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For electric vehicles, there is no one-size-fits-all solution

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For EVs, there is no 'one-size-fits-all' charging solution, and different options must be weighed carefully



The choice of charging method and technology is another key consideration. Different categories of EVs have different operational constraints.

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Globally, electric vehicles (EVs) continue to gain in popularity. As of 2018, according to the International Energy Agency (IEA), over 50 lakh electric passenger cars were in operation, with approximately 52 lakh charging points worldwide.

For large-scale adoption of EVs, a hassle-free charging experience is crucial. With EVs suffering from high upfront costs and an inability to travel over a long distance on a single

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is clear that the subsidies on EV sales alone will not be sufficient to meet the ambitious target set by the government. This is essentially so because of the inconvenience caused to EV adopters due to a shortage of charging stations, hindering EV deployment. The installation of a reliable, grid-friendly, and accessible network of public chargers is, therefore, a necessary prerequisite for the success of EVs.

This has been highlighted by the government in both the Union Budget and the Economic Survey. The Phase 2 of the FAME scheme has laid emphasis on the installation of a robust public charging infrastructure. In terms of deployment, the Energy Efficiency Services Ltd has led the way by commissioning 300 AC and 170 DC chargers across India. The government has installed 51 public charging points that are operational in Delhi NCR. While a promising start has been made, a few key factors must be considered to develop a large-scale EV charging network.

Currently, multiple charging standards are being adopted. The Department of Heavy Industries has introduced the Bharat AC-001 and DC-001 standards for EV chargers. The DC-001 standard relies on Chinese GB/T connector standards. There are two other major standards—CCS and CHAdeMO. Guidelines from the ministry of power indicate that a public charging station must be able to cater to EVs that adhere to any of the above standards. However, the development of a national standard for chargers and connectors will be more beneficial; it will also provide more clarity to the manufacturers, buyers and service providers. As the current Bharat standards are limited by a maximum power rating of 15kW, EVs with larger batteries that need to be charged at higher power levels, such as electric buses, will require different standards. The Bureau of Indian Standards is currently developing comprehensive standards for EV charging.

The choice of charging method and technology is another key consideration. Different categories of EVs have different operational constraints. Generally, commercial vehicles cover longer distances than personal vehicles in a day. They also require frequent and fast recharging, for which low-powered AC- and DC-based charging systems are not suitable. While larger on-board batteries may reduce the need for frequent recharge, they will add significantly to the upfront costs of EVs, and additional weight. Given this, the role of alternate charging

solutions must be explored. These can be grouped into three categories—opportunity charging, battery swapping, and hybrid trolleybus systems.

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frequent fast charging can degrade batteries faster than usual.

'Battery swapping' involves the removal and replacement of the on-board battery. This allows the EV to replace a discharged battery in a few minutes, by visiting a swapping station, where batteries are charged and stored. While this has been demonstrated to work across different vehicle categories, issues pertaining to the interoperability of batteries and related connectors need to be addressed.

'Hybrid trolleybus systems' are buses that draw power from overhead lines during operations. They have small on-board batteries that enable operation even when disconnected from overhead power lines.

Each of these solutions have unique advantages, making them better suited to certain categories of EVs more than others. For instance, battery swapping-based electric two-wheelers have been successful in Taiwan, whereas a large number of electric bus projects in Europe utilise opportunity charging and hybrid trolleybus systems. It is also important to note that these solutions need significant capital investment to build the required infrastructure. However, once built, the return on investment will increase with usage. Thus, for EVs, there is no 'one-size-fits-all' charging solution, and different options must be weighed carefully. That said, the future of EVs looks bright in India. As the technology matures, India must prepare itself to make the most of this opportunity to move towards a cleaner and greener future.

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