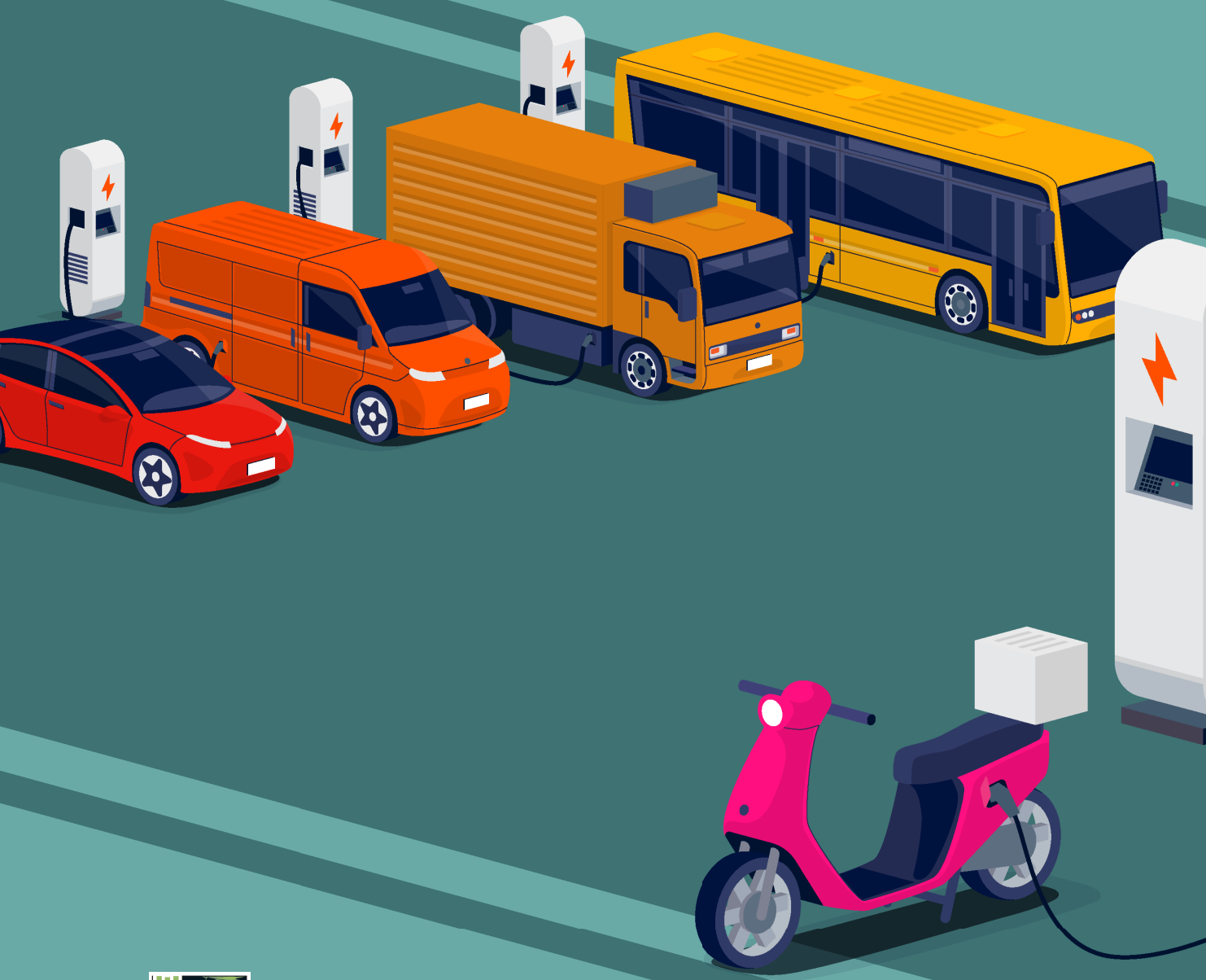

DECODING STATE ELECTRIC VEHICLE POLICIES

Are they designed for scale and performance?

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Authors: Anumita Roychowdhury, Shubham Srivastava and Moushumi Mohanty

Research support: Jatin Mehta

Editor: Akshat Jain

Design and cover: Ajit Bajaj

Graphics: Sanjit Kumar

Production: Rakesh Shrivastava and Gundhar Das

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Centre for Science and Environment
41, Tughlakabad Institutional Area
New Delhi 110 062
Phones: 91-11-40616000
Fax: 91-11-29955879
Website: www.cseindia.org

Contents

1. Why this study?

In the Conference of Parties 26 (COP 26) held in Glasgow in 2021, 28 countries, 44 cities, 10 automobile companies, 26 fleet owners, 15 financial institutions and 21 organizations—representing a sizeable share of the global vehicle market—came together to sign the declaration for 100 per cent transition to zero emissions by 2030–40. While signing the declaration, India also made a statement—'Two-wheelers and three-wheelers constitute more than 70 per cent of global sales and more than 80 per cent in India. All governments should also support the transition of these light vehicles to zero emission vehicles.' This ambition is expected to shape the zero emissions trajectory in India in the coming years.

In 2019, NITI Aayog stated its aim of electrifying 70 per cent of all commercial cars, 30 per cent of all private cars, 40 per cent of all buses, and 80 per cent of all two-wheelers and three-wheelers by 2030. But this is not yet backed by any regulatory mandate or long-term policy roadmap to bring more certainty in the market.

Though adoption of electric vehicles (EVs) is picking up, the numbers do not yet add up to meet such a high level of ambition. The total EV stock is still around 1 per cent of all new vehicle sales in the country.

Many states have announced ambitious electrification targets in their EV policies, which broadly set plans for a period of five years. While one group of states (Andhra Pradesh, Kerala and Uttar Pradesh) have set absolute goals of 10 lakh EVs by 2030, others (Meghalaya, Goa, Haryana, Delhi, Odisha, Assam, Punjab and Maharashtra) have set targets within a range of 10–30 per cent EV penetration in the market. Chandigarh and Bihar are the outliers with goals set at 80 per cent by 2026 and 100 per cent by 2030 respectively, while Karnataka aims to effectively convert all fleets in the state to electric by 2030. West Bengal has set a target of 25 per cent electrification of new vehicles by 2024 and 50 per cent by 2026.

All combined, this promises to add up to a substantial figure by the end of the decade. But that will be possible only if the policies are further refined and are implemented fully and effectively.

This brings us to the central question this report attempts to answer—Are there adequate and appropriate policy strategies in place to support and drive this ambition?

Currently, at the national level there are two incentive programmes for adoption of EVs. One is Faster Adoption of (Hybrid &) Electric Vehicles II (FAME II) created with a corpus of Rs 10,000 crore to support about 15.6 lakh vehicles, including 10 lakh two-wheelers, 5 lakh three-wheelers, 55,000 passenger cars and 7,000 electric buses. As of March 2022, FAME II has registered about 19.3 per cent of the planned fleet target, with total sales of 3,00,987 vehicles—1,62,201 two-wheelers, 1,25,359 three-wheelers and 12,489 cars.

However, so far just about 20 per cent of the targeted fleet has come on the road. The FAME II scheme has been extended till 2024 with an amendment that has increased the electric two-wheeler (E2W) subsidy to Rs 15,000/kWh.[1] FAME incentives are expected to improve price parity with internal combustion engine (ICE) vehicles, stimulate demand and target large-scale fleet conversion (public transport, delivery fleet, ride hailing, etc.).

The other central government incentive programme, that was announced during the pandemic, is the production-linked incentives (PLI) scheme to support giga-scale advanced cell manufacturing of up to 50 GWh. PLI of Rs 18,000 crore has been earmarked for manufacturers to set up production units of at least 5 GWh. PLI provides incentives between 2–12 per cent of the incremental sales revenue and 4–7 per cent of incremental exports revenue. This is linked to the National Mission on Transformative Mobility and Battery Storage, 2019 to promote local manufacturing of the value chain related to raw materials, electrochemistry, and end-of-life treatment of cells, modules and battery packs.

While central government policies and incentive programmes need to be backed by targets and mandates to stimulate the national EV market, there is considerable opportunity in the bottom-up pressure from the state-level EV policies that have also taken shape and are expected to define the terms of change at the ground level.

Nearly 21 state governments have framed and notified or have drafted electric vehicle policies to define the scope of intervention at the state level. Significant leveraging is possible if these policies are designed with clear targets, enabling mechanisms and compliance strategies.

Currently, there is wide variance in the scope and design of state programmes. An early discussion on gaps in current strategies can help strengthen the policy approach for time-bound implementation, scale and speed of action. States have an opportunity to offer an ecosystem that can trigger ground level transformation.

This requires a deeper understanding in terms of the scope of action and harmonized action for integrated markets.

Therefore, the Centre for Science and Environment (CSE) has carried out a rapid review of the EV policy documents of state governments to compare the key architecture and elements of the policies to understand their effectiveness. As most of the policies have taken shape only in the last couple of years and some of them are still in the draft stage, there is very little to show on ground. This review is useful because policies can indicate the direction and envisaged scale of change.

It is notable that the intended plan period for most of the policies announced so far is five years. This demands an accelerated roll out. While it is encouraging to see targets being set for substantially high levels of electrification within 3–5 years, there is no clarity yet about how these targets will be met and if the strategies proposed in the policies are adequate and ready for immediate roll out.

This raises questions not only about policy design but also about the roadmap and milestones, and detailing and preparedness of the departments responsible for multi-dimensional implementation to meet the requirements of the policy. The policies need to be rapidly translated into departmental business rules, departmental budget, regulation development and mobilization of technical support system for implementation.

It is clear from the review that state level policies can play an important role in addressing last mile bottlenecks in EV adoption and setting up of an EV manufacturing ecosystem. This bottom-up pressure can create consumer demand and value for the end user for quicker adoption; and provide infrastructure support for EV manufacturing to build supply chains and retain value within the state, thus creating new employment opportunities while curbing vehicular emissions.

Within the federal structure, state policies are expected to be uniquely designed according to local imperatives. This is reflected in the wide variety of targets set for the programmes, in different kinds of incentive structures, in varying combinations of instruments for demand creation and EV adoption, in diverse approaches to promote EV manufacturing and job creation, and in assorted funding strategies for market transformation.

However, as the automobile industry has often expressed concerns related to markets being fragmented by diverse policy and incentive structures, this requires evaluation.

While states can decide the scope and adoption of a combination of instruments and approaches according to local priorities and imperatives, there is still considerable opportunity to harmonize approaches in several sub-segments of policies—including target setting, incentive structure, fiscal and non-fiscal instruments, charging infrastructure design, industrial plan for investment and jobs, battery ecosystem, and recycling and appropriate regulations—to integrate the market for scale. If some of the gaps are addressed, this can create an effective level playing field for the industry and the consumers.

State level EV policies can be effective catalysts, as is evident in the early changes in the markets of Delhi and Maharashtra that have taken the lead to implement EV policies. These states have witnessed steep improvements in EV sales following the adoption of EV policies. For instance, the market share of EVs in Delhi increased from 3 per cent to 12.5 per cent after the introduction of EV policy in the first quarter of 2022, according to the VAHAN database of the Ministry of Road Transport and Highways (MoRTH). Though this is largely driven by the auto-rickshaw segment, this growth is evident in other vehicle segments as well. Similarly, Maharashtra registered 60 per cent of its total EV stock after the notification of the EV policy.

This review highlights the need for a cross learning platform among the states and a national guidance framework and matrix to guide state level policies towards most appropriate and effective designs.

1.1 Next steps

Need for national guidance framework and matrix for state level electric vehicle policy development and implementation: At the outset it is necessary to ensure that all state EV policies are formally notified and suitably amended as appropriate to firm up the mandate. Twenty-one states have already prepared policies. Though this is a good beginning, the policies are still quite patchy, widely different and without adequate cohesiveness. As most state governments are embarking on implementation, it is an opportunity to build guidance on specific strategies for effective roll out. In fact, a consortium of state governments implementing EV programmes to share experience and harmonize action as much as possible can maximize gains from the transition. It is evident that NITI Aayog is working towards such a matrix to evaluate, guide and track state level policies. This needs to be expedited quickly.

EV policies need to define the state level zero emissions mandate and set time-bound targets for electrification: Currently, there is wide variation in approaches to target setting across the states. While some have set percentage targets, others

have adopted number-based targets. But there are still several states that have not set any targets yet. This weakens the policy. Targets for electrification of vehicle fleet should be adopted to provide long-term policy visibility and to build confidence in the market. Target setting also needs to be measurable and verifiable to track progress.

Need more aligned action on incentives across states to harmonize the market: If the current incentive structures from all state policies are aggregated, about eight types of incentives can be broadly identified. These include purchase subsidies, tax measures, interest subvention, parking subsidies, scrappage subsidies, toll tax and permit fees exemptions. All states have not adopted all of them. There are different permutations and combinations. Only a few states have taken on board the maximum options or 6–8 of these incentives. Others have adopted lesser number of incentives. Even though state level incentives are decided based on the state's priorities and revenue implications, there is still considerable scope for rationalizing some of them for wider adoption.

Need firm roadmaps and milestones with timelines to pace up implementation: EV policies need to be clearly backed by detailed strategy development with indicators, timelines, identification of responsible departments and funding strategies to enable implementation. In most states, ground level strategy development and multi-department coordination are still very nascent. This needs to be improved to meet the targets for electrification within five years of the plan period.

Link incentives with technical eligibility criteria and standards and guidelines for infrastructure development: At this stage, most state level EV policies are not explicit about defining technical eligibility in terms of performance criteria related to speed and range of EVs or type of batteries. This is the reason why technical eligibility is not linked with incentives. This will have to be addressed for proper market development across the states and to influence product development in different vehicle segments. Similarly, development of charging infrastructure will require more harmonized guidelines for alignment with national standards and codes. These will have to address the unique challenges and opportunities of each vehicle segment, including two-wheelers, three-wheelers, cars, buses and other commercial vehicles.

Industrial promotion of EV manufacturing needs more targeted and monitorable action on ground: Several states have designed their respective EV policies to promote EV manufacturing as part of their industrial development

plan. They have offered a wide range of capital subsidies; infrastructure support in terms of concessional land, power, water and industrial parks; skill building incentives; and have set employment targets. Even though some states have begun to take steps, the progress is still slow. In this case, both infrastructure and demand creation will be addressed simultaneously to build confidence for new investments.

States need to combine e-bus strategy with public transport augmentation strategy: The combination of state level targets and support from central FAME II incentives has created an opportunity to scale up electrification of public transport. But this needs to become a win-win strategy for scaling up clean public transport as well. It is not clear yet if additional support for e-buses will be available at the state level and how the bus numbers are being worked out in relation to the total buses required for improving public transport services in cities.

Need a mandate for recycling system and infrastructure for EV batteries in all EV policies: It is understood that large scale deployment of EVs will require state-wide strategy for collection of downgraded or spent batteries for recycling and urban mining to recover minerals. But there are several states that have not provided for battery recycling systems. Such a strategy cannot be optional and needs to be mandated across all state policies.

Need dedicated funding strategy in states: Only a few states have identified revenue heads along with budgetary allocation to create dedicated funding for the EV programme. This needs to be mainstreamed across all state policies to make the incentive programme more revenue neutral, sustainable and make the cost of transition viable.

Disincentivize ICE vehicles to create opportunity for EVs: Only a few states have provided for higher taxes to disincentivize ICE vehicles and to cross subsidize EVs or use non-fiscal strategies like low emissions zones or preferential parking to incentivize EVs. It is necessary to ensure that these steps are further developed and implemented. Global experience shows that active disincentives in ICE vehicles are needed for market transformation. Often such proposals on disincentives for ICE vehicles in the EV policies fall by the wayside and are not implemented.

Governance and compliance framework: The transformative change that awaits the vehicle sector in states requires a well-defined coordination framework for all concerned departments; monitoring and reporting system for measurable and verifiable progress; department level strategy development; and a compliance

programme. Only a few state policies have provided for monitoring and reporting. This will have to be strengthened, detailed out and harmonized across all state policies.

Building consumer awareness: Strong outreach and communication strategies are needed to build consumer awareness about the mechanism for accessing incentives, availability of infrastructure, making buildings ready for EVs, availability of support systems and performance parameters of EVs. A cursory review in a few states has shown that often targeted fleet operators, including three-wheeler/commercial vehicle operators, are not fully aware of the policy incentives, targets of the EV programme in the state, the mechanism of accessing incentives, cost structures and cost recovery options. Therefore, the dormant and potential demand for EVs often cannot be adequately stimulated to drive the market demand.

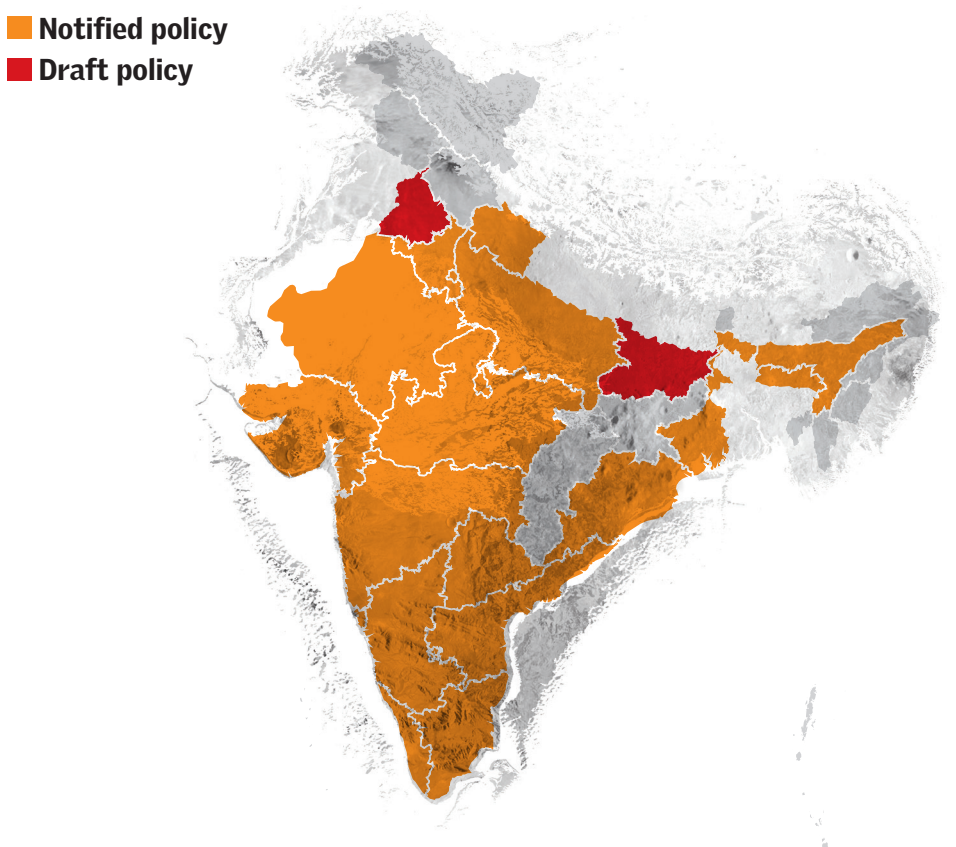
State level action has started but it needs to gather momentum: Rapid review of the state of implementation of the EV policies in Maharashtra and Telangana shows that action has been initiated on several fronts but it has to gather pace. This is critical for achieving the objectives of the policies.

2. Making of state EV policies

This review of state-level EV policies has considered 21 states that have released EV policies, a few of which are drafts. The states/UTs with approved EV policies are Assam, Goa, Gujarat, Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Rajasthan, Delhi, Tamil Nadu, Telangana, Meghalaya, Odisha, Maharashtra, Haryana, West Bengal, Chandigarh, Uttarakhand, and Uttar Pradesh (see *Map 1: EV policies in Indian states/UTs*). The states/UTs with draft policies include Bihar and Punjab. The policy drafts and notified policies that have been considered for this analysis are that of March 2022. If any further change has happened in any of the policies since then, it is not reflected in this analysis.

State EV policies have defined the design and scope in relation to the respective policy priorities of the states, resource mobilization—both technical and financial—regulatory environment, level of industrialization and the anticipated leveraging to build the EV value chain within the state.

Map 1: EV policies in Indian states/UTs



The policies released by different states vary in scope, priorities, targets and action. Therefore, this review seeks to classify policies under different priority heads and analyse, under each head, targets and the type of incentives—both fiscal and non-fiscal—infrastructure and industry support, and funding mechanism that states have provided for. Further, this review benchmarks policies against a common minimum level of policy action needed and whether policies have enough provisions for monitoring and review.

Though it is not possible to draw a hard line of distinction, there seems to be a broad grouping of states in terms of varying emphasis on demand incentives for EV adoption and promotion of EV manufacturing as part of their industrial plans. For instance, Delhi, Chandigarh, and Rajasthan have focussed more on demand incentives for EV adoption while a larger group of states have prioritized both promotion of EV manufacturing and EV adoption.

Key policy parameters in different priority verticals: There are a broad spectrum of policy approaches that have been adopted by the states—though variably—that can drive EV adoption. These measures can be broadly classified as fiscal and non-fiscal measures for EV adoption, charging infrastructure, industrial promotion and skill building.

This assessment has considered several indices that have a bearing on the effectiveness of the policy and are needed to track progress over time. These include clearly defined targets and mandates, adequate demand and supply side incentives, support for charging infrastructure development, infrastructure support for promoting manufacturing and skill building, recycling and reuse provisions, and EV funding mechanisms. All this is needed for the time-bound implementation of policies.

This review has also considered the adoption of an institutional mechanism—designated group/body—and a framework for periodic review of policy implementation on the ground. Feedback loops from the market are needed to tweak the policy design for improved impact.

Table 1: Varying emphasis of state policies

More focus on demand incentive for adoption	Priority to both manufacturing and adoption	More emphasis on industrial development
• Delhi • Chandigarh • Meghalaya • Maharashtra • Bihar • Goa • Gujarat • Rajasthan	• Assam • Haryana • Odisha • Kerala • Madhya Pradesh • Uttar Pradesh	• Andhra Pradesh • Telangana • Tamil Nadu • Karnataka • Uttarakhand • Punjab • West Bengal (Innovation and R&D)

Table 2: Key policy parameters

Demand incentives for consumers • Purchase subsidy • Tax exemption • Interest subvention on loans • Toll exemption • Parking subsidy • Permit exemption on • Scrappage/Retrofitment • Indirect disincentives for ICE vehicles **Non-fiscal** • Green zones • Public awareness	**Fiscal incentives for charging** • Capital subsidy • Concessional location • Concessional charging tariff • Tax exemption **Non-fiscal** • Building byelaws • Charging network digital integration • Priority application clearance • Standards and regulations	**Fiscal support for EV industry** • Capital subsidy • Tax exemption • Interest subsidy • Concessional infrastructure • Employment incentive **Non-fiscal** • Capacity building • Special Economic Zone
EV Adoption 	Charging Infrastructure 	Industrial Promotion 

BOX: KEY HIGHLIGHTS OF THE STATE ELECTRIC VEHICLE POLICIES

For a broad overview of state level EV policies, three different colours—Green, Yellow and Red—have been assigned to various parameters. Green represents availability of the parameter; Yellow stands for partial availability of the parameter; and Red denotes non-availability of the parameter.

While variable approaches are expected within the federal structure according to the priorities, revenue and funding considerations, and the local imperatives of the state governments, it is still possible to identify the areas which can be harmonized and further strengthen several aspects of the state policies to cumulatively transform the market.

Table 3: Overview of state EV policies

States	Policy Status	EV Target	EV Adoption Incentives	Charging Infrastructure Incentives	Industrial Promotion	Recycling	EV Fund	Review & Monitoring
Andhra Pradesh	Final							
Assam	Final							
Bihar	Draft							
Chandigarh	Draft							
Delhi	Final							
Goa	Final							
Gujarat	Final							
Haryana	Draft							
Karnataka	Final							
Kerala	Final							
Madhya Pradesh	Final							
Maharashtra	Final							
Meghalaya	Final							
Odisha	Draft							
Punjab	Draft							
Rajasthan	Final							
Tamil Nadu	Final							
Telangana	Final							
Uttar Pradesh	Final							
Uttarakhand	Final							
West Bengal	Draft							

Notes:

- EV target: Green stands for availability of target in EV adoption. Red colour means the policy has not envisioned any target under this category.
- EV adoption: Green refers to availability of purchase subsidies and tax exemptions such as road taxes and registration fees. Yellow defines availability of at least one of the above incentives. Red means the policy has not provided either of the incentives.
- Charging infrastructure & industrial promotion: Green identifies availability of capital subsidies and tax exemptions or reimbursements under heads such as State Goods and Services Tax (SGST) and electricity duty. Yellow states availability of at least one of the above incentives. Red means the policy has not provided either of the incentives.
- Recycling: Green means availability of recycling incentives, yellow states that policy encourages recycling and red states that the policy has not provided any incentives.
- EV fund: Green refers to availability of budgetary allocation or provision to establish an EV fund. Yellow states selective availability of funds such as VC fund for start-ups and red refers to unavailability of any incentives in the policy.
- Review and monitoring: Green refers to the establishment of a specific review and monitoring committee, while yellow means that only the state cabinet will be responsible for policy amendments and red underlines the unavailability of the said provisions.

2.1 Assessment of the key parameters of EV policies

Policy targets and timeline

Definitive goals are vital to set the tone of a policy and drive implementation with clear milestones for market creation. State governments have defined their respective ambitions which are expected to push adequate and requisite ecosystem planning and implementation strategies.

Currently, nearly all state level electric vehicle policies have adopted a time frame of five years for implementation with targets that are both quantitative and qualitative and vary between moderate to highly ambitious. Only a few have additionally indicated targets for 2030.

While accelerated action over a period of five years can quicken the pace of implementation, it is still necessary to have long-term policy visibility for market transformation. This is needed to bring more certainty in the market to positively influence investment decisions.

Two approaches have been adopted by states for target setting—set the overall target for fleet electrification by the end of the plan period; and a more stratified approach to setting targets for individual vehicle segments, charging infrastructure, investments and job creation.

Targets for overall fleet electrification: At this stage, states have taken diverse and arbitrary approaches to setting targets for fleet electrification. Nearly 15 states have set overall targets for fleet electrification and these largely vary between 25–30 per cent within five years. A few have also set lower targets of 10–20 per cent (Maharashtra, Odisha and Meghalaya). There are outliers on the upper side as well. Chandigarh is aspiring for 80 per cent electrification while Bihar has aimed for 100 per cent electrification by 2030.

A smaller group of states including Andhra Pradesh, Gujarat, Kerala and Uttar Pradesh have set number targets. Andhra Pradesh, Kerala and Uttar Pradesh have targeted to bring 10 lakh e-vehicles with varying timelines. Gujarat has set the target for two lakh vehicles.

The time frame of most of the targets is between 2024–2026. At this stage, the targets have been set without assessing the speed and scale of implementation of the enabling mechanisms (see *Table 4: Time-bound fleet electrification targets*).

Table 4: Time-bound fleet electrification targets

State/UT	Time-bound fleet electrification target
Andhra Pradesh	10 lakh EVs across all segments by 2024
Assam	25% electrification of vehicle fleet by 2026
Bihar	100% e-mobility by 2030 Bodh Gaya and Rajgir to be 100% EV cities with no emissions zones
Chandigarh	80% of new vehicle registration by the end of planned period
Delhi	25% of all new vehicle registrations by 2024
Goa	30% of annual vehicles registered from 2025 onwards
Gujarat	Deployment of first two lakh vehicles under individual or commercial use within four years of July 2021
Haryana	-
Karnataka	-
Kerala	10 lakh EVs by 2022
Madhya Pradesh	25% of all new public transport vehicles by 2026
Maharashtra	10% of new vehicle registrations by 2025 25% in 5 urban agglomerations 15% of the bus fleet of Maharashtra State Transport Corporation
Meghalaya	At least 15% EVs in the state by 2025
Odisha	20% of all vehicle registrations by 2025
Punjab	-
Rajasthan	-
Tamil Nadu	-
Telangana	-
Uttar Pradesh	Register 10 lakh EVs combined across all vehicle segments
Uttarakhand	-
West Bengal	25 per cent electrification of new vehicles by 2024 and 50 per cent by 2026

Source: Compiled from state electric vehicle policies

Targets for vehicle segments: Several state policies have additionally set time-bound targets for specific vehicle segments—two-/three-wheelers, cars, buses, goods vehicles, delivery fleet and government/institution owned vehicles.

Some states have taken a phased approach to prioritize big cities for rapid electrification (see *Table 5: Electrification targets for different vehicle segments*). This has largely aligned with FAME II that has prioritized incentives for public transport, para transit, delivery fleet and last mile connectivity. There is limited focus on personal cars in some states.

States have given number-based targets for specific segments. For example, while Assam has aimed for 100 per cent bus electrification, it has set number targets for other segments. Chandigarh has set 100 per cent target for all segments of vehicles except cars which stand at 50 per cent. Delhi has targeted 50 per cent electrification of its bus fleet (including small buses) and its delivery and aggregator fleet by 2023 and 100 per cent by 2025, while setting a specific number target for cars at 1,000 units. Maharashtra, on the other hand, has set varying percentage targets for different vehicle segments—10 per cent of 2-wheelers; 20 per cent of 3-wheelers; 5 per cent of 4-wheelers; and 25 per cent of urban fleet of fleet aggregators/operators by 2025. West Bengal has prioritized electrification of the bus service, delivery and ride-hailing fleet and targets to convert 75 per cent of the fleet by 2026.

However, Rajasthan, Bihar, Gujarat, Karnataka, Kerala and Uttarakhand have not set vehicle segment-wise targets.

States are most strident about setting targets for the bus fleet for which FAME II support is available. About ten states have set targets for electrification of their bus fleets. Several of them, including Andhra Pradesh, Assam, Chandigarh, Haryana and Madhya Pradesh, have aimed for 100 per cent electrification of bus fleet owned by the state transport corporations for intra-city service. Delhi and Odisha have aimed for 50 per cent electrification of their fleets, Punjab has aimed for 25 per cent and Tamil Nadu has aimed for 5 per cent electrification every year, and have at least 1,000 e-buses.

The combination of state level targets and support by central incentive programmes has created an opportunity to scale up electrification of public transport. However, it is not clear in several cases if additional support for e-buses will be available at the state level and how the bus numbers are worked out in relation to the total buses required for improving public transport services in cities.

There is further scope for improving the target for e-bus programme from that perspective. The learning curve from the CNG programme implemented a couple of decades ago in Delhi shows that while mandating 100 per cent conversion to CNG for buses, the Supreme Court had additionally mandated increase in the number of CNG buses to 10,000 to augment the bus service. A similar model will be helpful to guide state action for e-buses to combine bus electrification strategy with bus augmentation strategy to guide future investments.

While it is encouraging to see state level policies indicating substantially high level of electrification within 3–5 years, there is no clarity yet as to how these

targets will be met and if the strategies that have been proposed in the policies are being rolled out with immediate effect and with enough speed for such targeted transformations.

State level ambition will also have to align and be supported by central policies. Manufacturers will have to respond adequately to develop their product lines and supply capacities to meet the requirements of state level markets to enable the transition.

Moreover, it is not enough to indicate targets for electrification. The policies also require compliance and reporting strategies that are verifiable and measurable for tracking progress and for course correction. At this stage, the policies are weak on this aspect.

Table 5: Electrification targets for different vehicle segments

State/UT	Overall time-bound fleet target
Andhra Pradesh	Buses: Convert 100% APSRTC bus fleet of over 11,000 buses – First phase to achieve 100% conversion of buses in top 4 cities by 2024. Commercial fleet: Phase out fossil fuel based commercial vehicles and logistic vehicles in top 4 cities by 2024. Government and institutional fleet: All vehicles of government and corporations to be converted to EVs by 2024.
Assam	Buses: 100% electrification by 2030 2-wheelers: 100,000 units 3-wheelers: 75,000 units 4-wheelers: 25,000 units Government vehicles: All vehicles by 2030. After 2025 only EVs to be purchased Commercial fleet: Phase out all fossil fuel based commercial fleet by 2030
Bihar	-
Chandigarh	Phased fleet electrification target (over five years) Buses: 100% (electric/alternative fuel) in five years Two/three-wheelers (passenger): 100% in five years 3/4-wheelers (goods): 100% in five years Cars (personal): 50% in five years Cars (commercial – local permit): 100% in five years
Delhi	Buses: 50% of all new stage carriage buses (with 15 seats or more) to be procured – starting with 1,000 pure electric buses by 2020. Delivery and aggregator fleet: 50% of fleet by march 2023 and 100% electrification by 2025
Goa	100% 2W to be electric by 2030 50% of all ferries to electric by 2025

State/UT	Overall time-bound fleet target
Gujarat	2-wheelers: 1,10,000; 3-wheelers: 70,000; 4-wheelers (private and commercial): 20,000
Haryana	Buses: Convert 100% of bus fleet of STUs by 2029 In first phase, 100% conversion in Gurugram and Faridabad by 2024 Commercial fleet: Phase out all fossil fuel based commercial fleets and logistics vehicles in Gurugram and Faridabad by 2024 and all cities by 2024. Government/corporations/board vehicles: All to be converted by 2024
Karnataka	Focused fleet electrification in Bangalore: Commercial fleet: 100% electrification of auto-rickshaws, cab aggregators, corporate fleets, school buses and vans Buses: BMTC, KSRTC, NWKSRTC AND NEKSRTC to introduce 1,000 buses E3W/E4W goods: 100% electrification by 2030
Kerala	Pilot fleet of 2W: 2,00,000 vehicles; 3W: 50,000 vehicles; Goods carriers: 1,000 vehicles; Buses: 3,000 vehicles; KSRTC shall transition its entire fleet of 6,000+ buses into e-buses by 2025. Ferry boats: 100 vehicles KSRTC shall transition its entire fleet of 6,000+ buses into e-buses by 2025.
Madhya Pradesh	Buses: 100% public transport bus fleet by 2028 with first phase of 100% electrification in top 5 cities by 2026 Intra-city buses: SPVs to replace 50% of bus fleet with electric buses by 2026. Government/corporation vehicles: 100% by 2028 Commercial and logistic vehicles: 100% of fleet by 2028 Phase out all fossil fuel based commercial vehicles in all cities by 2030.
Maharashtra	By 2025: 10% of all vehicles 10% of 2-wheelers 20% of 3-wheelers 5% of 4-wheelers 25% of urban fleet of fleet aggregators/operators by 2025 (Now planning scaled up electrification of bus fleet)
Meghalaya	-
Odisha	Buses: At least 50% of all new stage carriages in next five years

State/UT	Overall time-bound fleet target
Punjab	Buses: 25% of bus fleet over policy period E2W: 25% of new sales over policy period E3W: 25% of new sales over policy period E2W (commercial), E4W (commercial) and E3W (goods carriers): Encourage fleet operators to achieve 100% transition in phased manner
Rajasthan	-
Tamil Nadu	Buses: STUs to strive to replace 5% of buses every year and around 10,000 e-buses to be introduced every year. Encourage other vehicle segments – no target
Telangana	-
Uttar Pradesh	Buses: 1,000 e-buses and to achieve 70% EV public transportation in 10 cities by 2030 Commercial fleet: 50% electrification in good vehicles in 10 cities by 2024 and all cities by 2030
Uttarakhand	-
West Bengal	Convert 75 per cent of service fleet—buses, delivery and ride sharing—to electric by 2026

Source: Compiled from state electric vehicle policies

Demand incentives for EV adoption

Consistent with the principle of national FAME II policy to give demand incentives for quicker EV adoption, all state EV policies have provided for a range of demand incentive programmes to stimulate demand for accelerated adoption of EVs.

These incentives can be broadly grouped as fiscal incentives and non-fiscal incentives. Fiscal incentives include purchase subsidy, tax exemption, interest subvention on loans, toll exemption, parking subsidy, scrappage/retrofitment and permit exemption. Non-fiscal incentives include green or special mobility zones, preferential parking and public awareness strategies (see *Table 6 A&B: Highlights of the fiscal incentives in state EV policies*).

Overall approach to incentive programme: There is significant variation in the combination of strategies and approaches adopted by different states.

Collectively, the incentives that state policies have identified, including the indirect strategy for disincentivizing ICE vehicles, add up to eight. These include purchase subsidy, tax exemption, interest subvention, toll exemption, parking subsidy, scrappage and retrofitment support, permit exemption and disincentives for ICE vehicles to cross subsidize EVs.

However, all states have not adopted all the options. States that have adopted maximum number of incentives—between 6–8 identified strategies—include Bihar, Delhi, Goa, Haryana, Maharashtra and Odisha. Madhya Pradesh and Meghalaya may not have provided all the options related to purchase subsidy, interest subvention and tax exemption, but have maximum strategies related to parking subsidy, scrappage incentives, toll exemption and permit exemption. Delhi and Haryana have additionally provided for disincentives for ICE vehicles in order to discourage new buyers.

States that include least number of incentives include Uttar Pradesh and Uttarakhand. Uttar Pradesh has only provided for tax incentives and Uttarakhand has provided for tax incentives and exemption from permit fees.

Varying structure of purchase incentives: Purchase incentives or subsidies offered by different state governments are structured differently.

Most states have structured purchase subsidies as fixed amount per kWh of battery with a maximum cap that cannot be exceeded. These subsidies have been designed for each vehicle segment separately. This is the most common approach though amounts specified vary across states.

Broadly, state policies are not very strong in linking incentives with technical eligibility criteria including types of batteries, top speeds and range of vehicles. Some states have taken a more delineated approach to make it more performance oriented. However, Delhi has categorically disallowed incentives for vehicles with lead acid batteries. A few others have provided higher incentives for lithium-ion batteries. For instance, Bihar has provided capital subsidy of up to Rs 20,000 for 24,000 units for two-wheelers with additional Rs 7,000 per unit that have Li-ion batteries. There is scope of further amendment in all states to ensure that only Li-ion batteries are given incentives to promote appropriate technologies.

Only a few states have provided incentives for personal cars. Delhi and Chandigarh have specifically mentioned personal cars and specified the number targets. Other states have provided incentives for 4-wheelers as a generic category without specifying if this includes personal cars.

Uttar Pradesh, Madhya Pradesh and Telangana have not provided purchase incentives. The reason for this is not clear when purchase subsidy is the most popular instrument for demand creation.

West Bengal offers incentives of Rs 10,000 per kWh with a cap of Rs 20,000 for E2W and Rs 150,000 for E4W.

Tax exemption for EV adoption: Yet another instrument that has been used widely is exemption from local taxes including registration fees and road tax. This is the most common approach among state governments as these are the key state tax heads related to vehicles. In addition to this, several state governments have also considered waiving off or reducing state goods and services tax (SGST).

A few states have taken a more stratified approach in providing this incentive. Madhya Pradesh, for instance, has stated that there will be 1 per cent waiver of motor vehicle tax on first 5,000 shared e-rickshaws (with registration fee exemption for 7,500 units), first 2,000 e-goods vehicles, first 6,000 e-cars (with registration fee waived off on 9,000 cars) and first 1,500 e-buses (vehicle registration fees exemption for 2,250 e-buses).

Similarly, Odisha has given 100 per cent waiver to buses for first four years and 100 per cent waiver on SGST for goods vehicles for the policy period. Telangana has given 100 per cent waiver for the first fixed number of vehicles in each vehicle segment.

Interest subvention for purchase of vehicles: Very few states have provided for interest subvention for purchase of e-vehicles. These include Bihar, Delhi and Odisha. Bihar has provided for 10 per cent interest subvention for freight vehicles and e-buses and 10 per cent interest subvention for all EVs manufactured in Bihar. In Delhi, e-autos have been given interest subvention of 5 per cent on loans and hire purchase scheme for purchase; and goods carriers have been given interest subvention of 5 per cent on loans and hire purchase. Odisha provides 100 per cent interest free loans for state government employees and interest subvention for public buses at 5 per cent. Goods vehicles get interest subvention of 5 per cent on loans for purchase.

This strategy is largely oriented towards promoting e-bus transport and local manufacturing, and incentivize specific groups of consumers like government officials to purchase e-vehicles.

Parking subsidy: Waiver of parking fees or discounted rates can be a powerful incentive to lower operational costs of EVs. Out of 21 states with EV policies, only five states—Assam, Bihar, Kerala, Madhya Pradesh and Odisha—have provided for parking subsidies.

This is an important strategy as most vehicles need top up charging when they are parked to optimize time and reduce dead mileage. This needs to be supported by preferential parking equipped with charging points in parking lots.

For successful implementation of this incentive, states need to adopt comprehensive parking policies to regulate and implement parking management area plans. For instance, Delhi has already notified parking rules that specifically provided for ward-wise implementation of parking management area plans that can identify the legal parking areas and integrate charging infrastructure within the parking facilities. Similar efforts are needed in other states too.

Scrappage incentive for fleet renewal and electrification: Several states have already adopted the policy for phasing out old vehicles or of taxing older vehicles higher to accelerate fleet renewal. Delhi-NCR is implementing a directive from the National Green Tribunal (NGT) to ban 10-year-old diesel vehicles and 15-year-old petrol vehicles. At the national level, MoRTH has issued two notifications related to scrappage policy—one on the scrappage incentives to be considered by state governments and the other on setting up of scrappage infrastructure.

Though the current scrappage policies or old vehicle phase out policies have not made any explicit links with electrification, several state EV policies have started to establish this link. A more cohesive approach of linking existing fleet renewal policies with electrification is needed at the state level. In any case, all state governments are expected to develop their respective scrappage policies for end-of-life vehicles and therefore this is an opportunity for linking targeted fleet renewal with electric vehicles and providing scrappage incentives.

Out of the 21 states with EV policies, nine have linked scrappage incentives with electrification. Chandigarh has provided for scrappage incentives in the range of Rs 5,000 to Rs 15,000 with bigger amounts for goods vehicles.

Delhi's scrappage incentive is up to Rs 5,000, given in the form of reimbursement. Auto permits are linked to deregistered ICE vehicles. Goa has provided for scrappage incentives that vary between Rs 5,000 for E2Ws to Rs 10,000 for E3Ws and E4Ws. Madhya Pradesh has provided for monetary aid for scrapping diesel buses and replacing them with e-buses. Maharashtra's scrappage incentive is permitted on reimbursement basis. Maharashtra has also asked for assured buyback and warranty incentives and 6 per cent of total vehicle cost capped at Rs 10,000. There is also a battery warranty of 4 per cent of vehicle cost capped at Rs 6,000. Odisha also provides scrappage incentives for goods vehicles.

This approach requires a lot more mainstreaming across all states as they are required to come up with scrappage policy and it should not be a missed opportunity.

Permit exemption: Out of the 21 states reviewed, seven have provided for incentives that allow permit exemption for e-vehicles. Bihar, Chandigarh, Delhi and Punjab have termed this as green plate registration. Madhya Pradesh has limited permit exemption for 1,500 buses. Meghalaya has provided for priority registration and preference to be accorded to e-vehicles if odd and even scheme is implemented. Tamil Nadu has waived off permit requirements.

This strategy can help to lower the cost for commercial and public transport vehicles that require permits to operate in cities.

Toll exemption: Only three states—Bihar, Haryana and Kerala—have provided for exemption from toll charges. This is not a common strategy among other states. This is an important strategy for public transport buses and para transit as toll taxes add to their cost burden and increase fare cost for the commuters using public transport.

Disincentives for IC engines: Global experience shows that while incentivizing EVs is necessary, it is equally important to disincentivize ICE vehicles. This requires active policy instruments. Out of 21 states, only three—Andhra Pradesh, Delhi and Meghalaya—have mentioned disincentives for ICE vehicles. Andhra Pradesh has provided for higher parking fees, taxes and congestion charges on polluting vehicles. Delhi has provided for higher registration fee on petrol and diesel vehicles to cross subsidize EVs. Meghalaya has provided for EV Adoption Fund to be created from pollution cess on diesel and petrol vehicles, budgetary allocation and other sources.

This is a critical approach to not only disincentivize ICE vehicles but also to generate additional revenue to cross subsidize EVs. This approach needs to be mainstreamed across all states. It is also evident that even if these provisions are included in the state policies, actual implementation is put off. Delhi has one of the oldest notified policies but it has not yet implemented these provisions.

Table 6: Highlights of the fiscal incentives in state EV policies

A.

States	Purchase subsidy/incentives	Tax exemption	Interest subvention on loans and financing mechanism
Andhra Pradesh	-	Registration fee and road tax to be reimbursed until 2024 Reimbursement of SGST	
Assam	E2/3/4W: Rs 10,000 per kWh with ex-factory price caps. Max subsidy should not be more than 40% of ex-factory price	Exemption/reimbursement of registration fees and road tax	
Bihar	At Rs 10,000 per kWh: E2W: Up to Rs 20,000 for 24,000 units (Additional Rs 7,000 for units with Li-ion batteries) E3W: Up to Rs 50,000 for 70,000 units (Incentive for pedal rickshaw pullers to convert/upgrade) E4W: Up to Rs 1,50,000 for 4,000 units E-bus: Up to Rs 25,00,000 for 1,000 buses Top up subsidy for BPL families	100% exemption from road tax and registration fees 50% exemption from road tax and registration fees for strong hybrid vehicles	10% interest subvention for freight vehicles and e-buses 10% interest subvention for all EVs manufactured in Bihar 10% interest subvention for pedal rickshaw owners to convert/upgrade to E3W
Chandigarh	E2W: Fixed battery - Rs 5,000/kWh (max Rs 30,000) for first 10,000 units Swappable battery Rs 3,000/kWh (max Rs 15,000) E-autos: Fixed battery - Rs 5,000/kWh (max Rs 30,000) for first 1,000 units Swappable battery Rs 3,000/kWh (max Rs 15,000) Small goods vehicles (L5N): Fixed batteries Rs 5,000/kWh up to Rs 50,000 for first 1,000 units Goods vehicles (N1): Rs 5,000/kWh up to Rs 80,000 for first 1,000 units E4W (personal): Rs 5,000/kWh for first 2,000 units (including hybrid and CNG) E4W (commercial): Rs 10,000/kWh up to Rs 2,00,000 for first 1,000 units (includes hybrids) Early bird incentive of additional Rs 3,500/kWh up to Rs 20,000	Road tax and registration fees waived off	

States	Purchase subsidy/incentives	Tax exemption	Interest subvention on loans and financing mechanism
Delhi	E2W with advanced batteries – Rs 5,000/kWh up to Rs 30,000 per vehicle E-autos/E-rickshaws/E-carts: Fixed purchase incentive of Rs 30,000 per vehicle Buses: Appropriate incentives Goods vehicles: Purchase incentives of Rs 30,000 to first 10,000 e-goods carriers E-cars: Purchase incentive of Rs 10,000 per kWh of battery capacity or max of Rs 1,50,000 per vehicle for first 1,000 cars. Vehicles with swappable battery (sold without battery): 50% of purchase incentive to owners and 50% to energy operators	Road tax waived on all e-vehicles	E-autos: Interest subvention of 5% on loans or hire purchase scheme for purchase Goods carrier: Interest subvention of 5% on loans and hire purchase
Goa	Incentives to be given to different segments according to eligibility criteria. E2W (3,000 units): Rs 10,000/kWh state subsidy capped at Rs 30,000 E3W (50 units): Rs 10,000/kWh capped at Rs 30,000 E-Rickshaw and e-carts: Rs 30,000 per vehicle Goods vehicles: Purchase incentive of Rs 30,000 per vehicle E4W: Rs 10,000/kWh capped at Rs 1,50,000 Subsidy amount being lowered over the period of 5 years E-buses: Appropriate incentives	Waiver of road tax and registration fee	Interest subvention on loans and/or hire purchase schemes of e-auto, e-rickshaw and e-carts from CESL 5% interest subvention on loans and/or hire purchase schemes of e-goods carrier from CESL
Gujarat	E2/3/4W: Rs 10,000 per kWh with ex-factory price caps		
Haryana	30% subsidy of road price of EV to be reimbursed to the buyer Dealers of REV exempted from submitting bank guarantee of Rs 1 lakh Extra incentives for purchase within 6 months of the policy notification: E-cars – Rs 75,000–1,00,000 depending on price. LMVs – Rs 50,000 E-rickshaws/e-carts – Rs 25,000 100% interest free loan for government employees. SGST exempted.	100% exemption from road tax Minimum registration token of Rs 100	100% interest free loans for state government employees
Karnataka		100% exemption from road tax	
Kerala	Incentives of Rs 30,000 or 25% of EV, whichever is lower, for 3 years	State tax breaks, road tax exemptions	

States	Purchase subsidy/incentives	Tax exemption	Interest subvention on loans and financing mechanism
Madhya Pradesh		Two-wheelers: First 15,000 E2Ws will be charged 1% motor vehicle tax. Registration fee exempted for all E2W vehicles Shared e-rickshaws and e-autos: First 5,000 vehicles to be charged 1% motor vehicle tax Registration fee exempted for 7,500 units Permit requirements for first 5,000 units to be waived off E-goods vehicles – 1% motor vehicle tax for first 2,000 units E-cars: First 6,000 e-cars to be charged 1% motor vehicle tax. Vehicle registration fees to be exempted for first 9,000 cars. Buses: First 1,500 e-buses to be charged 1% motor vehicle tax. Vehicle registration fees to be exempted for 2,250 e-buses.	
Maharashtra	E2W: Rs 5,000/kWh (max Rs 10,000 per vehicle) for 1,00,000 vehicles E3W (passenger): Rs 5,000/kWh (max Rs 30,000 per vehicle) for 15,000 vehicles E3W (goods): Rs 5,000/kWh (max Rs 30,000 per vehicle) for 10,000 vehicles E4W: Rs 5,000/kWh (max Rs 1,50,000 per vehicle) for 10,000 vehicles E4W (goods): Rs 5,000/kWh (max Rs 1,00,000 per vehicle) for 10,000 vehicles E-buses: 10% of vehicle cost – (Max Rs 20,00,000) for 1,000 buses. Early bird discount up to 31 December 2021 – Rs 5,000 per kWh of the vehicle battery capacity	All e-vehicles to be exempted from registration fees	Financial institutions and banks shall be encouraged to offer preferential interest rates
Meghalaya	E-buses: Purchase subsidy of Rs 4,000 per kWh for first 30 buses (max ex-factory price Rs 2 crore) E2W: Purchase subsidy of Rs 10,000 per kWh for first 3,500 units (max ex-factory price of Rs 1,50,000 per vehicle) E3W: Purchase subsidy of Rs 4,000 per kWh for the first 200 vehicles (max ex-factory price of Rs 5 lakh) E4W: Purchase subsidy of Rs 4,000 per kWh for the first 2,500 units (max ex-factory price of Rs 15 lakh)	100% exemption of road tax and registration fee	

States	Purchase subsidy/incentives	Tax exemption	Interest subvention on loans and financing mechanism
Odisha	2-wheelers: 15% subsidy or max subsidy amount of Rs 5,000 3-wheelers: 15% subsidy or max subsidy amount of Rs 12,000 4-wheelers: 15% subsidy or max subsidy amount of Rs 1,00,000 Buses: 10% subsidy or max limit of Rs 20 lakh per vehicle Goods vehicles: Purchase incentive of Rs 30,000 to first 5,000 electric goods vehicles	Buses: 100% exemption on road tax & registration fees for first four years 100% SGST to be reimbursed Goods vehicles: 100% SGST to be reimbursed 100% exemption on road tax & registration fees for policy period	100% interest free loan for state government employees Interest subvention for public Buses: Interest subvention of 5% loan for purchase of buses Goods vehicles: Interest subvention of 5% on loans for purchase Finance Department to frame financing mechanism
Punjab		100% waiver on motor vehicle tax on all vehicle categories	
Rajasthan	E2W: Rs 5,000 for less than 2kWh; Rs 7,000 for less than 4kWh; Rs 9,000 for less than 5kWh; Rs 10,000 for more than 5kWh E3W: Rs 10,000 for less than 3kWh; Rs 15,000 for less than 4kWh; Rs 17,000 for less than 5kWh; Rs 20,000 for more than 5kWh;	SGST reimbursement for all vehicles sold in the state	
Tamil Nadu	STUs to get subsidy for purchase of e-buses	E2W: 100% road tax exemption till December 2022 Waiver on registration charges E3W: Permit to be waived off, road tax and registration fee exemption Taxi, tourist vehicles: Permit fees waived off; 100% road tax exemption Goods vehicles: No permit requirement; 100% road tax exemption, waiver of registration fees Private cars: Registration fees waived off; 100% road tax exemption	

States	Purchase subsidy/incentives	Tax exemption	Interest subvention on loans and financing mechanism
Telangana		E-buses: 100% exemption of road tax and registration fees for first 500 e-buses. E2W: 100% exemption of road tax and registration fees for first 2,00,000 E2Ws. E3W: 100% exemption of road tax and registration fees for first 20,000 E3Ws. E4W (commercial): 100% exemption of road tax and registration fees for first 5,000 units. E-cars (private): 100% exemption of road tax and registration fees for first 5,000 units. E-tractors: 100% exemption of road tax and registration fees.	3W: Hire purchase at discounted interest rate to be encouraged.
Uttar Pradesh		First 1,00,000 buyers of private EVs manufactured within the state – 100% exemption from registration fees; 100% exemption from road tax for E2Ws and 75% exemption for other categories.	
Uttarakhand	E2W: Rs 7,500 or 10% of the vehicle price for the first 5,000 vehicles, whichever is lower E4W: Rs 50,000 or 5% of the vehicle price for the first 1,000 vehicles, whichever is lower	100% waiver of registration tax	
West Bengal	E2W: Rs 10,000 per kWh with a cap on Rs 20,000 E4W: Rs 10,000 per kWh with a cap on Rs 150,000	-	-

Table 6: Highlight of the fiscal incentives in state EV policies

B.

States	Toll exemption	Parking subsidy	Scrappage and retrofitment support	Permit exemption	Disincentive for IC engines and creation of EV fund
Andhra Pradesh				Priority permits to electric autos	Higher parking fees, taxes and congestion charges on polluting vehicles

States	Toll exemption	Parking subsidy	Scrappage and retrofitment support	Permit exemption	Disincentive for IC engines and creation of EV fund
Assam		Parking fees waived off	Retrofitment incentive at 15% up to Rs 15,000 for 3-seater autos		
Bihar	Exemption from toll charges	Exemption from parking charges		Green plate registration	
Chandigarh			E2W: Scrappage incentive - Rs 5,000 E-auto: Scrappage incentive - Rs 7,500 Goods vehicles: Retrofitment - 15% of costs Scrappage incentive - Rs 15,000 E-cars: Retrofitment – 15% of costs Scrappage incentive - Rs 7,000	Green number plate	
Delhi			Scrappage incentive up to Rs 5.000 to be reimbursed Auto permits linked to deregistered ICE vehicle	Green number plate	Pollution cess, additional road tax, and congestion fee waived for E2W, e-auto and e-cab
Goa			Eligible for scrappage incentives: 2W - Rs 5000; 3W - Rs 10,000	Green number plate E-rickshaw permit linked to de-registered ICE exchange for no cost	
Gujarat					
Haryana	Exemption from state toll tax				Higher registration fee, registration renewal, parking fee, congestion charges, taxes/ cess on sale and limitation of entry into city limits
Karnataka				Flexible stage carrier permit policy for e-buses (to cater outside BMTC area)	

States	Toll exemption	Parking subsidy	Scrappage and retrofitment support	Permit exemption	Disincentive for IC engines and creation of EV fund
Kerala	Exemption from toll charges	No parking charges	-	Free permits to fleet drivers	Creation of e-mobility zones
Madhya Pradesh		100% waiver on parking fees on all vehicles (rebate in case of autos).	Monetary aid for scrapping diesel buses and replacing with e-buses.	Permit requirements to be exempted for 1,500 buses.	Higher registration, renewal, parking fees, congestion charges, taxes/ cess on sale and limitation of entry into city limits
Maharashtra		Lane and parking preferences for EVs in the state 25% of dedicated off-road parking to be EV ready by 2023.	Scrappage incentive permitted on reimbursement basis: E2W: Up to Rs 7,000 E3W: Up to Rs 15,000 E4W: Up to Rs 25,000 Assured buyback and warranty incentives: 6% of total vehicle cost capped at Rs 10,000 Battery warranty: 4% of vehicle cost capped at Rs 6,000	No permits for e-autos Green number plates for all EVs registered	
Meghalaya		Preferential parking locations for EVs		Priority registration Preference if odd and even scheme implemented	Parking surcharges, pollution cess on ICE vehicles
Odisha		Subsidized parking based on city parking plan Goods vehicles: Unrestricted plying and parking	Goods vehicles: Scrappage incentive for old IC engines		

States	Toll exemption	Parking subsidy	Scrappage and retrofitment support	Permit exemption	Disincentive for IC engines and creation of EV fund
Punjab	Waived off on select state highways	Designated on-street parking with "pole-charging" facility	Department of Transport shall notify a scrapping policy	Permit fee exemptions for e-autos, e-rickshaws, e-goods carriers (3W) and e-buses Green number plates Green zones	
Rajasthan					
Tamil Nadu		10% of parking spaces in commercial buildings for EVs		Permits waived off for e-autos and e-taxis	
Telangana			3W: Retrofitment incentive at 15% of cost capped at Rs 15,000.		
Uttar Pradesh					
Uttarakhand				Waiver of permit fee for stage carriage commercial fleets Priority permit issuance for e-buses	
West Bengal		EV ready parking locations			

Source: Compiled from state electric vehicle policies

Incentives for e-retrofitment of old vehicles: Two states, Assam and Chandigarh, have provided for incentives for retrofitment of on-road vehicles to convert to battery operated vehicles. Assam gives an incentive of 15 per cent or up to Rs 15,000 for 3-seater autos. Chandigarh provides 15 per cent of the cost. Goa has incentivized retrofitment strategy. Delhi government is also encouraging retrofitment (see *Table 7: Retrofitment strategy*).

However, such incentives have been offered without adopting any guidance framework for retrofitment. While technically retrofitment of all categories of vehicles is possible, it is the small vehicles segment—2-3 wheelers—that are being prioritized. Any such option requires mandate on retrofitment based on the testing and certification system to be issued by the Automotive Research Association of

India (ARAI) as per the AIS specifications. Only those models should be allowed to be retrofitted that have been certified by ARAI to ensure safety and quality retrofitment. There is an additional concern that the option of retrofitment will flood the market with lead acid batteries that have other environmental consequences.

Table 7: Retrofitment strategy

States	Funding strategy
Andhra Pradesh	Retrofitment of 2/3/4-wheelers with electric motor and power train using advanced battery technologies and certified by ARAI and other govt recognized agencies
Assam	Retrofitment incentive at 15% up to Rs 15,000 for 3-seater auto rickshaws Subsidy policy
Chandigarh	Retrofitment incentive at 15% of cost up to Rs 15,000 for limited number of units
Delhi	-
Goa	Retrofitment allowed
Gujarat	-
Haryana	Converting e-autos can be made revenue neutral if EV battery is addressed as a separate component from base electric vehicle
Karnataka	Existing autos to be encouraged to convert to EVs
Kerala	-
Madhya Pradesh	Retrofitment of existing autos allowed
Maharashtra	-
Meghalaya	-
Odisha	-
Punjab	-
Rajasthan	-
Tamil Nadu	-
Telangana	Retrofitment incentive at 15% of retrofitment costs or up to Rs 15,000 for first 5,000 retrofit
Uttar Pradesh	100% exemption from registration fees 75% waiver on road tax
Uttarakhand	-
West Bengal	-

Source: Compiled from state electric vehicle policies

Charging infrastructure

Given the fact that charging infrastructure is the most critical part of the EV ecosystem, EV policies have a special focus on incentivizing and supporting charging infrastructure.

Broadly, policies have defined charging requirements and battery models which can be used, and have given incentives for charging and support for electricity. To this is added the criteria for setting up networks of charging points and responsibility of agencies to provide charging facilities. Yet again, here is wide variation in approaches (see *Table 8: Incentives for charging infrastructure*).

Table 8: Incentives for charging infrastructure

States	Charging requirements	Incentive for charging	Electricity
Andhra Pradesh	DISCOMS to set up chargers on PPP model. Network of locations and buildings to be planned. Charger every 50 km on highways. All new permits for buildings with more than 5,000 sqm to be mandated to have charging stations. Apply building codes.	Incentive for private charging: DC chargers (100V and above): Capital subsidy of 25% of value of equipment for first 100 stations – max Rs 10,00,000 DC chargers (below 100V): Capital subsidy of 25% of value of equipment for first 300 stations – max Rs 30,000 Capital subsidy of 25% of fixed capital cost – max Rs 10 lakh for swapping stations. 100% net SGST as reimbursement for purchase of advanced batteries for swapping	Energy sale: Separate EV tariff to be notified. Time-of-day sale to provide cheaper power. Third party to procure power at regulated rates and open access routes. Parties can set up RE systems.
Assam	Promote variety of business models—Privately owned, DISCOM owned and investor owned—to setup stations	Charging stations eligible for 25% capital subsidy with max limit of Rs 10 lakh for first 500 commercial units.	Exempt 90% of electricity duty of EV charging stations while 10% electricity duty to be paid by the provider during the policy period. Tariff to align with tariff order of utilities.
Bihar	Normal/fast charging/ swapping stations every 25 km on highways and every 3 km in cities	25% capital subsidy on equipment – max Rs 5 lakh per station for first 500 units.	Industrial rate of electricity
Chandigarh	Charging stations mandatory in all petrol pumps; Identify parking areas	Private charging: Grant on purchase and installation – Rs 6,000 for first 30,000 units. Public charging: Reimbursement of GST up to Rs 50,000 – only for first 50 fast chargers/swapping units (not applicable to chargers getting central subsidy) Max Rs 5,00,000 as upfront cost for first 50 fast charging/ swapping units	Special electricity tariff to be notified. Current energy charges are Rs 3.60/kWh Public charging: 100% electricity duty exemption

States	Charging requirements	Incentive for charging	Electricity
Delhi	Network of concessional locations to be identified Charging stations within 3 km from anywhere	Private charging: Grant of 100% for the purchase of charging equipment up to Rs 6,000 per charging point for the first 30,000 units. Public charging: Capital subsidy for charger installation. No operational subsidy to be provided. 100% of the net SGST to be reimbursed to energy operator for purchase of advanced batteries for swapping stations.	Electricity tariff to be notified. Maintain special lower tariff. RE and power banking facilities with the DISCOMS
Goa	Charging stations every 25 km on highways and 3 km within city. All buildings to be EV ready with 20% of the parking spaces with charging. To provide concessional locations for public charging.	Capital subsidy up to Rs 8,00,000 for installation of chargers. Recommended to waive off fixed demand charges during the policy period. For solar powered chargers – 20% capital subsidy.	Electricity at lower power tariff.
Gujarat	Charging standards and guidelines as defined.	Public charging: 25% capital subsidy on equipment – up to Rs 10 lakh per station for the first 250 units.	Public charging: Exempt 100% electricity duty Tariff to be notified.
Haryana	Fast charging/ Swapping stations every 50 km on highways State to facilitate availability of land Encourage RE for charging	Not defined	Electricity at commercially viable rates
Karnataka	Identify charging locations SPV for creating charging infrastructure Adopt amended building byelaws	Investment subsidy for first 100 fast charging stations	Special tariff at concessional rates Allow resale of power

States	Charging requirements	Incentive for charging	Electricity
Kerala	Relevant national regulations and standards. Charging station grid of 3kmx3km and every 25 km on highways. First phase – key cities of Thiruvananthapuram and Kozhikode	Capital subsidy of 25% of value of equipment – up to max subsidy of Rs 10,00,000 for first 100 DC chargers above 100V, and up to max Rs 30,000 for first 300 DC chargers below 100V Capital subsidy of 25% of fixed capital investment up to max subsidy of Rs 10 lakh for first 50 swapping stations.	Electricity rates during off peak hours (22:00 to 06:00 hours) and peak hours to be 75% and 150% respectively of normal rates.
Madhya Pradesh	Infrastructure as per notified guidelines and standards of Ministry of Power and international standards.	Up to 25% capital subsidy on: First 300 small charging stations capped at Rs 1,50,000 First 100 medium charging stations capped at Rs 2,00,000 First 100 large charging stations capped at Rs 10,00,000	Tariff charged by DISCOM shall be determined by electricity commission Domestic tariff applicable for domestic consumption. Upper ceiling of service charges shall be fixed for public charging stations
Maharashtra	Operational guidelines and eligibility criteria Cities to have charging infrastructure plan	Slow charging: 60% of the cost – Max incentive of Rs 10,000 – up to 1,500 chargers Fast charging: 50% of the cost – Max Rs 5,00,000 – Up to 500 chargers ULB to provide property tax rebate to residential owners	Electricity tariff as per order of 30.3.2020 of Maharashtra Regulatory Commission.
Meghalaya	Charging stations in key locations; priority electricity connection	Government land free of cost	Attractive electricity tariff and fixed demand charges
Odisha	Private charging: Residential and non-residential buildings mandated to have charging systems. Building byelaws to be EV friendly. Public charging: Network of locations. Highway refuelling	Private charging: Grant for purchase of equipment – Rs 5,000 for first 20,000 units Public charging: Capital subsidy of 25%. Special subsidy allowed for first 500 charging stations. 100% SGST reimbursement for purchase of batteries used in swapping	Electricity tariff to be notified. Special tariff for EV charging

States	Charging requirements	Incentive for charging	Electricity
Punjab	Network of concessional locations. Enhanced usage right on the charging stations to raise revenue and make charging stations viable. Amendments in Model Building Byelaws adopted for the state.	Public charging: 25% capital subsidy for first 1,000 charging points—up to Rs 50,000 per charging point. If charging equipment manufactured in Punjab, then max capital subsidy to be 50%—up to Rs 1 lakh per charging point. Private charging: No direct incentives for private chargers. Concessional land locations to be identified	EV charging stations a special category under single tariff rates of Rs 6.00 per kVAh (for non-residential supply) 100% electricity duty exemption Time-of-day tariff in off-peak hours
Rajasthan	-	-	-
Tamil Nadu	3x3 grid for charging network in selected cities. One charging station every 25 km on highways. Commercial buildings to have charging stations. Buildings to be EV ready Link with RE generation	State will invest in setting up of charging stations Schemes with appropriate capital subsidy for pubic charging stations.	Domestic service connection for slow charging and at domestic tariff. Public charging: Fix tariff at not more than 15% of the average cost of supply. Supply of RE to EV charging stations at zero connection cost.
Telangana	Government to facilitate initial batch of fast charging stations in Hyderabad. Charging station every 50 km on highways to Tier I cities. Parking, especially bus parking, to be EV ready. Government to develop night time community parking.	Not defined.	Special power tariff category
Uttar Pradesh	Setup 2 lakh slow and fast charging stations and swapping stations by 2024	Charging Infrastructure: Capital subsidy of 25% on fixed capital investment (excluding land cost) to first 100 charging stations – up to max Rs 6 lakh per charging station. Hydrogen refuelling: 50% capital interest subsidy on fixed capital (excluding land cost) for hydrogen generation unit – in the form of reimbursement of first 10 units – up to max of Rs 50 lakh per unit.	UPERC to introduce Special Power Tariff Policy to facilitate low-cost EV charging

States	Charging requirements	Incentive for charging	Electricity
Uttarakhand	-	Special focus on developing green highways in Dehradun, Haridwar, Rishikesh, Haldwani, Rudrapur and Kashipur. State will incentivize development of EV charging infrastructure.	-
West Bengal	DISCOMS to be encouraged to set up public charging stations. Buildings to be EV ready as per the amended building byelaws. Smart energy management. Battery swapping stations. Ward-wise zonal plan for implementation of charging network (Criteria for network - at least one station in every 3x3 grid; and one every 10 km on highways, with adequate plan for slow and fast chargers and other technical parameters)	Concessional locations for charging stations	Tariff for EV charging: Rs 6 kWh (per unit) single tariff. Revenue earned from public charging stations can be passed off as benefit to the consumers in the form of lower tariff. Energy sale: Promotional single tariff not exceeding Rs 6/kVAh for two years for high tension and low-tension station points. Cloud charging features.

Source: Compiled from state electric vehicle policies

Provisions on setting up of charging infrastructure: Most state policies have adopted design criteria for a targeted density of charging points in cities and on highways for adequate coverage. These are generic benchmarks and not based on city specific technical assessment or urban planning attributes. Goa, Delhi, Kerala and Tamil Nadu have adopted the criteria of providing charging on a grid scale of 3x3 km inside the city. Some of them want charging stations every 25 km on highways. Chandigarh wants charging points in all petrol pumps.

Most of the states have asked for buildings to be EV-ready and this requires amendment in building byelaws to enable that process. Andhra Pradesh for instance has asked for charging stations in all buildings with more than 5,000 sqm area. Several states have provided for concessional locations for setting up of charging stations. State policies largely expect DISCOMS to implement charging infrastructure. Several of them have made specific mention of that. But, overall,

there is support for both public charging as well as private charging stations in several polices.

While established protocol and standards for charging stations that have been issued at the national level apply to all and are mandatory, only a few states like Goa have specifically mentioned the requirement.

During the implementation stage, more detailing will be needed to plan the deployment of chargers, deciding the ratio between slow and fast charging, deciding adequate number of charging guns, planning urban layout of the charging stations to manage halting and charging places, and planning queue areas and entry and exit points to prevent choke points. This will also require proper planning for building level interventions.

Incentives for charging infrastructure: A wide array of incentive programmes have been adopted for charging infrastructure. Broadly, incentive structures include capital subsidy, concessional land, grant on purchase and installation, tax rebate, investment subsidy, delicensing of public charging activity, property tax rebate to residential owners, special subsidy for fixed number of chargers and higher capital subsidy if the charging equipment is manufactured locally within the state. In some cases, the minimum number of fast and slow chargers has also been specified.

Capital subsidy for charging infrastructure: One common strategy is to provide 25 per cent capital subsidy or a maximum amount for the first fixed number of stations. Some states have given break up of DC chargers and capacity. For instance, Andhra Pradesh's policy aims to provide capital subsidy of 25 per cent of value of equipment for first 100 stations or max Rs 10,00,000. Also, capital subsidy of 25 per cent of value of equipment for first 300 stations or max Rs 30,000. It will also provide capital subsidy of 25 per cent of fixed capital cost – or maximum Rs 10 lakh for swapping stations.

Assam, Bihar, Gujarat, Kerala, Uttar Pradesh, Karnataka, Tamil Nadu and Odisha have similar approaches toward providing capital subsidy but target numbers of stations vary across states.

Maharashtra has specified different incentive structures for slow and fast chargers. For slow charging, it will provide 60 per cent of the cost or maximum incentive of Rs 10,000 for up to 1,500 chargers. For fast charging, 50 per cent of the cost or maximum Rs 5,00,000 for up to 500 chargers.

Some states are providing support separately for private and public charging. Chandigarh, Delhi and Odisha are providing grant on purchase and installation for specified units for private charging. Capital subsidy is also being provided separately for public charging. In Tamil Nadu, the government will invest in setting up public charging stations.

There is also a strategy to provide higher support to encourage local production and manufacturing of charging equipment. Punjab. therefore, in addition to providing capital subsidy for public charging for specified charging points, is also offering higher capital subsidy of up to 50 per cent or maximum of Rs 1 lakh for charging points if the equipment is manufactured within the state.

Tax rebate for charging installation: States have also provided tax rebates for public charging and battery swapping. Chandigarh proposes to reimburse GST up to Rs 50,000 for first 50 fast chargers/swapping units. But this is not applicable to chargers getting central subsidy.

Delhi policy has assured 100 per cent of the net SGST to be reimbursed to energy operators to purchase advanced batteries for swapping stations. Delhi and Chandigarh have provided incentives for swappable batteries and vehicles without batteries for first 1,000 units. Odisha has allowed 100 per cent SGST reimbursement. Goa is waiving off fixed demand charges for the policy period.

Other supportive strategies: Maharashtra has an additional strategy in which ULBs are to provide property tax rebate to residential owners for providing charging facilities. Madhya Pradesh treats public charging as a delicensed activity.

Some states including Haryana, Tamil Nadu and Goa have linked renewable energy with charging. Goa provides 20 per cent capital subsidy to promote solar powered chargers.

Karnataka has further looked at institutional mechanisms for coordinating provision of charging by proposing a charging SPV. Punjab policy has mentioned enhanced usage right on the charging stations to raise revenue and make charging stations viable. Telangana and Delhi are explicit about charging provisions in parking areas. West Bengal policy has mentioned smart energy management and battery swapping stations.

Supporting access to electricity for EVs: Nearly 17 states have made provisions to make electricity available at concessional tariff. To support quicker uptake of

EVs, state policies have provided for special tariffs for electricity, its regulation, promotion of renewable energy, exemption from electricity duty and revenue model to subsidize cost to the consumer.

Andhra Pradesh has proposed to notify separate EV tariff and time-of-day sale to provide cheaper power. Assam has exempted 90 per cent of electricity duty of EV charging stations and 10 per cent electricity duty to be paid by the provider during the policy period. Chandigarh has provided for notification of special electricity tariff. Delhi is notifying electricity tariff and maintaining special lower tariff. Goa, Meghalaya, Maharashtra, Odisha, Karnataka, Punjab and Tamil Nadu have provided special tariffs. Bihar has proposed to charge industrial rates for electricity. Haryana only mentions electricity at commercially viable rates.

Kerala's policy has provided for variable electricity pricing—electricity rates will vary according to off peak hours (22:00 to 06:00 hours) and peak hours and this will be 75 per cent and 150 per cent of normal energy prices respectively. Punjab has also proposed time-of-day tariff in off-peak hours and a special category of single tariff rates for charging stations for non-residential use. West Bengal has proposed single tariff rates and also promotional tariff for two years. Tamil Nadu has proposed domestic service connection for slow charging to be at domestic tariff rates and public charging at tariff rates not more than 15 per cent of the average cost of supply. Karnataka has allowed resale of power and Andhra Pradesh has allowed third parties to procure power at regulated rates and open access routes.

On the other hand, Chandigarh has provided for electricity duty exemption for public charging. Gujarat's and Punjab's policy mentions 100 per cent exemption from electricity duty.

This is an important strategy to reduce operational costs. Studies have already shown that operational costs of EVs are expected to be lower than that of ICE vehicles. Additional incentives can add to the pull factor and reduce total cost of ownership.

Measures to promote clean electricity: State EV policies have also adopted additional measures to promote clean electricity for EV applications. Delhi's policy has proposed renewable energy (RE) and power banking facilities with DISCOMS. Andhra Pradesh has stated that parties will be encouraged to set up RE systems to support charging. Tamil Nadu's policy has recommended supply of RE to EV charging stations at zero connection cost.

It is now well understood that life cycle emissions benefits from the EV fleet can be maximized if electricity is sourced from RE and not coal power. There is enormous potential and opportunity for linking EV charging with decentralized RE generation in cities, including from rooftop solar. States need to optimize this strategy.

Technical specifications for charging infrastructure: At the national level, multiple standards and guidelines exist on charging infrastructure. Standardization authorities such as BIS (Bureau of Indian Standards) and AISC (Automotive Industry Standards Committee) have come out with standards/regulations for AC and DC charging equipment. Ministry of Power and Department of Heavy Industry (nodal ministry for FAME and PLI) have also come out with guidelines for installation of chargers and technical specifications for chargers.

Factoring in technical specifications of chargers and their equipment would help to ensure safety and efficient functioning of the ecosystem.

Twelve states have incorporated charger specifications in their respective policies. While Delhi and Goa have directly incorporated BEVC-AC001 specification, other states have followed Ministry of Power's guidelines. But there are also states like Bihar, Kerala, Rajasthan, Telangana, Uttarakhand and Uttar Pradesh that have not incorporated this explicitly.

Policy for industrial promotion of EV manufacturing

This rapid review of state EV policies has shown that nearly 15 states have taken the EV programme as an opportunity to build local manufacturing as part of their industrial policy and to retain part of the value chain within the states to generate jobs and ensure economic spin off. The role of state policies to build EV industry will be critical within the overall framework of Make in India and the efforts of the central government to implement PLI for the automobile and battery manufacturing industries.

Broadly, there are two strategies—to develop EV manufacturing as part of the industrial plan of the state and to incentivize manufacturers to set up industries in the state.

Industrial plan for EV manufacturing: A large number of states have stated their intention to promote and build EV manufacturing in their respective states.

Andhra Pradesh has provided more details regarding their industry plan. It has planned stratified support according to the size of the e-industry. It aims for large

projects with capital investment of up to Rs 200 crore creating jobs for over a 1,000 people; mega projects with capital investments over Rs 200 crore creating jobs for over 2,000 people; mega integrated automobile projects (including power train assembly, assembly line, EV battery assembly, press shop and body shop) as joint ventures or consortiums with investments over and above Rs 1,000 crore that will bring ancillary units of minimum Rs 200 crore investments within 3 years; and ultra-mega battery plants with annual output of 1 GWh or above with minimum Rs 1,000 crore investment.

Similarly, Tamil Nadu has also adopted an industrial policy for EV manufacturing. Incentives will be available for investment of above Rs 50 crore with the potential to create 50 direct jobs. Telangana aims to develop EV policy as electronic policy to set up electronics manufacturing clusters and industrial parks. It will promote reuse of batteries and urban mining of rare materials.

Punjab will develop EV manufacturing to create employment with labour flexibility. It aims for EV industrial parks and giga battery manufacturing units, along with e-tractor manufacturing units and skilling initiatives. Maharashtra plans to leverage central PLI schemes—at least one giga factory for manufacturing of advanced chemistry cells—and encourage EV start-ups.

Among others, Bihar aims for an EV manufacturing cluster in the state. Chandigarh targets to promote EV start-ups. Goa has provided for single window clearance for all investments, incentive approvals and payment. Gujarat has taken on board all provisions of Gujarat Industrial Policy 2020 to make them applicable to EV industry. Haryana aims to set up electric vehicle parks and incubation centres, along with providing infrastructure support in terms of land, power and water. Karnataka's policy has mentioned special packages of incentives, concession for ultra-mega and super mega projects, incentives for EV charging and battery manufacturing and assembly, and support and stipend for skill development. Kerala's policy will support EV manufacturing with priority allotment of land to set up EV clusters. Meghalaya will set up EV industrial estates, export promotion parks and technology parks.

Odisha in its policy on developing sustainable EV manufacturing industry states that all incentives under IPR 2015 and MSME Policy, 2016 will be extended to the EV industry. Small and micro EV battery manufacturing units will be facilitated as part of MSME Policy, 2016. MOU will be signed with lithium-ion manufacturers and the state will create dedicated areas/zones.

Capital subsidy for the industry: Assam offers capital subsidies over and above the 30 per cent capital subsidy available under the North East Industrial Development Scheme (NEIDS), 2017. Tamil Nadu provides higher capital subsidies for land located in its southern districts, and Gujarat uses district-wise bands to decide on capital subsidies. Andhra Pradesh and Madhya Pradesh offer additional capital subsidies to companies using cleaner production measures, as certified by the state pollution control boards, in their manufacturing processes.

Karnataka's policy offers 15 per cent capital subsidy to investors on value of fixed assets over five equal annual payments. The amount of land covered under the policy has a cap of 50 acres. A second incentive provides production linked subsidy of 1 per cent on turnover, which will be provided for a period of five years starting from the first year of commercial operations for large, mega, ultra, super-mega EV assembly and manufacturing units.

Further, Andhra Pradesh, Assam, Goa, Haryana, Gujarat, Karnataka, Madhya Pradesh, Odisha, Telangana and Tamil Nadu offer capital subsidies across the EV supply chain. The subsidies offered by the states range between 15 and 25 per cent of total investment or fixed asset value. Tamil Nadu offers preferential capital subsidy rates for investments made in battery manufacturing and additional capital subsidies for components and charging infrastructure manufacturers. The total subsidy offered in some states has a cap, which depends on the scale of investment. Typically, the cap ranges from Rs 20 to 40 crore for large-scale projects.

While this incentive is available in most states, the actual design of the strategies varies across states. Andhra Pradesh has provided for capital subsidy according to the size of the investments. For example, capital subsidy of 25 per cent of fixed capital investments or up to Rs 15 lakh for micro industry; 20 per cent of fixed capital investment or up to Rs 40 lakh for small and Rs 50 lakh for medium enterprise; and 10 per cent of fixed capital investment or up to Rs 20 crore for first two units under mega category. For clean production measures—as certified by the state pollution control board—35 per cent subsidy on cost of plants for MSMEs is allowed. Moreover, 25 per cent subsidy for micro, small and medium plants and special incentives according to needs have been offered.

Assam also provides for capital investment subsidy and additional incentives according to micro, medium and large units with additional interest subsidy on working capital loans. Haryana and Karnataka have also provided capital subsidy of fixed capital cost for micro, medium and large units and special incentives to

mega plants. It has also proposed 25 per cent subsidy for green measures capped at Rs 50 crore for micro, small, medium and large projects.

Telangana has provided for subsidies and incentives as per the Electronics Policy, 2016. The 20 per cent capital investment is capped at Rs 30 crore for mega enterprises. Odisha's policy includes 25 per cent capital subsidy in plant and machinery with upper limit of Rs 1 crore; and those owned by SC/ST and women to get 30 per cent capital subsidy. Industrially backward districts will get 5 per cent capital subsidy in plant and machinery with upper limit of Rs 1–1.25 crore. Bihar will provide additional seed fund of Rs 10 lakh to first 50 start-ups and all incentives under Bihar Industrial Investment Promotion Policy, 2016 will apply.

Tax measures targeted at industry: Under the industrial policy linked to EVs, the industry is expected to get a range of tax and duty concessions.

Assam, Bihar, Karnataka, Tamil Nadu, Telangana and Uttar Pradesh offer financial support with interest subvention on term loans. These range between 3 and 6 per cent in Tamil Nadu, Telangana and Assam, and between 10 and 20 per cent in Bihar. Uttar Pradesh provides 50 to 60 per cent annual interest reimbursement toward loans for land acquisition and infrastructure development for EV parks, and 5 per cent annual reimbursement toward loans for individual projects. Karnataka offers interest-free loans toward repayment of net Goods and Services Tax (GST) on 60 to 95 per cent of fixed asset value.

Andhra Pradesh, Haryana, Telangana and Tamil Nadu have allowed exemption from stamp duty and reimbursement in some cases. In addition, Karnataka is waiving off requirements of registration fees. Haryana will reimburse 100 per cent SGST and road tax for five years. Odisha will also reimburse SGST. Karnataka has proposed interest free loan on net SGST to mega, large, ultra-mega and super mega enterprises and concessional registration charges.

In addition to all of these, states also offer concessions on taxes, tariffs and duty. Karnataka, Tamil Nadu, Telangana, Andhra Pradesh, Bihar, Haryana, Madhya Pradesh, Punjab and Uttar Pradesh offer exemption/reimbursement on land-related charges. Most states provide 100 per cent reimbursement on stamp duty and land conversion fees as well as SGST payments.

Punjab will provide special incentives under Punjab Industrial and Business Development Policy, 2017 that will include 100 per cent GST reimbursement for

15 years, employment subsidy (Rs 48,000 per employee per year) for 5 years, 100 per cent exemption from land development charges and 100 per cent exemption from electricity duty for 15 years.

Telangana will provide subsidies and incentives as per the Electronics Policy, 2016 that includes power tariff discount, 100 per cent electricity duty exemption, interest subvention for five years, transportation subsidy, and exemption from stamp, transfer duty/registration fees. Tamil Nadu will provide subsidized land, exemption from electricity tax till 2025, employment incentives in the form of reimbursement of employer's contribution to EPF for all new jobs till 2025 (capped at Rs 48,000 per employee) and special package for EV battery manufacturing—land at 20 per cent subsidy. Existing automobile manufacturing units to be provided reskilling allowance.

More granular assessment will bring out how these measures will cumulatively incentivize the industry.

Additional support for infrastructure to promote manufacturing: Fifteen states have prioritized incentivizing a manufacturing ecosystem. However, only eight of these have allocated special funding to support the supply side of the EV industry. The rest mention support systems available under their already existing industrial policies that are not specifically tuned to EV manufacturing. Electric vehicles offer new opportunities for the manufacturing sector and have to be treated differently.

In addition to capital subsidies, tax and duty concessions and making land available at concessional rates, state policies have also adopted other promotional approaches. Andhra Pradesh has made explicit provisions for infrastructure support at 50 per cent of the cost of infrastructure, fixed power cost reimbursement and electricity reimbursement for five years, along with skill development and marketing incentives. Chandigarh has extended infrastructure incentives for first 10 start-ups along with allowing patent fee reimbursement.

States have provided a range of infrastructure support that variably includes fixed power cost for five years, exemption from electricity duty, subsidized water rates for the industry and reimbursement of land conversion fee. Karnataka has also given subsidy for effluent treatment plant. Haryana, Karnataka, Kerala, Tamil Nadu and Madhya Pradesh have provided several of these incentives.

Most states offer 100 per cent reimbursement on the state duty on electricity tariff. Over and above duty exemptions, Telangana offers a 25 per cent discount on the

electricity tariff for five years, capped at Rs 5 crore; while Andhra Pradesh and Haryana offer discounts on the fixed cost component in electricity tariff ranging from Rs 1–3 per kWh, for up to five years. Andhra Pradesh and Haryana additionally offer 50 per cent discount on industrial water tariff for up to three years.

Kerala has provided a dedicated fund for financing technology acquisition to support R&D. Madhya Pradesh has also provided for an R&D grant. Tamil Nadu has offered a special package for EV battery manufacturing and to provide concessional land. Telangana while offering lease rental assistance has also provided for preferred market access with government procurement.

Madhya Pradesh, Haryana, Punjab, Maharashtra and Telangana offer the promise of customized incentive packages for large-scale battery manufacturing plants. To avail production linked incentives (PLI) for batteries, manufacturers are required to enter into a tripartite agreement with the state and central governments. Maharashtra also promises state support to bid for PLI benefits.

States/UTs such as Tamil Nadu, UP, Telangana and Chandigarh have made provisions to support start-ups in EV space as well. These state policies have mainly talked about funding for start-ups through either establishment of start-up funds or budgetary allocation.

Andhra Pradesh, Haryana, Madhya Pradesh, Punjab and Telangana offer prioritized land allocation for the development of EV parks with readymade infrastructure. This includes infrastructure benefits for individual projects such as reimbursement for the costs of water treatment plants and dedicated power feeder lines for battery testing with special tariffs during non-peak hours.

West Bengal, Karnataka, Madhya Pradesh, Uttar Pradesh and Kerala plan to set up quality test centres for EVs in coordination with National Automotive Testing and R&D Infrastructure (NATRiP).

There is interest in exploring pilot projects such as Clean Street Test-Bed, Zero-Emission Vehicle Zones, Wireless EV charging, Smart & Intelligent Clean Energy Management System and Pop-up chargers for cities to integrate renewable energy, electric vehicles, and storage through IoT and big data analytics for integrating electric mobility within transport planning and innovative e-mobility solutions in times of COVID.

Table 9: EV programme for industrial development

States	Industrial plan	Incentives for the industry
Andhra Pradesh	Industrial policy for large projects with capital investment up to Rs 200 crore creating jobs for over 1,000 people. Mega projects with capital investments over Rs 200 crore creating jobs for over 2,000 people. Mega integrated automobile projects (power train assembly, assembly line, EV battery assembly, press shop, body shop, etc) – joint venture or consortium, with investments over and above Rs 1,000 crore that will bring ancillary units of minimum Rs 200 crore investments within 3 years. Ultra-mega battery plant with annual output of 1 GWh or above with minimum Rs 1,000 crore investment.	Capital subsidy – 25% of fixed capital investments up to Rs 15 lakh for micro industry. 20% of fixed capital investment up to Rs 40 lakh for small and Rs 50 lakh for medium enterprises. 10% of fixed capital investment up to Rs 20 crore for first two units under mega category. For clean production measures—as certified by state pollution control board—35% subsidy on cost of plants for MSMEs. 25% subsidy for micro, small and medium plants Special incentives according to needs. 100% stamp duty and transfer duty to be reimbursed. External infrastructure (power supply, water supply, roads, etc.) at 50% of the cost of infrastructure. Land rate Fixed power cost reimbursement at Rs 1.00 per unit for 5 years. Electricity duty to be reimbursed. 100% SGST to be reimbursed. Skill development incentive – Rs 10,000 per employee per year Marketing incentive
Assam		30% capital investment subsidy Additional incentive – 20% of cost of plant and machinery capped at Rs 15 lakh for micro units, Rs 50 lakh for small units and Rs 1 crore for medium units. 10% of cost of plant and machinery capped at Rs 10 crore for large units. 3% interest subsidy on working capital loan
Bihar	Incentivize manufacturing and assembly of EV, EV components, cells, batteries EV manufacturing cluster to be created	Additional seed fund of Rs 10 lakh to first 50 start-ups. All incentives under Bihar Industrial Investment Promotion Policy 2016.
Chandigarh	Promote EV start ups	Infrastructure incentive – max Rs 18,000 per month for first 10 start-ups. Patent fee reimbursement
Delhi	-	-
Goa	Single window clearance for all investments Incentive approvals and payment	Support for skilling and reskilling – stipend up to 50% of the cost of course or limited of Rs 10,000 per year
Gujarat	All provisions of Gujarat Industrial Policy 2020 applicable	

States	Industrial plan	Incentives for the industry
Haryana	Electric vehicle park and incubation centre Provide infrastructure support – land, power and water	Capital subsidy of fixed capital cost: 25% of fixed capital cost or max Rs 15 lakh for micro units 20% of fixed capital cost or max Rs 40 lakh for medium units 10% of fixed capital cost or max Rs 10 crore for large units 10% of fixed capital cost or max Rs 20 crore to the first two large units Special incentives to mega plants 25% subsidy for green measures capped at Rs 50 crore – micro, small, medium and large projects 100% stamp duty and transfer duty to be reimbursed Fixed power cost reimbursement for 5 years (at Rs 3 per unit) Exemption from electricity duty for 5 years Rate per unit less for charging of EVs Water rates 50% of current industrial supply rate 100% SGST to be reimbursed for 5 years 100% reimbursement of road tax Skill development incentive
Karnataka	Special packages of incentives, concessions for ultra-mega and super mega projects Incentive for EV charging and batteries manufacturing and assembly Support and stipend for skill development	Micro units: 25% of value of fixed assests up to Rs 15 lakh Small units: 20% of value of fixed assets up to Rs 40 lakh Medium units: Rs 50 lakh 100% stamp duty exemption with conditions Concessional registration charges Reimbursement of land conversion fee Subsidy for effluent treatment plants Exemption from electricity tariff for 5 years Interest free loan on net SGST to mega, large, ultra-mega and super mega enterprises
Kerala	Policy to support EV manufacturing Priority allotment of land Set up EV cluster	Fund to be created for technology acquisition To support local R&D Concession in electricity tariff and property taxes Investment allowance or capital subsidy Human capacity building and reskilling
Madhya Pradesh		Marginally increased incentives Land concession and FAR relaxation Incentives sanctioned under Industrial Promotion Policy 2010 R&D grants
Maharashtra	To leverage central PLI schemes – at least one giga factory for manufacturing of advanced chemistry cells EV start-ups to be encouraged	Zero emissions vehicle credit programme State EV Fund from green tax, green cess, etc.
Meghalaya	EV industrial estate, export promotion parks and technology parks.	

States	Industrial plan	Incentives for the industry
Odisha	Develop sustainable EV manufacturing industry All incentives under IPR 2015 and MSME Policy, 2016 to be extended Small and micro EV battery manufacturing units to be facilitated as part of MSME Policy, 2016 MOU with lithium-ion manufacturers Create dedicated areas/zones	SGST reimbursement New micro and small units – 25% capital subsidy in plant and machinery with upper limit of Rs 1 crore Those owned by SC/ST and women to get 30% capital subsidy in plant and machinery with upper limit of Rs 1.25 crore Those in industrially backward districts to get 5% capital subsidy in plant and machinery with upper limit of Rs 1 crore to 1.25 crore
Punjab	Develop EV manufacturing and create employment Labour flexibility EV industrial park Giga battery manufacturing unit E-tractor manufacturing Skilling initiatives	Special incentives under Punjab Industrial and Business Development Policy, 2017. 100% GST reimbursement for 15 years Employment subsidy (Rs 48,000 per employee per year) for 5 years 100% exemption from land development charges 100% exemption from electricity duty for 15 years
Rajasthan	-	-
Tamil Nadu	Adopting industrial policy for EV manufacturing. Incentives available to investment of above Rs 50 crore and that creates at least 50 direct jobs.	100% SGST on sale and manufacturing of EVs to be reimbursed. Capital subsidy of 15% for investment over 10 years. Cost of land not to exceed 20% of eligible investment for capital subsidy. 100% exemption from electricity tax till 2025. 100% exemption on stamp duty till 2022. 15% subsidy on cost of land (50% if in southern districts). Employment incentive in the form of reimbursement of employer's contribution to EPF for all new jobs till 2025 – capped at Rs 48,000 per employee. Special package for EV battery manufacturing – land at 20% subsidy (50% in southern districts). Additional capital subsidy of 20% for MSME sector producing EV components and charging equipment. Interest subvention up to 6% interest against 3% for medium scale units till 2025. Existing automobile manufacturers to be provided reskilling allowance.

States	Industrial plan	Incentives for the industry
Telangana	Develop as electronic policy. Electronics manufacturing cluster and industrial parks with infrastructure. Promote reuse of batteries and urban mining of rare materials	Subsidies and incentives as per the Electronics Policy, 2016. 20% capital investment capped at Rs 30 crore for mega enterprises 100% SGST reimbursement – capped at Rs 5 crore. Power tariff discount – 25% capped at Rs 5 crore. 100% electricity duty exemption – capped at Rs 0.5 crore for 5 years. Interest subvention of 5.25% capped at Rs 5 crore for 5 years Transportation subsidy of 60% with 10% reduction YoY – capped at Rs 5 crore for 5 years Stamp duty, transfer duty/registration fees – 100% on first and 50% on second transaction Lease rental assistance Preferred market access with government procurement.
Uttar Pradesh	Create quality infrastructure with comprehensive facilities to develop the state as EV manufacturing hub Incubation centres facilitating EV mobility or innovative business models will be encouraged (Start-up fund)	Mega Anchor Project and ultra-mega battery plant reimbursed up to 25% of land cost Defined Large, Anchor EVMUs/EBUs and MSME units to be provided incentives at par with industrial units under UP IIEPP 2017 EV Private Parks: To include manufacturing units, R&D and recycling ecosystem in land area not less than 150 acres
Uttarakhand	-	Land allocated for setting up EV manufacturing or EV component manufacturing units cannot be utilized for any other purpose for 15 years from the grant Term loans of Rs 10–50 crore will be provided to MSMEs interested in manufacturing EVs. For manufacturing units that employ at least 100 people, the state government will contribute to employee provident fund per company up to Rs 20 million. SGST reimbursement between 30% to 50% for 5 years since production start date. Exemption from stamp duty Reimbursement of electricity duty
West Bengal	Explore pilot projects such as Clean Street Test-Bed, Zero-Emission Vehicle Zones, Wireless EV charging, Smart & Intelligent Clean Energy Management System, Pop-up chargers for cities to integrate renewable energy, electric vehicles, and storage through IoT, big data analytics for integrating electric mobility within transport planning and innovative e-mobility solutions in times of COVID.	Research grant to fund the most innovative solutions in the mobility space

Source: Compiled from state electric vehicle policies

Targets for investment in EV manufacturing: Several states have taken strategic decisions and even set targets for investments in electric vehicle manufacturing (see *Table 10: Targets for EV manufacturing and investment*). Andhra Pradesh, Bihar, Karnataka, Maharashtra, Tamil Nadu, Telangana and Uttar Pradesh have stated the minimum investment target for manufacturing of vehicles as well as battery storage.

Responding to the state policies, many new investments in vehicle electrification and supply chain have been announced in the southern states of Tamil Nadu and Karnataka. Most of the investments are for vehicle manufacturing and not for giga-scale battery production and component manufacturing.

Table 10: Targets for EV manufacturing and investment

State EV policy	Overall time-bound fleet target
Andhra Pradesh	Attract combined investment of over Rs 30,000 crore in next 5 years. Target to bring in manufacturing units of high-density energy storage of at least 10 GWh capacity in next 5 years
Assam	-
Bihar	Attract on-ground investment of Rs 15,000 crore (Rs 300 cr per annum)
Chandigarh	-
Delhi	-
Goa	-
Gujarat	-
Haryana	-
Karnataka	Attract investment of Rs 31,000 crore
Kerala	-
Madhya Pradesh	-
Maharashtra	At least one giga factory for manufacturing of advanced chemistry cells in state
Meghalaya	-
Odisha	-
Punjab	-
Rajasthan	-
Tamil Nadu	Attract Rs 50,000 crore investment for EV manufacturing
Telangana	Attract investment of $4.0 billion by 2030
Uttar Pradesh	Attract Rs 40,000 crore in five years To bring manufacturing units of high-density power storage of at least 5 GWh capacity in 5 years
Uttarakhand	-
West Bengal	-

Source: Compiled from state electric vehicle policies

Table 11: Targets for job creation

State/UT	Overall time-bound fleet target
Andhra Pradesh	Electric mobility ecosystem to have employment potential of 60,000 people
Assam	-
Bihar	Create direct employment of 50,000 persons in the state
Chandigarh	-
Delhi	-
Goa	10,000 direct and indirect jobs by 2025
Gujarat	-
Haryana	-
Karnataka	Employment opportunities for 55,000 persons from supply and demand side
Kerala	-
Madhya Pradesh	-
Maharashtra	-
Meghalaya	-
Odisha	-
Punjab	-
Rajasthan	-
Tamil Nadu	Employment creation for 1.5 lakh people from investment in EV manufacturing and ecosystem
Telangana	Employment creation for 1.2 lakh people by 2030
Uttar Pradesh	Employment potential of 50,000 people
Uttarakhand	-
West Bengal	-

Source: Compiled from state electric vehicle policies

EVs and job creation

Several states have categorically expressed the ambition of becoming manufacturing hubs of EVs for local economic spinoffs and employment generation. It is interesting to note the convergence of the electric vehicle agenda and job creation. Several states have estimated the potential of job creation due to investment in EV programmes and manufacturing (see *Table 11: Targets for job creation*).

Several state policies mention skill development and innovation programmes. Tamil Nadu, Karnataka, Andhra Pradesh, Haryana and Madhya Pradesh offer skilling and reskilling allowances for contractors and assembly line workers. These are typically in the range of Rs 10,000 per worker annually. Bihar has set up a seed fund and offers Rs 10 lakh to the first 50 start-ups operating in the EV domain. Karnataka and Tamil Nadu also have similar plans of a venture capital fund for

research in EV mobility. On an average, these benefits for new job creation range between Rs 35,000–50,000 per employee annually.

Some states such as Tamil Nadu and Uttar Pradesh offer 50–100 per cent contribution toward employee provident funds (EPF), while Punjab offers a fixed annual allowance tied to new jobs created. Tamil Nadu has additionally provided for employment incentives in the form of reimbursement of employer's contribution to EPF for all new jobs till 2025—capped at Rs 48,000 per employee.

Goa will provide support for skilling and reskilling—stipend up to 50 per cent of the cost of course up to Rs 10,000 per year. Haryana will provide incentives for skill development while Kerala will help in human capacity building and reskilling. Tamil Nadu will also provide reskilling allowance to the existing automobile manufacturers.

This is an important area of intervention as there are concerns around job displacement due to rapid shift from ICE vehicles to EVs and need for just transition. This strategic approach to link transition to EVs with job and livelihood generation can help in equitable transition.

Recycling of EV batteries

Recycling and reuse are vital components to ensure circularity of the entire EV ecosystem. Mandating recycling in the state and providing enabling incentives wherever applicable can also provide economic benefits and augment supply chains for the industry (see *Table 12: Recycling ecosystem*).

Few states have opted to include reuse and recycling in the EV industrial promotion framework. In its lifetime, an EV is expected to consume around two battery packs, each of which will last for about five years on average. The EV sector will be the source of e-waste (batteries, motor components and controllers) that can be an opportunity for the sector—both environmental and economic. To this end, some states offer incentives towards scrappage and for setting up recycling plants. Specifically, Delhi, Assam, Andhra Pradesh and Meghalaya plan to encourage setting up of battery recycling businesses, though their EV policies do not provide any support for setting these up.

There is no mention of recycling or reuse in policies released by Bihar, Gujarat, Haryana, Karnataka, Kerala and Uttarakhand. Other states also have not defined any clear action plan to incentivize the recycling ecosystem. Only Chandigarh offers financial incentives to battery recycling facility operators—Rs 2,000 per passenger

Table 12. Recycling ecosystem

States	Recycling plan
Andhra Pradesh	Battery recycling plants to be incentivised for material mining
Assam	Set up recycling plants and businesses and promote reuse of batteries Nodal agency to be aggregator to purchase EV batteries with at least 70% rated capacity. To be purchased from charging stations and battery swapping stations to store renewable energy
Bihar	-
Chandigarh	Encourage reuse after end-of-life in the recycling businesses set up by the Chandigarh Administration. Amendment of industrial policy to include recycling.
Delhi	EV battery downgraded at 70–80% capacity—requiring two batteries in a vehicle's lifespan. Recycling business to be promoted for end-of-life batteries for urban mining of rare material.
Goa	Encourage re-use of used batteries Set up recycling business with EV manufacturers for urban mining
Gujarat	-
Haryana	-
Karnataka	-
Kerala	-
Madhya Pradesh	Encourage reuse of batteries Set up recycling business for end-of-life batteries Charging stations and swapping stations to be remunerated for end-of-life batteries A nodal agency to be aggregator of batteries High value material like nickel and cobalt to be recovered and resold to battery manufacturers Appropriate protocol to be adopted
Maharashtra	-
Meghalaya	Reuse batteries Set up recycling business along with EV manufacturers
Odisha	Batteries to be labelled for ease in waste collection EV battery manufacturers to have schemes for collection of batteries and not charge the users for collection Synergy with current e-waste management Benchmark labels of materials to be recycled from batteries Policy for recyclers to be notified.
Punjab	Dumping of EV batteries in landfill to be prohibited OEMs to have buy back schemes and e-marketplaces for resale of used batteries OEMs and private players to set up recycling units State to facilitate setting up of recycling units
Rajasthan	-
Tamil Nadu	Charging operators to function as end-of-life battery recycling agencies. EV owners will deposit batteries with them. Battery recycling business to be set up. Appropriate protocols and investment subsidies to be notified. OEMs to take responsibility for recycling
Telangana	Urban mining of rare material to be promoted Cell battery recycling to be set up
Uttar Pradesh	Waste treatment plants in electric vehicle manufacturing units and EV battery manufacturing units to be subsidized.
Uttarakhand	-
West Bengal	Setting up of Battery Industrialisation Hub to fast-track development of recyclable batteries among other things.

Source: Compiled from state electric vehicle policies

vehicle and Rs 20,000 per e-bus. Chandigarh has proposed an amendment to the industrial policy to include recycling and aims to encourage reuse after end-of-life by setting up recycling businesses.

Odisha is more explicit in its approach to recycling and has asked for batteries to be labelled for ease in waste collection. Benchmark labels of materials to be recycled from batteries need to be provided. EV battery manufacturers should institute schemes for collection of batteries and not charge users for collection. Odisha has sought synergy with current e-waste management. The state has also asked for a policy for recyclers to be notified.

Punjab has prohibited dumping of EV batteries in landfills. Original equipment manufacturers (OEMs) are required to have buy back schemes and e-marketplaces for resale of used batteries. OEMs and private players are to set up recycling units and the state will also facilitate setting up of recycling units. Similarly, Uttar Pradesh has asked for waste treatment plants in electric vehicle manufacturing units and EV battery manufacturing units to be subsidized.

Tamil Nadu has further mentioned that charging operators would need to operate as end-of-life battery recycling agencies and EV owners will deposit batteries with them.

West Bengal's policy aims for setting up of Battery Industrialisation Hubs to fast-track development of recyclable batteries among other things.

States are looking to set up battery recycling businesses with the support of appropriate protocols and investment subsidies to be notified. OEMs will also have to take responsibility for recycling.

However, several states including Rajasthan, Haryana, Gujarat, Kerala and Karnataka have not made specific battery recycling strategies.

Creating dedicated EV fund

While a case for state funding of EV initiatives to complement central level funding is already established, the need for setting up adequate sources of finance in the support framework is equally significant. States are drawing from already existing industrial development funds to focus on priority areas (see *Table 13: Funding strategy for EVs*).

Very few states have provided for dedicated EV funds or have earmarked revenue sources to create that fund. The establishment of an EV fund represents a state's commitment to vehicle electrification. An EV fund may be setup through budgetary allocation or through a feebate scheme that aims to disincentivize ICEs.

Delhi, Madhya Pradesh, Maharashtra, Meghalaya and Odisha have stipulated setting up of a fund that will be utilized to incentivize the EV ecosystem. However, other states have not mentioned any action or even partial action plans for an EV fund. In the absence of this, states are missing a very essential parameter to promote an EV ecosystem in the state.

In particular, states such as Karnataka, Tamil Nadu and Telangana have made provisions to fund the start-up ecosystem. While UP and Punjab have not provided a specific funding strategy, the two states will promote electrification through dovetailing of existing funds under other policies in their respective states.

Maharashtra has additionally taken the approach of zero emissions vehicle credit programme and State EV Fund from green tax, green cess, etc.

Delhi has provided for extra steps for creation of a dedicated fund that also includes the principle of polluter pay for ICE vehicles to meet the cost of EV transition. This includes feebate concept—inefficient polluting vehicles to incur surcharge and efficient ones to receive rebate. State EV fund to be created from: Pollution cess on diesel (Air Ambience Fund); additional road tax on diesel and petrol vehicles on a sliding scale (diesel vehicles to pay higher and two wheelers lower); congestion fee on all trips with ride hailing and aggregator services (petrol and diesel vehicle trips); and environment compensation charge.

On similar lines, Goa has also provided for feebate concept in which inefficient polluting vehicles will incur surcharge and efficient ones will receive rebate. State EV fund will be created from pollution cess on sale of diesel and petrol, and budgetary allocation. Goa decarbonization fund will also be created which will contribute to the state's EV fund.

Madhya Pradesh has additionally identified revenue sources that include outdoor advertisement licence fees, parking surcharge on ICE for ULB parking and ULB e-mobility bonds. Chandigarh's policy has asked for UT EV Fund for EV adoption through annual budgetary allocation and combination of green cess on road tax on all ICE vehicles, conventional fuels and electricity.

Table 13: Funding strategy for EVs

State/UT	Funding strategy for policy implementation
Andhra Pradesh	-
Assam	-
Bihar	-
Chandigarh	UT EV Fund for EV adoption—through annual budgetary allocation, combination of green cess on road tax on all ICE vehicles, conventional fuels and electricity
Delhi	Adopt feebate concept—inefficient polluting vehicles to incur surcharge and efficient ones to receive rebate State EV Fund to be created from: Pollution cess on diesel (Air Ambience Fund) Additional road tax on diesel and petrol vehicles on a sliding scale (diesel vehicles to pay higher and two-wheelers lower) Congestion fee on all trips with ride hailing and aggregator services (petrol and diesel vehicle trips) Environment compensation charge
Goa	Adopt feebate concept—inefficient polluting vehicles to incur surcharge and efficient ones to receive rebate State EV fund to be created from: Pollution cess on sale of diesel and petrol Budgetary allocation Goa decarbonization fund
Gujarat	-
Haryana	-
Karnataka	-
Kerala	-
Madhya Pradesh	Income will be generated from Outdoor Advertisement Licence Fee, parking surcharge on ICE for ULB parking and ULB e-mobility bonds
Maharashtra	State EV Fund to aggregate fund from green cess and green tax Zero emissions vehicle credit programme
Meghalaya	Meghalaya EV Adoption Fund to be created from pollution cess on diesel and petrol vehicles, budgetary allocation and other sources Additional income to be generated from outdoor advertisement license fee, parking surcharge on IC engines, electric mobility bonds, etc.
Odisha	Dedicated State EV fund to be financed from additional cesses/levies on ICE vehicles and budgetary support
Punjab	-
Rajasthan	-
Tamil Nadu	EV venture capital fund for financial support to start ups
Telangana	T-Fund: Financial support for EV research and innovation start-ups
Uttar Pradesh	Start-up fund to promote start-ups
Uttarakhand	-
West Bengal	A State EV fund shall be created.

Source: Compiled from state electric vehicle policies

3. Assessing ground reality

Most state policies have taken shape in the last couple of years and a few are still in the draft stage. There has not been much lead time to enhance ground level action yet. But keeping in mind that most policies have defined the plan period as five years with clear targets, rapid action in all areas of the EV ecosystem is urgently needed.

Based on the stated objectives of state policies, substantial increase in the number of e-vehicles is expected by the end of the plan period. But that hinges on the assumption that the states will be able to implement the full range of proposed action and further strengthen the implementation.

As the plan period is already underway, a reality check is necessary to understand the scale of operation and the extent to which the policy provisions have been incorporated and internalized by the departmental business rules aligned with the respective budget lines.

For this purpose, CSE visited Maharashtra and Telangana, states which have notified their respective EV policies, to understand the action on the ground. While Telangana is more focussed on supply side approaches to develop EV industry and retain value chain within the state, Maharashtra is more explicit in its provision for demand side support for rapid adoption of EVs.

Maharashtra's policy checks a lot of the boxes for an electric vehicle consumer—an overall EV market share target, vehicle segment-wise market share targets, vehicle segment-wise incentives, and charging infrastructure incentives and related protocols. The policy has also incorporated unique elements that other states missed out on, such as the assured buy-back incentives and extended warranty incentives for OEMs, mandatory charging infrastructure plans for cities, and even a possible ZEV credit system for the state. Maharashtra's policy, however, has limited support for industrial development in the state.

Telangana Electric Vehicle and Energy Storage Policy, on the other hand, focuses heavily on making Telangana the preferred destination for EV, energy storage systems (battery) and component manufacturing. Given Telangana's legacy of strong electric and electronics manufacturing, led by public sector undertakings such as Electronics Corporation of India Limited (ECIL) and Bharat Heavy Electricals Limited (BHEL), the decision to invest resources in the manufacturing

sector does not come as a surprise. Telangana's plan is to attract investments worth $4 billion and create employment for 1,20,000 people by 2030 through EVs in shared mobility, charging infrastructure development and EV & ESS manufacturing activities. However, this move is at the cost of seeing minimal expected market share growth for EVs in the state, since there are no direct purchase incentives offered to the consumer.

Choosing these states helped understand the perspectives of stakeholders in both a supply-side incentive led state policy and a demand-side incentive led state policy. Interviews were conducted with transport officials, municipal officials, charging point operators, EV owners and many other stakeholders involved in the implementation of the two state policies. The results, facts and figures from all interactions were then followed up and cross checked with secondary research.

3.1 Maharashtra electric vehicle policy implementation

The revised Maharashtra state electric vehicle policy was notified in July 2021. The policy shows promise with several target-based policy action points it entails and the administrative responsibilities it consigns to the departments at both the state level and the city level. Mumbai is at the centre of the policy implementation as it is identified as one of the aggressively targeted urban agglomerations to become the lighthouse for EV adoption in Maharashtra. CSE has interacted with officials in the State Transport Department, Municipal Corporation of Greater Mumbai (MCGM), and Brihanmumbai Electric Supply & Transport Undertaking (BEST) to understand the stages of implementation of each policy point in the policy and the urgency to achieve these ambitious targets.

Maharashtra electric vehicle policy is among the few policies that have categorized their incentives in terms of the vehicle categorization done by VAHAN, that is, L1 and L2 for two-wheelers, L5M for three-wheeler autos, and so on (see *Table 14: Incentives given in Maharashtra based on vehicle categorization*). This categorization fits well with their agenda of routing the incentives through the OEMs to the consumers. Maharashtra Transport Department is the responsible authority for disbursing the purchase incentives in the state.

Table 14: Incentives given in Maharashtra based on vehicle categorization

Sr. no.	Vehicle segment	Incentive available	No. of vehicles to be incentivized	Maximum incentive per vehicle (Rs)
1	E2W (L1 & L2)	Rs 5,000/kwh	1,00,000	10,000
2	E3W autos (L5M)	Rs 5,000/kwh	15,000	30,000
3	E3W goods carrier (L5N)	Rs 5,000/kwh	10,000	30,000
4	E4W cars (M1)	Rs 5,000/kwh	10,000	1,50,000
5	E4W goods carrier (N1)	Rs 5,000/kwh	10,000	1,00,000
6	E-buses*	10% of vehicle cost**	1,000	20,00,000

*Incentive shall be available for STU buses only. State government shall also consider extending support to STUs for procurement of additional e-buses, if required.

**Ex-factory cost

Source: Maharashtra Transport Department

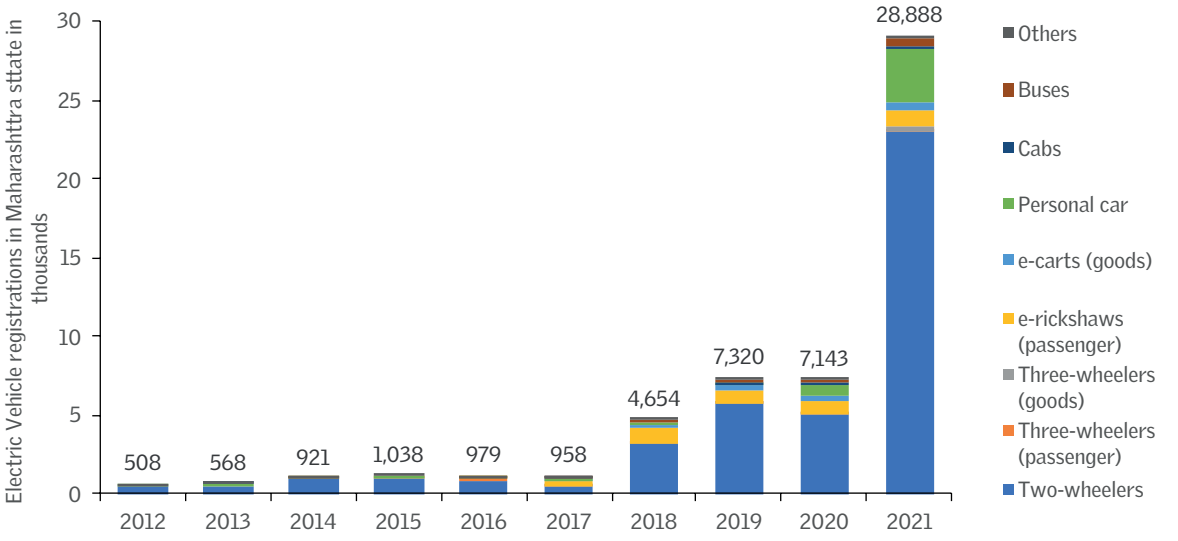
Conversations with different state agencies have brought out several aspects of the steps taken to implement the policy.

Disbursement of incentives: State level mechanism for disbursement of incentives to the consumers has to be established immediately. For disbursing incentives, the State Transport Department is creating a web portal which will facilitate the incentive disbursement process between the department and the OEMs. Credentials for logging into the portal will be provided to the OEMs only. The vehicles will be sold to consumers at a discounted rate (after incentives) through dealers, and OEMs will then submit the number and model of vehicles sold to receive the discounted incentives.

Consumers and the general public will access the portal for viewing the dashboard that will reflect time series information about number of incentives disbursed in the state, total amount of incentives, number of electric vehicle registrations in the state, calculation of incentives on specific vehicle models and so on. KPMG has been employed by the department to help them setup this portal. According to the officials at KPMG, the transport department also has plans to conduct awareness campaigns and mass communication programmes once the portal is live. OEMs will be looped into the process for these awareness programmes as well and will be encouraged to conduct similar campaigns of their own.

Currently, incentives are being managed by the state's industry department, since the transport department is not ready with their system yet. The state fund for incentives also rests with the industry department for now. KPMG has indicated that the industry department's web portal to track the number of registrations in the state is

Graph 1: Segment-wise yearly electric vehicle registrations in Maharashtra in the last decade



Source: Maharashtra Transport Department, KPMG, CSE analysis

not very intuitive even for KPMG who have access to the data. This makes it harder to extract smaller pieces of information such as monthly statistics for registrations, and so on. Delhi has been able to track their monthly progress after the notification of the policy, which has helped them assess the efficiency of the implementation strategies. Yearly registrations are readily available with the Transport Department, and were shared with CSE. Maharashtra can learn from Delhi.

Evidence of incentive programme stimulating the market: The numbers showcase the positive effect the policy has had on electric vehicle adoption in the state and how important 2021 was for electric vehicles. According to the data, Maharashtra registered 28,888 electric vehicles in 2021, out of which 17,409 (60 per cent) were registered after the notification of the policy. The number of vehicles registered in the state in 2021 alone exceeded the numbers registered in the last nine years, between 2012 and 2020, by 20 per cent.

Other interesting observations were also made from the data. Maharashtra was the worst COVID-19 hit state in the country, reporting over 20 thousand new cases per day during the 2020 peak and over 60 thousand new cases per day during the 2021 peak.[2] Commuters were seen shifting towards personal modes of transportation to reduce risk of infections.

While the overall number of electric vehicles registered in the state decreased in 2020, the share of electric personal cars in the mix increased 7 times, from 1.5 per cent in 2019 to 10.5 per cent and continued to increase to 11.8 per cent in 2021. The dominant segment, two-wheelers, saw a 7 per cent decrease in its share in the mix in 2020, however the number rebounded quickly next year in 2021.

Not all incentives promised in the policy have been implemented: Scrappage incentives are another aspect of the policy that are currently not being tracked or pushed for. The voluntary nature of scrapping one's own vehicle has resulted in low number of takers of the scrappage incentive for buying EVs. The state scrappage policy is yet to be formed.

EV cell yet to be formed: According to the policy, the Transport Department must also form an EV cell with the sole purpose of looking after the implementation of such strategies in the policy. The department states that this committee has not been formed yet, but once it is, coordination will be smoother between departments.

Planning and consultation: Most of the elements of the policy are at the planning and consultation stage. To establish the required supporting infrastructure for vehicles, the policy has targeted for each NCAP city in the state (Akola, Amravati, Aurangabad, Badlapur, Chandrapur, Jalgaon, Jalna, Kolhapur, Latur, Mumbai, Nagpur, Nashik, Navi Mumbai, Pune, Sangli, Solapur, Thane and Ulhasnagar) to have a charging infrastructure plan for the city which should be incorporated with the city development plans (CDPs) later in the city planning stages.

The environment department in MCGM has begun consultations with private agencies in harmony with other departments such as MCGM's environment clearance division, building proposals department and so on. Consultations with power companies such as Tata Power, Adani Power and DSP have also begun, according to a senior official in the environment department.

Approval process and detailing of charging infrastructure underway: The idea is to develop a checklist of clearances and specifications which can be applied directly if and when a private company approaches MCGM for setting up stations in the city. This will help expedite the process for private companies by providing them with single-window clearances.

The electric vehicle policy plans for city-wise targets for public and semi-public charging stations 2025. Greater Mumbai needs to setup 1,500 charging stations

by 2025. In the initial stages of planning, MCGM will set up five stations per ward, or 120 stations in Greater Mumbai (Greater Mumbai has 24 wards).

Apart from this, 85 stations will be setup in government office complexes, which will also be open for public use, subject to availability of access to the site. MCGM will employ charging point operators (CPOs) on a public-private partnership model. CPOs have not been decided yet. MCGM is also preparing a spatial plan for setting up the stations. Once the land parcels are identified, MCGM will invite bids for CPOs and provide them the land at concessional lease rates.

Special focus on e-buses: It may be noted that Maharashtra has taken the decision that about 80 per cent of the funding that has come for air pollution control from the XVth Finance Commission will be spent to buy electric buses. Mumbai and Navi Mumbai have expanded their e-bus fleet.

Review of the initiative of the e-buses in Mumbai shows that the electric vehicle policy targets for 25 per cent electrification of public transport by 2025 in all five targeted urban agglomerations, including Greater Mumbai. Brihanmumbai Electric Supply &Transport Undertaking or BEST is the bus transport aggregator in the city. Currently, BEST has 386 electric buses in its fleet, all running on the GCC model. BEST has deyailed out the specifications of current and proposed electric bus fleet. According to BEST, running e-buses has been a pleasant experience, with reduced noise and smoother rides, which adds to consumer comfort. The drivers do not need to be trained extensively for running e-buses, and they only need to pass a small driving test for accelerating-decelerating e-buses.

Running e-buses in Mumbai has been challenging recently due to the current metro rail network construction in the city. Traffic bottlenecks result in reduced utilization of the buses, since the battery is depleted much quicker when going through slow moving traffic from the constantly running air-conditioning, head and tail lights, and so on. BEST states that currently procured buses had a range requirement for 180 kms, however, the buses could only run 160 kms on a single trip.

BEST has plans for procuring 2,100 new e-buses for Greater Mumbai, out of which 200 buses are double decker e-buses and rest are single decker buses, midi buses and mini buses. The procurement will be finalized by March 2022, which will make BEST's fleet 80 per cent electrified. Further, by 2027, BEST plans for 100 per cent electrification of its fleet.

Table 15: Specifications of current and new proposed electric bus fleet with BEST

	Existing fleet (Total 346 buses)	New fleet (Total 1,900 buses)
Manufacturer	Tata – 340 buses (200 9-meter and 140 12-meter) Olectra-BYD – 40 buses PMI-Foton – 6 buses	Tata – 1,400 buses (Single decker 11 to 12 meter) E-way trans – 500 buses (400 Midi 9-meter and 100 Mini 7-meter)
Range	9-meter – 140 to 150 km 12-meter – 150 to 160 km	Single decker – 200 km (minimum) Midi – 170 km (minimum) Mini – 160 km (minimum)
Passenger capacity	9-meter – 25 (+ 12 standing) 12-meter – 35 (+ 25 standing)	Single decker – 42 Midi – 30 Mini – 20
Charging time	Up to 3 hours	1 hour for single deckers and 45 minutes for mini buses

Source: BEST Mumbai, CSE analysis

In the new procurement, BEST has made several changes in the tender clause, to improve bidding parameters. This has helped them reduce their running cost per km by 34 per cent from the previous amount, from Rs 83/km to Rs 54.85/km. This could be achieved by several factors. These include adopting strategies from the NITI Aayog's Model Concession Agreement for more efficient and affordable public transportation. BEST also increased the parameters for the required ranges in the buses and reduced the time required for opportunity charging to maximize utilization. The yearly (350 days) assured kilometres have been increased for buses to reduce the cost per kilometre. Twenty extra buses were ordered which can be used as replacements when maintenance is required or breakdown occurs.

Charging infrastructure to support opportunity charging for buses is currently not available anywhere other than the bus depots. A charging network plan is in the pipeline. At this time, only five depots have charging stations for buses—Worli depot, Back Bay depot, Shivaji Nagar depot, Malvani depot and Dharavi Kala Killa depot.

The buses currently charge for 3 hours after the battery is completely depleted. However, during the afternoon hours—between 2 pm and 4 pm—about 30 per cent e-buses are held back due to lower demand. The charging requirement also reduces to 1.5 hours from 2 hours during this time period due to lower utilization. Additionally, BEST will also setup 55 charging stations in the city for two-wheeler, three-wheeler and four-wheeler charging. The type of charging equipment and the chargers shall be decided by the operator selected for setting up the stations.

Despite this flexibility given to CPOs, BEST suggests that all chargers should be fast chargers.

Take away from Maharashtra: Maharashtra's EV policy has comprehensively covered a lot of ground in theory. Most sectors of the EV ecosystem have been touched upon and quantifiable targets have been attached to these sectors as well. However, the implementation on ground is much slower in several areas for such an ambitious policy.

A web portal for OEMs to apply for incentives is a good strategy. This ensures convenience for the consumer who will not need to go through an application approval process for incentives which, more often than not, can be tedious.

The market share of EVs is rising fast, however the infrastructure to support these vehicles is still not in place. Cities need to prepare the charging network plans and start mobilizing funds and inviting bids to complete their infrastructure targets. BEST has setup a good system for bidding parameters for e-buses, and will soon have an 80 per cent share of electric buses in its fleet against the required 25 per cent by 2025.

Maharashtra is one of the few states that make mention of a ZEV credit system. While any such mechanism is not in place yet, discussions within the environment department have begun, and the feasibility of a credit system is being assessed. Global best practices such as in California, China, Norway and Germany have shown that a credit system can help induce a steadily rising share of EVs in the market since manufacturers are held accountable through either penalization or incentivization to manufacture more EVs. A similar system for the state can be useful to control a preferred growth rate in different segments in the state.

Several preparatory steps have been initiated but action will have to be accelerated quickly now.

3.2 Telangana electric vehicle policy implementation

Telangana has clearly carved out policy objectives which have given priority to both reducing the cost of mobility through increasing the EV market share in the state, and making Telangana the preferred state for electric vehicle, energy storage system (ESS) and component manufacturing. However, the incentives are far more supply side heavy.

Table 16: Exemption of road tax and registration fee in Telangana

Segment	Number of vehicles getting exemptions	Other incentives (scrappage / retrofitting)
E2Ws	2,00,000	n/a
E3Ws (passenger three-seater autos)	20,000	15% retrofitment cost up to 15,000 for 5,000 vehicles
E4Ws passenger commercial	5,000	n/a
E-LCVs (including E3Ws goods)	10,000	n/a
Private cars	5,000	n/a
Buses	100	n/a
Tractors	No limit	n/a

Source: Telangana Industries and Commerce Department

CSE visited Hyderabad to meet with the State Transport Department and the Greater Hyderabad Municipal Corporation to understand how the policy has been working out for inducing EV adoption in the state and to assess the challenges related to implementation.

The policy promises exemption in road and registration taxes for a certain number of vehicles on a first come first serve basis (see T*able 16: Exemption of road tax and registration fee in Telangana*). There is no scrappage policy for any kind of vehicle segment, but the state does offer retrofitment cost incentive for passenger auto rickshaws.

There are no direct purchase incentives available for the vehicles, unlike in many states such as Delhi. Road taxes applicable in Delhi are also far less than in Telangana.

Telangana has a peculiar road tax regime and tax exemption conditions. While the registration fee is applicable as a one-time payment, two types of road taxes are to be paid by vehicle owners: quarterly taxes and lifetime taxes. The lifetime taxes are applicable as percentage cost of the vehicle, which can be between 9–12 per cent of the vehicle cost. This tax is exempted under the EV policy during the time of purchase. Apart from this, the EV policy also exempts the quarterly taxes for a period of five years from the date of registration.

A comparison with Delhi can help understand the numbers better. In Delhi, a commercial car can get an incentive amount equal to 19 per cent of its on-road price, after subtracting. In Telangana, 12 per cent of the cost of the vehicle (which

is the applicable road tax) will be given as incentive, which is very close to Delhi's share of incentive. All these numbers exclude the FAME incentive for now, which can be secured on top of the state incentives in both states.

Similarly for an e-rickshaw or an e-auto, the road tax and registration fee combined do not exceed Rs 4,350 for one year in Delhi. In addition to that, Rs 30,000 per vehicle is applicable as incentive, which will bring down the cost of a vehicle with an on-road price of Rs 2.7 lakh (Mahindra Treo SFT) by about 12 per cent. The same electric three-wheeler model is not getting any direct purchase incentives in Telangana, but is still evading the heftier 12 per cent road and registration fee that would have been applicable on an ICE three-wheeler. This makes it comparable to the incentive a vehicle receives in Delhi. The point of the comparisons made here is to establish how without being given a direct purchase incentive, a vehicle owner in Telangana can enjoy a similar discount for any vehicle segment as someone who buys the electric vehicle in Delhi.

There are however challenges in some other aspects of financial incentives. The policy mentions an incentive of Rs 15,000 for the first 5,000 passenger three-wheelers to retrofit the EV powertrain. The Telangana Auto and Motor Welfare Union has shown concerns for the disconnect between the actual cost of retrofitment and government support. There are 5 lakh auto-rickshaws in the state, out of which 3.5 lakh are in Hyderabad itself.[3]

According to the union, each auto-rickshaw would require Rs 1 lakh for the EV powertrain retrofitment. Now that the Telangana State Renewable Energy and Development Corporation (TSREDCO) has asked the Transport Department to identify and convert old autos to electric, the cost will be borne by the drivers to make this change. Current government support therefore needs to be upped or backed with other strong incentives (such as indirect and non-fiscal EV incentives for free parking, exemption from commercial tolls, etc.) for drivers to be readily interested.

Apart from retrofitting, purchase of new electric autos is also a challenge. Within one year of policy notification, i.e., between October 2020 and October 2021, Telangana registered 7,443 electric vehicles out of which only 44 were auto-rickshaws. Out of the rest, 5,968 were bikes, 779 were cars, 29 were taxis and 623 were light goods vehicles. An official at the Telangana Auto Drivers' Welfare Samakhya has indicated that limited registrations in e-auto and e-taxi numbers are simply because these segments are still very expensive for the driver or the aggregator. An electric auto that costs Rs 1.8 to 2 lakh ex-showroom will be sold at

Table 17: Allocated charging stations in Hyderabad under FAME II

Sr. no.	Company name	Locations	No. of charging stations	Total
1	Rajasthan Electronics Instruments Ltd (REIL)	(i) Hyderabad	37	57
		(ii) Karimnagar	10	
		(iii) Warangal	10	
2	National Thermal Power Corporation (NTPC)	(i) Hyderabad	32	32
3	Energy Efficiency Services Limited (EESL)	(i) Hyderabad	49	49

Source: TSREDCO

an on-road price of about 3 lakh after the road tax, registration fee and insurance is accounted for. More government support will be needed to induce electrification in these commercial segments.

TSREDCO is the agency primarily responsible for setting up the public charging facilities such as airports, metro stations, parking lots and so on. In addition, Telangana is supposed to have a fixed ceiling cost of service for EV charging stations. According to the corporation, 30 stations which were received under FAME I have already been established in the city in various government departments for their captive needs.

The 30 stations are a mix of fast, moderate and slow chargers. There are five fast chargers with power output of 122 kW, five moderate chargers with the Bharat DC-001 connector type with output power range of 15 kW and 20 slow chargers with the Bharat AC-001 connector type with power output of 10 kW.

Under FAME II, 138 chargers have been sanctioned, out of which 118 are being installed in Hyderabad, 10 in Warangal and 10 in Karimnagar. Each charging station will have 3-4 chargers with 7-10 guns for charging.

To install the 138 chargers and other chargers in the future, 240 locations have been formally allocated at public places near highways, parking lots and substations. Warangal and Karimnagar will have all their chargers located at 32 and 22 locations near substations respectively.

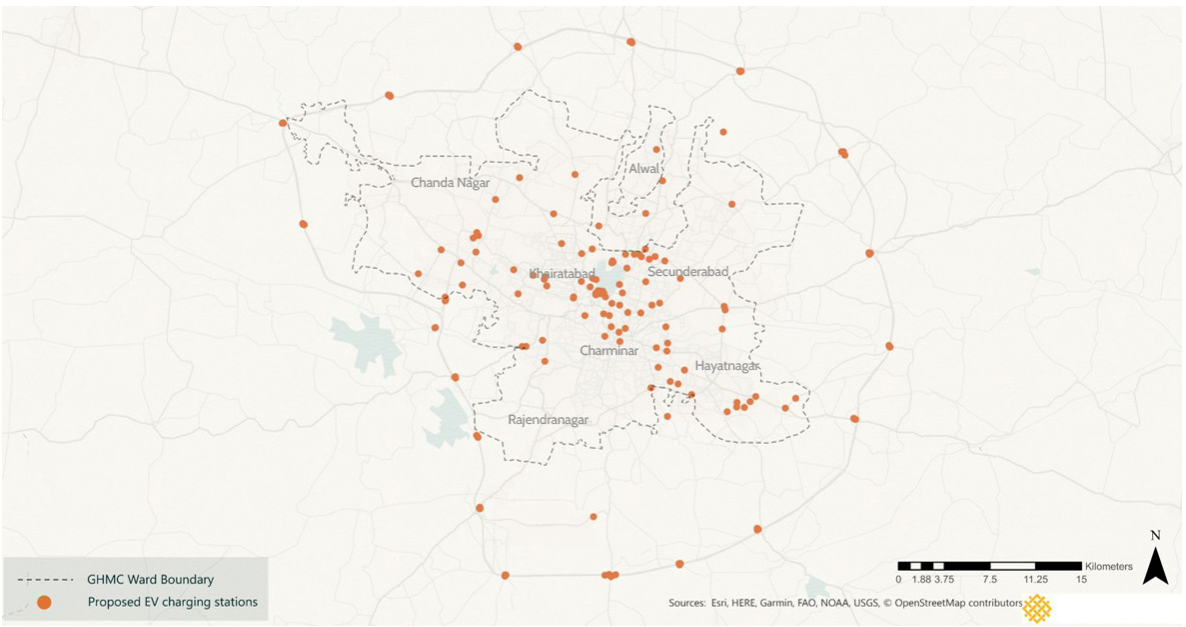
Action on charging infrastructure: In Hyderabad, the Metropolitan Development Authority (HMDA) has identified 86 locations at public places near highways, Greater Hyderabad Municipal Corporation (GHMC) has identified 46 locations

at public places and parking lots, and the Southern Power Distribution Company of Telangana (TSSPDCL) has identified the rest of 54 locations near substations. Many of these locations are also near or at metro stations, making Hyderabad Metro one of the first in the country to provide public charging stations.

TSREDCO is planning on installing a total of 600 charging stations by March 2022 in the state including the ones currently existing. Hyderabad will have 250 of these stations, while other Tier II and Tier III cities will get 350 stations, majority of which will be located on highways.

The corporation has already announced the service charge ceiling for the stations, which is Rs 12.06 + GST per unit. In other words, if an electric car with a 20 kWh battery may use up to 25 units of charging (considering that the charging efficiency of the equipment cannot be equal to 1 or ideal), it equals to a little over Rs 600 for a near full charge. A petrol car will barely get 6 litres of petrol in this price. It must be noted here that Rs 12.06 is the ceiling service cost for charging at public charging stations. A car owner would almost never visit a public charging station to get a full charge from 0–100 per cent. At residential areas, this cost will be much lower due to the lower rates of electricity tariff applicable.

Map 2: Locations of proposed charging stations as given by HDMA, GHMC and TSSPCL in Hyderabad



Source: TSREDCO, WRI India

Action to build industrial hub around EVs: One of the policy objectives is to establish Telangana as the preferred destination for electric vehicle, battery and component manufacturing, and to attract investments worth $4 billion or Rs 30,000 crore and create employment for 1.2 lakh people in the manufacturing sector and infrastructure development.

Since the notification in October 2020, the state was able to attract Rs 5,600 crore in the electric vehicle sector, employing 3,800 people directly and 7,000 indirectly. Two industrial clusters have been established in the state for supporting manufacturing activities, one at Chandanvelli and a new 340 acres energy park at Divitipalli in Mahbubnagar. Another manufacturing cluster is being constructed in Zaheerabad, which will be a National Investment and Manufacturing Zone (NIMZ).

Telangana has entered into several MoUs since the policy was launched with several Indian and international manufacturers. Bus manufacturers such as Mytrah Energy and Olectra Greentech Limited signed MoUs with the state in 2020 to start bus and component manufacturing in the state. Olectra has already setup a manufacturing unit in Chandanvelli. Mytrah will bring in Rs 2,000 crore investment in the state when it sets up manufacturing.

ETO Motors, a three-wheeler passenger and cargo manufacturer, has also signed an MoU to invest Rs 150 crore in the state to setup a manufacturing unit for its subsidiary Keto Motors. The project will generate employment for 1,500 people. The new Zaheerabad NIMZ is largely gathering investments from international electric powertrain and battery manufacturers. One Moto, a UK based EV start-up will be investing Rs 250 crore in setting up an electric vehicle and lithium-ion battery manufacturing facility at Zaheerabad. The company is already assembling 1,000–1,500 completely knocked down (CKD) kits of bikes every month. Once the facility is operational, the dependence on China and UK will be moot.

Triton EV is another electric vehicle manufacturer that will setup shop at Zaheerabad with a Rs 2,100 crore EV manufacturing unit. The company has plans for manufacturing four-wheelers and is also developing concepts for manufacturing e-rickshaws, semi-trucks and even defence electric vehicles.

Take away from Telangana: Telangana's state policy has resulted in several strategies for overcoming the consumer barriers towards electric vehicle adoption. The state has adopted an incentive programme, a plan for setting up charging network in the state is underway, and EV model availability and expansion is being addressed by its several supply side incentives. Having said that, the magnitude

at which these policies are being implemented can be improved, especially the demand side incentives.

The commercial segment should be prioritized in the state to electrify passenger kilometres, and for this additional fiscal or non-fiscal support with incentives may be provided. Tier I and Tier II cities should be selected to have charging infrastructure network plans, which can be later incorporated in other city planning tools such as Master Plans and Development Plans. It is also suggested to have quantifiable targets so tracking progress can be easier. These targets can be number of vehicles that utilized the state incentives, market share of electric vehicles, number of chargers setup, and so on. A dashboard should reflect this progress to keep people engaged and informed.

With an array of supply side incentives for the manufacturers specifically, the state should also consider putting in place a ZEV credit scheme, where conventional ICE manufacturers can also be encouraged to get into EV manufacturing

3.3 Monitoring and review of EV programmes

All states except Haryana, Rajasthan and Uttarakhand have set up an EV cell or a review committee/board to close-loop efforts stipulated within their policies. Though the UP policy has not outlined a specific committee to conduct periodic reviews, the state's policy has named the state cabinet as the final authority on provisions mentioned in the policy.

A number of states have a review framework in place for implementation of their EV policies—Delhi, West Bengal, Assam, Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Telangana, Chandigarh, Meghalaya and UP.

A periodic review mechanism will help states stay on track and help factor in market dynamics wherever necessary. A fine example of this fine tuning is the increase of E2W demand incentives to Rs 15,000/kWh in FAME II. This change has spurred the E2W market with immediate impact.

4. Way forward

To meet the minimum targets set by states for the plan period, state level policies can play an important role in addressing the last mile bottlenecks towards EV adoption and setting up of EV manufacturing ecosystems. This bottom-up pressure can create consumer demand and value for the end user for quicker adoption, and infrastructure support for EV manufacturing to build supply chains and retain value chains within the state creating new employment opportunities while curbing vehicular emissions.

Within the federal structure, state policies are expected to be uniquely designed given specific local imperatives. This is reflected in the widely varying target setting approaches, incentive structures, varying emphasis on demand creation and manufacturing, and targets set for market transformation.

Yet there are questions about the adoption of an optimum combination of methods and instruments to maximize impacts locally. While respecting the autonomy of decisions made by various states, it is still possible to create a national guidance framework and matrix to guide state level policies for most appropriate and effective design. It is possible to create opportunities for harmonization and alignment of state level policies in several areas that can create a more effective level playing field for the industry and the consumers.

State policies may vary in design and magnitude of the fiscal incentives as it has revenue implications. But there are design principles and instruments related to non-fiscal instruments, infrastructure design, industrial plans to draw investments and create jobs, and support systems for battery recycling. There is considerable scope in harmonizing and rationalizing these strategies to bring more uniformity across the Indian markets. The automobile industry has concerns related to markets being fragmented by diverse policy and incentive structures. This needs to be evaluated.

4.1 The next steps

Need for national guidance framework and matrix for state level electric vehicle policy development and implementation. At the outset, it is necessary to ensure that all state EV policies are formally notified and suitably amended as appropriate to firm up the mandate. Already 21 states have prepared their respective policies. Though this is a good beginning, these policies are still quite patchy, widely different and do not have adequate cohesiveness. As most state

governments are embarking on implementation, it is an opportunity to build guidance on specific strategies for effective roll out. In fact, a consortium of state governments implementing EV programmes to share experience and harmonize action as much as possible can maximize gains from the transition. It is evident that NITI Aayog is working towards such a matrix to evaluate, guide and track state level policies. This needs to be expedited.

While states are developing their respective electric vehicle policies for implementation, a national guidance framework that cohesively addresses the appropriate approaches (to target setting, designing fiscal and non-fiscal instruments, planning attributes of infrastructure for charging and battery production, setting electricity supply and tariffs, infrastructure development for EV manufacturing and attendant industries, and building consumer awareness) may help to guide the optional measures and desirable compulsory measures for it to be a useful template for robust planning.

EV policies need to define the state level zero emissions mandate and set time-bound targets for electrification. Currently, there is wide variation in approaches to target setting across the states. While some have set percentage targets, others have adopted number-based targets. But there are still several states that have not set any targets yet. This weakens the policy. Targets for electrification of vehicle fleets need to be adopted to provide long-term policy visibility and to build confidence in the market. Targets also need to be measurable and verifiable to track progress.

Several states have not notified their draft polices. This needs to be done to make policies binding and to start their implementation. Currently, different departments are involved with framing of the policies that include either transport department or power department or environment department. At this early stage of policy framing, gaps need to be reviewed and areas need to be identified for further refinement and harmonization.

Target setting is a critical strategy to drive the market to build scale and investments in a time-bound manner. So far, the electrification targets announced by the states include either absolute goals of 10 lakh EVs in varying timelines in some states (like Andhra Pradesh, Kerala and Uttar Pradesh) or percentage targets within a range of 10–30 per cent EV penetration (except Chandigarh and Bihar that have aimed for 80 per cent by 2026 and 100 per cent by 2030 respectively). These combined promises can add up to a substantial figure by the end of the decade. But this can be further optimized.

Moreover, not all states have defined the overall targets. States including Haryana, Karnataka, Punjab, Rajasthan, Tamil Nadu and Uttarakhand have not adopted overall targets for electrification. Some of them including Haryana, Karnataka, Punjab and Tamil Nadu have adopted targets for specific vehicle segments. Uttarakhand, Telangana, Rajasthan and Bihar have not adopted vehicle segment-wise targets either. There is considerable scope of rationalizing this strategy across states. Targets with respect to EV adoption, charging infrastructure, logistics fleets and aggregators can be effective in early electrification to build demand and scale up usage for market development. More rationalized target setting would go a long way in setting up the ambition of the state.

Moreover, states can initiate programmes to mandate production and sale of electric vehicles based on credit programmes and fuel efficiency targets. The sale of vehicles could be tied to the manufacturer's share of conventional vehicle sales to arrive at the cap for each manufacturer. This directive could be combined with banking and trading of electric vehicle credits.

Need more aligned action on incentives across states to harmonize the market: If the current incentive structures from all state policies are aggregated, about eight types of incentives can be broadly identified. These include purchase subsidies, tax measures, interest subvention, parking subsidies, scrappage subsidies, toll taxes and permit fees exemptions. But all states have not adopted all of them. There are different permutation and combinations. Only a few states have taken on board the maximum options—6–8 of these incentives. Others have adopted lesser number of incentives. Even though state level incentives are decided based on the state's priorities and revenue implications, there is still considerable scope of rationalizing some of them for wider adoption.

Some states have promised more than others. The lead states that have included close to 6–8 types of incentives include Bihar, Delhi, Goa Haryana, Maharashtra and Odisha. Madhya Pradesh and Meghalaya have adopted maximum strategies related to parking subsidy, scrappage incentives, toll exemption and permit exemption. Delhi and Haryana have additionally provided for disincentives for ICE vehicles. Uttar Pradesh and Uttarakhand have adopted the least number of incentives. Karnataka and Telangana have not provided separate purchase incentives but have given tax rebates and other concessions.

Existing policies that can work for EVs also need to be leveraged. For instance, states are currently required to frame scrappage policies. But not many states have linked scrappage incentives with electrification.

Quantum and structure of incentives are expected to vary considerably across states given the local imperatives, scale of the economy and revenue sources of the states. Even though there are many divergent approaches, there is clearly an opportunity to build some more incentive programmes in some states.

At this stage, all the incentive programmes of the state governments have not been evaluated from the perspective of their revenue implications. That is often the primary concern of the state governments. This will require further evaluation to understand the aligned action by states. There is also considerable scope of further improving and aligning non-fiscal incentives.

Need firm roadmap and milestones with timeline to increase the pace of implementation: EV policies need to be clearly backed by detailed strategy development with indicators, timelines, identification of responsible departments and a funding strategy to enable implementation. In most states, ground level strategy development and multi-department coordination are still very nascent. This has to be improved to meet the targets for electrification within five years of the plan period.

Compliance and monitoring systems need to be in place to make progress verifiable and measurable. This requires centralized dashboards to put out data on the progress in key parameters of EV policies, mechanism for providing all kinds of incentives and publicizing the programme, working out the details of funding support, setting milestones for EV charging infrastructure, and audits to assess adequacy of local level electricity supply and distribution. They need to undertake the reforms in taxation as promised in the policies, work out the agreements with fleet aggregators and delivery fleet among others. While some states are providing incentives with regard to land and power facilities, implementation on ground is far from ideal.

Link incentives with technical eligibility criteria and standards and guidelines for infrastructure development: At this stage, most state level EV policies are not explicit about defining the technical eligibility in terms of performance criteria related to speed and range of EVs or type of batteries to access incentives. This will have to be addressed for proper market development across the states and to influence product development in different vehicle segments. Similarly, development of charging infrastructure will require more harmonized guidelines on designing charging infrastructure and alignment with national standards and codes. The detailing will also have to address the unique challenges and opportunities of each vehicle segment including two- and three-wheelers, cars, buses and other commercial vehicles.

Factoring in technical eligibility in state EV policies can promote appropriate vehicle technologies and batteries and improve the overall quality and performance of the EV programme. This has not been adopted adequately and uniformly across states and needs addressing. Several states have allowed incentives for vehicles with lead acid batteries. Some have enhanced the incentive for lithium-ion batteries without barring lead acid batteries. Bihar provides additional incentives of Rs 7,000 per kWh for auto rickshaws using li-ion battery instead of lead acid battery.

It is important to note that at the central level, FAME II incentive programme has already taken on board the technical eligibility criteria for accessing incentives. Otherwise, it can lead to a number of unintended consequences as was noted during FAME 1 period when mild hybrids, low-speed scooters and lead acid battery driven vehicles used up the subsidy.

Industrial promotion of EV manufacturing needs more targeted and monitorable action on ground: Several states have designed their respective EV policies to promote EV manufacturing as part of their industrial development plan. They have offered a wide range of capital subsidy and infrastructure support in terms of concessional land, power and water, industrial parks, and skill building incentives. They have also set specific employment targets. Even though some states have begun to take steps, the progress is still slow. In this case both infrastructure and demand creation will be addressed simultaneously to build confidence for new investments.

It is observed that states have largely drawn references from their existing state industrial policies. As the EV manufacturing ecosystem is at a nascent stage, it is vital to understand the unique supply chain challenges that this sector faces. Therefore, a policy that could offer a special targeted bouquet of incentives to this sector will be important to catalyse the manufacturing ecosystem. Beside taxation and capital subsidy support, states have to incentivize technology transfer and focus on availability of skilled work force that could meet the requirement of work.

Some states are more explicit in detailing the capital subsidy, tax incentives and other support and in taking a stratified approach towards the size of investments and providing infrastructure support, R&D support, and skilling and employment incentives. Policies also provide for support for start-ups. Several states have taken strategic decisions and even set targets for investments in electric vehicle manufacturing.

At this stage, it is difficult to gauge the response of the industry to these incentives at the state level. Ground level review shows that Telangana's state policy has resulted in several strategies for overcoming the consumer barriers towards electric vehicle adoption. For example, two industrial clusters have been established for supporting manufacturing activities. Telangana has entered into several MoUs since the policy was launched with several Indian and international manufacturers. Several bus manufacturers have signed MoUs to start bus and component manufacturing in the state. Similar action has been taken for e-autos. Having said that, a lot more is needed to speed up implementation and to ensure that investments are being drawn to the states.

States need to combine e-bus strategy with public transport augmentation strategy: The combination of state level targets and support from central FAME II incentives has created an opportunity to scale up electrification of public transport. But this needs to become a win-win strategy for scaling up clean public transport as well. It is not clear yet if additional support for e-buses will be available at the state level and how the bus numbers are being worked out in relation to the total buses required for improving public transport services in cities.

Need dedicated funding strategy in states: Only a few states have provided for a dedicated funding strategy and have identified revenue heads along with budgetary allocation to create dedicated funding for the EV programme. This needs to be mainstreamed across all state policies to make the incentive programme more revenue neutral, sustainable and make the cost of transition viable.

The establishment of an EV fund represents a state's commitment to vehicle electrification. An EV fund may be setup through budgetary allocation or through a feebate scheme that aims to disincentivize ICEs. Most states have not mentioned any action or even partial action plan for an EV Fund and are missing a very essential parameter to promote an EV ecosystem. Some are promoting electrification through dovetailing of existing funds under other policies. Only one state has considered zero emissions vehicle credit programme. Only three states have considered—but variably—identifying revenue heads like advertisement license fee and parking surcharge on ICE vehicles; or higher road tax, congestion tax and green tax on ICE vehicles. However, action on this—especially on taxing ICE vehicles higher—is the slowest.

There is need for guidance and mandate to create dedicated fund from budgetary allocation as well as by tapping into other revenue sources including enhanced

taxes on polluting vehicles and activities. This needs to be sustained over a period of time and made more sustainable.

Harmonize guidelines on charging infrastructure: Collectively, it includes defining charging requirements and models for its provisions, incentives for setting up charging, and concessional tariff for electricity. Targets for charging density and making buildings e-ready and fixing responsibility on DISCOMS have also been worked out. This now requires detailed implementation strategy and timeline related to deployment of chargers, deciding the ratio between slow and fast charging, adequate number of charging guns, urban planning layout of the charging stations to manage halting and charging places, and queue area and entry and exit points to prevent choke points. This will also require proper planning for building level interventions.

While collectively the incentive structures have been identified to include capital subsidy, concessional land, grant on purchase and installation, tax rebate, investment subsidy, delicensing of public charging activity, property tax rebate to residential owners, special subsidy for fixed number of chargers and higher capital subsidy if the charging equipment is manufactured locally within the state, the adoption of a combination of these strategies varies widely across states. There is a lot of scope for harmonizing these strategies across all states.

While most states have suggested incentives for public charging only, few have combined strategies for supporting public as well as private charging. Similarly, the sates that are looking at EV programmes as part of their industrial plan can optimize the incentive structure to further support local manufacturing.

Only a very few states have considered more innovative and diverse approaches including property tax rebate to residential owners for providing charging (Maharashtra) or to make public charging a delicensed activity (Madhya Pradesh). Haryana, Tamil Nadu and Goa have linked renewable energy with charging. These approaches can be further standardized for all states. Similarly, electricity tariff policy can be made more effective to reduce total cost of ownership.

Moreover, twelve states have incorporated charger specifications and standards in their respective policies. This can be made more explicit in all policies.

Additionally, to boost charging infrastructure, states have to look at concessional land and other non-fiscal measures, and provide support to power distribution companies to promote charging infrastructure.

Need a mandate for recycling system and infrastructure for EV batteries in all EV policies: It is understood that large-scale deployment of EVs will require state-wide strategy for collection of downgraded or spent batteries for recycling and urban mining to recover minerals. But there are several states that have not provided for battery recycling systems. Such a strategy cannot be optional and needs to be mandated across all state policies.

Mandating recycling in the state and providing enabling incentives wherever applicable can also provide economic benefits and augment the supply chain for industry. Delhi, Assam, Andhra Pradesh and Meghalaya plan to encourage setting up of battery recycling businesses. Several states have not included this within the scope of their policies. As Odisha has done, it is necessary to seek synergy with current e-waste management and ask for a policy for recyclers to be notified. Battery recycling businesses can be supported by the appropriate protocols and investment subsidies and involvement of OEMs in the business.

A specific mandate on commercialization of EV battery second life and a circular economy in battery manufacturing can also contribute to reduction in prices of batteries in the medium to long term. Batteries used in electric vehicles contain expensive materials that are also toxic. Recycling batteries can recover expensive materials while avoiding the environmental cost of disposing of hazardous materials. EV batteries at the end of their service life retain 70 to 80 per cent of their initial capacity. Used batteries can be repurposed and reused in lower performance applications. The reuse of batteries can help reduce the lifecycle cost of batteries, lowering the cost of electric vehicles and making them more cost-competitive. Battery recycling could be incentivized with investment subsidies. Vehicle manufacturers could be offered incentives for using batteries with recycled content in the case of fresh application and on the basis of remaining capacity of end-of-life batteries purchased for recycling.

Disincentivize ICE vehicles to create opportunity for EVs: Only a few states have provided for higher taxes to disincentivize ICE vehicles and to cross subsidize EVs or use non-fiscal strategies like low emissions zones or preferential parking to incentivize EVs. It is necessary to ensure that these steps are further developed and implemented. Global experience shows that active disincentives for ICE vehicles are needed for market transformation. Often such proposals on disincentives for ICE vehicles in the EV policies fall by the wayside and are not implemented.

The EV policies of Meghalaya, Delhi, Haryana and Chandigarh point at policy intent to disincentivize ICE vehicles through additional taxation. However, little has been done on the ground to establish a clear mandate for the same.

It is important to disincentivize ICE vehicles through taxation and non-fiscal measures such as restrictions on plying on the roads. This could change public perception about EV adoption. Tools such as a fossil fuel tax or carbon tax on the sale of diesel or gasoline fuel are already in place. However, their quantum has not yet crossed the threshold that will make EVs more attractive than ICE vehicles. Funds collected as a result are utilized for the state's electric vehicle initiatives under the Air Ambience Fund. In addition, increased road and registration tax and parking charges for conventional vehicles could reduce attractiveness of ICE vehicles and indirectly create demand for EVs.

Governance and compliance framework: The transformative change that awaits the vehicle sector in states requires well defined coordination framework for all concerned departments, monitoring and reporting system for measurable and verifiable progress, department level strategy development, and a compliance programme. Only a few state policies have provided for monitoring and reporting. This will have to be strengthened, detailed out and harmonized across all state policies.

Even though several states have provided for an EV cell or a review committee or board to close-loop efforts stipulated within their policies, this requires strong coordination and governance structures for implementation and inter-departmental coordination. A periodic review mechanism that states have advocated can help to firm up the roadmap.

Building consumer awareness: Strong outreach and communication strategy is needed to build consumer awareness about the mechanism for accessing incentives, availability of infrastructure, making buildings ready for EVs, making support systems available, providing information about performance parameters of EVs, among others. A cursory review in a few states has shown that often targeted fleet operators, including three-wheeler/commercial vehicle operators, are not fully aware of the policy incentives, targets of the EV programme in the state, the mechanism of accessing incentives, cost structures and cost recovery, among others. Therefore, the dormant and potential demand for EVs often cannot be adequately stimulated to drive the market demand.

State level action has started—needs to gather momentum: Rapid review of the state of implementation of the EV policies in Maharashtra and Telangana shows that action has been initiated on several fronts as per the EV policy but it has to gather pace. This is critical to achieving the objectives of the policies.

References

1 The amendment of FAME II released by MHI on 11 June 2021. Available at https://fame2.heavyindustries.gov.in/WriteReadData/userfiles/227493.pdf as accessed on 18 January 2022

2 Anon 2022. Covid-19 in India, Government of India. Available at https://www.mygov.in/covid-19 as accessed on 18 January 2022

3 Anon 2022. *"Many challenges in turning old autos into EVs"*, Hans News Service, Hyderabad. Available at https://www.thehansindia.com/news/cities/hyderabad/hyderabad-many-challenges-in-turning-old-autos-into-evs-722887?infinitescroll=1 as accessed on 18 January 2022

Many states have announced ambitious electrification targets in their EV policies. This is keeping in line with India's statements at COP 26 while signing the declaration for 100 per cent transition to zero emissions by 2030–40; and with NITI Aayog's ambitious aims to electrify all vehicle segments. The promises are many and the aims are high but, this report asks the question, are there adequate and appropriate policy strategies in place to support and drive this ambition?

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phones: 91-11-40616000 Fax: 91-11-29955879
Website: www.cseindia.org