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A REVIEW OF STATE GOVERNMENT POLICIES FOR **ELECTRIC MOBILITY**

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ABSTRACT

This review of EV policies of 12 Indian states, with notified or draft policies in place, provides a comprehensive overview of policy incentives and mechanisms being deployed for promoting electric mobility in these states. It is expected to be useful for state- and city-level policy makers as they design, revise, refresh and implement tailored initiatives to support the accelerated growth of the EV ecosystem.

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ABBREVIATIONS

CSO	Charging Service Operator
DC	Direct Current
DCR	Development Control Regulations
DFC	Delhi Finance Corporation
DISCOM	Electricity Distribution Company
e-2W	Electric Two-Wheeler
e-3W	Electric Three-Wheeler
e-4W	Electric Four-Wheeler
EMI	Equated Monthly Instalment
EPF	Employees' Provident Fund
ETP	Effluent Treatment Plant
EV	Electric Vehicle
EVHS	Electric Vehicle Homecharge Scheme
EVSE	Electric Vehicle Supply Equipment
FAME	Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles
GBP	British Pound Sterling
GoI	Government of India
GST	Goods and Services Tax
ICE	Internal Combustion Engine
INR	Indian Rupee
kWh	Kilowatt-hour
LCV	Light Commercial Vehicle
MBBL	Model Building Byelaws
MoHUA	Ministry of Housing and Urban Affairs
MoEFCC	Ministry of Environment, Forest and Climate Change
MoRTH	Ministry of Road Transport and Highways
MSME	Micro, Small and Medium Enterprise
MW	Megawatt
NBFC	Non-Banking Financial Company
NEMMP	National Electric Mobility Mission Plan
NEV	New Energy Vehicle
NFC	Near-field Communication
NSDC	National Skill Development Corporation
OEM	Original Equipment Manufacturer
PPP	Public Private Partnership
RFID	Radio-frequency Identification
SGST	State Goods and Services Tax
SOP	Standard Operating Procedure

STP	Sewage Treatment Plant
STU	State Transport Undertaking
TCO	Total Cost of Ownership
TOU	Time-of-use
ULEZ	Ultra Low Emission Zone
UPI	Unified Payments Interface
URDPFI	Urban Regional Development Plans Formulation and Implementation
USD	United States Dollar
UT	Union Territory
V2G	Vehicle-to-Grid
VFA	Value of Fixed Assets
ZEV	Zero Emission Vehicle

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EXECUTIVE SUMMARY

Between 2017 and 2020, 15 Indian states have either notified or drafted state Electric Vehicle (EV) policies. The vision of state EV policies may be broadly translated into two objectives. The first objective aims to make states preferred destinations for EV and component manufacturing, while the second is to increase EV adoption within states. To attain these objectives, state EV policies have defined a range of supporting incentives which can be divided into three categories -

1. CONSUMER DEMAND INCENTIVES

Given the nascent status of the EV market in the country, demand incentives support the early market development of electric vehicles. They may be purchase or operational incentives, with the former defraying the higher upfront costs of EVs and the latter encouraging on-road EV usage. Demand incentives primarily fall within the mandate of transport authorities and urban development authorities for execution and enforcement at the city and state levels.

State EV policies have outlined a good mix of demand incentives for promoting EV adoption in their regions. The road tax exemptions are a robust complement to the FAME-II purchase subsidies and should be implemented at the earliest by state transport departments. Fiscal allocations for road tax exemptions in state budgets can help in faster deployment of this incentive.

Among non-financial incentives, permit waivers for EVs and a complementary ban on permit renewals for polluting vehicles are expected to be highly impactful in promoting the steady conversion of Internal Combustion Engine (ICE) commercial vehicles to electric. This is significant, as light commercial vehicles are primed for electrification due to favorable economic viability of EVs in these segments. States will need to capitalize on the readiness of this segment, by providing specific incentives for commercial fleets.

Few state policies mention information and educational programs for EVs. This must be remedied at the earliest to increase consumer awareness about EV technologies and available EV incentives. Furthermore, higher-emission vehicles need to be disincentivized through appropriate measures such as fuel cess, carbon tax, higher road taxes etc. And finally, governments should link their EV adoption targets to their environmental sustainability goals, to improve budget allocation and inter-departmental coordination for EV action.

2. CHARGING INFRASTRUCTURE INCENTIVES

A robust network of EV charging infrastructure reassures consumers of charging availability thus reducing range anxiety associated with electric vehicles. State incentives for EV charging include a mix of financial incentives, and planning and regulatory frameworks, that support the deployment and integration of EV charging. At the state level, charging infrastructure mandates come under the purview of energy department agencies, including electricity regulatory commissions, electricity transmission and distribution companies, and renewable energy development corporations. Urban development authorities are responsible for planning regulations that govern the location and setting up of charging stations. Currently, state capital subsidies and land allocation concessions are geared towards heavy, capital-intensive public charging stations with multiple EV points and high-powered DC chargers. Considering that the first wave of electrification will be led by light vehicles such as 2Ws, 3Ws and small cars, states need to right-size their approach to charging infrastructure, by providing incentives for lighter EV charge points, and by promoting private sector participation through mechanisms such as EV tariffs for commercial charging and by providing electricity connections to charging operators.

State urban development departments need to prioritize amendments to urban development regulations and building byelaws. This will ensure that new buildings are equipped with the necessary electrical infrastructure to support EV charging. At the same time, states can consider innovative financing mechanisms to support community charging banks in existing multi-unit residences and office areas. Additionally, states need to support location planning for public charging infrastructure such that it optimizes accessibility and utilization. Finally, only a few states have specified the need for integrated consumer interfaces through data-sharing and ease of payment. However, none of the state policies reflect on the need for optimizing grid utilization through managed charging, and planning for electricity grid upgrades, in line with growing charging loads.

3. INDUSTRY INCENTIVES

Industry incentives are aimed at vehicle manufacturers, battery producers and ancillary companies, to encourage the production of electric vehicles and component parts of the EV value chain. Incentives are provided as capital and infrastructure subsidies, as well as human resource and research development.

The investment promotion subsidies and land and infrastructure incentives allow states to create attractive incentive packages for manufacturers. However, monetary incentives are expensive and can only do so much to catalyze the ecosystem. Non-monetary incentives such as EV manufacturing targets, set in conjunction with the industry, may be other effective measures that states can consider for spurring production. At the same time, an attractive business environment requires clear and efficient processes to ensure that companies can set up industries without too many hassles. This requires a planned approach to industrial clusters that consider the social and environmental concerns of local populations.

The other set of incentives that states have deployed relate to skill development, employment generation and research and development. These will be crucial in developing the necessary human resources and effect the shift to higher-value manufacturing. Rather than competing amongst themselves, states may choose to specialize in certain segments of the EV value chain for greater growth.

States, with existing EV policies, are now beginning the process of revising and implementing these policies. At the same time, more states aim to draft and notify their own EV policies. This policy review seeks to provide an overview of state incentives, to facilitate peer-to-peer learning, and to recommend state actions for effective implementation. However, states also need to progress from policy making towards implementation, by putting in place appropriate governance structures, execution roadmaps and budget plans that support necessary state action for the transition to electric mobility.

INTRODUCTION

With ten years remaining to achieve India's ambitious goal of reaching 30% electric vehicle penetration by 2030, radical and coordinated action is needed between all stakeholders to create the necessary momentum. The uptake of electric vehicles, or EVs, is still in its infancy in India, accounting for 0.9% of two-wheeler sales and 0.1% of car sales in 2019 across the country. Compare this to the global market share for electric cars, which was 2.6% in 2019 and is estimated to surpass 3% in 2020.

Governments play an essential role in supporting the mainstreaming of EV technology in the motor vehicle sector. The competitiveness of newer technologies in comparison to incumbent ones grows over time due to established supply chains, scale economies of production, consumer preference, and improved performance and maturity. However, relying only on market forces to achieve the transition to EVs from an entrenched internal combustion engine (ICE) vehicle market is unrealistic. The EV ecosystem will require additional support in its nascency, and the government has a significant role to play.

The case for accelerating EV adoption is strong – transport emissions in Indian cities are growing rapidly, with road transport contributing about 87% of the total. In combination with the aggressive movement towards renewable power generation, EVs can significantly cut down the share of transport and pollution emissions at the local and national levels. Further, transportation is the third-largest energy consumer and the largest consumer of oil fuels, responsible for 70% of diesel and 99.6% of petrol consumption. With India importing about 80% of its oil demand, and the price of crude oil being highly vulnerable due to global geopolitics, transport decarbonization reduces the risk to the country's energy security.

¹ Deccan Herald. April 2020. Electric vehicle sales in India up 20% in 2019-20: SMEV. Available at: <https://www.deccanherald.com/>

² International Energy Agency. June 2020. Global EV Outlook 2020. Available at: <https://www.iea.org/reports/global-ev-outlook-2020>

³ Sharma, S., et al. "India-California Air Pollution Mitigation Program (ICAMP)." (2013).

⁴ India 2020 – Energy Policy Review, IEA



Simultaneously, electrification presents India an opportunity to strengthen its role and move upstream in the global automotive value chain. Through a two-pronged strategy of localizing production for domestic EV consumption and developing low-cost solutions in niche areas for outsourcing, the country can capitalize on this once-in-a-lifetime opportunity through strategic industrial development of the EV sector.

The government of India has backed an extensive program for transport electrification through the implementation of the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) schemes (I and II), the reduction of the Goods and Services Tax (GST) on EVs to 5%, and an income tax exemption of up to INR 150,000 on interest payments for EV loans. A range of other guidelines and notifications on EV charging standards, delicensing of EV charging services, capping of EV tariff for charging infrastructure, model Development Control Regulations (DCR) and building codes for EV charging, and green license plates for EVs further support the ecosystem.

With transportation being a concurrent subject, states hold many of the policy and implementation levers needed to catalyze the transition to electric mobility.

Therefore, electric mobility requires a coherent strategy developed in close coordination between national and state governments, setting achievable but ambitious targets backed by policy reforms and an implementation roadmap. In this context, it is heartening to see states recognizing the opportunities presented by EVs and working towards realizing the potential gains from the sector. In this report, we explore state actions to support India's electric mobility agenda through the powerful instrument of state EV policies.

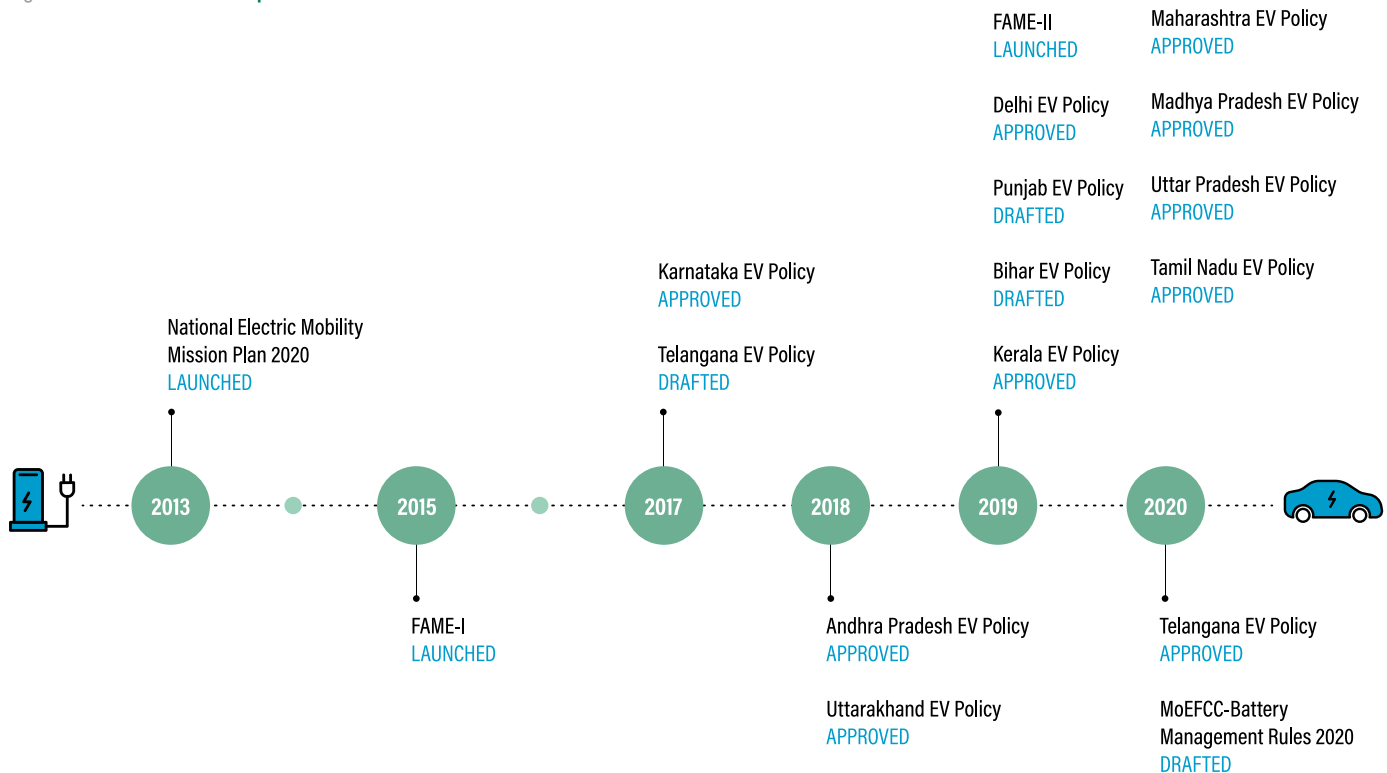
STATE-LEVEL INCENTIVES FOR SUPPORTING THE EV ECOSYSTEM

1.

The Government of India (GoI) has ambitious targets for electric mobility in the country. However, it is state governments and local authorities that are tasked with the actual implementation of policies and programs to enable the transition to EVs. States, too, see opportunities in the nascent e-mobility sector for economic growth and industrial development. Thus, in addition to supporting the on-ground implementation of central government orders and schemes, some state governments have gone a step further to adopt and implement stand-alone state policies to promote electric mobility.

While an EV policy is not essential for state action, the presence of such a policy signals a state government's commitment to promoting e-mobility. Further, an EV policy provides a vision and objectives to be achieved, and takes an ecosystem approach to incentivize or support various aspects of the EV value chain at the state level. And finally, an EV policy helps define and coordinate action between the responsible government departments and agencies to leverage synergies and partnerships in building the EV ecosystem.

Figure 1: Timeline of state EV policies



Starting with the notification of the Karnataka Electric Vehicle and Energy Storage Policy in 2017, a total of 14 states have notified or draft EV policies as of January 2021. Other than Karnataka, states with notified EV policies include Delhi, Kerala, Maharashtra, Uttarakhand, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh and Telangana. Besides, Bihar, Chandigarh, Punjab, Haryana, Gujarat, Assam and Himachal Pradesh have draft EV policies awaiting state cabinet approvals. Figure 1 shows the timeline of state EV policies' development, highlighting the accelerated state activity on electric mobility in the past couple of years.

State EV policies vary widely in their scope and scale, with most policies having a validity period of five years from the date of notification. Tamil Nadu and Telangana have 10-year policies, while Delhi's EV policy is valid for only three years. The policies are spearheaded by different departments in different states. The department of industries is a common nodal agency responsible for the formulation and implementation of the EV policy in several states. In Kerala, Punjab and Delhi, the transport department has taken the lead. In Madhya Pradesh, the nodal agency is the urban development and housing department.

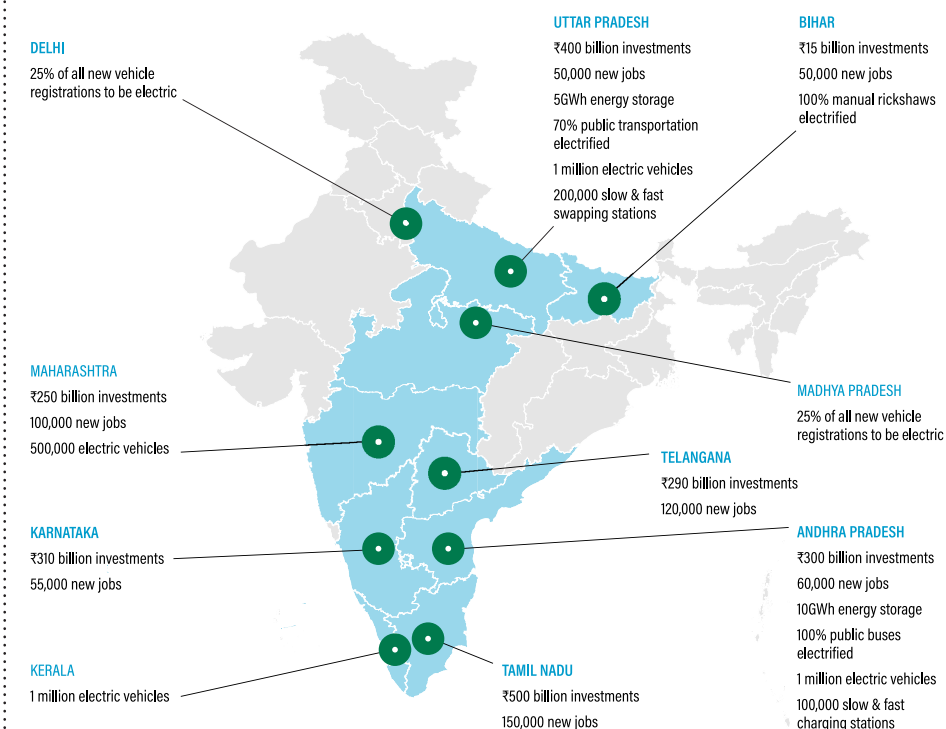
Accordingly, state EV policies' objectives and targets also vary, with a few common themes emerging among them. As the policy's objectives are important for understanding the potential efficacy of its incentives, it is worthwhile to examine these different motivations here briefly.

In implementing EV policies, states aim to become e-mobility hubs within the country, a vision that is translated into two broad sets of objectives. One set focuses on making states preferred destinations for the manufacture of EVs and components. This includes measures such as fiscal support for setting up industries, promoting innovation as well as research and development (R&D), and skilling the workforce to improve the industrial outlook. The second set of objectives aims to increase the uptake of electric vehicles within the states, for benefits such as reducing pollution and a transition to sustainable mobility. Figure 2 highlights targets defined by state EV policies.

1.1

VISION AND OBJECTIVES
OF STATE EV POLICIES

Figure 2: State EV policy targets



To attain these targets, state EV policies have defined a range of supporting incentives and suggested regulatory and governance frameworks. Effective incentive design and efficiency of implementation will be critical for states to achieve their EV targets.

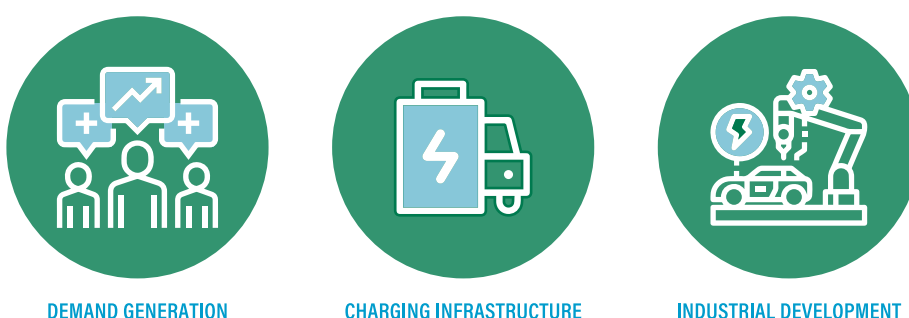
1.2

SCOPE AND STRUCTURE OF THE REPORT

This report reviews EV policies of 12 Indian states with notified or draft policies in place. It is targeted at state- and city-level policymakers concerned with the design and execution of policy measures to support the EV ecosystem.

As more states aim to frame EV policies, and states with existing EV policies seek to refine them, this report seeks to provide a comprehensive overview of the range and types of incentives being offered in different regions and to facilitate policy transfer through peer-to-peer learning. The report also highlights some recommended actions to fill gaps in the current policy frameworks, strengthen existing incentives and improve the efficacy of public investment in the sector.

Figure 3: Types of incentives for EV ecosystem



The report divides policy incentives and measures into three categories – consumer demand incentives, charging infrastructure incentives, and industry incentives – as shown in Figure 3. Each of these categories is treated in separate chapters, starting with an analysis of the different incentives and policy instruments being deployed, followed by recommendations for consideration. The report’s concluding chapter emphasizes the need for effective implementation and governance of state EV policies for impactful results.

The report does not cover on-ground implementation towards the achievement of the state EV policies, since some policies have recently been notified or are still under consideration. Further, state EV policy implementation has been delayed or fragmented in many cases, a gap that must be remedied but is not within the scope of this report. Unless otherwise mentioned, **all discussions of the different EV policy incentives offered by states refer to the policy documents and not to the state of implementation today.**



CONSUMER DEMAND INCENTIVES

2.

.....

Demand incentives support the early market development of electric vehicles, given the nascent status of the EV market in the country. Central and state governments provide consumer incentives to enable EVs to be more competitive with conventional internal combustion engine (ICE) vehicles. Until the EV industry matures and becomes more mainstream, consumer incentives are meant to overcome barriers to adoption and to promote the purchase and use of EVs.

Consumer barriers to EV adoption are relatively well-known; they include higher purchase costs, a limited driving range, and the lack of EV charging infrastructure. A less-acknowledged barrier is low EV awareness, with many consumers lacking adequate familiarity with the emerging technology to make an informed decision.

⁵ <https://www.teriin.org/blog/what-would-make-indians-buy-evs-our-survey-has-some-answers>

Supplementing the GoI's FAME-II incentives, state-level consumer demand incentives may be categorized as purchase incentives and operational incentives, with the former aiming to reduce the higher purchase costs of EVs and the latter encouraging on-road EV usage. Demand incentives primarily fall within the mandate of transport authorities and urban development authorities for execution and enforcement at the city and state levels.

Table 1 provides a comparative snapshot of demand incentives offered by state EV policies. Incentives are further defined and analyzed in the section below.

Table 1: **Matrix of EV demand incentives**

States	PURCHASE INCENTIVES				OPERATIONAL INCENTIVES			
	Purchase Subsidy	Tax Exemptions	Access to Financing	Scrapping and Retrofit incentives	Priority or Free Permits	Green zones	Parking Incentives	Toll fee waivers
Andhra Pradesh	●	●	●	●	●	●	●	●
Bihar	●	●	●	●	●	●	●	●
Delhi	●	●	●	●	●	●	●	●
Karnataka	●	●	●	●	●	●	●	●
Kerala	●	●	●	●	●	●	●	●
Madhya Pradesh	●	●	●	●	●	●	●	●
Maharashtra	●	●	●	●	●	●	●	●
Punjab	●	●	●	●	●	●	●	●
Tamil Nadu	●	●	●	●	●	●	●	●
Telangana	●	●	●	●	●	●	●	●
Uttar Pradesh	●	●	●	●	●	●	●	●
Uttarakhand	●	●	●	●	●	●	●	●

● Not addressed in the policy ● Addressed in the policy

Financial purchase incentives

Financial purchase incentives help defray the higher upfront costs of EVs, a key barrier to adoption. Globally, the most common purchase incentives in use are purchase subsidies and tax reductions. Besides, a couple of Indian states utilize favorable terms of financing and scrapping incentives to encourage EV adoption. Scrapping incentives are primarily targeted at commercial vehicle segments, in which vehicle owners may need additional financial assistance to switch to EVs.

While widely used, the practical design of financial incentives is necessary to ensure their impact. To maximize impact, incentives should be offered upfront at the time of purchase, not afterward. Incentives on low-end vehicles are more impactful in influencing consumer purchase decisions than those on high-end vehicles. And importantly, incentives should be designed with an extended timeframe in mind, and should not be prematurely withdrawn before the market has adequately developed.

Purchase subsidy

Purchase subsidies are a widely used policy measure, enabling EVs to be more competitively priced against ICE vehicles. Subsidies may be offered as income tax credits, purchase rebates, or upfront purchase price reductions, depending on how they are structured and delivered to the buyer.

⁶ Hardman, Scott et al. 2017. The effectiveness of financial purchase incentives for battery electric vehicles – A review of the evidence. *Renewable and Sustainable Energy Reviews*. Vol 80, pp.1100-1111.

TAX CREDITS VS. UPFRONT SUBSIDIES

The US federal government, for example, offers income tax credits ranging from \$2,500 to \$7,500 for the purchase of a new EV⁷, which are realized by buyers at the end of the tax year. In contrast, India's FAME-II scheme offers purchase subsidies in the form of an upfront reduction in the purchase price to be reimbursed to OEMs of eligible vehicle models by the GoI.

Consumer research has found that subsidies on EV purchases are most effective when delivered at the time of purchase.

Which states are using it?

- Delhi and Maharashtra provide purchase subsidies across multiple small vehicle segments for eligible EV models and a defined number of EVs in each segment.
- Bihar offers purchase subsidies for the first 100,000 vehicles manufactured within the state, including strong hybrids.
- Kerala offers a purchase subsidy on electric three-wheelers, while Tamil Nadu promises an undefined subsidy amount for state transport undertakings (STUs) to purchase e-buses.

While Maharashtra's and Kerala's subsidies are based on the vehicle's purchase price, Delhi's and Bihar's subsidies are provided on the battery size of vehicles.

Further, for buyers in Delhi who purchase EVs (without batteries) fitted out with a battery swapping model, 50% of the subsidy amount is provided to the registered owners and the remaining 50% to the energy operators to defray deposit costs of the battery swapping service. In Bihar, an additional incentive of INR 7,000/kWh is suggested for e-2Ws and e-3Ws using lithium-ion batteries instead of the conventional lead-acid batteries. These are innovative approaches for subsidy design, which structure and deliver the subsidy where it can have a greater impact.

⁷ <https://afdc.energy.gov/laws/409>

Table 2: Purchase subsidies for EV segments

PURCHASE SUBSIDIES FOR EV						
	Segment	2W	3W	Cars	Light Carriers	Buses
Delhi	Subsidy (in INR)	5,000/ kWh	30,000	10,000/ kWh	30,000	As appropriate
	Max. amount (in INR)	30,000	N/A	150,000	N/A	N/A
	No. of vehicles	N/A	N/A	1,000	N/A	N/A
Bihar	Subsidy (in INR)	10,000/ kWh	10,000/ kWh	10,000/ kWh	Not defined	10,000/ kWh
	Approx. amount (in INR)	20,000	50,000	150,000		2.5 million
	No. of vehicles	24,000	70,000	4,000		1,000
Maharashtra	Subsidy	15% on BP*	15% on BP*	15% on BP*	Not defined	10% on BP*
	Max. amount (in INR)	5,000	12,000	100,000		2 million
	No. of vehicles	70,000	20,000	10,000		1,000
Kerala	Subsidy	N/A	30,000	N/A	N/A	N/A
	Subsidy period		1 year			

*Base price of the vehicle

Tax exemptions

The motor vehicle tax, or road tax as it is commonly known, is a state-level tax that varies widely from one state to another. It is structured differently for transport and non-transport vehicles, typically levied as a periodic (half-yearly or annual) road tax on transport vehicles and as a one-time lifetime tax on non-transport vehicles. It is a prime fiscal instrument in the state government toolbox, and therefore unsurprising that all state EV policies offer road tax exemptions or reductions for EV buyers.

Which states are using it?

- Delhi, Maharashtra, Karnataka, Kerala, Bihar, Uttarakhand, Tamil Nadu, Andhra Pradesh and Punjab offer 100% road tax exemption for newly-purchased EVs, for varying durations of time. Longer tax exemption periods are expected to benefit commercial vehicles, which pay road tax on an annual or semi-annual basis.
- Telangana and Madhya Pradesh offer road tax exemption for a fixed number of vehicles in each vehicle segment.
- Uttar Pradesh provides a road tax exemption for the first 100,000 buyers of locally manufactured EVs, 100% exemption for e-2Ws and a 75% reduction for other EVs.
- All states except Punjab have offered an exemption on registration fees for EVs. Despite the road tax exemption mandated in EV policies, most states have yet to implement the tax waiver. Currently Karnataka and Madhya Pradesh levy a reduced road tax of 4% on EVs, while Kerala has slashed its road tax rates by half for EVs.

Access to financing

Access to financing for EVs remains to be solved. The uncertainty of residual value, risk of technological obsolescence, and lack of historical data make it difficult for financing institutions to assess the risk profile for EV lending, especially for commercial vehicles. This has led to fewer banks offering loans for EVs, often with higher down payments, higher interest rates, and for shorter loan terms than ICE vehicles.

With a significant share of India's vehicle sales dependent on debt financing, accessible and favorable EV finance will be integral to scaling adoption and reducing ownership costs. Policy-supported mechanisms such as down payment subsidies, interest subventions, low-interest loans, and extended repayment periods can provide more affordable financing for EV buyers.

Which states are using it?

- Delhi offers an interest subvention of 5% for the commercial e-3W, e-cart, and e-carrier segments, for loans availed from the Delhi Finance Corporation (DFC) and other empaneled finance providers.
- Bihar offers an interest subvention of 10% for electric light freight vehicles and buses, extended to other electric vehicle segments for vehicles manufactured in the state.
- Telangana's existing state self-employment schemes are to be extended to provide financial assistance to purchase EVs for commercial purposes. For e-3Ws, Telangana will encourage financing institutions to provide a hire purchase scheme at discounted interest rates.

SBI GREEN CAR LOAN

Currently the only EV-specific loan scheme floated by a commercial bank in India, the SBI green car loan, offers a concession of 20 basis points on the rate of interest applicable for an e-car loan.

More schemes offering accessible financing are necessary, especially for commercial fleet segments such as electric two wheelers, e-autos and e-taxis.

Figure 4: Retrofitted e-autorickshaw in India



Source: <https://blog.gaadikey.com/mahindra-electric-baghirathi-group-jointly-power-karnatakas-ev-dream>

Scrapping and retrofit incentives

Scrapping and retrofit incentives aim to remove high-polluting, older ICE vehicles from roads while accelerating the existing vehicle fleet's transition to EVs. This is done by offering financial incentives for retrofitting ICE vehicles to convert them into EVs or for scrapping eligible vehicles and purchasing EVs.

SCRAPPING SCHEME IN FINLAND

Finland runs a scrapping scheme periodically, in which the government offers up to EUR 2,000 (approx. INR 178,000) in bonuses for scrapping old ICE vehicles and purchasing new EVs or other clean fuel vehicles.

The repeated provision of the scrapping incentive every couple of years enables a continuous transition to low-carbon transport, as older, polluting vehicles are phased out and replaced by significantly cleaner vehicles.

⁸ <https://www.lvm.fi/en/-/facts-on-passenger-car-scrapping-premium-and-purchase-support-for-gas-fuelled-trucks-into-force-1244949#:~:text=A%20scrapping%20premium%20of%20EUR%20%2C000%20will%20be%20awarded%20for,emissions%20of%20120%20grams%20per>

Which states are using it?

- Delhi offers a scrapping incentive of INR 5,000 and INR 7,500 for purchase of eligible electric two-wheelers and three-wheelers respectively, which can be availed upon proof of scrapping and de-registering old polluting ICE vehicles. The incentive is contingent on a matching contribution from the dealer or OEM.
- Punjab aims to notify a detailed scrapping policy for old vehicles in which EV adoption will be incentivized through transition credits.
- Telangana offers a retrofitting incentive at 15% of the retrofitting cost, capped at INR 15,000 per vehicle, for 5,000 e-autos.

Scrapping incentives are effective in substituting ICE vehicles with EVs, without a net addition of vehicles on the road. As the price difference between ICE vehicles and EVs shrinks, purchase subsidies can be slowly tapered off, with a proportional increase in scrapping incentives.

Taken together, the different financial incentives can add up to a significant offset on EV purchase costs, as shown in Table 3

Table 3: Comparison of purchase incentives in different states (in INR)

e-2W price of ₹ 135,000	Delhi	Mumbai	Bangalore
Purchase Subsidy	₹ 12,000	₹ 5,000	₹ 0
Road Tax*	5,400	8,100	5,400
Scrapping Incentive	10,000	0	0
TOTAL INCENTIVES	₹ 27,400	₹ 13,100	₹ 5,400

e-3W price of ₹ 273,000	Delhi	Mumbai	Bangalore
Purchase Subsidy	₹ 30,000	₹ 12,000	₹ 0
Road Tax**	1995	6000	2500
Scrapping Incentive	15,000	0	0
TOTAL INCENTIVES	₹ 46,995	₹ 18,000	₹ 2,500

e-4W price of ₹ 15,00,000	Delhi	Mumbai	Bangalore
Purchase Subsidy	₹ 150,000	₹ 100,000	₹ 0
Road Tax	187,375	164,890	254,830
TOTAL INCENTIVES	₹ 337,375	₹ 264,890	₹ 254,830

*Currently e-2Ws are charged 4% road tax in Delhi and Karnataka. Maharashtra charges 6%.

**3W Road tax is collected annually in Delhi and Maharashtra. Amount indicated is the cumulative road tax savings over the policy period. Karnataka collects lifetime tax.

Operational incentives

While purchase incentives are offered at the time of buying an electric vehicle, governments can also incentivize EV usage through recurring operational incentives. These may include perks such as zero-emission zones or open permit systems for EVs, or they may include usage benefits, such as parking incentives and usage fee waivers.

Non-financial, operational incentives effectively promote EV adoption, but must be designed keeping in mind differences in traffic conditions, travel patterns, consumer preferences, and other local variations⁹. Especially in congested metropolitan areas, operational incentives can prioritize road use for EVs and boost their usage. However, effective deployment of operational incentives, including reserved parking spaces and low-emission zones, requires appropriate regulatory frameworks and enforcement capacity, which is often missing in Indian cities. Developing and implementing the necessary policies and regulations will be an essential first step to incentivize EVs in this regard.

Priority or free permits

State transport authorities issue operating permits to transport vehicles such as autorickshaws, trucks, taxis, and buses, according to the state's motor vehicle rules. Often, permit frameworks tend to be highly regulated, as in the case of a fixed number of permits for autorickshaws within cities or the monopolies on city bus operation permits by state-owned operators. By providing priority permits or periodically removing restrictions on the number of permits for electric vehicles, EV penetration among commercial vehicles can be significantly incentivized.

Which states are using it?

- Andhra Pradesh will offer permit priority for e-autos.
- In Delhi and Tamil Nadu, an open permit system will be applicable for e-autos, wherein permits will be given on a first-come-first-served basis.
- Tamil Nadu also offers permit waivers for light freight EV-3W goods vehicles, e-carriers, and electric light goods carriers.
- Punjab offers a 100% permit fee exemption for all commercial EVs, from e-2Ws to e-buses. For hybrid 4Ws, a 50% permit fee exemption is available.
- Punjab and Kerala will grant new permits only to e-autos in specified cities.

While the GoI has exempted EVs from permit requirements, states are yet to implement the measure in their regions¹⁰. As an alternative, states can consider removing permit caps for EVs, or renewing permits only for EVs in segments such as e-autos and e-taxis. These vehicles travel between 100 km and 200 km per day on average, and converting them to EVs can accelerate the number of electrified kilometres traveled.

⁹ Hardman, Scott. 2019. Understanding the Impact of Reoccurring and Non-Financial Incentives on Plug-in Electric Vehicle Adoption – A Review. Plug-in Hybrid and Electric Vehicle Research Center, Institute of Transport Studies, University of California Davis. Working Paper.

¹⁰ https://www.business-standard.com/article/economy-policy/centre-advises-state-govts-to-exempt-evs-from-permit-requirements-119071901531_1.html

Figure 5: Ultra low emission zone (ULEZ) in London



Source: Associated Press

Green zones

Green zones, as referred to in state EV policies, are equivalent to low-emission or zero-emission zones, where the movement of polluting vehicles is restricted or penalized with an emission charge.

Which states are using it?

- Kerala's policy encourages the establishment of EV zones in environmentally fragile regions such as Munnar.
- Andhra Pradesh and Punjab have mandated green zones as a strategic measure in target cities for e-mobility.

Another example of a green zone includes Uttar Pradesh's green bus routes, which will be identified within the state's model electric mobility cities and ensure 70% electric vehicles in public transportation along these routes. While not the same instrument, this is similar to lane priority offered for EVs in the U.S., where single-occupant EVs are permitted to use the high-occupancy lanes on highways in states such as New York and California.

LONDON'S ULTRA LOW EMISSION ZONE (ULEZ)

The ultra low emission zone (ULEZ) covers a significant (and expanding) part of central London. Drivers of older, polluting cars pay a daily charge of GBP 12.50 for entering the ULEZ¹¹.

¹¹ <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone>

Parking incentives

Parking incentives include the waiver of parking charges for electric vehicles in public parking areas and/or the provision of reserved parking spots, often equipped with EV charging points. They make it easier for EV owners to find parking and reduce associated parking costs of using a personal vehicle, especially in dense urban areas.

Which states are using it?

- Kerala and Madhya Pradesh provide an exemption from parking charges for EVs.
- Punjab offers reserved EV parking slots in public parking spaces across “target cities” and will provide designated street parking spots equipped with street-pole charging.
- Telangana aims to provide preferential parking slots with the required charging infrastructure for EVs.

Cities with unorganized parking can work towards enacting parking policies, with reserved and/or free parking for EVs. For cities with parking policies, a mandate for reserved EV parking can be integrated with the provision of public charging points.

GLOBAL USE OF EV PARKING BENEFITS

Parking benefits such as free and discounted parking for EV users, integrated with EV charging in some cases, is allowed in certain public locations in China, South Korea, France, Germany, Italy, Norway, Spain, Sweden, and the United Kingdom. In Seoul, EV users have access to free parking along with free public charging facilities. In China, cities such as Nanchang have halved the fees for parking on streets or in public lots.

Toll fee waivers

These waivers exempt EV users from the payment of standard toll fees, typically for intercity or regional trips. Like parking incentives, they help reduce operational costs of EVs. With toll fees on national highways in India exceeding INR 1 per km, this amounts to significant savings on longer-distance trips.

Which states are using it?

- Punjab and Bihar offer toll fee waivers for EVs on select state highways.

With the benefits of toll fee waivers likely to be realized on longer, interstate trips, this incentive will be optimally effective only when adopted by neighbouring states.

RECOMMENDATIONS FOR EFFECTIVE DEMAND CREATION

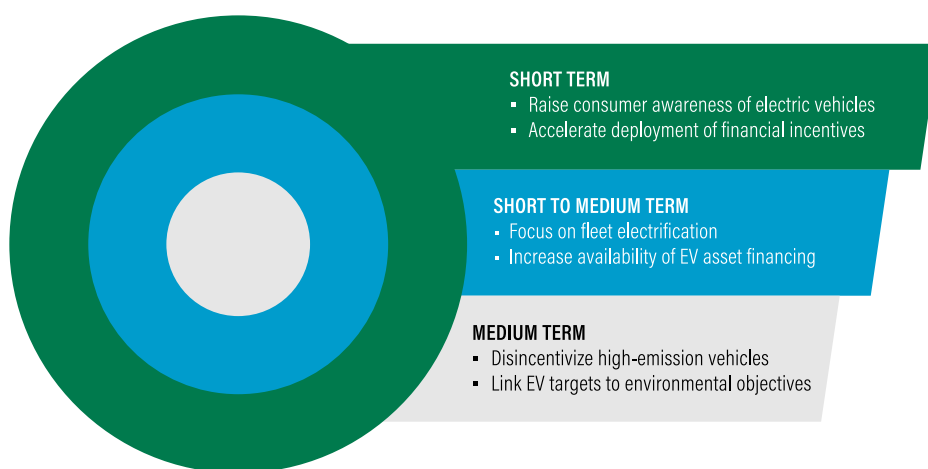
State EV policies have outlined a good mix of demand incentives for promoting EV adoption in their regions. Financial incentives will play an outsized role in demand creation for EVs, at this early stage of the sector's development. The road tax exemptions are a robust complement to the FAME-II purchase subsidies and should be implemented at the earliest by state transport departments. Fiscal allocations for road tax exemptions in state budgets can help in faster deployment of this incentive.

Among non-financial incentives, permit waivers for EVs and a complementary ban on permit renewals for polluting ICE vehicles are expected to be highly impactful in promoting a steady conversion of commercial vehicles to electric. This is significant, as light commercial vehicles are primed for electrification due to favorable economic viability of EVs in these segments¹². States have not capitalized on the readiness of this segment, with very few incentives for commercial fleets.

And finally, few state policies mention information and educational programs for EVs. This must be remedied at the earliest to increase consumer awareness about EV technologies and available EV incentives. As states look ahead toward accelerating EV adoption, given below are some recommendations on how demand incentives might be supplemented or further sharpened for greater efficacy.

Recommendations are categorized by priority as shown in Figure 6, with short-term measures to be implemented in the next one to two years, and medium-term measures over three to five years.

Figure 6: **Priority actions for accelerating EV adoption**



1 Raise consumer awareness: As EVs become more competitive against conventional ICE vehicles on aspects such as cost and performance, one of the biggest hurdles to their mainstreaming is the lack of consumer awareness about EV technology. States should take a proactive approach to raise consumer awareness and experience of EVs and available incentives, through information campaigns and public demonstrations. Delhi's 2021 "Switch Delhi" campaign is a good example of such an initiative.

¹² Kumar, Parveen & Kanuri, Chaitanya. October 2020. Total cost of ownership of electric vehicles: Implications for policy and purchase decisions. Blog by WRI India. Available at: <https://wri-india.org/blog/total-cost-ownership-electric-vehicles-implications-policy-and-purchase-decisions>

GO ULTRA LOW CAMPAIGN

Go Ultra Low¹³ is a joint government and industry campaign in the United Kingdom, aimed at educating and informing citizens about electric vehicles, and providing useful information on owning and operating an EV. Supported by the Office of Low Emission Vehicles, the campaign counts all major auto manufacturers among its partners.

2 Accelerate the deployment of financial incentives: The delay from policy notification to implementation observed in states is a major barrier to the success of state actions for transport electrification. States must accelerate the execution of the road tax exemption in particular, to gain the necessary momentum for EV adoption. Single-window mechanisms to avail of incentives, and clarity on redemption processes, will go a long way in creating a seamless experience for EV buyers.

3 Focus on fleet electrification: Commercial operators of passenger and cargo fleets will be important stakeholders in spearheading the EV transition. Fleet conversion mandates, service tax exemptions and permit waivers can boost EV adoption in commercial segments. For example, Andhra Pradesh's suggested SGST exemption for vehicle leasing and taxi services would help service providers save 2.5% on operational costs.

State governments themselves deploy large numbers of vehicles for institutional use. Accelerating government fleet electrification through mandates and incentives is within the control of states and can provide the necessary stimulus for EV adoption at large. This is seen in Delhi's EV policy, which has mandated the electrification of the entire government car fleet within a year from the time of policy notification.

4 Increase availability of EV asset financing: As private banks and non-banking financial companies (NBFCs) take a cautious approach to commercial EV financing, government action is instrumental in increasing the flow of debt financing for EVs. At the central level, including electric vehicles as a priority lending sector can help increase available capital and improve financing terms. At the subnational level, states can help fill the gap through state financial corporations to provide EV loans on favorable terms, as demonstrated by Delhi's initiative to provide loans through the DFC.

INTEREST-FREE EV LOANS

Scotland's low-carbon transport loan¹⁴ scheme offers interest-free loans of up to £120,000 to Scottish businesses to purchase new or used electric vehicles, including e-motorcycles and scooters, e-cars and vans, and electric goods vehicles.

¹³ <https://www.goultralow.com/>

¹⁴ <https://energysavingtrust.org.uk/grants-and-loans/low-carbon-transport-business-loan/>

5 Disincentivize high-emission vehicles: While incentivizing zero-emission electric vehicles is important for enabling increased uptake, it is equally important to disincentivize ICE vehicles by levying appropriate costs on purchase and use. Bonus-malus systems, as they are called, are effective in supporting EV adoption by penalizing transport-induced pollution and emissions with commensurate rewards for clean vehicles. Examples of disincentives for polluting vehicles include fuel cesses, carbon taxes and emission charges.

In devising a bonus-malus system, it is important to link rewards and penalties to vehicle performance and not to technology. This requires a rationalization of tax structures and usage fees based on CO₂ emissions, with all low-emission vehicles (such as strong hybrids and hydrogen cell fuel vehicles) benefiting from the incentives as per their performance.

BONUS-MALUS INCENTIVE STRUCTURES IN EUROPE

The bonus-malus (or feebate) tax system is a policy initiative in which polluting vehicles incur a surcharge (malus) while clean vehicles receive a rebate (bonus). France, Sweden and Norway have deployed variations of this system. In Sweden, vehicles with low emissions (max 70g CO₂/km) receive a grant, while an increased amount of vehicle tax is imposed on petrol and diesel vehicles depending on their CO₂ emission levels. Further, several European countries have indicated horizon years for bans on ICE vehicles, a clear policy signal that nudges potential buyers to choose electric vehicle options.

6 Link EV targets and incentives to environmental objectives: Most state EV policies have time-bound EV adoption targets. However, these are neither tied to the demand incentives themselves nor to environmental objectives such as lowered air pollution or reduced transport share of greenhouse gas emissions. Ensuring that EV targets are based on environmental objectives enables states to allocate budgets and design incentives more effectively through an impact-driven approach.



CHARGING INFRASTRUCTURE INCENTIVES

3.

Easy access to charging infrastructure is a prerequisite for widespread EV adoption. Range anxiety and uncertainty of EV charging availability are key barriers to EV adoption. A robust network of charging points reassures consumers of charging availability, which reduces the range anxiety associated with electric vehicles.

EV charging infrastructure, or electric vehicle supply equipment (EVSE) as it is formally known, may be publicly or privately provisioned. Individual EV owners prefer to charge on their own premises, with studies showing that 50% to 80% of all EV charging by individuals occurs at home, while another 15% to 25% happens in the workplace¹⁵. Commercial vehicles and EV fleets, on the other hand, charge at captive charging hubs or through the public EV charging network.

¹⁵ Hardman, S. et al. 2018. A review of consumer preferences of and interactions with electric vehicle charging infrastructure. *Transportation Research Part D: Transport and Environment*, Vol 62, pp 508-523. Available at: <https://doi.org/10.1016/j.trd.2018.04.002>

Central and state governments play an active role in building an ecosystem of charging infrastructure. This is done through government investment in charging infrastructure and the creation of a governance framework for EV charging. The GoI has drawn up various standards and notifications regarding hardware specifications, licensing of EV charging services, cost of electricity supply for EV charging and operational guidelines. Through the FAME scheme, it has also allocated funding to cover the capital cost of more than 2,600 public charging stations across 62 cities¹⁶.

At the state level, charging infrastructure mandates come under the purview of energy department agencies, including electricity regulatory commissions, electricity transmission and distribution companies, and renewable energy development corporations. Urban development authorities are responsible for planning regulations that govern where and how to locate charging stations. Finally, state government agencies own much of the land available for setting up public charging infrastructure, which is critical to the rollout of an accessible charging network.

Table 5 highlights the measures proposed by state EV policies to facilitate EV charging provision. They include a mix of financial incentives, and planning and regulatory frameworks that support the deployment and integration of EV charging within the existing electrical systems.

Table 4: Matrix of EV charging infrastructure incentives

States	Capital subsidies on EVSE	Concessional land provision	Concessional EV tariffs	Use of renewable energy sources	Amendments to DCRs	EVSE network integration and management	Promotion of alternative clean fuel technologies
Andhra Pradesh	●	●	●	●	●	●	●
Bihar	●	●	●	●	●	●	●
Delhi	●	●	●	●	●	●	●
Karnataka	●	●	●	●	●	●	●
Kerala	●	●	●	●	●	●	●
Madhya Pradesh	●	●	●	●	●	●	●
Maharashtra	●	●	●	●	●	●	●
Punjab	●	●	●	●	●	●	●
Tamil Nadu	●	●	●	●	●	●	●
Telangana	●	●	●	●	●	●	●
Uttar Pradesh	●	●	●	●	●	●	●
Uttarakhand	●	●	●	●	●	●	●

● Not addressed in the policy ● Addressed in the policy

Capital subsidies on EVSE

Capital subsidies and tax concessions aim to subsidize the cost of the EVSE meant primarily for public use. State incentives favor plug-in charging facilities, with few incentives on offer for battery-swapping equipment. While not explicitly mentioned, it is expected that the incentives may be availed of by both public sector undertakings (PSUs) and private players interested in setting up charging infrastructure.

Which states are using it?

■ Andhra Pradesh, Maharashtra, Bihar, Punjab and Madhya Pradesh provide varying levels of capital subsidies for fixed numbers of public charging stations, as shown in Table 5.

■ Delhi offers an unspecified capital subsidy for installing public charging infrastructure. It is the only state to offer financial incentives for private charging

¹⁶ <https://www.livemint.com/politics/policy/government-approves-2-636-new-charging-stations-in-62-cities-prakash-javadekar-11578076280181.html>

equipment, with a 100% grant up to INR 6,000 available per charging point for the first 30,000 private charging points.

- Delhi and Andhra Pradesh will also reimburse SGST levied on the purchase of advanced batteries for swapping stations.
- Karnataka's and Tamil Nadu's policies offer unspecified capital subsidies on the cost of setting up public charging stations.

Given the low expected utilization of EV charging facilities in the near future, subsidies are critical to eliciting participation by charging service operators (CSOs). However, state policies have focused on subsidies for capital-intensive public charging stations, which are characterized by multiple charge points and DC charging. There is no focus on grants for public AC charge points, low-powered charging types that are optimal for use by electric two-wheelers and three-wheelers.

Table 5: **Capital subsidies for EVSE equipment**

State	Charger type	Subsidy amount	No. of eligible stations
Andhra Pradesh	High-voltage DC charging	25% (up to INR 1 million)	100
	Low-voltage DC charging	25% (up to INR 30,000)	300
	Battery swapping	25% (up to INR 1 million)	50
Maharashtra	Commercial charging stations	25% (up to INR 1 million)	250
Bihar	Commercial charging stations	25% (up to INR 500,000)	500
Punjab	Charging stations (not locally manufactured)	25% (up to INR 50,000)	1000
	Locally-manufactured charging equipment	50% (up to INR 100,000)	
Madhya Pradesh	Small charging stations	25% (up to INR 150,000)	300
	Medium charging stations	25% (up to INR 200,000)	100
	Large charging stations	25% (up to INR 1 million)	100

ELECTRIC VEHICLE HOMECARGE SCHEME, UNITED KINGDOM

The Electric Vehicle Homecharge Scheme (EVHS) is a grant that provides a 75% contribution to the cost of one chargepoint and its installation. A grant cap is set at £350 (including VAT) per installation. The main requirement is that a person owns, leases, or has ordered a qualifying vehicle and has dedicated off-street parking at their property. A person may apply for two charge points at the same property if they have two qualifying vehicles.

Concessional land provision

The cost of land in cities creates a barrier for accessible siting of public charging stations. Land provision incentives aim to reduce the high cost of land acquisition for EV charging through instruments such as concessional rental charges and long-term leases.

Which states are using it?

- Delhi, Uttar Pradesh and Punjab will provide land to charging service operators (CSOs) at concessional rental rates, while Madhya Pradesh offers a “rental holiday” for three years to CSOs selected to operate EV charging in a public-private

partnership (PPP) with the government.

- Uttar Pradesh specifies that it will facilitate land acquisition for EV charging by PSUs, implying that the incentive will not be applicable to private CSOs.

- Punjab and Madhya Pradesh allow CSOs to operate or sublet a percentage of allocated space for charging stations in lounges, cafeterias, retail kiosks, and other revenue-generating operations to support the project's financial viability.

- Karnataka, Andhra Pradesh and Bihar will allot land parcels for the installation of public charging stations, but do not specify if this will be at concessional rates.

Public charging stations located on distinct land parcels are only one type of solution needed for our cities, suitable as charging hubs for commercial fleets and in locations of high EV charging demand.

States can integrate charging facilities with parking lots and organized on-street parking, to optimize the use of existing parking spaces.

Table 6: State EV tariffs

STATE	EV TARIFF (in INR)		
	ENERGY CHARGE	DEMAND CHARGE	
		Low Tension	High Tension
Andhra Pradesh	6.7/kWh	-	-
Assam	5.25 to 6.75/ kWh	130/kW per month	160 /kVA per month
Bihar	6.3 to 7.4/ kWh	-	-
Chhattisgarh	5/kWh	-	-
Delhi	4.5/kWh	-	-
Gujarat	4 to 4.1/ kWh	-	25 to 50 per kVA per month
Haryana	6.2/kWh	100/kW per month	-
Himachal Pradesh	4.70 to 5/ kWh	-	130/ connection per month and 140/ kVA per month
Jharkhand	6.00 to 6.25/ kWh	40 to 150/ connection per month	
Karnataka	5/kWh	60/kW per month	190/kVA per month
Kerala	5/kWh	75/kW	250/kVA per month
Madhya Pradesh	5.9 to 6 /kWh	-	100 to 120/kVA of Billing Demand
Maharashtra	4.05 to 4.24/kWh	-	70/kVA per month
Meghalaya	10.09/kWh	100 to 230/ connection per month	
Odisha	4.20 to 5.70/ kWh	200 to 250/kW per month	200 to 250/kVA per month
Punjab	5.4/kWh	-	-
Rajasthan	6/kWh	40/HP per month	135/kVA per month
Tamil Nadu	5 to 8.05/ kWh	70/kW per month	-
Telangana	6/kWh	-	-
Uttar Pradesh	5.9 to 7.7/ kWh	-	-
Uttarakhand	5.5/ kWh	-	-

Concessional tariffs for EV charging

Concessional EV tariffs are meant to reduce the cost of electricity procurement for EV charging, resulting in lower charging costs for consumers. In its Charging Infrastructure Guidelines and Standards (June 2020 amendment), the Union Ministry of Power mandated that state electricity regulatory commissions fix an EV tariff that is not more than the average cost of supply plus 15%. Several state EV policies reiterate this mandate of a separate, concessional power tariff for connections to EV charging stations. Some states offer the concessional tariff only for public charging stations, while others extend it to private customers in residential and non-residential buildings as well.

Which states are using it?

- EV policies of Telangana, Delhi, Kerala, Andhra Pradesh, Karnataka, Uttar Pradesh, and Punjab include the provision for a concessional power tariff for EV charging connections. Delhi's policy explicitly mentions that the tariff will be applicable for both public and compliant private EV charging points.
- Tamil Nadu defines separate tariffs for EV charging, based on whether it is for public or private use. A domestic consumption tariff is applicable for private charging at home, while a different tariff is applicable for private charging in offices, malls, and gated communities. A concessional tariff is provided for public charging stations only.
- Madhya Pradesh applies the domestic consumption tariff for charging at home while mandating a lower tariff for public charging stations.
- Bihar will charge industrial electricity tariffs for EV charging, while Maharashtra will charge according to existing rates as per the charging facility's location.
- Punjab is the only state that offers a 100% exemption on electricity duty for EV charging facilities for five years.

In addition to the above, the EV policies of Uttar Pradesh, Punjab, Andhra Pradesh, and Kerala also provide for time-of-day metering for lower charges during off-peak hours. Madhya Pradesh specifies a ceiling for the charges to be levied on customers at public charging stations.

TIME-OF-USE TARIFFS FOR EV CHARGING

Hawaiian Electric, the electricity provider in the U.S. state of Hawaii, offers time-of-use (TOU) tariffs for EV owners¹⁷, for charging at home or on the DC public charging network. Charging is cheapest between 9am and 5pm, and most expensive during peak hours, i.e. between 5pm and 10pm. For home charging, EV owners may opt for a TOU tariff for the whole residence, or a separate metered connection for EV charging on which the TOU tariff will be applicable.

¹⁷ <https://www.hawaiianelectric.com/products-and-services/electric-vehicles/electric-vehicle-rates-and-enrollment>

Some states offer additional support in providing and expediting the power connections for EV charging.

- Bihar's EV policy supports CSOs in getting electricity connections and assures a 100-kW load connection to every charging station location. This incentive is expected to be highly beneficial for operators, as power connectivity forms a significant cost in EVSE installation.
- Delhi is the only state to frame standard operating protocols (SOP) for private customers, including individuals and building associations. Customers can request the installation of private charging points through the state DISCOM's web portal. Installation expenses will be recovered through the customer's electricity bill.
- Andhra Pradesh and Madhya Pradesh have mandated that DISCOMs supply power to charging and battery-swapping stations within 48 hours of application. Municipalities are also expected to issue provisional permissions immediately to expedite the setting up of charging facilities.



Figure 7: Renewable energy powered charging stations in California



Source: <https://www.envisionsolar.com/gallery/>

Use of renewable energy sources

To truly decarbonize mobility, the use of renewable energy sources for electric vehicles is essential. EV charging loads can also accommodate a greater share of renewables in the electricity grid through use of mechanisms like time-of-day metering. This promotes higher charging activity during the day when renewable energy generation tends to be the highest. To further this mutually beneficial linkage, some state EV policies have encouraged captive renewable energy generation and open access for EV charging facilities.

Which states are using it?

- Several states, including Tamil Nadu, Telangana, Delhi, Kerala, Andhra Pradesh, Punjab, and Bihar, promote the preferential supply of renewable energy for public charging stations. These states also give permission for captive renewable energy generation by charging operators.

- Andhra Pradesh and Delhi further allow power procurement from renewable energy sources through the open access route, irrespective of the size of demand. Madhya Pradesh will also provide open access to CSOs, as long as cumulative demand for the operator is more than 1 megawatt (MW). Open access is a provision through which large customers, typically with power demands above 1MW, have access to the transmission and distribution network from suppliers other than the state DISCOM.

- Punjab, Tamil Nadu, and Karnataka offer concessions on connection charges and waivers of wheeling charges to access renewable energy.

- Telangana and Madhya Pradesh offer net metering facilities for captive renewable energy generation by CSOs. Delhi offers power banking facilities with the local DISCOMs for charging operators who use renewable energy

Figure 8: EV charging spots in building parking areas



Source: https://commons.wikimedia.org/wiki/File:EV_charging_stations_Arlington_08_2017_5214.jpg

Amendments to development control regulations

Development control regulations (DCR), an umbrella term for laws and regulations governing land use and building specifications, need to be amended to accommodate EV charging infrastructure. Zonal regulations and building bylaws are the most common DCR frameworks, which govern the provision of public and private EV charging, respectively. In 2019, the Union Ministry of Housing and Urban Affairs (MoHUA) amended the Model Building Byelaws (MBBL) 2016 and the Urban Regional Development Plans Formulation and Implementation (URDPFI) Guidelines 2014, providing guidelines for the planning of public and private EV charging points. While most state EV policies mention the need for regulatory amendments, only a few provide specific measures.

Which states are using it?

- Delhi's building bylaws mandate that at least 20% of a residential complex or workplace's parking capacity should be 'EV ready,' i.e. equipped with the conduits and power supply infrastructure required for EV chargers. Buildings are also required to have an additional power load to accommodate charging points, with a safety factor of 1.25.
- Bihar, Punjab, Andhra Pradesh, Maharashtra, Madhya Pradesh and Karnataka have policies that mandate the amending of building bylaws in urban areas to incorporate infrastructure for EV charging. They, however, do not provide further specifics.
- Commercial complexes, housing societies, and residential townships with a built-up area of 5,000 square meters in Andhra Pradesh and Uttar Pradesh are required to provide charging infrastructure as part of permit requirements.
- Maharashtra, Bihar, and Kerala permit petrol bunks to set up charging or swapping stations as long as they fulfill safety norms

The GoI guidelines are non-binding in nature, and it is up to municipalities and urban development authorities to make the necessary amendments to the DCR. For public charging stations, rules including EV charging in urban planning requirements must be formulated. For private charging, building codes need to be amended to mandate that new building constructions be equipped with EV charging connections in parking areas.

EV-READY BUILDING CODES

Regions in the U.S., the UK and China have adopted building codes that require new residential and non-residential buildings and parking lots to be equipped with necessary electrical infrastructure to accommodate EV charging.

In the United Kingdom:

- Existing residential buildings with more than 10 parking spaces undergoing “major renovation” are required to have one chargepoint and cabling routes installed to support chargepoints in each parking space.
- New non-residential buildings and older such buildings with more than 10 parking spaces undergoing big renovations are required to install at least one EV charger and cabling routes to support chargepoints at one in five parking spaces.
- Large existing non-residential buildings with more than 20 parking spaces are required to install at least one EV charger by 2025.

In Guangzhou (China):

- New residential parking spaces must be 100% built with charging facilities or reserved for construction and installation of EVSE.

In Denver (Colorado, U.S.):

- New single-family homes are required to have one EV-ready space per dwelling unit.
- New multi-family residential buildings need 5% of spaces to be EV-installed, 15% of spaces to be EV-ready and 80% of spaces to be EV-capable.
- New commercial buildings need 5% of spaces to be EV-installed, 10% of spaces to be EV-ready and 10% of spaces to be EV-capable

EVSE network integration and management

To make the use of public charging easier, information on available charging facilities and digital payment modes need to be provided in an integrated interface. Network integration and management policies help in achieving this by mandating standard operating, data-sharing and communication protocols to be followed by CSOs. Very few states have included provisions to enable this integrated management of public charging networks.

Which states are using it?

- Andhra Pradesh and Madhya Pradesh encourage cloud-based technologies for digital payments and metering of the electricity used. Payment apps, NFC (near-field communication) enabled devices, RFID (radio-frequency identification) tags, and other similar technologies can be integrated for payments.
- Delhi and Madhya Pradesh are developing an open database on public charging infrastructure in their states, which will be made freely available through integration with in-vehicle navigation systems, charging apps, and maps. All charging operators are required to provide necessary data on location, type and availability of charging points.
- Madhya Pradesh, Karnataka, and Delhi require CSO payment/tracking systems to be integrated with other transport services through a common mobility card or other similar interfaces.

Figure 9: Integrated consumer interface of EVSE network



Promotion of alternative clean fuel technologies

Globally, alternative vehicular technologies such as hydrogen fuel cells show promise and are being developed alongside the EV ecosystem. Keeping in view the potential for long-term competitive advantage, a few states' EV policies provide financial support to develop a hydrogen fuel cell ecosystem.

Which states are using it?

- Andhra Pradesh aims to provide a subsidy of 25% on the fixed capital investment for hydrogen generation and fueling plants. It is capped at a maximum of INR 100 million per unit for the first 10 units. In addition, developers of private hydrogen generation and refueling infrastructure are eligible for 100% of the net SGST.

■ Uttar Pradesh aims to promote the development and use of hydrogen-powered fuel cells and solar-powered cells. While private developers will be incentivized to set up hydrogen stations, service providers will be incentivized to adopt them.

More states should consider investing in the development of alternative technologies for EV infrastructure, to promote wider adoption of alternatives for zero emission vehicles (ZEVs).

ELECTRIC VEHICLE INFRASTRUCTURE DEVELOPMENT (EVID) PROGRAM

The EVID Program by the Government of Canada aims to accelerate the market entry of next generation clean energy infrastructure, by supporting demonstration projects of innovative EV charging and H₂ refuelling technologies, which will lead to an increased uptake of ZEVs.

The Program may contribute up to 50% of total project cost per demonstration project, with a funding range between CAD 250,000 to CAD 3 million.

3.1

RECOMMENDATIONS FOR CHARGING INFRASTRUCTURE PROVISION

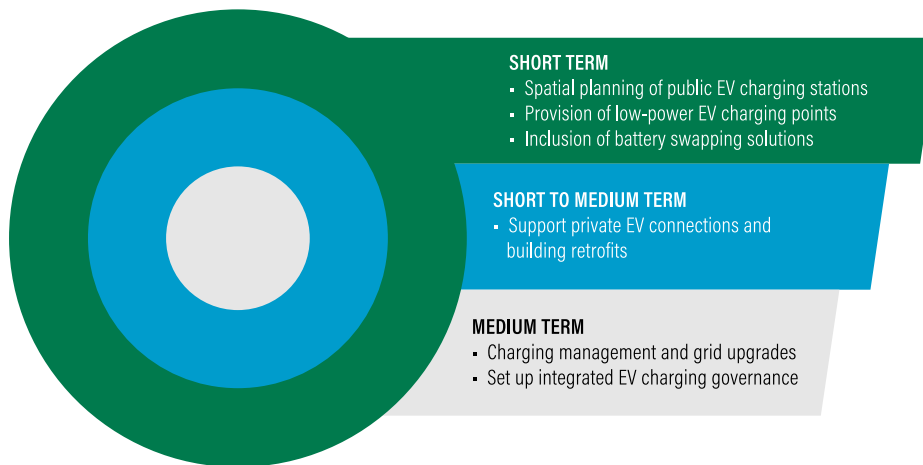
State incentives for EV charging infrastructure are focused primarily on public charging stations, with capital subsidies and land allocation concessions geared towards heavy, capital-intensive infrastructure. Considering that the first wave of electrification will be led by light vehicles such as 2Ws, 3Ws and smaller e-cars, states need to right-size their approach to charging infrastructure. An enabling framework for the provision of EV charge points and battery swapping solutions, supplied and operated by private sector enterprises, can help scale up charging availability and create a distributed charging network for easy accessibility.

State urban development departments need to prioritize DCR amendments to ensure that new buildings are equipped with the necessary electrical infrastructure to support EV charging. With Indian cities urbanizing and expanding at a rapid pace, expediting regulatory requirements for new constructions can help expand private EV charging significantly. At the same time, states can consider innovative financing mechanisms to support community charging banks in existing multi-unit residences and office areas, to help remove a key barrier to consumer adoption.

Lastly, some states have started specifying the need for integrated consumer interface through data-sharing and ease of payment. However, none of the state policies reflect on the need to establish vehicle-to-grid connectivity, which is critical for states to better plan for and manage EV charging loads.

The recommendations provided below highlight some of these gaps and necessary state actions to address them. They are prioritized in terms of urgency of action, as shown in Figure 10.

Figure 10: Priority actions for boosting EV charging



1 Spatial planning of public charging stations: Public charging stations supported by FAME-II are expected to provide a skeletal charging network for spurring the nascent EV ecosystem. They are also expected to bridge the demand gap of charging infrastructure until it becomes economically viable for private energy operators to expand their network. Given these objectives, a planned approach is necessary for positioning public charging stations, in order to maximize accessibility and utilization for all local inhabitants.

2 Provision of low-cost EV charging points: Charging stations act as centralized charging hubs with multiple points and provisions for DC fast charging. However, the majority of charging needs in the next few years will come from electric 2Ws and 3Ws, which do not need high-powered charging. States can promote low-power EV charge points as a low-cost alternative for scaling up EV charging infrastructure. Low-powered AC charging points, each with the capacity of charging one EV at a time, can be easily accommodated where even one parking space is available. This allows for the provision of a more distributed charging network with low space and power requirements, which can be driven by the private sector.

3 Inclusion of battery swapping solutions: The 2020 notification by the Union Ministry of Road Transport and Highways (MoRTH) allows for the sale of electric vehicles without batteries. This is expected to make battery swapping technology a more prominent component of the EV charging infrastructure mix, especially for commercial electric two- and three-wheelers. However, many states do not provide the same level of subsidy support for battery swapping as they do for plug-in charging. Mainstreaming battery swapping through equivalent financial support can boost EV penetration among 2Ws and 3Ws, by making it cheaper to buy EVs without batteries.

4 Support private EV charging connections and building retrofits: Individual EV consumers and building managers will need clear processes and guidelines for setting up EV charging at their premises. States should create standard operating procedures to streamline the process of installing charging infrastructure. For instance, right-to-install rules for charging infrastructure allow tenants to set up EV charging without the need for permission from home owners.

Electricity service providers should be mandated to provide EV charging connections upon request. Community charging in buildings, which comprises a common bank of chargers for captive use, can fulfill charging requirements without expensive grid upgrades. States should also encourage self-provision of charging infrastructure through innovative financing schemes for buildings.

RETROFITTING MULTI-UNIT RESIDENCES AND WORKPLACE CAMPUSES

The EV Charge Network Program¹⁸ was deployed by California's electricity distributor, Pacific Gas and Electric (PG&E). The program had a goal of installing 7,500 Level 2 chargers at multi-unit dwellings and workplaces by the end of 2020. Property owners with at least 10 parking spots available for charging infrastructure were eligible to receive grants and installation assistance for setting up EV charging, with a choice between owning the infrastructure or having infrastructure owned by PG&E.

5 Charging management and grid upgrades: The charging load on the electricity grid will continue to grow as EVs become more common. EV charging load management with metered charging connections and smart chargers is crucial to distribute the load on the grid and delay the need for augmentation. This reduces the costs of implementing charging infrastructure, especially as charging demand is currently low.

There will also be locations where grid augmentation cannot be avoided or where significant civil work will be required to connect to the nearest power distribution point. In these cases, the costs of ancillary electrical infrastructure and/or of civil works for power connection is significant for CSOs. State governments may consider offering a fixed partial capital subsidy to bear these costs, especially in the case of public-private partnerships (PPP).

6 Set up integrated EV charging governance: Public EV charging is expected to be a dynamic space, with multiple public and private sector operators. For ease of consumer experience and for centralised governability, an integrated governance framework is required to define operational specifications and processes. On the front end, EV charging information should be integrated, and inter-operability permitted between different CSOs for ease of consumer experience. For an integrated backend, charging facilities must possess specified communication capabilities to be connected to a centralized management system hosted by the electricity provider. This allows utilities to better manage the additional electrical loads from EV charging.

¹⁸ https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-charge-network.page



INDUSTRY INCENTIVES

4.

Figure 11: Electric two-wheeler factory in India



Source: Ather Energy

Electric vehicles provide a rare opportunity for new market entrants to counter the heavyweights of the automotive industry, and for new regions to capitalize on the projected industrial growth within this sunrise sector. Industry incentives, or supply-side incentives, are aimed at vehicle manufacturers, battery producers, and ancillary companies, to encourage the production of electric vehicles and component parts of the EV value chain. Incentives are generally in the form of subsidies, grants, and tax waivers, as well as infrastructural support in terms of land allocation and industrial park creation.

The central government has laid out a production-linked incentive (PLI) scheme to boost manufacturing in the automotive sector, which also benefits EV manufacturers. However, there are no specific incentives in GoI schemes for the EV industry. State EV policies, on the other hand, have focused strongly on supply-side incentives for EV and component manufacturers, to achieve industrial growth and employment generation. While some states have applied industrial incentives for the EV sector on par with other industries, others have explicitly provided more favorable incentives by earmarking it as a “thrust sector” or “priority sector.”

Some states have prioritized specific components of the EV value chain, notably battery manufacturing, with higher incentives to promote the localization of this critical component. In addition to financial incentives, state EV policies provide incentives for innovation, research and workforce development, to create a competitive advantage. Table 7 below provides an overview of the industry incentives being offered by state EV policies.

Table 7: **Matrix of EV industry incentives**

States	Capital subsidies	Tax exemptions and interest subsidies	Land development incentives	Infrastructure concessions and subsidies	Battery recycling initiatives	Employment incentives	Skill development	R&D initiatives
Andhra Pradesh	●	●	●	●	●	●	●	●
Bihar	●	●	●	●	●	●	●	●
Delhi	●	●	●	●	●	●	●	●
Karnataka	●	●	●	●	●	●	●	●
Kerala	●	●	●	●	●	●	●	●
Madhya Pradesh	●	●	●	●	●	●	●	●
Maharashtra	●	●	●	●	●	●	●	●
Punjab	●	●	●	●	●	●	●	●
Tamil Nadu	●	●	●	●	●	●	●	●
Telangana	●	●	●	●	●	●	●	●
Uttar Pradesh	●	●	●	●	●	●	●	●
Uttarakhand	●	●	●	●	●	●	●	●

● Not addressed in the policy ● Addressed in the policy

Capital subsidies for industrial development

States facilitate investment promotion through capital cost subsidies to offset high upfront development costs. These are offered as tiered incentives for industries of different sizes ranging from micro, small and medium enterprises (MSMEs) to ultra-mega projects.

States are linking subsidy amounts to geographic location of industries, with lower subsidies in more developed regions and higher subsidies in under-developed regions.

In states such as Maharashtra, EV manufacturers can avail of subsidies at one tier above their eligibility, effectively receiving higher incentives than their size or location qualifies them for.

Which states are using it?

- Karnataka and Andhra Pradesh provide varying capital subsidies by size of industry (see Table 8 for details). Both states offer differentiated subsidies based on industry type as well. Karnataka's subsidies for large to ultra-mega industries are restricted to battery manufacturing/ assembly and charging infrastructure manufacturing companies. In addition to these, Andhra Pradesh offers subsidies for EV manufacturers (of 2Ws, 3Ws, 4Ws and buses) and hydrogen storage and fueling equipment manufacturers, too.
- Tamil Nadu offers capital subsidies only for intermediate products used in the manufacture of EVs and charging infrastructure, where State Goods and Services Tax (SGST) reimbursement is not applicable.
- The Kerala government will proffer a 20% capital subsidy on new EV manufacturing units, while Telangana offers capital subsidies up to 20% of investment capped at INR 300 million for mega enterprises.
- In Maharashtra, while there is no capital subsidy for new industries, expansion projects of MSMEs get a 25% subsidy only on additional capital equipment acquired for technology upgrade, subject to a maximum of INR 2.5 million.

Table 8: **Capital subsidies by size and type of industry**

Capital Subsidies	MSME	Large	Mega	Ultra-mega
Karnataka	INR 1.5 million to 5 million (25% of investment)	EV battery manufacturing/assembly - 20% up to INR 200 million for first 2 units EV charging equipment manufacturing - 20% up to INR 50 million for first 5 units		
Andhra Pradesh	1.5 million to 50 million	10% of investment (max INR 100 million) for first 2 units in various segments	10% (max INR 200 million) for first 2 units in various segments	Special incentives for mega, ultra-mega and integrated automotive projects
Tamil Nadu	All industries - 15% of eligible investment (payable over 10 years) EV battery manufacturing - 20% of eligible investment (payable over 20 years) MSMEs - additional capital subsidy for e-vehicle component or charging infrastructure manufacturers			
Kerala	20% capital subsidy for new EV manufacturing units			
Telangana	Up to 20% capital subsidy capped at INR 300 million for mega enterprises			

Tax exemptions and interest subsidies

Apart from capital subsidies, tax exemptions or reimbursements of the SGST and interest subsidies on loans are the two other fiscal incentives deployed by states under the umbrella of industrial promotion subsidies.

Which states are using it?

- Uttar Pradesh, Uttarakhand, and Maharashtra offer SGST exemptions/ reimbursements and interest subsidies on loans (see Table 9 for details).
- Bihar, Punjab, Tamil Nadu, Andhra Pradesh, and Telangana offer SGST reimbursements for periods ranging from 5 to 15 years from the date of commencement of commercial production.
- Most states have upper limits on the amount of SGST reimbursement that may be

claimed, depending on the size of industry and its location within the state.

■ Karnataka, rather than offering an SGST exemption, allows sanctioning of SGST as an interest-free loan for large, mega, ultra-mega and super mega enterprises.

Table 9: Tax exemptions and interest subsidies by industry size

Capital Subsidies	MSME	Large	Mega	Ultra-mega
Maharashtra	100% of gross SGST payable 5% interest subsidy on loans	50% of gross	Customized package of incentives for prestigious mega and ultra-mega projects, on a case-to-case basis	
Uttarakhand	Interest subsidy on loans from 5% to 10% up to INR 800,000 for medium enterprises	7% interest subsidy up to INR 2.5 million/year	10% (max INR 200 million) for first 2 units in various segments	Special incentives for mega, ultra-mega and integrated automotive projects
	30% of net SGST payable will be reimbursed		50% of net SGST payable will be reimbursed	
Uttar Pradesh	90% SGST reimbursement for small industries for 5 years	60% SGST reimbursement for 5 years	70% SGST reimbursement for 10 years	
	5% interest subsidy per annum for 5 years, up to INR 5 million/year			
Andhra Pradesh	100% SGST reimbursement for 5-7 years	100% SGST reimbursement for 10 years	NA	NA
Telangana	NA	NA	100% net SGST reimbursement, up to INR 50 million/year, total cap of INR 250 million over 7 years	
Bihar	80% SGST reimbursement for 5 years			
Tamil Nadu	100% SGST reimbursement up to 2030 (up to 100% of eligible investment)			
Punjab	100% SGST reimbursement for 15 years (up to 200% of eligible investment)			
Karnataka	NA	100% of net SGST can be sanctioned as interest-free loans for 8-13 years		

Land development incentives

Land acquisition and development costs are significant capital expenditure items for setting up new industrial units. Incentives for land development include subsidies on the cost of land, fee waivers for the conversion of agricultural to industrial land, and stamp duty and registration charge exemptions on the purchase and registration of land.

Through land development incentives, states aim to promote under-developed districts by offering higher incentives in certain regions. The development of industrial clusters is also catalyzed by extending benefits availed by larger auto OEMs to ancillary component suppliers.

Which states are using it?

■ Tamil Nadu, Uttar Pradesh, and Uttarakhand offer land cost subsidies for manufacturing units, depending on size and location of industry (see Table 10 for details).

- Tamil Nadu also offers 100% exemption on stamp duty on land transactions, for industries that obtain land by sale or lease in the state.
- Uttarakhand offers 50% exemption on stamp duty in transactions for the purchase or lease of land for industrial development/expansion.
- Andhra Pradesh, in the case of mega integrated projects, offers land to dependent ancillary units at the same rates that are offered to OEMs in the area, up to 50% of the land allocated to the OEM. Stamp duty and transfer duty paid on the purchase or lease of land meant for industrial use will also be reimbursed.
- Karnataka offers 100% reimbursement of the land conversion fee for conversion from agricultural to industrial land. In addition, the state offers 100% exemption on stamp duty on lease and sale deeds of land sold by approved industrial estates/parks.

Some states have focused on the creation of EV industrial parks, which incentivize companies to set up manufacturing through the convenience of land parcels equipped with infrastructure and ready to be built upon. Andhra Pradesh and Tamil Nadu aim to develop exclusive EV parks with plug-and-play manufacturing facilities. Kerala and Bihar, too, aim to create EV manufacturing clusters with speedy land allotment, common infrastructure creation, R&D facilities, etc. Telangana and Punjab encourage the setting up of EV manufacturing in existing industrial areas.

Table 10: Land concessions by industry size

	MSME	Large	Mega	Ultra-mega
Uttarakhand		15% of land rate	25% of land rate	30% of land rate
Uttar Pradesh			Battery plants - 25% of land cost	
Tamil Nadu	15% land cost subsidy, increasing up to 50% for units in southern districts 20% land cost subsidy for EV battery manufacturing units			
Andhra Pradesh			Mega integrated projects - land to dependent ancillary units at same rates as respective OEMs	

Infrastructure concessions and subsidies

Subsidies on infrastructural services help reduce operational costs through concessions primarily on electricity charges. States such as Andhra Pradesh and Uttar Pradesh offer additional subsidies for overall infrastructure development.

Which states are using it?

- Maharashtra and Andhra Pradesh offer power tariff subsidy of INR 1/unit, while Telangana offers a power tariff discount of 25% for 5 years (capped at INR 50 million for mega enterprises).
- Maharashtra, Punjab, Uttarakhand, Andhra Pradesh, Telangana, and Uttar Pradesh will waive/reimburse 100% electricity duty for varying periods of time.
- Karnataka offers 100% electricity duty exemption for 5 years, only for MSMEs in EV battery manufacturing/assembly and in EV charging/swapping infra equipment manufacturing.
- Andhra Pradesh will further provide all external infrastructure, such as power supply, water supply, roads at the doorstep of the industrial unit, at 50% of cost of the infrastructure, with a limit of INR 20 million per project.

- Uttar Pradesh further offers an infrastructure interest subsidy of 5% per annum for 5 years, as reimbursement on loans taken for the development of infrastructural amenities.

Figure 12: **Battery recycling and reuse solutions**



Battery recycling initiatives

Battery recycling initiatives are necessary for a sustainable circular economy, as EV battery packs have potential second-life applications well beyond their use in electric vehicles. States are well-positioned to encourage the creation of an e-marketplace for the resale of used batteries and to facilitate safe recycling units for EV batteries with suitable incentives.

Which states are using it?

- Delhi's policy promotes the reuse of EV batteries by setting up recycling businesses in collaboration with battery and EV manufacturers through urban mining of rare earth materials from the batteries.
- Punjab will encourage relevant OEMs and private ecosystem players to operate schemes for battery buyback. Further, the creation of an e-marketplace would be encouraged for the resale of used batteries and the establishment of recycling units for EV batteries will be facilitated with suitable incentives.
- The Telangana government intends to facilitate the reuse of EV batteries in stationary energy storage applications, and will enable collaborations between battery manufacturers, EV manufacturers, energy storage operators and recyclers. It is also one of the few states to provide incentives for the mining of rare earth materials and battery recycling businesses that are on par with EV ancillary manufacturing.
- In Uttar Pradesh, large anchor and service units will be provided capital interest subsidy at 50% per annum up to Rs 10 million per year for 5 years, on loans taken for procuring equipment and machinery for battery recycling.

- In Madhya Pradesh, energy operators and battery swapping operators will operate as end-of-life battery recycling agencies, where EV owners can deposit end-of-life vehicle batteries and get a remunerative price. Batteries will be reused as ‘power banks’ to store renewable energy.

NORWAY SUPPORTS BATTERY RECYCLING PLANT

Enova, a Norwegian government enterprise supporting clean energy and climate efforts, will provide \$5 million in support to Hydro and Northvolt (a Swedish battery company) for setting up a plant to recycle used electric car batteries in Norway

Employment incentives

These incentives are offered to manufacturers generating local employment, with the objective of facilitating the creation of good quality, formal economy jobs, as seen by the focus on incentives linked to schemes such as employee provident funds (EPFs). These subsidies are activated only when industries employ a certain threshold of workers from within the state for a continuous period.

Which states are using it?

- Punjab provides direct subsidy to companies at the rate of INR 36,000/male employee per year, and INR 48,000/employee per year in case of female and SC/ST/OBC employees, for a period of 5 years.
- Uttarakhand and Tamil Nadu provide incentives linking job creation to EPF reimbursement. Tamil Nadu reimburses the employer’s contribution to the EPF for all new jobs created until the end of 2025, paid for one year and not exceeding INR 48,000 per employee. In Uttarakhand, for every 100 people employed by a company, the state will contribute INR 20 million to the company’s EPF.
- Kerala, as per its Industrial Policy, provides 75% of the employer’s contribution to the EPF for 3 years for every additional employee hired.

Skill development

In view of the rapidly evolving technologies and the resultant new skills required for the EV sector, states plan to devise skill development programs to align the workforce with the necessary skill sets. Especially where states have stringent local employment requirements for companies to avail of industry incentives, skill development initiatives are a complementary policy to ensure that the local workforce has the required training for employment in the EV industry.

Which states are using it?

- Delhi intends to set up vocational courses to train EV drivers, mechanics and charging station staff in partnership with automobile OEMs and energy operators to make workers industry-ready. It is the only state focusing on service sector job creation in the EV industry, given that it is an urban administrative centre without significant industrial activity.

- Tamil Nadu, Andhra Pradesh and Karnataka provide a stipend or reskilling allowance for the training of employees by companies. While Tamil Nadu offers an unspecified amount, Andhra Pradesh and Karnataka provide up to INR 10,000 per employee per year, to a maximum of the first 50 employees for a single MSME or large company.
- Uttarakhand will provide training reimbursement assistance at the rate of INR 1,000 per trainee for 50 trainees for up to 6 months to units providing skill training.
- The EV policies of Punjab, Maharashtra, Kerala and Madhya Pradesh state that skilling initiatives will be taken up for workforce development. Punjab proposes skill development at various levels, ranging from 3- to 6-month-long industry-readiness courses to master's programs at universities within the state. The other states focus more on vocational courses through Industrial Training Institutes (ITIs) and skill development centers.

R&D initiatives

With a view to *support high-value industrial growth, state EV policies envision Research and Development programs. Initiatives under this umbrella are wide ranging, from the creation of centers of excellence to the setting up of government and academic partnerships for technology development, to *nurturing incubators to promote innovation.

Which states are using it?

- Delhi, Punjab, Maharashtra, Tamil Nadu and Kerala are among the states that aim to set up centers of excellence focused on electric mobility.
- Tamil Nadu, Karnataka and Andhra Pradesh provide incentives to support research and innovation. Karnataka will commission the Karnataka Electric Mobility Research and Innovation Centre as a research hub, and will also set up a venture capital fund and start-up incubation center. Andhra Pradesh will set up a research fund of INR 5 billion to support a center for automotive research and smart mobility.
- Telangana will develop a dedicated facility to house EV-specific R&D centers by domestic and global EV players. This hub is also expected to attract global research and development activities on other emerging mobility trends such as connected and
- Bihar will offer R&D funding for companies which invest 200 crores and generate at least 200 jobs. The government will also encourage companies to establish R&D units within the state.

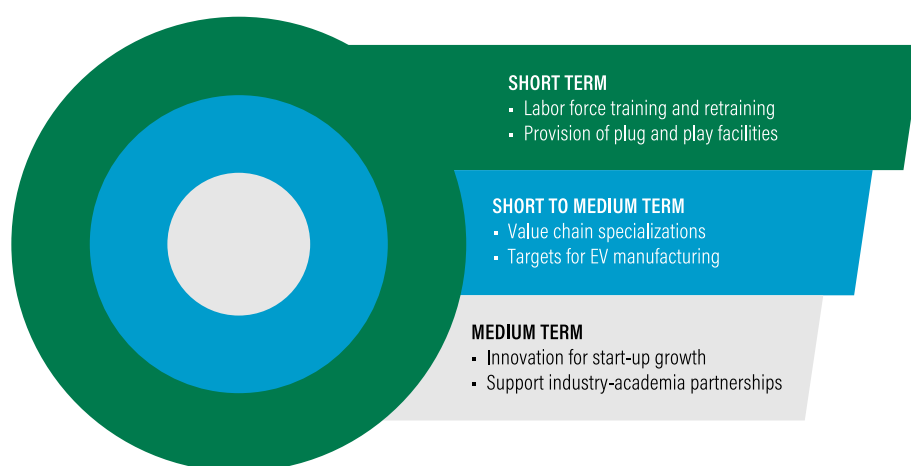
Taken together, the investment promotion subsidies and the land and infrastructure incentives allow states to create attractive incentive packages for manufacturers. However, monetary incentives are expensive and can only catalyze the ecosystem. Non-monetary incentives such as EV manufacturing targets, set in conjunction with industry, may be other effective measures that states can consider to spur production, especially states with significant automotive clusters. At the same time, an enabling ecosystem requires clear and efficient processes to ensure that companies can set up industries without too many hassles. This requires a planned approach to industrial clusters, which take into account the social and environmental concerns of local populations.

4.1

RECOMMENDATIONS FOR SUPPORTING INDUSTRIAL GROWTH

The other set of incentives that states have deployed relate to skill development, employment generation, and research and development. These will be crucial to develop the necessary human resources and move towards higher-value manufacturing. Rather than competing among themselves, states may choose to specialize in certain segments of the EV value chain for greater growth. These and other recommendations are highlighted below, ranging from priority actions to mid-term strategies for states to consider.

Figure 13: **Priority actions for catalyzing industrial development**



1 Labor force training and retraining: One of the biggest sectors in the country, the automotive industry, contributes 22% to India's manufacturing GDP. With the coming shift to electric mobility, jobs in the industry will also transform, with some traditional jobs declining, new jobs developing and the nature of other jobs changing. States will need to look ahead to ensure a smooth transition through a considered understanding of the employment landscape and its potential transformation, and the introduction of appropriate training and reskilling programs in partnership with industry. For the benefit of both incoming young workers as well as experienced auto industry workers, governments should streamline skill development and certification processes to an industry-wide standard, to reduce potential economic shocks to communities and improve resilience.

2 Provision of plug and play facilities: For states looking to attract mid-sized manufacturing in the EV sector, the ready availability of industrial land parcels and shared infrastructure facilities can reduce set-up costs for companies and improve attractiveness of a given location. Additionally, shared facility requirements specific to EV industries can be better allocated through designated EV clusters or industrial parks.

3 Value chain specializations: While state EV policies have focused on incentivizing the overall EV industrial ecosystem, some states provide additional incentives for strategic industries such as battery manufacturing. Two states that stand out in their specialized incentives are Andhra Pradesh and Punjab, which have additionally focused on hydrogen generation and refueling technologies, and on e-tractor manufacturing respectively. Such a stratified approach focusing on specialized components of the EV value chain can help states scale up industrial growth and employment generation by becoming key hubs within the country, and even globally.

4 Targets for EV manufacturing: In addition to incentivizing consumers, states can also push automotive manufacturers towards an electric transition. China and California both have schemes that require automotive manufacturers to achieve a certain share of EVs as part of their annual production or sales. Adoption of such programs can provide a supply-side push to EV manufacturing, which in turn is likely to lead to a greater marketing and sales push for EVs from manufacturers.

GLOBAL TARGETS FOR EV MANUFACTURERS

Targets for EV manufacturing have been effectively used in different countries to ramp up production of electric vehicles.

China's new energy vehicle mandate¹⁹ applies to passenger car manufacturers. New energy vehicles (NEVs), which include battery electric, plug-in hybrid and fuel cell vehicles, are assigned credits, and auto manufacturers have to meet annual mandatory requirements of NEV credits, which are fulfilled by producing or importing NEVs.

California's Air Resources Board has a ZEV program which requires auto manufacturers to produce a number of ZEVs and plug-in hybrids each year, based on the total number of cars sold in California by the manufacturer. Requirements are defined in terms of percent credits, going up from 4.5% in 2018 to 22% by 2025.²⁰

The EU has passed a mandate requiring zero- and low-emission vehicles to comprise 15% of automakers' sales by 2025, increasing to 35% from 2030 onward.²¹

5 Innovation and start-up growth: The EV industry offers an opportunity for new players to enter the automotive market, and several start-ups are now working on EV manufacturing and battery technology development. While many of them are currently small enterprises, at least a few are likely to grow and establish significant production facilities in the near future. By providing a strong support ecosystem for start-ups, states without traditional automotive clusters can foster greater innovation in electric mobility. Dedicated electric mobility incubators, shared prototyping and manufacturing facilities combined with robust R&D programs can help states reap the benefits of a still-nascent EV industry.

6 Support for industry-academia partnerships: State policies include incentives for skill development and research, but do not adequately support ties between industry and academia, which can act as a catalyst for the development of competitive industrial clusters. State governments are ideal stakeholders to support strong academia-industry linkages in two ways: (i) through the creation of autonomous parastatal agencies that can help form a consortium of academics, researchers, manufacturers and industry bodies dedicated to the EV industry, and (ii) through strategic regional development that brings together premier academic and research institutes with industrial and manufacturing facilities, generating positive feedback loops that attract productive companies and a talented workforce to create industrial clusters.

¹⁹ <https://www.sustainalytics.com/esg-blog/how-chinas-electric-vehicle-policies-have-shaped-the-ev-market/>

²⁰ <https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program/about>

²¹ Transport & Environment, July 2019. Electric surge: Carmakers' electric car plans across Europe 2019-2025. Available at: https://www.transportenvironment.org/sites/te/files/publications/2019_07_TE_electric_cars_report_final.pdf

LOOKING AHEAD

5.

..... This review highlights that state governments, with their EV policies, have started taking definitive steps towards transport electrification in their regions. The state EV policies employ a range of incentives and measures to address barriers to EV penetration and to support the different pieces of electric mobility development. While there is some disparity between states in the quality of incentives defined, and some states have focused more on one aspect of the ecosystem over another, the policies provide a good starting point for meaningful state-level action on electric mobility.

States with existing EV policies are now beginning the process of revising and implementing them. At the same time, more states aim to draft and notify their own EV policies. The preceding chapters of the report focus on the three key pillars of a comprehensive EV ecosystem, with specific analyses and recommendations on policy incentives and regulations for consideration and deployment. In concluding this review of state EV policies in India, there are five takeaways for states to keep in mind for effective formulation and execution of policies.

- 1 **Link the policies with objectives and targets:** Clearly defined objectives to be achieved through EV policies, and targets to aim towards in achieving the objectives, are necessary for the design of effective policy. While many state EV policies have stated objectives and targets, they are neither holistic nor connected to the incentives themselves
- 2 **Ensure that the recommended policies are limited and specific:** Incentives vary widely in their degree of specificity across the state policies. Moreover, some state policies mention a wide array of incentives without defining the means of implementation. Keeping policy incentives limited and specific will help in financing and implementing them.
- 3 **Create an execution roadmap:** Objectives and targets are meant to be achieved over a 5- or 10-year period. States must define interim targets, steps to deployment and review mechanisms to provide a roadmap for on-ground stakeholders implementing the policies.
- 4 **Establish governance structures for implementation:** Some state policies highlight nodal departments for different aspects of implementation. Other states have formed EV steering committees to oversee inter-departmental coordination and policy execution. Most governance structures end at the state level, however, without adequate devolution to the local level. Capacity-building and establishing lines of accountability from the ground up will support more comprehensive deployment of the EV policies
- 5 **Allocate or plan for fiscal resources to fund policy incentives:** Several state EV policies have recommended subsidies and tax exemptions as catalytic incentives for promoting the EV sector, both among consumers and manufacturers. In the absence of funding allocations from the state government, however, these recommendations remain on paper, with delayed implementation. Fiscal planning to fund incentives with specific revenue streams or predictable state budget allocations will be essential for nodal departments and agencies to move forward assuredly on deploying incentives.

As we enter the new decade, decisive and urgent action will be needed to achieve the target of 30% electric vehicles by 2030 in India. At the end of the day, the formulation and notification of an EV policy is only one piece of a large puzzle. States must realize the potential for economic and environmental gains from the budding electric mobility ecosystem and move towards implementation with strong political will and coordinated multi-stakeholder action.

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