

A large, 3D-style sign for an 'EV Station' mounted on a building facade. The 'EV' is in a large, bold, sans-serif font, and 'Station' is in a smaller font below it.

Charging Infrastructure Market for Electric Vehicles in India

Prospering Opportunities & Value Proposition Evaluation & Outlook By
Charging Stations, By Number of Chargers, By OEMs, By PSU's, By
Discoms, By Smart City /Grid Operators

E-REP Market Series Report

December 2018

Why enincon's report upon "Charging Infrastructure Market for Electric Vehicles in India"

INR. 2.5 Million is the estimated cost for setting a DC fast charging infrastructure for passenger (4W) electric vehicles in India as on 2018. Will it be reduced to make it a lucrative business proposition for unorganized players

New Charging Pattern Observed Globally & is Expected to be Similar in India

There are significant technical differences between charging electric cars and refueling gasoline cars that make charging behavior different from traditional refueling behavior:

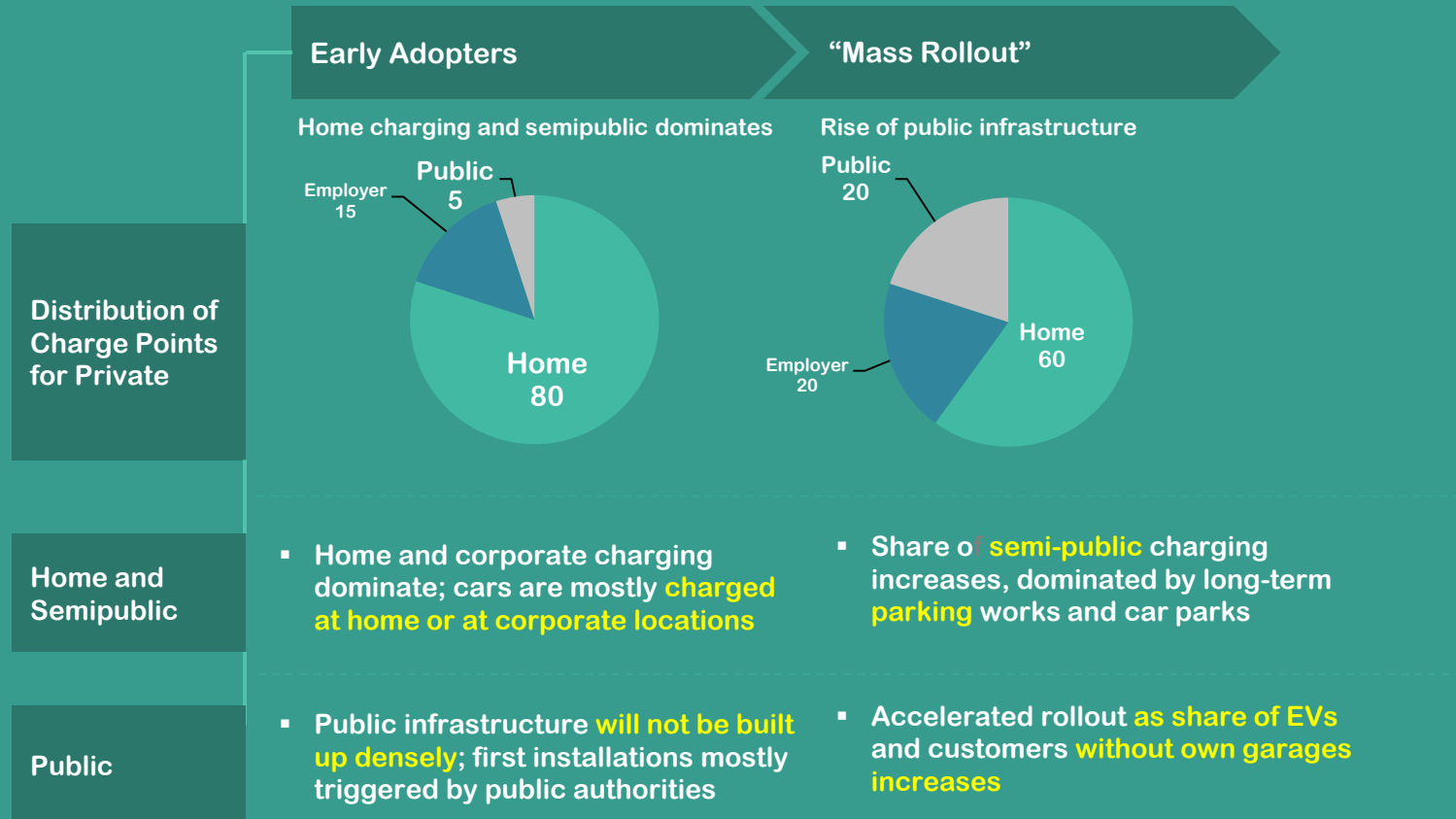
- a. **Charging Speed:** Refuelling an ICE car at a petrol station only takes a few minutes and the infrastructure already exists. For full battery EVs, even fast-charging a battery to 80% will require 20-30 minutes (depending on battery size and fast-charging speed), and slow-charging a BEV usually takes multiple hours.
- b. **Charging Frequency:** The range of BEV is less than that of gasoline cars and only Tesla's Model S has a range of 426 km with 85 kwh battery. This reduced range capacity compared to traditional ICE vehicles means that "plugging" in to charge will need to happen more frequently than refuelling. However, an European driver of a BEV with a range of 150 km who has the opportunity to recharge at home or at work will have a limited need for additional recharging most of the time, since average trips are quite short. In most European countries, passenger vehicle driving distances average 40-80 km per day, with 2-3 trips per day. So most drivers would have an occasional need for additional charging outside of their homes or workplaces. This trend shall be similar in India as well.

However, in future the charging behavior shall change for both slow and fast charging rate and following factors might have an impact:

- i. **Need for public charging infrastructure for EV :** The need for public charging stations will increase if consumers who do not have access to a garage or other private or semiprivate residential parking – a large share of people living in cities – also adopt EVs. For instance, in Germany almost two-thirds of all households have a garage or parking space. Looking at the urban metropolis of London, however, two-thirds of homes have neither a garage nor off-street parking
- ii. **Battery Size:** Conversely, the need for public slow-charging stations would decrease if the average battery size and range of BEVs increases. With less frequent charging required, drivers who rely solely on public stations will use them less, and those with access to stations at home and work may stop using public stations altogether
- iii. **Usage of Car:** When it comes to slow- vs. fast-charging stations, the potentially changing role of the BEV may shift the ratio required. Experience from Norway shows that currently BEVs are often purchased as a second car for households and used primarily for daily commuting purposes. If the adoption of BEVs grows and more people want to use their BEV for long-distance trips (between cities or even countries), the demand for fast-charging stations will increase. Although for this to happen in India it is anticipated to take longer than 2030.

Exhibit 1

Implications of Charging Infrastructure & its Adaptability in India



Source: Company Data, Goldman Sachs and enincon research & analysis

Charging infrastructure, mainly setting up of level 2 charging at public level shall be the toughest challenge in terms of service integration for India. For fast DC charging; cost & high renewable energy biggest factors!

Convenient EV charging infrastructure will be a key factor for a successful EV market in India. Currently, there are two primary charging locations, at home or work. Both sources involve legal challenges in terms of taxation, theft and accounting that will need to be addressed. While OEMs are offering home-charging solutions with customer EV purchases, and attempting to kick-start the charging market through platforms integration with other eMobility ecosystem partners, the lack of widespread public charging stations as of yet, continues to place a greater focus on hybrid vehicles. **The cost barrier in terms of setting infrastructure for level 2 & fast DC charging public infrastructure shall as of now need financial assistance from the Government to make it feasible a growth market scenario like.** Public and semi-public charging infrastructure is still uncertain, as large-scale investment has not yet surfaced to support semi and public-charging infrastructures as a standalone business. Currently, there are limited pilot projects, including cooperative urban initiatives supported by city-government funding and installed by energy utilities, state-funded projects, and business supported efforts designed to show eMobility feasibility. Enincon's research of PEV pilots reveals that, despite existing barriers to greater EV acceptance, drivers do change their perceptions toward PEVs once they are provided with information and hands-on experiences. Hence, a deep dive upon the opportunities likely to evolve in the process of developing EV market in India was required to unfurl the estimates for the charging infrastructure in the country. Also, India has already attracted interests of many global majors in this business despite being a nascent market for EV's and exciting times ahead demanded for a calibrated approach for the market participants which can only be achieved if the decision making process is assisted with crude market feed and insights which was the very motive of enincon's team. In this dossier we have attempted to study the EV market through automobile industry interface with their adaptability mix index determination for EVs as per their geographic presence. Apart from this the role of smart grid facilitator shall also be examined in effectively electrifying the transportation for passenger vehicles and heavy vehicles like buses by establishing more charging infrastructure suitable to usage. An exact estimate of charging infrastructure set up as per slow and fast chargers with battery swapping stations included shall be done for all regions and further granularization for tier based cities shall also be done coupled with best suitable state in terms of developing charging infra (CI) for EVs in India. The dossier also determines the outlook for EV charging infra market with clear opportunity estimates for OEMs, Auto makers, Battery Manufacturers, Power Developers etc. Further, separate sections upon the cost estimates for setting up a slow and fast charger along with cost of setting up a battery swapping station (BSS) with modulation in engineering, labour, land and other costs split clearly defined. Consequently the challenges in setting up of the CI will also be done for both stand alone CI and BSS on state wise basis. Also, an effective due diligence shall also be done for OEMs and Value Integrators so that all the pre-requisites before entering the Indian market is well known and following which a detailed market entry strategy as per the value chain player wise shall also be done. Also, the dossier includes dedicated company profiles of all major players who are existing or planning to venture in charging infra market as per dedicated market intelligence feed.

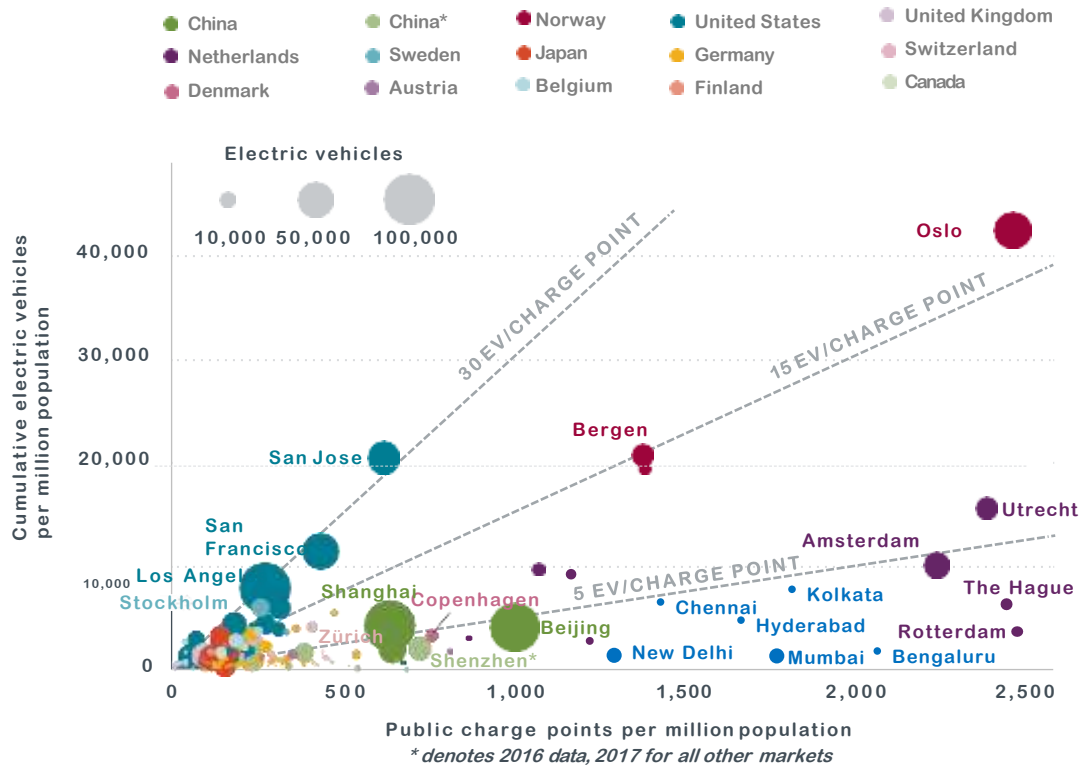


Exhibit 02

Public charging infrastructure and electric vehicle registrations per million population by metropolitan area, with size of circles indicating total electric vehicles – India & Global Comparison

Source: enincon research & analysis and ICCT White Paper on EV

BUSINESS CASE FOR CHARGING INFRASTRUCTURE MARKET IN INDIA FOR ELECTRIC VEHICLES

- Need to counter air pollution coupled with rising fuel prices in India provides for booming business case for establishing a robust EV market and hence for a strong charger infra market in India
- Favorable policy interface such as FAME I and FAME II and pushing the adaptation of EVs through embellished incentives for end users
- Market orientation of Automobile industry OEMs to invest heavily in manufacturing of all 2W, 3W and 4W category of vehicles and provide for them as value integrator and supplier for EV charging infra as well builds up good industry outlook
- Smart cities and smart grid is promoted which are both the right enablers for developing a robust charging infrastructure base for EVs in India
- Global benchmarks to develop charging infrastructure in India is likely to be developed so that local players get benefitted by state of the art technologies and best in class standards
- Changing charging infrastructure industry structure in India with many global majors planning to enter the market which shall open up scores of opportunity for value chain players with increasing FDI
- PSU's and many local private sector giants also have envisaged to enter this business segment which is promising for India. Further, with the likes of NTPC, Tata Power, BHEL & Fortum India the growth shall be faster than anticipated

REPORT INSIGHTS

- Business case for expanding charging infrastructure for electric vehicles in India with factored growth trends for automobile industry in the country
- Examination of geographical presence of automobile manufacturers in India and its impact of developing the charging infra market
- In-depth evaluation of opportunity for smart grid and smart city players in facilitating the charging infra in India as per district wise interface
- Typical cost structure for setting up of EV charging infra with layout details, standards & specifications as per global benchmarks
- Complete know-how of existing EV charger industry structure in India with coverage of existing suppliers in both 4W and 2W fast & slow charging, coupled with plans of global players and domestic majors venturing in this business
- Direct channel checks based feed upon EV Charger market characteristics and active business models in India with market dominants, PSU movements and major private players initiatives
- Exact cost estimation of cost economics for setting up of EV charging infrastructure in India with split of cost of equipment's, installation cost as per public, semi-public and private infrastructure & O&M costs
- Battery swapping station setting up cost with split of type of station like side swapping, rear swapping & bottom swapping with all impediments factored
- Region wise, state wise and tier 1, 2 & 3 city wise infrastructure requirement in EV charging with state ranking index based on D2I Model feed
- EV Charger market as per each region and state's with outlook as per chargers type and capacity
- Due diligence for OEM's & value integrators to develop EV Charging infra in India
- Detailed market entry strategy (MES) for OEMs, PSUs, Discoms, Auto OEMs etc. to enter EV Charging Infra market
- Company profiles of leading EV Charging Infra providers coupled with all major players planning to venture in India

KEY HIGHLIGHTS

- Opportunity for both domestic and foreign players under Charging Infrastructure Market in India & Outlook till 2025
- Opportunity for both domestic and foreign players under split of value chain services in Charging Infrastructure Market in India & Outlook till 2025
- Best suited region for venturing into EV Charging infra market in India, coupled with best state based upon parametric ranking of each city as well through D2I Model feed
- Opportunity assessment for Auto OEMs in Indian EV Charger market and outlook
- Opportunity assessment for PSU's and major private players to venture in Indian EV Charger market and outlook
- Complete track of opportunity for power distribution company and battery manufacturers to be an active player in setting up EV charging infra market in India
- Cost break up of setting EV Charging infra by type and capacity with granular level details and unmatched accuracy
- Company Benchmarks for products, services, margins, financial performance for top EV Charger suppliers in India

PRESS EXCERPTS

“The Union government plans to provide ₹1,000 crore as subsidy for building a nationwide charging infrastructure for electric vehicles as it seeks to expedite the roll-out of India’s ambitious EV programme”

Live Mint

“Swiss engineering major ABB is bullish on the growth opportunity in India’s electric vehicle charging market. The company is also keen to harness its strong foothold in solar energy generation in India to provide not just EV chargers but a clean charging ecosystem altogether”

AUTOCAR India

KEY QUERIES ADDRESSED

- What shall be in-store for India for Charging Infra Market in India
- What shall be scale of opportunity for both domestic and foreign players under Charging Infrastructure Market in India & Outlook till 2025?
- What shall be the opportunity for both domestic and foreign players under split of value chain services in Charging Infrastructure Market in India & Outlook till 2025
- Which is the best suited region for venturing into EV Charging infra market and which state offers highest market potential in terms of developing EV charging infrastructure in India?
- What shall be the opportunity assessment for Auto OEMs in Indian EV Charger market and outlook?
- What shall be the opportunity assessment for PSU’s and major private players to venture in Indian EV Charger market and outlook ?
- What shall be the track of opportunity for power distribution company and battery manufacturers to be an active player in setting up EV charging infra market in India?
- What shall be the cost break up of setting EV Charging infra by type and capacity in India with demographic variance?
- What shall be the key drivers and barriers to robust market growth?
- Which company shall lead the Charging Infra for EVs market in India?

MUST BUY FOR

- Automobile OEMs (2W, 3 W & 4 W developers)
- Power distribution companies
- PSUs in Power Generation Business
- IPPs
- Smart Grid & Smart City Operators
- EV Charger Suppliers
- EV Charging Station Set up providers
- EV Manufacturers
- Battery Manufacturing OEMs in India
- Power Project Funding Bodies
- Foreign Collaborating Agencies
- Utility Solar Power Project Developers
- Government & Regulatory Bodies
- Research Institutions/Bodies
- Funding Bodies/Banks

COMPANIES MENTIONED

- ABB India
- Delta India
- Schneider India
- Siemens
- Raychem India
- BHEL
- NTPC Limited
- Tata Power
- Analogic India
- Deltron
- EoS Power
- Ador Powertron
- Kraff Power Con
- Elind
- EESL
- Fotrum India



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THANK YOU!

Happiness does not come from doing easy work but from the afterglow of satisfaction that comes after the achievement of a difficult task that demanded our best

- Theodore Isaac Rubin