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 H_2 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

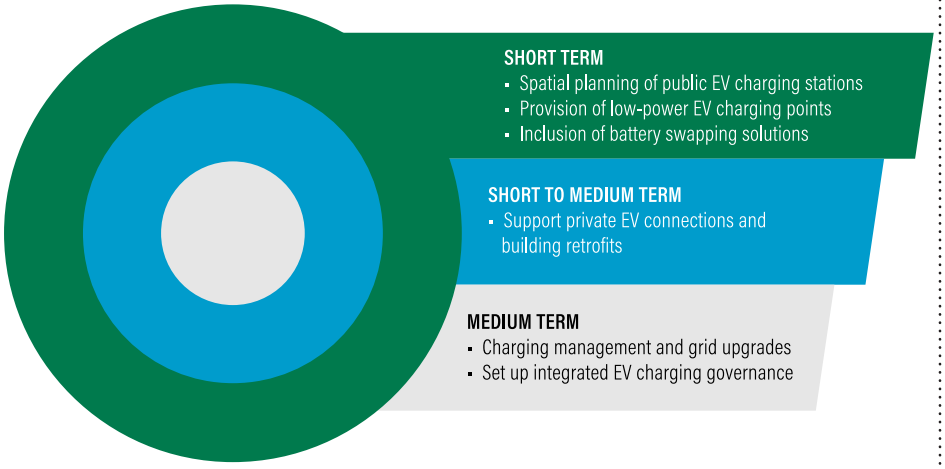
State incentives for EV charging infrastructure are focused primarily on public charging stations, with capital subsidies and land allocation concessions geared towards heavy, capital-intensive infrastructure. Considering that the first wave of electrification will be led by light vehicles such as 2Ws, 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 Program[18] 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