

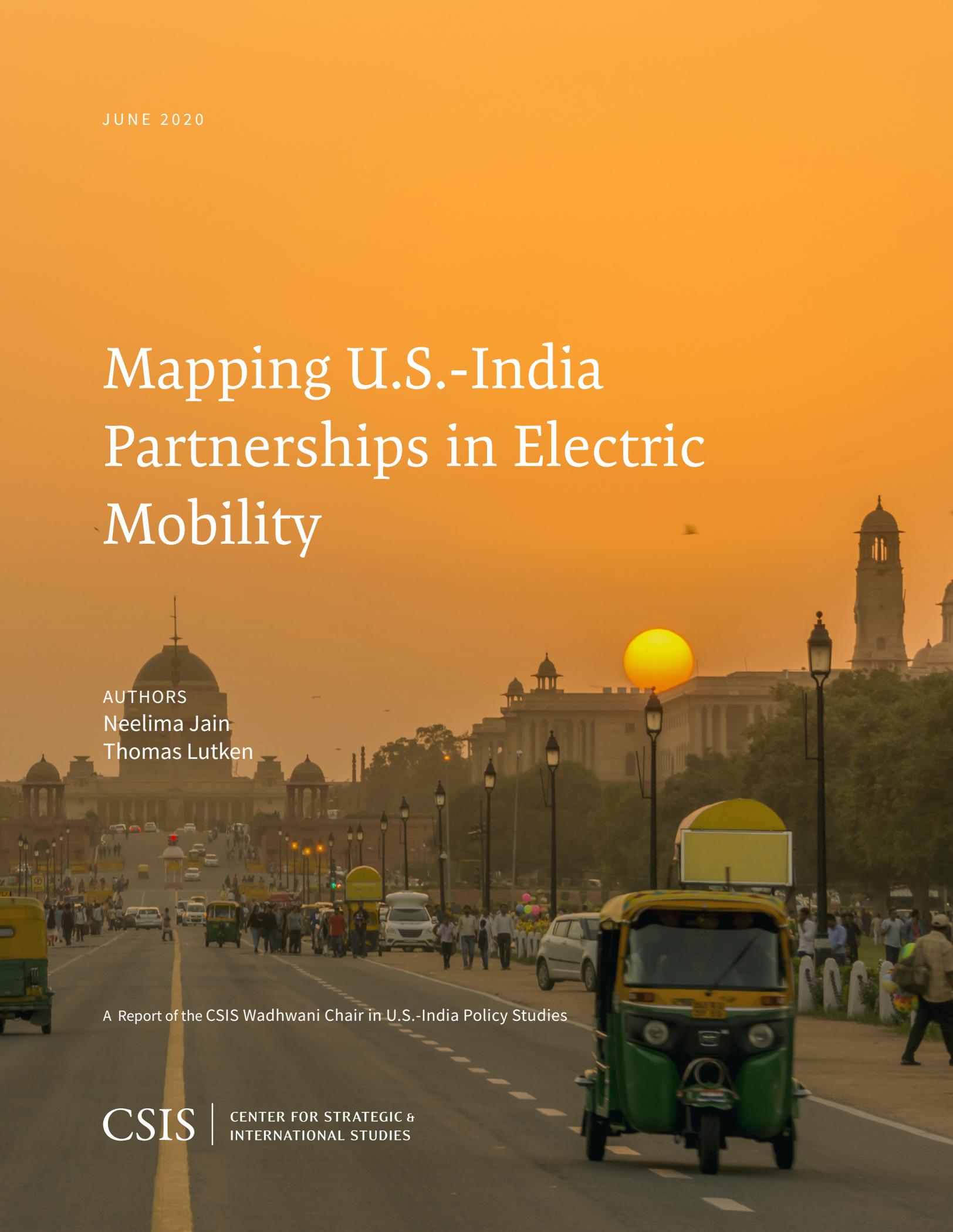
JUNE 2020

# Mapping U.S.-India Partnerships in Electric Mobility

AUTHORS  
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A Report of the CSIS Wadhvani Chair in U.S.-India Policy Studies

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# Acknowledgments

The authors would like to thank Richard M. Rossow and Kriti Upadhyaya for editing and support on this project. This report was made possible by the generous support of the ClimateWorks Foundation.



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# Executive Summary

By 2040, 465 million new vehicles are expected to hit Indian roads, resulting in a rise in India's oil demand by two-thirds.<sup>1</sup> For India, transitioning to electric mobility (e-mobility) and fostering energy security are two mutually reinforcing sides of the same coin. Indian states are playing a pivotal role in designing, executing, and monitoring electric vehicle (EV) policies and interventions. Despite policy actions to incentivize the adoption of e-mobility, India's share in the global EV market remains at a dismal 0.1 percent.<sup>2</sup> A number of obstacles stand in the way of states' ambitions regarding EVs, including limited EV model availability, high vehicle prices, limited availability of charging infrastructure, limited usage convenience, and low consumer awareness.<sup>3</sup> To meet these challenges, Indian states can leverage the experiences of other subnational governments from around the world to understand initiatives that have worked and those that were less successful. Promoting e-mobility calls for international collaboration that can bring together new partners and innovative approaches to stimulate transformative actions across Indian EV value chains.

With 22 percent of the global market share, the United States is the second-largest EV market globally.<sup>4</sup> The United States and India are similar in one crucial way: the reliance on states to establish and implement policies. This report, made possible by the generous support of the ClimateWorks Foundation, aims to assist U.S. subnational agencies in identifying opportunities for collaboration with Indian states on electric mobility. First, this report compares the EV market dynamics of the United States and India by examining EV share, market drivers, barriers, policies, and technologies. This comparison provides examples of policy instruments that inform the identification of collaborative U.S.-India partnerships. Second, it catalogues a wide array of incentives that Indian states have proposed, identifies best practices that U.S. states have put in place, and discerns gaps in the Indian EV value chains that need immediate policy attention for driving the uptake of

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1 IEA, *India Energy Outlook 2015* (Paris: 2015), <https://www.iea.org/reports/india-energy-outlook-2015>.

2 Ibid

3 "Electricity Laws and Incentives in Florida," U.S. Department of Energy, AFDC, <https://afdc.energy.gov/fuels/laws/ELEC?state=FL#:~:text=>.

4 "India State Level EV Policies," TransportPolicy.net, n.d., <https://www.transportpolicy.net/standard/india-state-level-ev-policies/>.

EVs. Finally, it recommends opportunities to collaborate on shared priorities, disseminate best practices, and coordinate action, thus charting a way forward for how the United States can best support India in navigating the transition to sustainable mobility.

India's success will offer a number of useful lessons to the United States as India continues to recalibrate and recondition its EV policies to address the evolving needs of a niche yet fast-paced market. As EVs gain momentum, similarities and differences between the two countries will continue to uncover mutually beneficial partnerships. The opportunities that this report presents are only a beginning of a shared transition to EVs.

# Introduction

India is currently the world's third-largest importer of crude oil and aims to reduce reliance on imported oil by encouraging the adoption of electric vehicles (EVs).<sup>5</sup> In both the United States and India, states play a leadership role in advancing electric mobility (e-mobility) objectives. Yet even the most ambitious states must work through various commercial, technical, or policy challenges associated with implementing their plans. In learning from U.S. states with similar ambitions, the Indian states may effectively build capacity, political support, and creative strategies through collaborative engagement. Expanding U.S. technical partnerships with Indian states could potentially be an important tool in promoting low-carbon mobility in India. It is in this context that this report attempts to identify potential areas of collaboration between U.S. and Indian subnational agencies.

## Background

In the face of global climate change, India, a large CO<sub>2</sub>-emitting country, has indicated its willingness to target a large-scale e-mobility transition. There has been some wavering in terms of targets, timelines, the creation of a national mission, and the management of the roles of multiple central government agencies.<sup>6</sup> However, one thing is clear: an electric future for India requires the cooperation and leadership of reform-oriented Indian states. Transport is a concurrent competence matter for states in India—meaning states can enact legislation as long as it abides by national primary legislation—with significant authority vested in the states for setting their own mandates, standards, and regulations. Hence, any successful mobility intervention will need to include robust partnerships with states.

The United States has been an early adopter of private EVs. The country has a long history of various stakeholders, including in the technology, energy, and automobile industries, that have perpetuated the growth of EV technology and in doing so created new areas of potential competitive advantage for U.S. industry and innovators. Several social and

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5 PTI, "Nitin Gadkari bats for biofuel, electric cars to reduce air pollution, cut crude oil import," *Times of India*, July 12, 2019, <https://timesofindia.indiatimes.com/india/nitin-gadkari-bats-for-biofuel-electric-cars-to-reduce-air-pollution-cut-crude-oil-import/articleshow/70196144.cms>.

6 Bhanvi Arora, "India Says Never Targeted 100% Electric Mobility by 2030, Scales Down Aim," *BloombergQuint*, March 8, 2018, <https://www.bloombergquint.com/business/india-says-never-targeted-100-electric-mobility-by-2030-scales-down-aim#gs.d2wWjbgP>.

economic trends in the country are transforming the way local communities conceive of the future of transportation and mobility. Development patterns are changing with a renewed focus on city-centric living, as opposed to support for exurbs. Emergence of new business models have led to the rise of ride-sharing applications. Also, there is a shift in consumer habits e.g., members of the “millennial” generation are not purchasing cars.

States are leading the charge to understand what e-mobility means in terms of city planning and the requisite infrastructure. Subnational entities are exploring innovative policies and business models that can support the growth of the entire supply chain of e-mobility technologies and are examining approaches to encourage consumers to adopt EVs. In pursuing such endeavours, states, both in the United States and India, continue to seek out partners to help them establish the enabling environment for e-mobility deployment. CSIS’s U.S.-India State and Urban Initiative has showcased that through sustainable working relationships, these states are keen to learn from each other as they advance in their respective agendas for a low-carbon transition.

### *U.S.-India State and Urban Initiative*

In 2016, the U.S. Department of State and CSIS Wadhvani Chair jointly created a novel program called the U.S.-India State and Urban Initiative to map state-level engagement opportunities in the energy sector and expand the list of U.S. partners working directly with Indian states on energy. Building on a unique peer-to-peer learning model, the initiative aimed to support and inform states in both countries on current energy access developments and best practices, advance information sharing and experiential learning, and disseminate relevant knowledge and expertise. Since the launch, the initiative has emerged as a productive platform for cross learning, knowledge sharing, and capacity building between subnational governments of the two countries. CSIS has successfully brought together state governments, research institutions, and the energy industry to support Indian states on emergent energy transition issues. The platform has facilitated engagement with 19 Indian states, 33 U.S. states, 9 U.S. cities, over 50 universities and research institutions, and more than 100 companies. More than 10 new partnerships have been created between U.S. and Indian subnational agencies.

The U.S.-India State and Urban Initiative platform has the potential to become a clearing house of e-mobility policy and deployment information and to provide in-depth expert assistance and peer forums, thus bringing a network of Indian state governments and U.S. partners together. Strong subnational linkages between the United States and India through this initiative can help usher in the collective e-mobility transition in both countries.

# E-mobility: A Common Goal

The two largest democracies in the world are making significant commitments toward promoting an EV future. While in the nascent stages of its electric vehicle initiative (EVI), India has made several strides in encouraging the adoption of e-mobility. The national government's determination is evident through its goal of 30 percent EV penetration by 2030.<sup>7</sup> Between the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) Schemes I and II, the government has extended financial support of \$1.2 billion.<sup>8</sup> Twelve states and union territories have followed suit and published draft or final EV policies.<sup>9</sup> On the other hand, state in the Zero-Emission Vehicle (ZEV) Alliance are leading the EV transition within the United States. The top 30 U.S. cities make up about 74 percent of the total electric car sales.<sup>10</sup> Government policy support at the state and local levels varies significantly across the United States.<sup>11</sup> It is this local variation in the EV adoption that makes the U.S. states the global learning repository for future policy actions.

## *EV Market Comparisons: The United States and India*

India and the United States are using different approaches to achieve their EV goals. India's national EV policy takes the form of the FAME program, which offers subsidies for many types of EVs, from two-wheelers to electric buses. The program provides over \$1.3 billion, with over \$1 billion going to demand incentives to increase the adoption of EVs directly and another \$130 million for charging infrastructure.<sup>12</sup>

In contrast, the United States does not have a centralized EV policy but rather uses existing legislation in conjunction with a national subsidy program to spur EV adoption. The Corporate Average Fuel Economy (CAFE) standards are regulations requiring manufacturers to meet an increasingly stringent fuel economy across their fleet. Owing to

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7 Richa Sahay, "How can India transition to electric vehicles? Here's a roadmap," World Economic Forum, October 3, 2019, <https://www.weforum.org/agenda/2019/10/how-can-india-transition-to-electric-vehicles-heres-a-roadmap/>.

8 Shanthi S., "Paving the Way for Emobility: State And Central Government EV Policies In India," Inc42, December 31, 2019, <https://inc42.com/features/paving-the-way-for-emobility-state-and-central-government-ev-policies-in-india/>.

9 "India State Level EV Policies," TransportPolicy.net, n.d.

10 Lingzhi Jin and Hui He, "Comparison of the electric car market in China and the United States," ICCT, May 2019, [https://theicct.org/sites/default/files/publications/ICCT\\_US-China\\_EV-mkt-%20comp\\_20190523.pdf](https://theicct.org/sites/default/files/publications/ICCT_US-China_EV-mkt-%20comp_20190523.pdf).

11 "The surge of electric vehicles in United States cities," ICCT, June 2019, [https://theicct.org/sites/default/files/publications/ICCT\\_EV\\_surge\\_US\\_cities\\_20190610.pdf](https://theicct.org/sites/default/files/publications/ICCT_EV_surge_US_cities_20190610.pdf).

12 "Notification regarding Phase-II of FAME India Scheme," Indian Ministry of Heavy Industries and Public Enterprises, DHI, March 2019, <https://dhi.nic.in/writereaddata/UploadFile/publicationNotificationFAME%20II%208March2019.pdf>.

this law, a manufacturer can use sales of non-emitting EVs to increase its fleet efficiency while still selling many cars with less than 40 miles per gallon (MPG) efficiency.<sup>13</sup> The qualified EV rebate offers up to \$7,500 in tax rebates to consumers based on the battery capacity of the vehicle. This program is limited to the first 200,000 vehicles sold per manufacturer, after which the rebate shrinks.<sup>14</sup>

**Table 1: EV Policy Landscape: The United States and India**

		United States	India
Regulations (Vehicles)	ZEV Mandate	X	
	Fuel Economy Standards	X	X
Incentives (Vehicles)	Fiscal Incentives	X	X
Target (Vehicles)		X	X
Industrial Policies	Subsidy	X	
Regulations (Chargers)	Hardware Standards	X	X
	Building regulations	X	X
Incentives (Chargers)	Fiscal Incentives	X	X
Targets (Chargers)		X	X

Source: IEA, *Global EV Outlook 2019 (Paris: 2019)*, <https://www.iea.org/reports/global-ev-outlook-2019>.

The two countries prioritize different types of EVs. India’s FAME Scheme II aims to subsidize 1 million two-wheelers but only 35,000 cars.<sup>15</sup> This contrasts with the United States, where the vast majority of EVs are 4-wheeled passenger vehicles. Yet the key component, battery technology, is similar, and technology breakthroughs in energy density or manufacturing techniques would yield benefits in both countries. The United States has released standards that specifically target medium- and heavy-freight trucks while allowing the possibility to use three-phase alternating current (AC) power (up to 166 kilowatts) for fast chargers.<sup>16</sup> Unlike most other countries, India sets specific charging standards for long-range EVs and heavy-duty vehicles (primarily targeting buses).<sup>17</sup>

<sup>13</sup> “Final Rule, Safer Affordable Fuel-Efficient (SAFE) Vehicles rules,” U.S. Department of Transportation, National Highway Traffic Safety Administration, March 31, 2020, [https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final\\_safe\\_preamble\\_web\\_version\\_200330.pdf](https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/final_safe_preamble_web_version_200330.pdf).

<sup>14</sup> “Qualified Plug-In Electric Vehicle (PEV) Tax Credit,” U.S. Department of Energy, Alternative Fuels Data Center, accessed April 2020, <https://afdc.energy.gov/laws/409>.

<sup>15</sup> “Notification regarding Phase-II of FAME India Scheme,” Indian Ministry of Heavy Industries and Public Enterprises, DHI.

<sup>16</sup> IEA, *Global EV Outlook 2019 (Paris: 2019)*, <https://www.iea.org/reports/global-ev-outlook-2019>.

<sup>17</sup> India State Level EV Policies,” TransportPolicy.net, n.d.

While India and the United States are at different stages of e-mobility development, there are opportunities for collaboration and partnership. Given that states play pivotal roles in driving the mobility agenda in both countries, partnerships between and among these states can spur the future of e-mobility.

**Table 2: The United States Versus India**

Comparative Factors	United States	India
<b>Global EV Market Share</b>	22 percent	Less than 0.5 percent
<b>Share of EVs in Country's Automotive Market</b>	2.5 percent	Less than 0.1 percent
<b>Projected Market Share of EVs in 2030 (IEA's EV30@30 Scenario)</b>	30 percent	29 percent (54 percent when including two- and three-wheelers)
<b>Announced Battery Manufacturing Facility</b>	<ul style="list-style-type: none"> <li>35 gigawatt per hour (GWh) factory by 2020 by Panasonic.</li> <li>9.8 GWh factory in 2022 by SK Innovation.</li> </ul>	<ul style="list-style-type: none"> <li>30 GWh/year factories to be completed in 2025, 2026, and 2027 by LIBCOIN and BHEL.</li> </ul>
<b>Regulations</b>	<ul style="list-style-type: none"> <li>The federal government has proposed to freeze GHG emission standards for light-duty vehicles (LDV) from 2022 to 2025.</li> <li>Twenty U.S. states have signaled willingness to adhere to the previously declared update of CAFE standards.</li> <li>ZEV mandate in 10 states.</li> </ul>	<ul style="list-style-type: none"> <li>CO<sub>2</sub> emissions standards for LDVs in 2022.</li> </ul>
<b>Target</b>	<ul style="list-style-type: none"> <li>There is no central target, so the individual states have adopted targets on their own.</li> <li>Targets of 3.3 million EVs in 8 states combined by 2025.</li> <li>ZEV mandate in 10 states: 22 percent ZEC credit sales in passenger cars and light-duty trucks by 2025.</li> <li>California: 1.5 million ZEVs and 15 percent of effective sales by 2025, and 5 million ZEVs by 2030.</li> </ul>	<ul style="list-style-type: none"> <li>30 percent EV sales by 2030 across all modes .</li> <li>CO<sub>2</sub> emissions standard of 113 grams CO<sub>2</sub>/kilometer in 2022.</li> </ul>
<b>Incentives</b>	<ul style="list-style-type: none"> <li>Incentives to deploy charging infrastructure are provided in more than half of U.S. states.</li> <li>Tax credits for EVs worth \$2,500+ and \$417 per kWh for batteries.</li> </ul>	<ul style="list-style-type: none"> <li>Approved FAME II, providing incentives for public and shared three-wheelers, buses, and private two-wheelers.</li> <li>FAME II dedicates 10 percent of the budget to the deployment of chargers.</li> </ul>
<b>Policy</b>	<ul style="list-style-type: none"> <li>U.S. Department of Energy's Vehicle Technologies Office supports the development of battery and electric drive systems.</li> </ul>	<ul style="list-style-type: none"> <li>12 states and union territories have published EV policies.</li> </ul>

<b>Public Charging Points as of 2019</b>	80,000	350
<b>Charger Types</b>	<p>Slow Chargers: SAE J1772 Type 1; Tesla has its own connector.</p> <p>Fast Chargers: SAE J3068; Accepts CCS Combo 1 (SAE J1772 &amp; IEC 62196-3) and CHAdeMO (IEC 62196-3); Tesla has its own connector.</p>	<p>Slow Chargers: IEC 62196-2 Type 2 and IEC 60309 (Bharat AC-001) (&lt;10 kW); Bharat DC-001 (&lt;15 kW).</p> <p>Fast Chargers: IEC 62196- 2 Type 2; Requires CCS Combo 2 and CHAdeMO (IEC 62196-3).</p>

Source: IEA, *Global EV Outlook 2018* (Paris, 2018), <https://www.iea.org/reports/global-ev-outlook-2018>; and Datalabs, *Electric Vehicle Market Outlook Report (2020)*, <https://datalabs.inc42.com/product/electric-vehicle-market-outlook-report-2020/>; India State Level EV Policies,” *TransportPolicy.net*, n.d., <https://www.transportpolicy.net/standard/india-state-level-ev-policies/>.

## EV Dynamics in the United States

The United States represents the second-largest EV market (third, if European countries are viewed as a collective entity),<sup>18</sup> yet it does so without a centralized EV policy or a national goal for EV penetration. The EV market share in the United States in 2018 was roughly 2 percent, with more than a million vehicles on the road.<sup>19</sup> To its credit, the federal government does invest hundreds of millions of dollars in battery and electrification technologies while offering direct tax rebates up to \$7,500 on EV purchases.<sup>20</sup> Additionally, the CAFE standards effectively serve as a legal means of limiting transportation CO<sub>2</sub> emissions.<sup>21</sup> These standards do not mandate what kind of fuel or vehicle should be used but rather that the average fleet efficiency of a manufacturer should be at a steadily increasing minimum. This is largely due to the influence of U.S. states, which use a variety of incentive policies to increase EV adoption.

## States Are the Prime Movers

The U.S. federal government plays a modest role in shaping EV charging infrastructure. Several state governments play more direct roles. From additional adoption incentives to building codes that improve charging infrastructure, U.S. states exhibit many different successful strategies. The state playing the most active role in e-mobility is California. The Clean Air Act allows California to adopt stricter emissions guidelines for its vehicle fleet through the California Air Resources Board.<sup>22</sup> This body has mandated a rising percentage of new vehicle sales in California to be “zero emission vehicles,” the majority of which are battery-powered EVs. California aims for its new vehicle fleet to comprise of 22 percent EVs by 2025. Ten U.S. states have collaborated to produce the Zero Electric Vehicle (ZEV)

18 Peter Slowik and Nic Lutsey, *The Continued transition to Electric Vehicles in U.S. Cities* (Washington, DC: ICCT, 2018) [https://theicct.org/sites/default/files/publications/Transition\\_EV\\_US\\_Cities\\_20180724.pdf](https://theicct.org/sites/default/files/publications/Transition_EV_US_Cities_20180724.pdf); and Roland Irle, “USA Plug-In sales for 2019 YTD October,” EV-Volumes, n.d., <http://www.ev-volumes.com/country/usa/>.

19 “Electric Vehicle Sales,” Edison Electric Institute, April 2019, [https://www.eei.org/issuesandpolicy/electrictransportation/Documents/FINAL\\_EV\\_Sales\\_Update\\_April2019.pdf](https://www.eei.org/issuesandpolicy/electrictransportation/Documents/FINAL_EV_Sales_Update_April2019.pdf).

20 Bill Canis, Corrie E. Clark, and Molly F. Sherlock, *Vehicle Electrification: Federal and State Issues Affecting Deployment*, R-45747 (Washington, DC: Congressional Research Service, June 2019), <https://fas.org/sgp/crs/misc/R45747.pdf>; and “Qualified Plug-In Electric Vehicle (PEV) Tax Credit,” U.S. Department of Energy, Alternative Fuels Data Center, accessed April 2020, <https://afdc.energy.gov/laws/409>.

21 “Final Rule, Safer Affordable Fuel-Efficient (SAFE) Vehicles rules,” U.S. Department of Transportation.

22 “Vehicle Emissions California Waivers and Authorizations,” U.S. Environmental Protection Agency, <https://www.epa.gov>.

Task Force Multi-State ZEV Action Plan 2018-2021 and have founded the International ZEV Alliance, a global initiative between 16 North American and European national and subnational governments to accelerate the global transition to ZEVs.<sup>23</sup> These states contain over 90 million people, make up 28 percent of the U.S. population, and include 60 percent of U.S. EVs. By combining their market share, coupled with a multi-pronged nationwide public awareness campaign, these states are expanding e-mobility in the United States.

**Table 3: EV Adoption in 10 U.S. States**

State	EV Fleet (as of June 2019)	Charging Stations (as of April 2020)
California*	326,038	6,958
Washington**	35,989	1,129
Georgia	29,944	916
Florida	28,535	1,590
Texas	21,683	1,437
New York*	19,647	1,788
Colorado**	15,901	891
Oregon*	15,527	722
Massachusetts*	12,408	872
Hawaii	8,300	307

*Note: Massachusetts and Hawaii are not in the top 10 states but were chosen for their innovative policies and their existing/potential CSIS partnership status.*

*\* State is a member of the ZEV task force and has adopted California’s ZEV Mandate.*

*\*\* State had adopted California’s emission standards by June 2019 but not the ZEV Mandate. See “Advanced Technology Vehicle Sales Dashboard,” Auto Alliance, <https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard>.*

California is the national leader in driving EV policy, with 48 percent of all EVs in the United States, making it a clear outlier. This is in large part because of California’s aggressive state-level rebate of \$4,500 per EV, the highest in the country. Other leading states include Texas and Florida, which take practical steps such as providing parking or access perks at a state level and allowing utilities and municipalities to offer smaller-scale rebates as adoption incentives.

This range of policies and adoption techniques offers an opportunity for a range of partnerships. Depending on the priorities, gaps, or strengths of an Indian state, they can be paired with a complementary U.S. state.

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gov/state-and-local-transportation/vehicle-emissions-california-waivers-and-authorizations.

<sup>23</sup> “Multi-State ZEV Task Force,” Multi-state ZEV Task Fore, November 2019, <https://www.zevstates.us/>.

## Key Market Drivers

EV uptake in U.S. states is primarily driven by the following factors:

### 1. Consumer Incentives and Mandates

While the technology for making batteries has improved greatly over the last 10 years, the chief obstacle to the adoption of EVs in the United States is their high cost. Consumer subsidies play a critical role in reducing EV costs in the near term.<sup>24</sup> Within the United States, California has the largest state-level subsidy, with other states such as Colorado and Oregon also using large tax-rebate programs to spur EV adoption. Washington uses a state sales-tax exemption to boost its EV adoption.

### 2. Manufacturer Incentives and Mandates

On the manufacturer side, several U.S. states (California and those choosing to adopt its program) mandate that a percentage of their new vehicles must be EVs. Georgia uses a tax credit for manufacturers. In California (and other participating states), manufacturers must meet EV sales requirements, with a target of 22 percent of vehicles sold by 2025. On the other hand, a combination of grants and tax abatements were offered by Nevada to support the development of battery production in the state.<sup>25</sup> Nevada offered \$195 million in transferable tax credits, 20 years of sales-tax abatement, worth approximately \$725 million, and 10 years of property- and business-tax abatement, worth approximately \$332 million, through 2034.<sup>26</sup>

### 3. Charging Infrastructure

Another key component of sound EV policy is improving the local charging infrastructure. As an emerging mode of transportation, EVs lack the support network of gas refuelling stations and petroleum transportation and distribution. Public charging and workplace charging infrastructure are both linked to higher EV uptake in the United States.<sup>27</sup> Several U.S. states incentivize the installation of home charging systems. New York, Massachusetts, and Colorado offer funding for charging businesses or apartment complexes. Additionally, states such as Hawaii, Oregon, and Washington place requirements that new buildings must include charging infrastructure.

### 4. Public Awareness and Outreach

Hawaii and Washington focus on utility-level outreach, while Colorado uses a state-wide coalition of businesses and state organizations to spread education about the benefits of EVs. The ZEV task force states share their outreach and public awareness campaign, “Drive Change, Drive Electric,” which has targeted local advertising and drive-day campaigns in the Northeast and on the West Coast. The “Electrify America” campaign also launched an application to allow easy charging across the country.

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24 Nic Lutsey et al., *Power Play: How Governments Are Spurring the Electric Vehicle Industry* (Washington, DC: ICCT, May 2018), [https://theicct.org/sites/default/files/publications/EV\\_Government\\_WhitePaper\\_20180514.pdf](https://theicct.org/sites/default/files/publications/EV_Government_WhitePaper_20180514.pdf).

25 “Multi-State ZEV Task Force”, *zevstates.use*, November 2019 <https://www.zevstates.us/>

26 Hirsch, J. (2015, May 30). Elon Musk’s growing empire is fueled by \$4.9 billion in government subsidies. *Los Angeles Times*. Retrieved from <http://www.latimes.com/business/la-fi-hy-musk-subsidies-20150531-story.html#page=1>

27 Slowik and Lutsey, *The Continued Transition to Electric Vehicles in U.S. Cities*.

**Table 4: U.S. States: E-mobility Key Enablers**

State	Consumer	Manufacturer	Charging Infrastructure	Public Awareness
<b>California<sup>28</sup></b>	\$4,500 EV tax rebate; exemption from vehicle inspection; reduced roadway taxes or tolls; access to restricted lanes; reserved parking.	Mandated market share of EV production.	Rebate 50 percent of defaulted loans.	Awareness campaign, including drive days, targeted advertising, and local campaigns.
<b>Washington<sup>29</sup></b>	Exempts 6.5 percent of individual’s sales tax (up to \$2,900) and offers fleet rebates (up to 50 percent of cost or \$250,000).	Uses California’s fleet average GHG emissions guidelines.	Required installation in new buildings after July 2021. This offers utilities increased return.	Encourages utility-level outreach.
<b>Georgia<sup>30</sup></b>	High-occupancy vehicle (HOV) lane access; time of use (TOU); exemption from vehicle inspection.	Tax credit worth up to \$3,500 per new full-time employee for 5 years.	\$2,500 or 10 percent income tax credit (businesses).	N/A
<b>Florida<sup>31</sup></b>	HOV access; insurance incentives; county/utility-level rebates up to \$1,000.	N/A	County/utility-level rebates; free residential equipment and installation (e.g., Duke Energy).	N/A
<b>Texas<sup>32</sup></b>	Required 50 percent alternative fuels in state fleets (not just EV); grant program for commercial/private alternative fuel vehicle (AFV) fleets (\$4.9 million in FY 2019).	N/A	Local/utility level rebates up to \$4,000 or 50 percent of cost in multi-family dwellings and \$10,000 to workplaces (e.g., Austin).	N/A

28 Zero Emission Vehicle program: [https://ww2.arb.ca.gov/sites/default/files/2019-06/zev\\_regulation\\_fact-sheet\\_082418\\_0.pdf](https://ww2.arb.ca.gov/sites/default/files/2019-06/zev_regulation_fact-sheet_082418_0.pdf); “Clean Vehicle Rebate Program (CVRP),” Moving California, <https://ww3.arb.ca.gov/msprog/lct/cvrp.htm>; “California Capital Access Program (CalCAP) Electric Vehicle Charging Station (EVCS) Financing Program,” California State Treasurer, <https://www.treasurer.ca.gov/cpcfa/calcap/evcs/index.asp>; and “Drive Change. Drive Electric.” Drive Change. Drive Electric., <https://driveelectricus.com/>.

29 “Washington State Electric Vehicle Fleets Initiative,” State of Washington, Office of the Governor, [https://www.governor.wa.gov/sites/default/files/WashingtonStateEVFleetsInitiative\\_Jan2019update.pdf](https://www.governor.wa.gov/sites/default/files/WashingtonStateEVFleetsInitiative_Jan2019update.pdf); and “Electricity Laws and Incentives in Washington,” U.S. Department of Energy, Alternative Fuels Data Center (AFDC), <https://afdc.energy.gov/fuels/laws/ELEC?state=wa>.

30 “2010 Georgia Code,” Justia, <https://law.justia.com/codes/georgia/2010/title-48/chapter-7/article-2/48-7-40/>; and “Electricity Laws and Incentives in Georgia,” U.S. Department of Energy, AFDC, <https://afdc.energy.gov/fuels/laws/ELEC?state=ga>.

31 “Electricity Laws and Incentives in Florida,” U.S. Department of Energy, AFDC, <https://afdc.energy.gov/fuels/laws/ELEC?state=FL#:~:text=>.

32 “Rebate Grants Program,” Texas Commission on Environmental Quality, <https://www.tceq.texas.gov/airquality/terp/rebate.html>; and “Electricity Laws and Incentives in Texas,” U.S. Department of Energy, AFDC, <https://afdc.energy.gov/fuels/laws/ELEC?state=tx>.

<b>New York</b> <sup>33</sup>	Up to \$2,000 tax rebate; HOV access; reduced roadway taxes or tolls.	Mandated market share of EV production.	\$5,000 or 50 percent rebate for property owners; \$8,000 for employers and \$500 additional for employees; \$250,000 to municipalities per charging facility.	“Drive Change, Drive Electric,” in partnership with manufacturers; awareness campaign, including drive days, targeted advertising, and local campaigns.
<b>Colorado</b> <sup>34</sup>	\$4,000 tax credit; exemption from or reduction in weight surcharges (collected annually at time of registration or renewal).	Goal of 940,000 EVs by 2030.	\$9,000 or \$30,000 direct current (DC) fast-charging grants for non-residential charging.	EV plan includes outreach and stakeholder engagement.
<b>Oregon</b> <sup>35</sup>	\$2,500 tax rebate.	Mandated market share of EV production.	Requires new residential and commercial parking lots to have at least one level 2 charger.	Awareness campaign, including drive days, targeted advertising, and local campaigns.
<b>Massachusetts</b> <sup>36</sup>	\$2,500 individual tax rebate; \$7,500 for public fleets.	Mandated market share of EV production.	\$50,000 for apartments or corporations.	“Drive Change, Drive Electric,” in partnership with manufacturers; awareness campaign, including drive days, targeted advertising, and local campaigns.

33 “Drive Clean Rebate for Plug-In Cars,” New York State, <https://www.nysesda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate>; “Alternative fuels and electric vehicle recharging property credit (for tax years beginning on or after January 1, 2013),” New York State Department of Taxation and Finance, [https://www.tax.ny.gov/pit/credits/alt\\_fuels\\_elec\\_vehicles.htm](https://www.tax.ny.gov/pit/credits/alt_fuels_elec_vehicles.htm); and “Electricity Laws and Incentives in New York,” U.S. Department of Energy, AFDC, [https://afdc.energy.gov/laws/state\\_summary?state=NY](https://afdc.energy.gov/laws/state_summary?state=NY).

34 State of Colorado, *Colorado Electric Vehicle Plan* (Denver, CO: January 2018), <https://drive.google.com/file/d/1tY5p3xrjLLlvY08JOc3nskL7zQ3ejGva/view>;

“Supporting Colorado’s Clean Energy Transition,” State of Colorado, Office of the Governor, July 2017, [https://drive.google.com/file/d/14OLX75zXN8JBM0v4k3zjKl\\_27fIWN8rB/view](https://drive.google.com/file/d/14OLX75zXN8JBM0v4k3zjKl_27fIWN8rB/view); and

“Income 69: Innovative Motor Vehicle and Truck Credits for Electric Plug-in Hybrid Electric Vehicles,” Colorado Department of revenue, <https://www.colorado.gov/pacific/sites/default/files/Income69.pdf>.

35 “Accelerating Zero Emission Vehicle Adoption in Oregon to Reduce Greenhouse Gas Emissions and Address Climate Change,” State of Oregon, Office of the Governor, Executive Order 17-21, [https://www.oregon.gov/gov/Documents/executive\\_orders/eo\\_17-21.pdf](https://www.oregon.gov/gov/Documents/executive_orders/eo_17-21.pdf); “Oregon Clean Vehicle Rebate Program,” Oregon Department of Environmental Quality, <https://www.oregon.gov/deq/aq/programs/pages/zev-rebate.aspx>; and

“Electricity Laws and Incentives in Oregon,” U.S. Department of Energy, AFDC, <https://afdc.energy.gov/fuels/laws/ELEC?state=or>.

36 “MOR-EV,” Massachusetts Offers Rebates for Electric Vehicles, <https://mor-ev.org/>; and “Electricity Laws and Incentives in Massachusetts,” U.S. Department of Energy, AFDC, [https://afdc.energy.gov/laws/state\\_summary?state=MA](https://afdc.energy.gov/laws/state_summary?state=MA).

<b>Hawaii</b> <sup>37</sup>	HOV access; parking exemptions; charging TOU incentive.	N/A	Rebate of \$35,000 for DC fast-charging. Requires at least one charging station in parking lots with over 100 spaces.	Electric utility's EV plan includes outreach and stakeholder engagement.
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## EV Dynamics in India

The Indian government recognizes the benefits of EV adoption, including a reduced oil import bill and improved air quality. Further, India hopes to cut its transport carbon emissions by 37 percent by making passenger mobility electric.<sup>15</sup> The transition to e-mobility may provide a fresh opportunity for India's burgeoning automotive industry to stake out a place in the global supply chain. Thus, India is pursuing policy changes to incentivize the adoption of e-mobility. The first major step in India's EV policy came in 2013 with the release of the National Electric Mobility Mission 2020. The mission announced a financial commitment of \$1.8 billion to achieve 30 percent e-mobility by 2030.

**Table 5: EV Sales in India FY 2019**

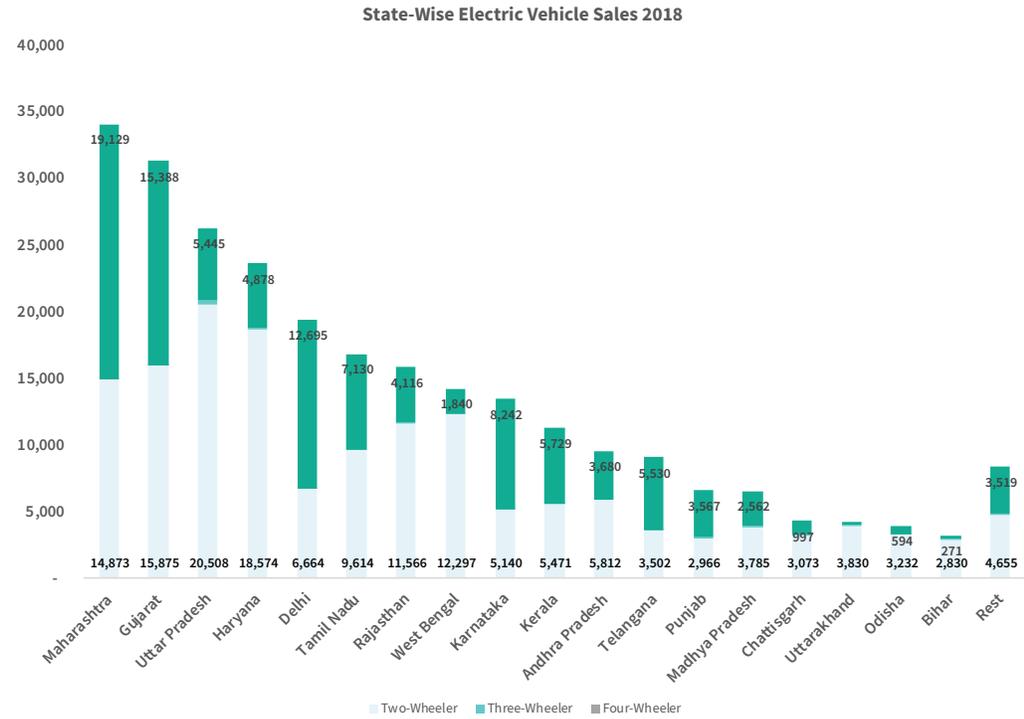
Fiscal Year 2019	Vehicles Sold	EVs Sold	EV Sales as a Percentage of Total Vehicle Sales
<b>Two-wheeler</b>	17,417,616	126,000	0.7%
<b>Three-wheeler</b>	636,569	630,000	99%
<b>Four-wheeler</b>	3,491,263	3,600	0.1%
<b>Total</b>	<b>21,545,448</b>	<b>759,600</b>	<b>3.5%</b>

Source: Data from Society of Indian Automobiles and Manufacturers, "EV Sales in India cross 7.5 lakh mark in FY2019," *Auto-car India*, May 1, 2019, <https://www.autocarindia.com/car-news/ev-sales-in-india-cross-75-lakh-mark-in-fy2019-412542>.

In April 2015, the Indian central government, led by the Department of Heavy Industry (DHI), announced a new initiative: FAME-India Scheme Phase I (FAME I). The scheme provided an initial two-year investment for electric and hybrid vehicle technology manufacturing, later extended for another two years. FAME I focused on four areas of investment: technology development, demand creation, pilot projects, and charging infrastructure. The policy put into place incentives aimed at increasing demand for all types of electric and hybrid vehicles—two-wheelers, three-wheelers, four-wheelers, light commercial vehicles, and buses. The Indian government specifically offered reduced purchase prices for electric and hybrid vehicles and provided grants for pilot projects, research and development, and the creation of public charging infrastructure. FAME I has supported 278,000 hybrid and electric vehicles and sanctioned 465 buses.

<sup>37</sup> "Electrification of Transportation (EoT) Strategic Roadmap," Hawaiian Electric, <https://www.hawaiianelectric.com/clean-energy-hawaii/electrification-of-transportation>; and "Electricity Laws and Incentives in Hawaii," U.S. Department of Energy, AFDC, <https://afdc.energy.gov/fuels/laws/ELEC?state=hi>.

**Figure 6: State-specific Electric Vehicle Sale Under FAME-I**



Source: “Electric Vehicles Sales Report in India 2018,” ElectricVehicles.in, December 11, 2018, <https://electricvehicles.in/electric-vehicles-sales-report-in-india-2018/>.

FAME-II began in April 2019 as a three-year initiative with an outlay of \$1.6 billion aimed at encouraging faster adoption of hybrid vehicles and EVs. It earmarked \$1.1 billion for demand-based incentives based on kW consumption at different rates for electric buses, three-wheelers, four-wheelers, plug-in hybrid vehicles, lithium-ion battery-powered vehicles, electric motor vehicles (whose manufacturers also have certain incentives), and full EVs.

Further, FAME II allocated \$131 million for the setup of one slow-charging station for every electric bus and one fast-charging station for every 10 electric buses through projects such as pantograph charging and flash charging, with an overall target of 300 charging stations on India’s highways by the end of 2019. Such charging infrastructure, which reports have indicated will make use of Chinese and Japanese technologies, will also ideally be interlinked with renewable energy sources.

The 2019 Indian budget reflected a deepening commitment to EVs, with the finance minister announcing a \$2,000 tax benefit for buyers and a 5 percent reduction of the goods and services tax (GST) on EVs. Particularly, the budget signaled an investment in local EV manufacturing and encouraged investments by component manufacturers.

*States Are the Prime Movers*

Indian states have considerable authority over the power and transportation sectors and are playing a pivotal role in designing, executing, and monitoring e-mobility policies

and interventions. Many states are also eager to become EV manufacturing hubs. To varying degrees, state governments are promoting EVs across India by providing a range of subsidies and other benefits, on both the demand and supply sides. States are incentivizing consumers to opt for e-mobility through their respective policies.

At less than 1 percent, the market share of EVs in India remains limited. There remain several barriers thwarting EV adoption in the market. The International Council on Clean Transportation (ICCT) lists five key barriers for EV uptake<sup>38</sup>:

1. Availability of a range of EV models across multiple segments and consumer price points;
2. Cost competitiveness of EV technologies with conventional alternatives;
3. EV deployment across different fleets;
4. Range anxiety and time to recharge—convenience to match conventional alternatives; and
5. Lack of awareness and knowledge on EVs.

Some policies are focused on manufacturing, while others are focused on providing public infrastructure such as charging stations.<sup>39</sup> Indian states have attempted a suit of policy interventions to address market barriers and spur EV demand. For example, Madhya Pradesh is unique in its use of a pollution tax, simultaneously funding its EV efforts while disincentivizing dirtier forms of transport. Only Maharashtra and Delhi feature direct subsidies for purchasing EVs over and above the FAME subsidies from the central government.

The table below explores 10 key states and their policy tools to address market barriers and facilitate an e-mobility ecosystem. Public awareness is notably absent from most policies.

**Table 7: Stimulating EV Demand – EV Policies across Indian States**

BARRIERS	POLICY ACTION	Andhra Pradesh	Delhi	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Tamil Nadu	Telangana	Uttar Pradesh	Uttarakhand
Expand EV model availability	Stimulate investment in EV production	X		X	X	X	X	X	X	X	X
	Support R&D and demonstration activities	X		X	X	X	X	X	X	X	X
Improve EV cost competitiveness	Financial incentives	X	X	X	X	X	X	X	X	X	X
	Non Financial incentives	X	X	X	X	X		X	X	X	
	Disincentivize conventional vehicle purchase	X	X						X		
	Battery recycling and reuse	X	X	X		X		X			X
Accelerate EV deployment across different fleets	Public fleet transition	X	X	X	X	X		X	X	X	X
	Commercial and corporate fleet transition		X			X			X	X	
Develop charging infrastructure network	Regulations and frameworks	X	X	X		X	X	X	X	X	
	Engagement through grants and partnership			X		X				X	
	Incentives for charging infrastructure investment	X	X	X	X	X	X	X	X	X	X
	Home and workplace charging infrastructure		X			X	X	X	X		
Raise public awareness	Mass communication	X				X					
	Personal communication					X					
	Education and skills training	X	X	X	X	X	X	X	X	X	X

Source: Barriers and policy actions are adapted from Aparna Menon, Zifei Yang, and Anup Bandivadekar, *Electric Vehicle Guidebook for Indian States* (Washington, DC: ICCT, 2019), <https://theicct.org/publications/electric-vehicle-guidebook-indian-states>.

38 Aparna Menon, Zifei Yang, and Anup Bandivadekar, *Electric Vehicle Guidebook for Indian States* (Washington, DC: ICCT, 2019), <https://theicct.org/publications/electric-vehicle-guidebook-indian-states>

39 World Economic Forum (WEF), *EV-Ready India – Part 1: Value Chain Analysis of State EV Policies* (Geneva: October 2019), [http://www3.weforum.org/docs/WEF\\_EV\\_Ready\\_India.pdf](http://www3.weforum.org/docs/WEF_EV_Ready_India.pdf).

CSIS has devised an EV policy breakthrough index that ranks the adopted EV policies on the four factors listed above in section 2.2.2—extent of subsidies on EV adoption, EV manufacturing support, charging infrastructure mandates, and public awareness efforts.<sup>40</sup> Madhya Pradesh and Andhra Pradesh top the index with subsidies for manufacturers, mandates on charging infrastructure, and a campaign to raise public awareness on EVs. Tamil Nadu is a close runner-up, featuring generous manufacturing subsidies.

**Table 8: Indian State EV Policy: A Breakthrough Index**

State	Consumer Incentives	Manufacturer Incentives	Incentivizing Charging Infrastructure	Encouraging Public Awareness	Total Score
Madhya Pradesh	3	10	10	3	26
Andhra Pradesh	3	10	10	3	26
Tamil Nadu	3	10	10	0	23
Delhi	10	0	10	0	20
Karnataka	3	10	3	0	16
Maharashtra	10	3	3	0	16
Kerala	3	3	3	3	12
Uttar Pradesh	3	3	3	0	9
Uttarakhand	3	3	3	0	9

*Note: Index score for Indian states in the area of EV policy. Data gathered from various Indian states' policy documents, compiled by the author.*

### Areas to Strengthen

In their aspiration to lead India in e-mobility, states have taken important steps to encourage uptake of EVs. But more progressive sets of measures are needed for mass adoption of EVs. It will take comprehensive sets of instruments and localized action to fully operationalize a holistic e-mobility ecosystem in a state. Indian states have released draft or final policies for accelerating innovation in their transition to e-mobility. However, analysis by World Economic Forum (WEF) and Ola Mobility Institute (OMI) and CSIS's Breakthrough Index indicates that states' EV policies may not always mirror EV ambitions.<sup>41</sup> By adopting the approach developed by Van Der Steen et al. and state analysis by WEF and OMI, the table below lists state-specific policy areas in the value chain that need further attention and investment.<sup>42</sup>

40 Richard Rossow and Thomas Lutken, "Indian States Electric Vehicle Policy: A Breakthrough Index," cogitAsia, CSIS, February 7, 2020, <https://www.cogitasia.com/indian-states-electric-vehicle-policy-a-breakthrough-index/>.

41 WEF, *EV-Ready India*.

42 Ibid.; and Martin Van der Steen et al., "Policy strategies for an emergent technology: lessons from the analysis of EV-policy in 8 North- European countries," *World Electric Vehicles* 7, no. 4 (December 2015), <https://www.mdpi.com/2032-6653/7/4/710>.

**Table 9: State-specific Areas to Strengthen**

Value Chain	Areas to Strengthen	Definition	Andhra Pradesh	Delhi	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Tamil Nadu	Telangana	Uttar Pradesh	Uttarakhand
Electric Vehicles	R&D	Instruments focused on influencing the research and design of EVs and EV components.		X				X				
	Production	Instruments focused on influencing the production of EVs and vehicle components such as batteries and other hardware.										
	Consumers	Instruments focused on influencing customers of EVs.			X							
	Service	Instruments focused on influencing service providers for EVs, such as car dealerships, mechanics etc.		X		X		X	X	X		
Charging Infrastructure	R&D	Instruments focused on influencing the research and design of complete charging infrastructure.	X	X		X		X	X	X	X	X
	Production	Instruments focused on influencing the production of charging stations and EV system components.	X					X	X	X		
	Consumers	Instruments focused on influencing customers of charging stations.		X						X	X	X
	Service	Instruments focused on influencing service providers for charging stations, such as energy suppliers, power plants, grid managers, software developers, etc.				X		X				
Network	Smart Mobility Services	These are all of the instruments that focus on connecting stakeholders in the EV / infrastructure value chain. For instance, policy measures aimed at realizing smart grids, smart economies, and smart mobility.	X	X	X	X	X	X	X	X	X	

Clearly, much work remains to be done in India on connecting all concerned stakeholders in the EV and infrastructure value chain. Close partnerships between the United States and India will provide vital laboratories to develop smart products and services in e-mobility.

## Areas of Collaboration

U.S. states demonstrate many best practices that support EV policies and can act as models for Indian states seeking to accelerate EV adoption. The partnership-based approach will help Indian states address the prevailing barriers created by a lack of regulation frameworks, technical and operational restrictions on research and development, limited consumer awareness, range anxiety, and cost concerns. At their best, U.S.-India partnerships can not only facilitate information exchange but also encourage the replication of best practices. In the context of best policy practices that U.S. states have in place, a potential partner (an Indian state) is selected on the basis of:

1. Policy action(s) that best remedies a specific policy gap in an Indian state;
2. Policy action(s) that could be tailored to the unique local conditions of an Indian state; or
3. Past associations, ongoing partnerships, or sister-city relationships.

Accordingly, the tables below identify for each state: areas of collaboration; potential U.S. state partners; and examples of relevant policy actions that the Indian state can embrace. Also, the table builds upon the state-specific gap analysis in section 2.3.2 of this report and adapts the policy actions by ICCT.<sup>43</sup>

### State: Andhra Pradesh

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
R&D	Roadshows; partnerships; research hubs	Denver, Colorado	Set up utility charging pilot or research center.
Production	Facilitate public-private partnerships (PPPs); provide purchase subsidies and low-interest loans	Colorado	Deploy public land for charging infrastructure and battery swapping stations.
Smart Mobility	Interoperability; utility participation; billing models	Con Edison, New York	Encourage demand management through the use of smart meters.

**State: Delhi**

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
<b>R&amp;D</b>	Roadshows; university partnerships; research hubs	Argonne National Laboratory, Chicago	Set up research centers in collaboration with universities or national laboratories.
<b>Service</b>	Ride-sharing; regulations	Chicago, Illinois	Design electric car-sharing program for the city.
<b>Consumers</b>	Incentives; mandates; public outreach	Chicago, Illinois	Design incentives for investment in charging infrastructure.
<b>Smart Mobility</b>	Demand management; utility participation	Vermont	Implement demand response through digitization.

**State: Karnataka**

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
<b>Consumers</b>	Non-financial incentives; disincentivize conventional fleet; personal outreach	California	Establish low or zero emission zones.
<b>Smart Mobility</b>	Interoperability; demand management; grid management	California	Support grid modernization initiatives.

**State: Kerala**

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
<b>R&amp;D</b>	Roadshows; expert groups; incubation center	Texas	Support development and demonstration of new technology.
<b>Service</b>	Battery reuse; regulations; fleet transition	Texas	Develop government procurement guidelines.
<b>Smart Mobility</b>	Utility participation	Texas	Authorize utilities to install charging stations in state-owned facilities.

## State: Madhya Pradesh

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
Smart Mobility	Interoperability; utility participation; regulations and framework	New York	Unify charger standards and interoperability.

## State: Maharashtra

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
R&D	University partnerships; expert groups; research hubs	Lawrence Berkeley, California	Set up research centers in collaboration with universities or national laboratories.
Service	Regulations and framework; skill training; campaigns	California	Integrate electric mobility in zoning laws and land-use policies.
Production	Battery reuse; mandates; financial incentives	California	Mandate that Original Equipment Manufacturers (OEMs) produce and sell EVs.
Smart Mobility	Grid management; fleet transition; partnerships	California	Install charging stations in public transit hubs, airports, and train stations.

## State: Tamil Nadu

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
R&D	Roadshows; expert groups; research hubs	Massachusetts	Support the organization of technical events for stakeholders.
Service	Skill training; campaigns	Massachusetts	Promote workplace charging infrastructure.
Production	Battery reuse; mandates; financial incentives	Massachusetts	Incentivize end-of-life recycling.
Smart Mobility	Grid management; fleet transition; partnerships	Massachusetts	Provide financing schemes targeting commercial vehicle/fleet owners.

### State: Telangana

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
R&D	Market research; expert groups; research hubs	Georgia	Fund and facilitate PPP platform.
Service	Charging incentives; fleet transition	Georgia	Implement user incentive schemes for ride sharing
Consumers	Financial incentives; non-financial incentives	Connecticut, Arizona	Implement a registration exemption program.
Smart Mobility	Interoperability; utility participation	Georgia	Encourage data sharing and interoperability.

### State: Uttar Pradesh

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
R&D	Utility partnerships; expert groups; research hubs	Washington	Set up utility charging pilots or research.
Consumers	Incentives; tools for information; government collaborations fleet transition	Washington	Promote awareness among multi-unit home dwellers and property owners.
Smart Mobility	Regulations and standards; grid management	Washington	Set standards for grid interoperability and encourage data sharing.

### State: Uttarakhand

Areas of Collaboration	Examples of Collaboration	Potential Partners	Example of Partner's Policy Action
R&D	Roadshows; engagement through grants; expert groups; research hubs	Oregon	Fund and facilitate a PPP platform.
Consumers	Outreach; incentives; fleet transition	Oregon	Promote electric mobility in tourist destinations.
Smart Mobility	Utility participation; grid integration	Oregon	Implement utility preferential EV rates.

# Conclusion

Electricity and transport are concurrent competence matters in India, with significant authority vested in the states for setting their own mandates, standards, and regulations. The states have fallen short of creating a coordinated, cohesive, and multidisciplinary mobility strategy to accelerate uptake of EVs in India. Hence, strengthening the capacity of Indian states will be key to supporting India's transition to e-mobility in a reliable and sustainable manner. This presents a slew of opportunities for U.S. subnational agencies to collaborate with Indian states. U.S. states are well positioned to provide examples of the types of actions that could be more widely embraced by India to grow the EV ecosystem.

As may be apparent from this report, each Indian state has a different market context and differs in its approach to adopting EVs. However, there are common gaps that must be addressed through collaborative partnerships<sup>44</sup>

- **There is limited availability of EV models across multiple fleets and consumer price points in the Indian market.** Availability of more models in more vehicle segments, especially lower-cost and higher-range EVs, is a key to continued EV market development.<sup>45</sup> U.S.-India collaborations to enhance manufacturers' capacity in providing EV technologies and to simulate investments in production must be encouraged.
- **India is far behind the curve on attaining cost parity of EV technologies with conventional alternatives.** As EVs are at an early stage of development in India, their market price is higher than conventional gasoline and diesel alternatives. Collaborations that could help states devise measures to make EVs more affordable and appealing to consumers should be explored.
- **Inadequate charging infrastructure, lack of uniformity on tariff policy, and long charging cycles make it difficult for EVs to match the convenience of conventional alternatives.** Grid modernization, unification of charging standards, and innovation in billing models are areas of collaboration that may potentially overcome the barrier of developing a charging infrastructure value chain in the Indian market.

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44 Aparna Menon, Zifei Yang, and Anup Bandivadekar, *Electric Vehicle Guidebook for Indian States* (Washington, DC: ICCT, 2019), <https://theicct.org/publications/electric-vehicle-guidebook-indian-states>

45 Slowik and Lutsey, *The Continued Transition to Electric Vehicles in U.S. Cities*.

- **There is a general lack of awareness and knowledge about EVs in India.** Without the provision of clear and relevant information, the uptake of EVs in India will continue to remain low. Collaborations must be sought on creating targeted outreach campaigns, establishing market research, and designing training programs.
- **There remain several challenges in the deployment of EVs across the public and commercial fleets.** States can achieve this transition either by mandating or incentivizing requirements. Opportunities on ride sharing, interoperability, and financing fleet owners remain open for collaboration.

This report highlights multisectoral opportunities to enhance U.S.-India state cooperation on the e-mobility value chain in India. For all the progress that the United States makes in EVs, the fast-growing markets of India are where the major benefits of collaboration will be reaped.

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