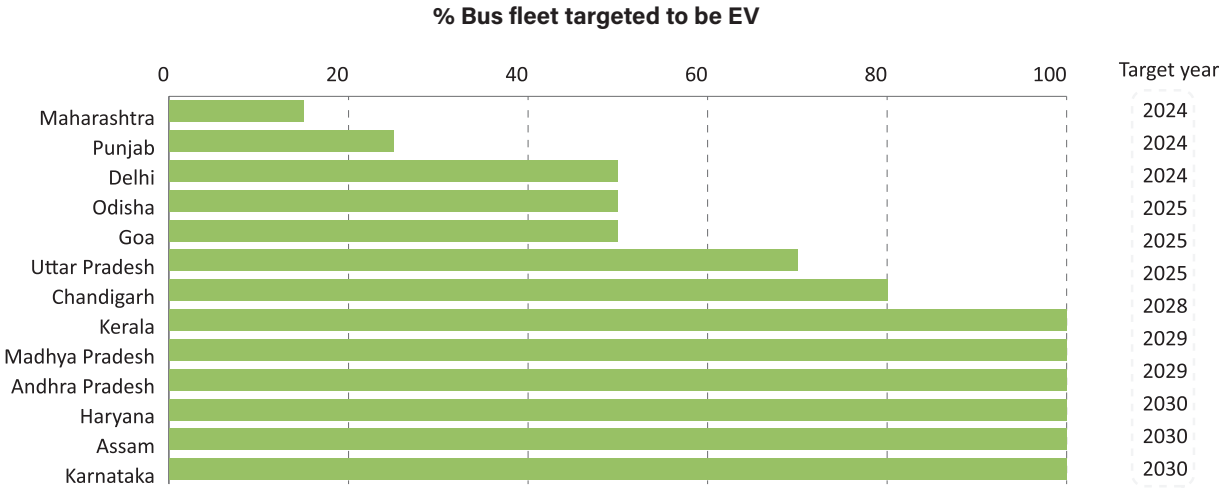
Source: State EV Policies, JMK Research

While NITI Aayog has explicit goals for different vehicle categories, only a few states/UTs as indicated in the above table have stated targets on similar lines till now. In addition, while for E2W, E3W, E4W, not more than 3 to 4 states/UTs have stated targets, for E-buses, the number of such states is higher.

Targets for bus fleets to be converted to EVs

Different states have set targets in terms of some percentage of their bus fleet to be converted to EVs by a defined target year.

Fig 3.3: Targets for proportion of bus fleet to be converted to EVs (in %)



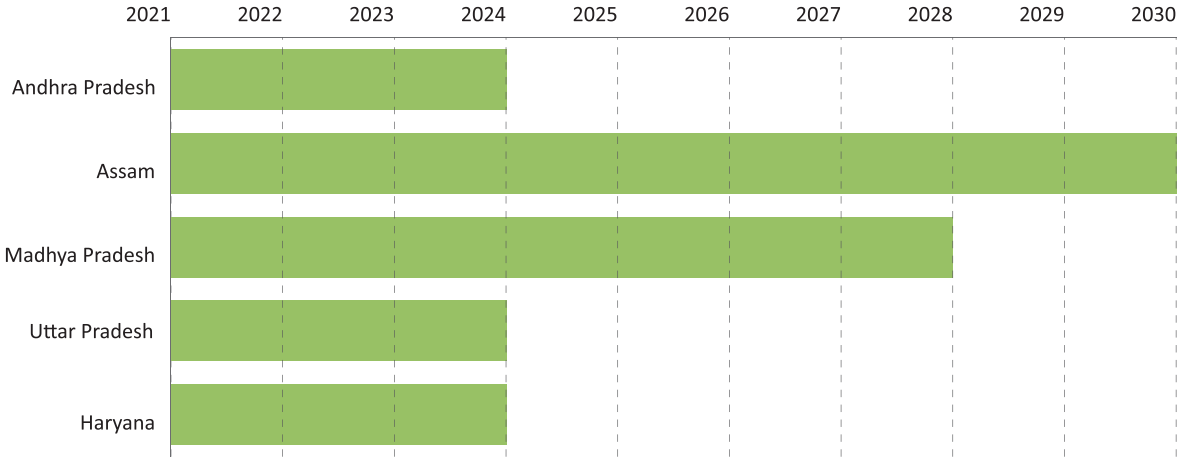
Source: State EV Policies, JMK Research

States such as Meghalaya, Tamil Nadu, and Karnataka have not explicitly stated their public transport targets in terms of percentage conversion or strict timelines. While Meghalaya plans to replace the Meghalaya Transport Corporation buses with battery electric vehicles in a phased manner, Tamil Nadu State Transport Undertakings (STUs) strives to replace 5% of the buses as EVs every year and about 1,000 EV buses may be introduced every year.

Targets for transition of government vehicles to EVs

Some states have set separate targets for the transition of vehicles owned by government agencies to electric. Andhra Pradesh, Assam, Madhya Pradesh, Uttar Pradesh, and Haryana have set a target to transition 100% of the vehicles owned by government agencies to EVs during their respective policy periods.

Fig 3.4: Target year for transitioning Govt vehicles to EVs



Source: State EV Policies, JMK Research

Some other quasi targets for conversion of government fleet to completely electric one includes the following:

- In Maharashtra, starting April 2023, all government and semi-government agencies will be purchasing only electric vehicles. Earlier, this was to be implemented from April 2022, but a resolution passed by the state's Environment Department deferred the policy decision by a year.
- In Assam, after 2025, only EVs will be purchased by government agencies.
- The Government of Punjab in its EV policy has stated that it will target to achieve 100% transition of public fleet to electric in a phased manner.
- As per Bihar's EV policy, all government departments are to buy EVs as a strategy to promote EV adoption, without a defined time-period.
- Delhi government, in February 2021, announced conversion of its entire fleet to electric within the next six months. Following this objective, the Delhi Pollution Control Committee (DPCC) became the first government body in Delhi to completely switch to electric vehicles in July 2021.

TAKEAWAY 4

STATE EV POLICIES NEED TO DEFINE TARGETS FOR CHARGING INFRASTRUCTURE IN ORDER TO MEET THE ESTIMATED REQUIREMENT OF 20.5 LAKH CHARGING STATIONS FOR FIVE CRORE EVS BY 2030

Majority of the states/UTs in India have announced incentives for setting up charging stations but only a few of them have defined targets in terms of number of charging stations to be established by their respective policy periods. While Maharashtra has defined targets for just seven cities for a total of 2,375 charging stations, Andhra Pradesh and West Bengal have laid down targets for establishing 1,00,000 charging stations each by 2024 and 2026 respectively. This total number, however, is far below the estimated number of charging stations required i-e- 20.5 lakh to support 5 crore EVs by 2030.

The plans and targets have been discussed in detail for these states/UTs:

- In Delhi, Maharashtra, and Goa, all new home and workplace parking are supposed to be EV ready with 20% of all vehicle-holding capacity/parking required to be EV ready.
- In Uttar Pradesh and Madhya Pradesh, some cities will be declared as model Electric Mobility (EM) cities to adopt EVs, charging & hydrogen refuelling infrastructure, and new EV enabling building codes.
- In Karnataka, Madhya Pradesh, Goa, respective EV policies lay down plans to provide charging stations at Municipal Corporations public parking spaces, bus depots, international airports and government complexes etc.
- In Haryana, Madhya Pradesh, Himachal Pradesh, and Telangana, fast charging stations and battery swapping infrastructure to be provided at every 50 km on prominent highways.
- In Himachal Pradesh, at least one charging station will be available within every 1km x 1km grid in major cities and towns and at least one slow charging station on both sides will be installed at every 25km on state highways.

Despite numerous states in India having designed EV policies and the central government having already announced demand and supply side incentives under the FAME scheme, there remains a lag in achieving the desired outcomes.

This report, therefore, makes the following recommendations to accelerate EV adoption in India, thereby making e-mobility a reality, and not a dream.

III. RECOMMENDATIONS TO ENABLE FASTER ACCELERATION OF EV ADOPTION AND REALISE SALES OF 8 CRORE EVs BY 2030

The EV penetration in India's vehicle market is currently not more than 2% and the above analysis indicates that despite the central and state governments having defined targets for the industry, the growth uptake is slower than what is needed.

A slew of policy measures to increase the EV fleet and associated charging infrastructure is therefore the need of the hour.

RECOMMENDATION 1

TARGETS AND INCENTIVES ACROSS ALL THE STATE EV POLICIES SHOULD ALIGN WITH THE VISION OF REALISING EV SALES PENETRATION OF 8 CRORE EVS BY 2030

Although most state EV policies prioritise public transport and paratransit, they differ in terms of targets and supply-side (manufacturing) and demand-side (consumer and charging infrastructure investments) incentives. Owing to difference in timelines as well as EV target in terms of absolute numbers versus percentage amongst various State EV policies, a comparison is difficult to make.

In addition, there exist some states that have announced fiscal incentives to promote adoption of EVs without mentioning any specific targets. Rajasthan, Bihar, Telangana, and Uttarakhand are such states announcing fiscal incentives for EVs.

The respective states, therefore, need to keep the national target – in terms of numbers of EVs/charging stations and timelines – in mind before formulating their EV policies. This will ensure that the ground-level targets indicate an actual picture of the nation-wide EV sales forecast and validating if going with the current progress, this sales forecast could be turned into a reality.

RECOMMENDATION 2

FOCUS ON HIGH-VISIBILITY CASES OF FLEET FOR 100% CONVERSION TO ELECTRIC

All government offices' vehicles, vehicle aggregators' fleet, and taxis can be a good case to start with the adoption.

1. **Government Fleet:** We suggest that as a first step, all the government-used vehicles should be 100% electric only. Some states have already set targets for transition of vehicles owned by government agencies to 100% EVs, such as Andhra Pradesh, Assam, Madhya Pradesh, Maharashtra, Uttar Pradesh, and Haryana. Meghalaya EV policy also mandates adoption of EVs in the Government and its Boards, Corporations, Government undertakings, Development Authorities, Municipalities in a phased manner. Interestingly, government-held Energy Efficiency Services Limited (EESL) already concluded the procurement and deployment of 1,590 EVs (E-Cars) in more than 160 Central and state government departments in 49 cities as of August 2021. There is a need for all states to announce clear targets and plans to transition government owned fleets to electric, to lead by example and boost confidence of its citizens.
2. **Vehicle Aggregators' Fleet:** To combat the perennial air pollution problem in India, vehicle aggregators offering e-commerce, last-mile connectivity, food delivery, and ride-hailing services should be given soft EV mandates in the form of clean transportation commitments (similar to 100% RE mandates given by companies like Facebook, Google, Infosys, etc.), initially starting with a small number, and then progressively increasing it.
    - In Delhi, a minimum requirement of electric fleet is being considered from next year for cab aggregators like Uber and Ola. According to the draft aggregator policy, 10% of all two-wheelers and 5% of all four-wheelers are mandated to be electric within the first six months from the date of notification. Two years from the notification, the share will have to rise to 50% of all new two-wheelers and 25% of all new four-wheelers. With this, the Delhi government has become the first state in India to notify an Aggregator's Policy to mandate EV fleets.
    - Maharashtra state government, in 2021, had set a target for such companies to electrify 25% of their fleet by 2025. The state of Maharashtra has said that it will offer companies like Amazon and Uber new incentives to electrify their delivery fleet ahead of a 2025 target for cleaner air.
    - At a company-specific level, some big e-commerce, food-delivery, and ride-hailing companies in India have come up with EV targets, either in terms of number of vehicles or a proportion of their fleet to be replaced with EVs. Companies with large fleets such as Amazon, Flipkart, Uber, Ola, Zomato, Swiggy have all committed to varying percentages of fleet electrification. Many of them are also partnering with automotive and charging infrastructure companies to meet their targets.

RECOMMENDATION 3

DEFINE CLEAR TARGETS FOR CHARGING STATIONS

Given NITI Aayog's projection of eight crore EVs on road by 2030 and our estimates of atleast eight EVs per charging station, India needs to have at least 39 lakh cumulative charging stations between FY 2022 and FY 2030. Since this is way higher than the numbers estimated to be installed currently (~15,000),[4] massive steps need to be undertaken for installation of charging stations in India to overcome the chicken and egg problem the EV sector is facing today.

- All the new home and workplace parking areas should be mandated to have a percentage of overall parking space as EV ready. Even petrol pumps need to be mandated to have atleast one charging station in their premises. Some steps already taken in the right direction and that can be emulated by other states alike include:
    - In Maharashtra, new residential buildings will be mandated to have at least 20% of the total parking spaces as EV ready, of which 30% should be in common parking spaces or parking spaces unallotted to any individual residence owner.
    - Similarly, in Andhra Pradesh, Uttar Pradesh, and Madhya Pradesh, all new permits for commercial complexes, housing societies and, residential townships with a built-up area of 5,000 sq.mt and above will mandate charging stations.
    - EV charging infrastructure is mandatory for all the Petrol Pumps (Both Private and Govt. Owned) operational in UT Chandigarh in 6 Months from the issuance of the final EV policy.
    - Madhya Pradesh and Uttar Pradesh mandate Municipal Corporations Public parking spaces to have charging stations.
- Further, policies could consider capping rental costs for public charging stations, making availability of land banks easier and leasing costs slashed, and establishing a charging infrastructure investment facility funded by public money, say partially.
- As per the Charging Infrastructure Guidelines and Standards by the Ministry of Power (MoP), at least one charging station should be available in a grid of 3km x 3km and one charging station to be set up every 25km on both sides of highways/roads. A similar plan needs to be adopted by all the states for state highways as well as national highways.

4 The Better India. Can India Charge 102 million Electric Vehicles by 2030? Experts Share Solutions. March 2022.

RECOMMENDATION 4

STRINGENT TAX REGIME FOR ICE AND TAX REBATES ON EV

We recommend waiver of taxes like road tax and concession in toll fees on EVs at a central level. As of July 2021, only six states including Karnataka, Maharashtra, and Tamil Nadu have waived road tax on EVs. In addition, additional taxes, cess, fee should be levied on inefficient or polluting vehicles to fund rebates to be offered by the state to EVs.

The Delhi government, for instance, applies cess of 25 paise per litre on diesel, collection from which accrues to the Air Ambience Fund under the Environment Department. From the date of issuance of this policy, 50% of the amount collected in Air Ambience Fund is transferred to State EV Fund on a monthly basis.

RECOMMENDATION 5

FINANCING BY BANKS/STATE GOVERNMENTS/NBFC

Investments required for India's mobility transition is enormous and there is a need for higher liquidity and lower cost of capital for EV assets and infrastructure. Mobilising the investments to finance OEMs, charging stations, battery manufacturers, and end consumers will require targeted and systemic policy support.

i) **Push for financing by Banks:** Currently, majority of banks and financial institutions are not motivated to extend finance citing risks associated with uncertainty of resale value and product quality. Even if financing is available, EV buyers are unable to obtain tenures and interest rates comparable to Internal Combustion Engine-based vehicles (ICEs).

   Key Financing Challenges Faced by the EV Sector:

   - *High Interest Rates:* Interest rates of 20% or more (twice that of petrol vehicles) by NBFCs
   - *Low Loan-to-Value Ratio:* Down payment between 20-50% including capital intensive E-buses
   - *Short Loan Tenures:* Tenures shorter than ICE vehicle loans by several months, thereby leading to higher equated monthly instalments (EMIs)
   - *Limited Financing Options:* Few dedicated EV loan products other than E-rickshaw loans and SBI's green car scheme and Union Bank's EV-specific car loan, the Union Green Miles.

Table 4.2: Comparison of Interest Rates (ICE vs. EV)

State/UT	ICE	EV
Rate of Interest by Organized Financiers	7%–10%	9%–13%
Rate of Interest by NBFCs	12%–16%	20%–24%

Source: Industry News Articles, JMK Research

The need of the hour, therefore, is to offer direct financial assistance and extend credit to OEMs, battery manufacturers, charge point operators, and end consumers that make the entire EV ecosystem, a sector with positive social and environmental outcome. An example of such a programme being introduced includes:

- Axis Bank and The Private Infrastructure Development Group (PIDG) guarantee arm, GuarantCo, have announced a partnership and intent to execute an umbrella guarantee framework of USD 200 million (INR 1,562 crore) with a programme size of USD 300 million (INR 2,343 crore) towards accelerating the E-Mobility ecosystem in India. The programme includes Capex financing for a wide range of entities engaged in the manufacturing, distribution or servicing of electric vehicles, batteries, components, and charging infrastructure. The ramp-up period of the programme will be two years from the date of signing. In addition, Axis Bank has also committed to making 5 percent of its two-wheeler loan portfolio electric by FY 2024.
- Financial assistance directly to the end consumer includes interest-free loans as in the case of Telangana and UP.

ii) **Inclusion of EVs under Priority Sector Lending:** In order to push the retail financing of EVs, the sector should be brought under the umbrella of the Reserve Bank of India's priority-sector lending (PSL) guidelines. The PSL mandate, which has a proven track record of improving the supply of formal credit towards areas of national priority, is capable of offering a strong regulatory incentive for banks and NBFCs to scale their financing to EVs. Further, NITI Aayog suggests recognition of EVs as an infrastructure sub-sector by the ministry of finance and the incorporation of EVs as a separate reporting category under the RBI.

iii) **Creation of fund specially curated for Charging Infrastructure:** Setting up a charging station, being a capital-intensive exercise with no immediate returns, requires financial assistance that can lower the initial CAPEX for setting up the business and cover the associated risks. One such instrument is viability gap funding capable of reducing the overall cost of operations of the business.

iv) **Leasing Model:** A number of financiers, start-ups, mobility solution providers have already come up with customised options for customers to use a vehicle for their personal use for a monthly fee, without owning it. These schemes are offered with zero down payment and there is no hassle of paying for insurance, road tax, registration or maintenance by the customers. Mahindra Finance and Greaves Finance are among the companies that have launched leasing schemes for EVs. The government-held Non-Banking Financial Companies (NBFCs), the likes of Power Finance Corporation Limited, should also adopt such mechanisms for the ease of customers.

v) **Special Concessional Credit Lines:** Similar to the Line of Credit taken by State Bank of India (SBI) from World Bank for Rooftop Solar installations, we recommend concessional lines of credit for the nationalised banks for the EV sector. Small-scale component suppliers and smaller OEMs can improve business efficiency through this scheme.

RECOMMENDATION 6

ZERO-EMISSION VEHICLE (ZEV) ADOPTION TO BE MADE MANDATORY

Experience from leading EV markets indicates that a ZEV requirement is a transformative policy measure that can stimulate EV adoption and hence manufacturing. Governments across the world, particularly in the west, have introduced ZEV mandates to lower road transport emissions and improve the average fleet economies for auto manufacturers. California (USA) is one state to look out for that has targeted for 100% ZEV mandate by 2035 and has led the adoption of EVs in the United States. The Joe Biden government also recently announced that 40-50% of all new cars sold by 2030 must be 100% electric. This takes the mandate to a federal level and is expected to greatly boost domestic EV manufacturing. India also needs to follow the footsteps in adopting ZEV mandate. In fact, Maharashtra state government has already highlighted the importance of having a ZEV Credit Program in India under its EV policy document. Some examples of the type of mandates to be laid down by the government include:

1. Under the scrappage policy, all 15-year-old vehicles can be mandated to be replaced by EVs only and that can be backed through government incentives. At the supply side, the government can push manufacturers to produce more EV models by giving tax breaks (such as GST). For example, if 50% of an OEM's sales are accounted for by EVs, then the GST on vehicle sales is waived off for the OEM. This will ensure increase in sales of E4Ws.
2. To promote increased usage of E3Ws for cargo and passenger use alike, a nationwide EV mandate may not be possible as of now. However, cities with high air pollution, for instance Delhi, can be mandated to only grant new licenses to e-rickshaws. The overall sales can be augmented by offering incentives like Delhi is offering that reduces the cost of electric autos by almost 26%, making them more affordable for E3W buyers.

IV. CONCLUSION

The Indian e-mobility sector has witnessed near-explosive growth in 2021, covid pandemic notwithstanding. The pent-up demand for new vehicle purchases and the recognition of the cost benefits of electric vehicles along with continuous fuel price rise led to a 200% surge in their sales over 2020. The future also looks bright for this sector as the country is forecast to witness sales of more than 5 crore EVs by 2030 as per this report's estimates.

This huge EV sales projection however demands for an equitable availability of supporting infrastructure. We forecast the number of charging stations required by 2030 to be ~20.5 lakh. Adequate charging infrastructure is the key prerequisite that will define the adoption trends of EVs in India. While EVs are being worked upon by major OEMs, an ecosystem for the development of chargers, charging stations, and other services is steadily being built in India. EV policy incentives of various states as well as central initiatives, including introduction of FAME schemes along with other factors like lowering of GST rates, have already been able to set up an initial base for a level playing field.

However, lot of efforts still need to be undertaken to encourage the uptake of EVs in India. The key stakeholders are being encouraged to drive the market growth on the back of proper regulatory mechanism and industry initiatives and through shifts in market design, business models, and financial structuring. At a policy level, conversion of 100% of government fleet to EVs should be a must-have mandate followed by mandating atleast some percentage of vehicle aggregator fleet to electric to initiate the momentum of having increased number of EVs on roads. The state and national EV policies working in consortia is the need of the hour. In order to encourage the adoption of EVs for general public, financing by banks at lower interest rates; inclusion of E-Cars, meant for personal use, under FAME scheme for incentives; and availability of a greater number of charging stations is a pre-requisite. For EV OEMs, opening up of special concessional credit lines and introducing additional taxes on ICEs are some of the immediate measures that will offer them cushioning against the higher investment costs that this sector demands.

India stands a good chance in converting its ICE vehicles to EVs. Given the prevalence of small vehicles such as 2Ws, 3Ws, economy 4Ws and small goods vehicles in the country, India has an opportunity to take a leadership role in the electrification of small vehicles. Add to this, huge oil import bills which the country is estimated to save every year, with the conversion of over 3.99 crore two-wheelers[5] in India to EVs. There is a real possibility of getting this done, provided there is enough innovation by the industry, a policy regime that encourages access to latest technologies, and a sincere effort by the Indian industry to achieve global competitiveness.

5 NITI Aayog, MOVE, Global Mobility Summit, 2018