Solve. New

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# Powering India’s EV future: The charging infra playbook

REPORT

redseer
Strategy Consultants

Bangalore. Delhi. Mumbai. Dubai. Singapore. New York

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# Executive Summary (1/3)

## 1. Current State of Public Charging in India

- India currently has ~30,000 public charging stations, but many face **operational challenges**.
- A proportion of chargers remain **non-functional** due to theft of charging guns and copper wiring
- Even among functional chargers, **utilization is low (<10%)**, largely because:
  - A significant share are slow AC chargers
  - Rural and highway locations often face unreliable grid supply
  - Stations are unevenly distributed, with dense concentration within city limits and limited presence in highways/expressways
  - Additional issues such as theft, poor maintenance, and lack of enforcement worsen reliability

## 2. EV Demand and Usage Dynamics

- EV adoption has surged, with **~6x sales growth over the last 3-4 years**
- Penetration is expanding across multiple use cases and vehicle segments
- The **commercial segment** (fleet operators, logistics, last-mile mobility) is emerging as a strong demand driver
- However, despite rising sales, **charging utilization has lagged**, creating a mismatch between demand growth and infrastructure readiness

# Executive Summary (2/3)

## 3. Economics of Charging Infrastructure

- With **low utilization and frequent outages**, the **commercial viability** of charging operators remains weak
- Weak economics discourage further investments, **slowing infrastructure expansion**
- A **virtuous cycle** will only emerge when:
  - Higher EV adoption drives consistent utilization
  - Reliability and grid readiness improve
  - This creates commercial sense, unlocking infrastructure scale-up

## 4. The Scale of the Challenge

- India will need **~1.3 million public charging stations by 2030** to support its ambition of **30% EV penetration**.
- Currently, only **~15,000 chargers are operational**, highlighting a significant gap
- For sustainable scale-up, **EV adoption and charging infra expansion must move in tandem**
- Addressing **reliability, grid readiness, theft, and enforcement issues** will be critical to bridging the gap and enabling viable growth

# Executive Summary (3/3)

## 5. The Solution

- Current Trends
  - Strategic mandates at both central and state levels are **boosting EV adoption**, laying the foundation for large-scale transition
  - Charging Point Operators (CPOs) today offer a mix of **slow AC and fast DC chargers**, with competition intensifying in the **fast-charging space**
  - **Public Sector Units (PSUs)** currently dominate the sector with **>50% market share**, but several new-age companies are entering to capture growth opportunities
  - Technology standards are shifting towards **high-power fast chargers**, requiring specialized charging guns and stronger grid support
- What is Required
  - **Interoperability as the cornerstone**: Adoption of open protocols (OCPI, OCPP) to ensure standardized chargers across operators
  - **Reliability focus**: Robust maintenance, anti-theft measures, and grid upgrades to improve uptime
  - **Demand-supply alignment**: Infrastructure rollout to follow **EV adoption hotspots**, supported by usage data and real-time tracking
  - **Ecosystem partnerships**: Collaboration between **OEMs, DISCOMs, CPOs, and private players** to accelerate scale
  - **Policy push**: Viability Gap Funding (VGF) for tier-2/3 cities, EV-ready norms for new construction, and fiscal incentives for infra expansion
  - **Technology innovation**: Battery swapping (2W/3W), solar-charging, and V2G integration to diversify solutions and strengthen grid resilience

*India's EV infrastructure is still in its growth phase*

On the other hand, EV demand is surging

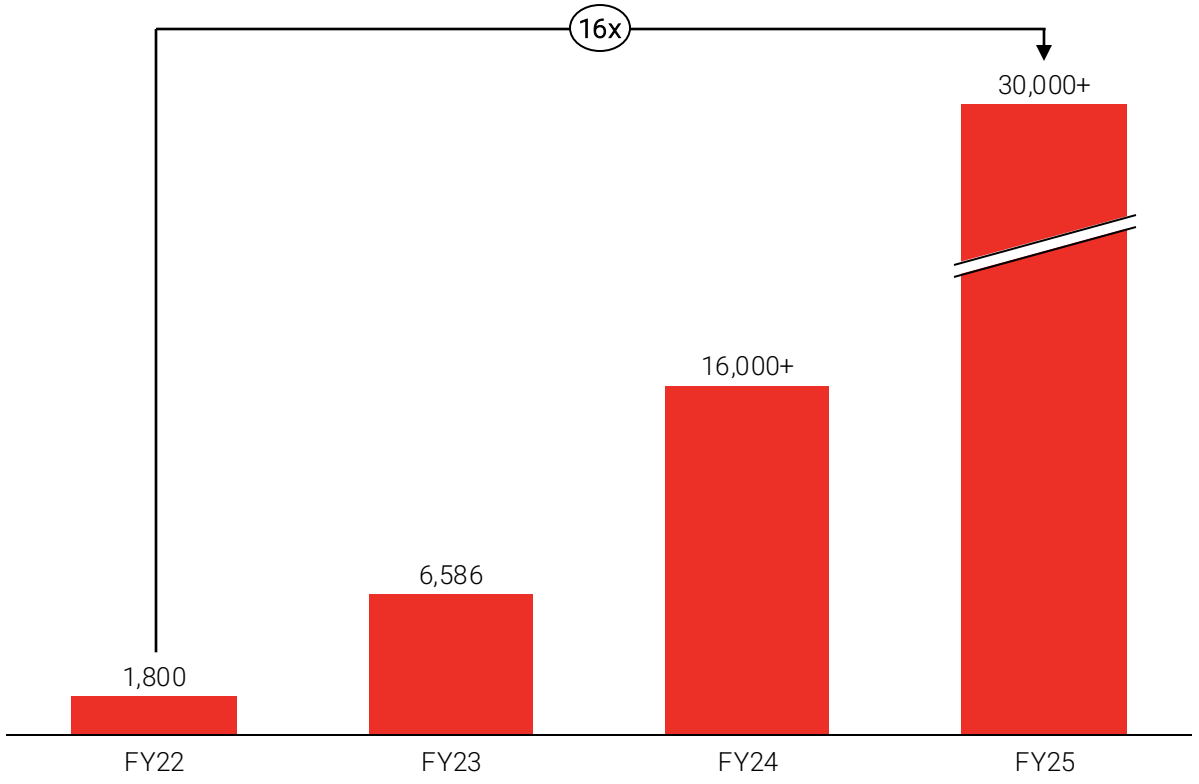
Policy measures and strategic mandates are boosting EV demand

Supply is catered by both traditional & new age CPOs

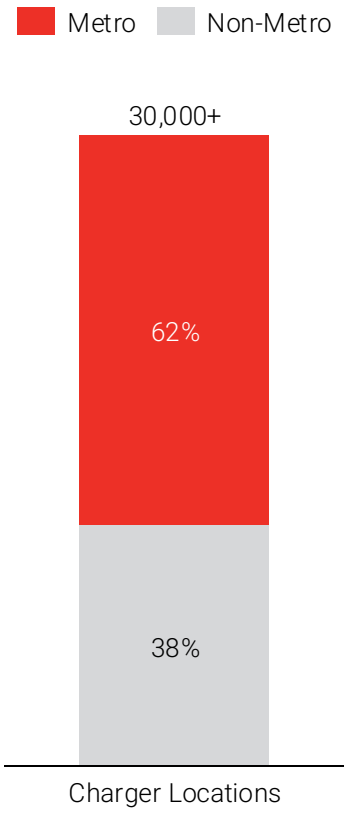
Enablers and constraints shaping future of infrastructure

# India currently has ~30,000 EV charging stations for public use located largely in metro cities

## EV charging infrastructure
FY22-25




## Charger locations – Metro vs Non-metro
%, FY25



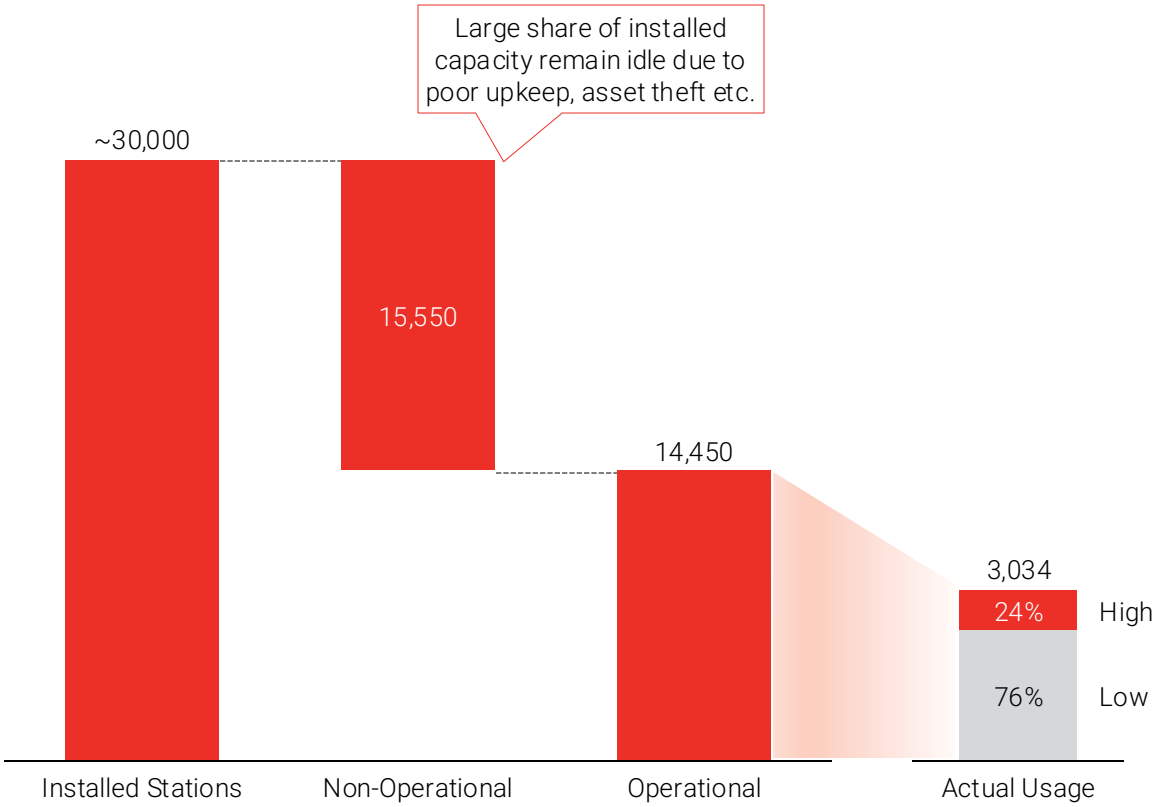

Note(s): (1) Metros include 8 cities i.e., Delhi-NCR, Mumbai, Chennai, Kolkata, Mumbai, Pune, Hyderabad & Ahmedabad (2) Non-metro cities include Tier 1 and Tier 2+ cities

Sources(s): Redseer Analysis, PIB, BEE, CII

# However, over half of India's public chargers are non-operational with limited on-ground usage

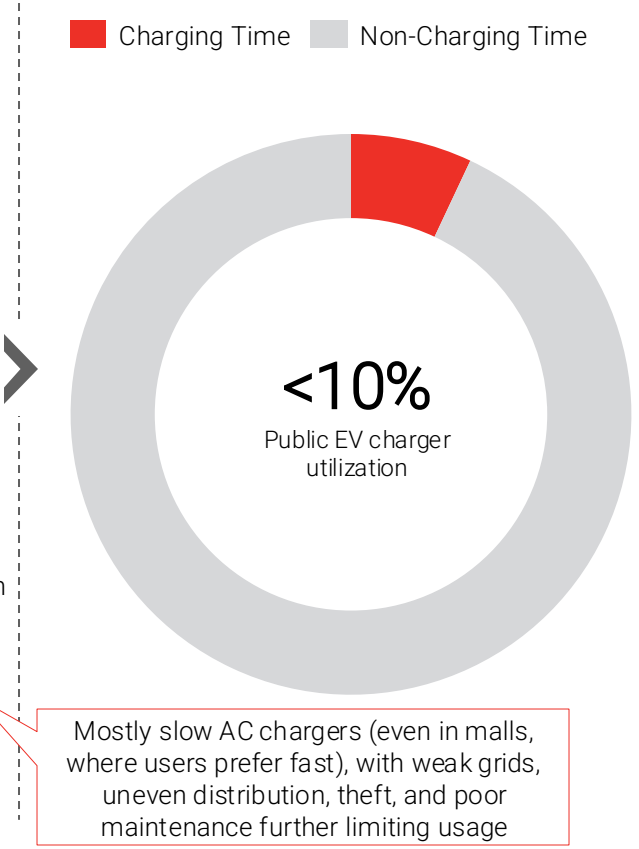
## Public EV charging stations: Installed vs. Operational vs. Utilized

#, FY25




## Public EV charger utilization

Estimated %, FY25



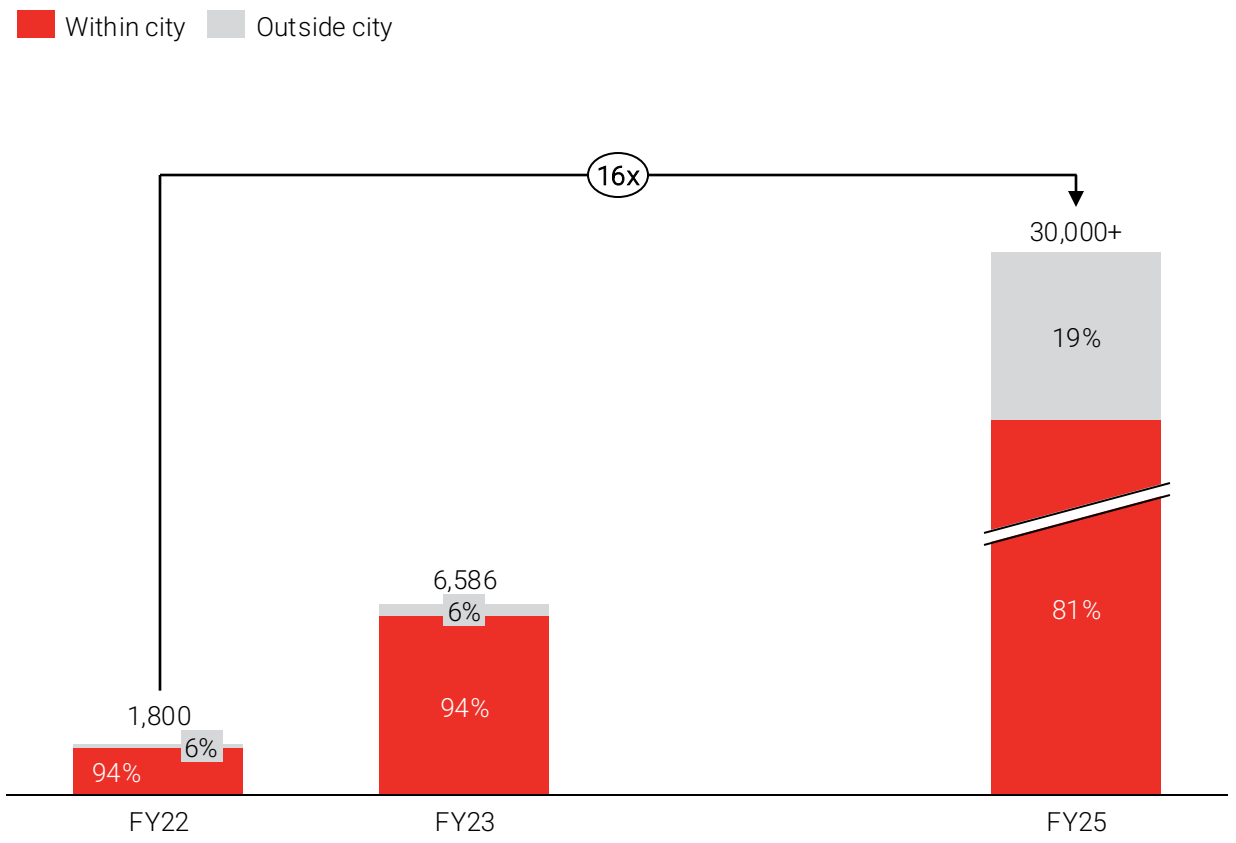

Note(s): (1) High-utilization chargers are those used frequently by multiple vehicles each day, reflecting strong demand and optimal siting, defined as >10% utilization. Low-utilization chargers, in contrast, experience only sporadic use, typically averaging 2-3% utilization and defined as ≤10% utilization. (2) Non-charging time includes idle time as well as time taken for repair and maintenance work etc

Sources(s): Redseer Analysis, PIB, IEEFA

# Moreover, chargers are densely concentrated within city limits, limiting long range usage of EVs

## EV charging infrastructure

#, FY22, FY23, FY25




## Remarks

- NHAI and MoP's 2024 EV Charging Guidelines mandates chargers installation every 20 km on highways, expressways and major roads to improve intercity connectivity and reduce range anxiety, but deployment is still at a pilot stage.
- As of Aug 2025, India EV's network includes ~30,000 public charging stations with most concentrated in urban hotspots and metro cities such as Bengaluru, Mumbai, Delhi

Note(s): (1) Outside city refers to EV charging stations located along national highways and expressways.

Sources(s): Redseer Analysis, PIB, Bee India

# Even globally, India significantly trails developed economies on public charging infrastructure

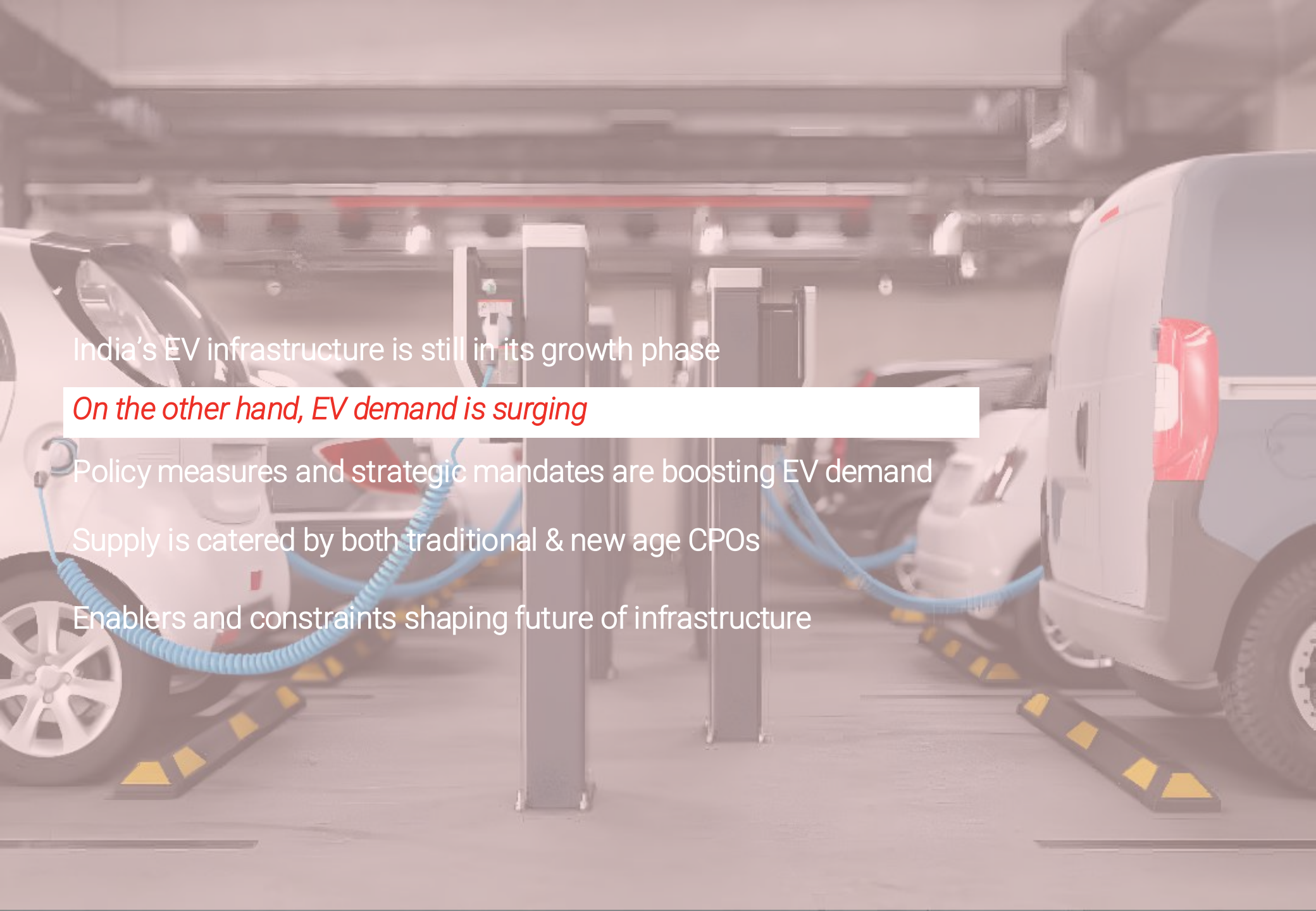
Charging infrastructure – India vs. others
FY25

| Parameters |  |  |  |  |
|---|---|---|---|---|
| Country | India | China | USA | Norway |
| EV Sales Penetration | 7.7% | ~54% | ~10% | **97.4%** |
| Public Chargers (per 1000 EVs) | ~5 | **~200** | ~55 | ~29 |
| Fast Charger Penetration (%) | Low | 45% | 30% | **~70%** |
| Charger Density (per 100 km road) | ~5 | ~100 | ~70 | **~180** |

Charging infrastructure in India is below global performance benchmarks and requires aggressive scale up to support EV adoption

Note(s): (1) Interoperability refers to charging stations that can be used by any EV, regardless of the manufacturer or the charging network it belongs to

Sources(s): Redseer Analysis, NITI Aayog, MoP



India’s EV infrastructure is still in its growth phase

*On the other hand, EV demand is surging*

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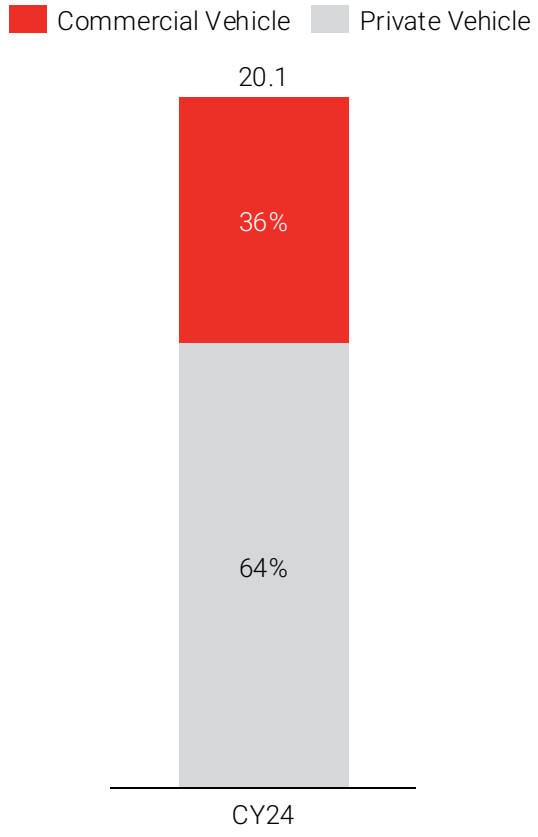
Enablers and constraints shaping future of infrastructure

# India touched ~2 Mn million EV sales in CY24, led by 2Ws & 3Ws

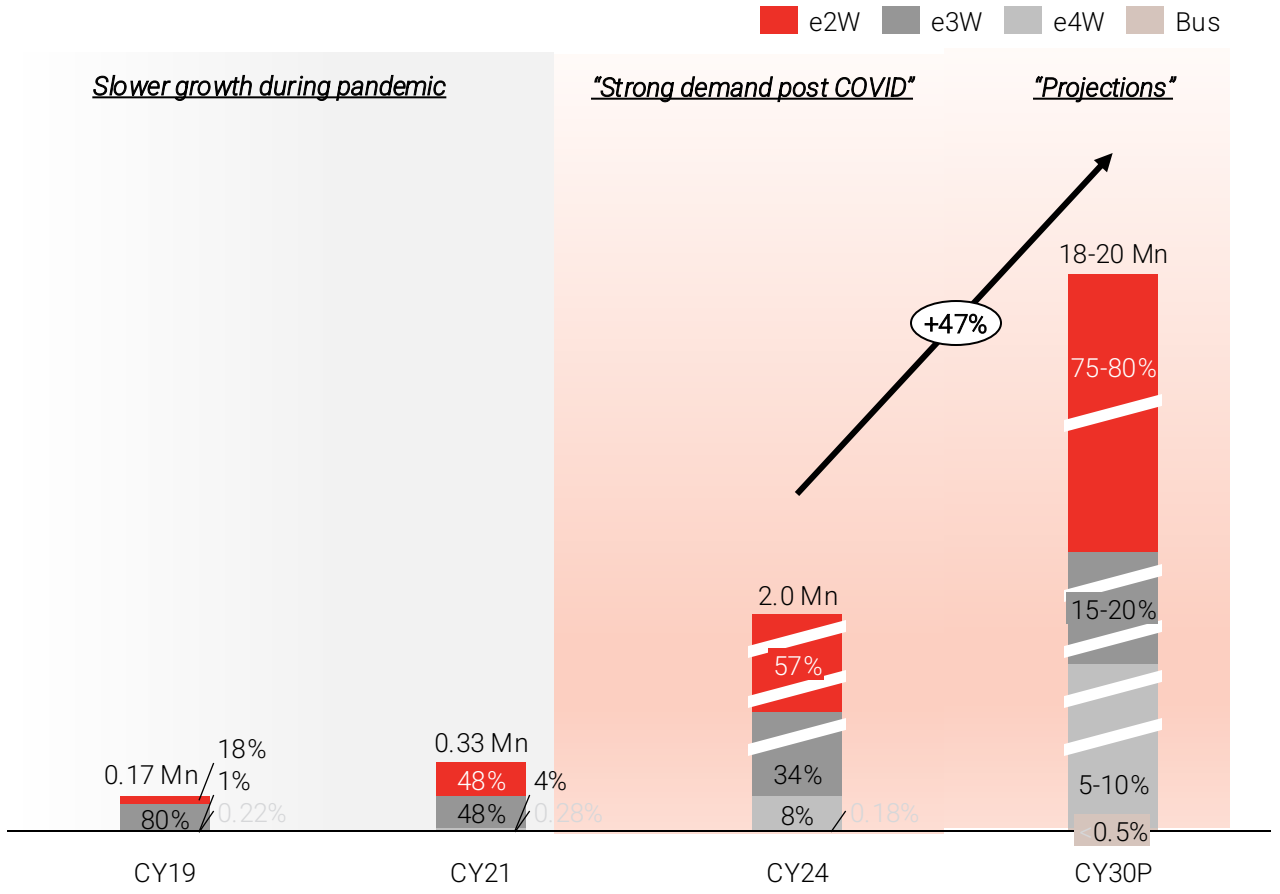
## Overall EV sales - split by passenger & commercial

In lakhs, CY24




## Overall EV sales split

In Mn units, CY19, 21, 24, 30P



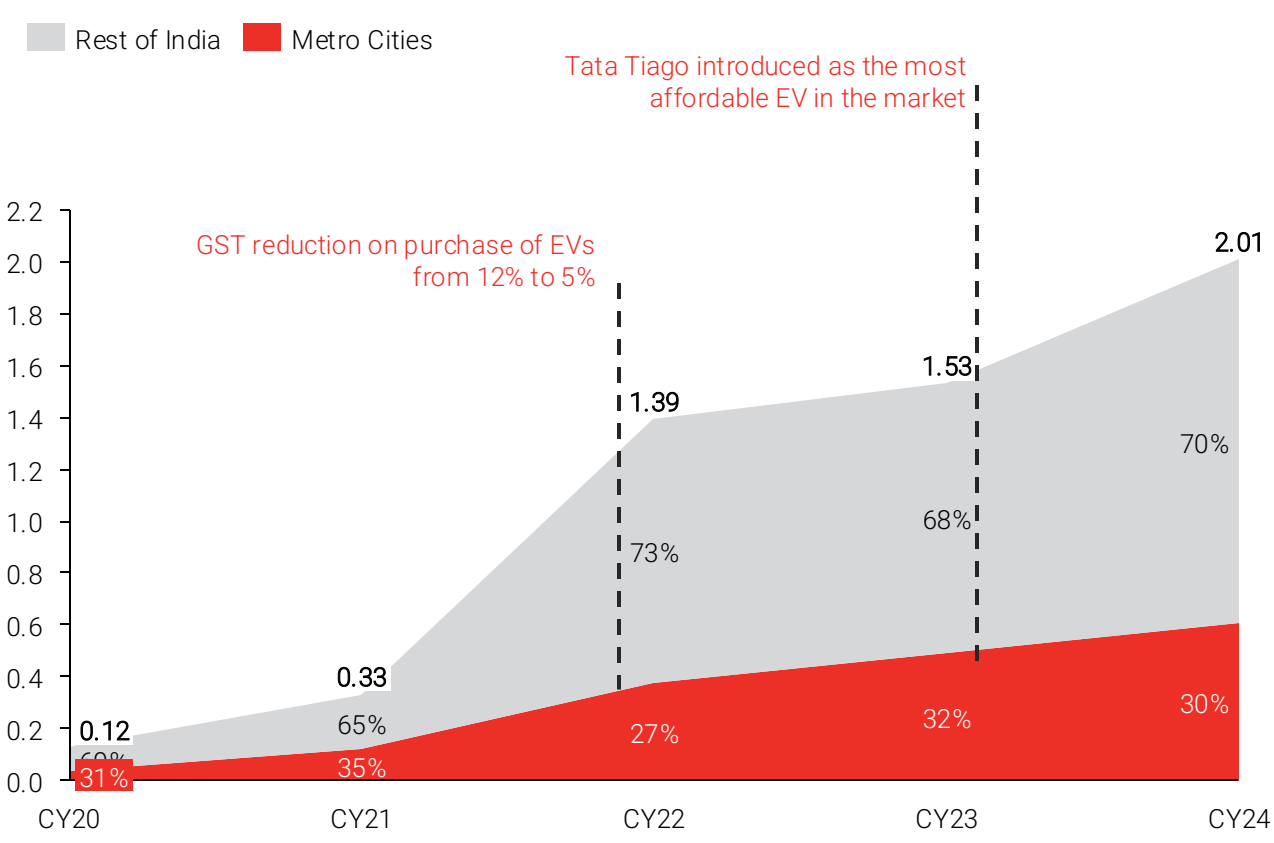

Note(s): (1 Telangana data and slow speed e2Ws (<25km/hr.) is not captured in VAHAN database, though both contribute to charging demand need.

Sources(s): Redseer Analysis, Vahan as of August'2025

# EV adoption has been on a consistent rise in non-metro cities

## EV Sales - split by City Tier

In Mn, CY20-24




## *Remarks*

More models in the mass segment and growth of charging infrastructure has driven adoption outside metro cities

In cities like Jaipur, ~25% of all car sales are EVs

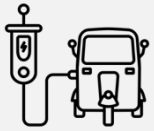
For entry level EVs such as the Tiago, ~49% of sales are from other than top 20 cities and states like Bihar, MP, UP & Andhra Pradesh

Note(s): (1) Metro cities includes 8 cities i.e., Delhi-NCR, Mumbai, Chennai, Kolkata, Mumbai, Pune, Hyderabad & Ahmedabad ; (2) Delhi-NCR includes Gurugram, Noida, Ghaziabad only (3) Telangana data is not updated in the chart

Sources(s): Redseer Analysis, Vahan as of August'2025

# These EVs are being deployed across multiple use cases for each vehicle segment

Commercial EV use cases and growth drivers by type

| EV Category | Use cases (non-exhaustive) | Growth drivers |
|---|---|---|
|  *Electric 2-wheeler (e2W)* | • Use case 1: Last-mile delivery for e-commerce and food delivery (Amazon, Flipkart, Swiggy, Zomato)<br>• Use case 2: Bike taxi services (Ola Bike, Uber Moto, Rapido) and shared mobility platforms (Yulu) | 1 Increasing demand for last-mile delivery<br>2 Lower operational costs compared to ICE vehicles<br>3 Battery-swapping options reduce downtime for high-usage fleets |
|  *Electric 3-wheeler (e3W)* | • Use case 1: Urban goods transportation (Bigbasket, Amazon)<br>• Use case 2: Large size last mile deliveries (Zomato, Swiggy, Amazon)<br>• Use case 3: Passenger transport in urban areas (auto rickshaws) | 1 High demand for local freight and retail transport<br>2 E-commerce partnerships for green supply chains<br>3 Promotion of old ICE replacement with e3W in pollution heavy zones |
|  *Electric 4-wheeler (e4W)* | • Use case 1: Car rentals and ride-sharing platforms<br>• Use case 2: Urban logistics and delivery services (Amazon, Flipkart)<br>• Use case 3: Corporate fleet vehicles for employee transport | 1 Increasing use of electric LCV in FMCG and delivery logistics<br>2 Corporates switching to e-fleets to meet sustainability goals<br>3 Development of charging infra and battery technology |

Sources(s): Redseer Analysis

# With businesses undergoing 'electrification' of fleets, the demand for EVs is strongest in the commercial segment

Policy Mandates Accelerating EV Adoption in India

| Sector | Company | Stated EV Goal | Key Initiatives |
|---|---|---|---|
| E-commerce | Flipkart | **100% EV** fleet by 2030 | Collaborates with Hero Electric, Mahindra Electric, and Piaggio for EV deployments, **member of EV100**, Achieved **10,000 EVs** milestone |
| | amazon | **100,000 EV** fleet globally by 2030 | Met **10,000 EVs India** target ahead of 2025; part of The Climate Pledge to reach net zero by **2040** |
| Food and Grocery delivery | eternal | **100% fleet** transition to EV | **EV100 member**; Partnered with various EV bike rentals for EV deliveries via battery swapping, and fleet-as-a-service, focused on last-mile operations |
| Logistics and Last mile | FedEx | **Carbon-neutral** operations globally by 2040 | Committed **$2B** to fully electrify its delivery fleet by **2040**, while also investing in alternative fuels, carbon capture, and EV pilots with **BrightDrop (GM)** |
| | Ecom Express | **10,000 EVs** in fleet | Collaborating with OEMs to deploy both **2W** and **3W** EVs |
| Ride Hailing | Uber | Electrify every ride by **2040** | Uber Green was launched in 3 metro cities, plans to deploy **25,000 e-4Ws** and **10,000 e-2Ws**. Key partners include Lithium Urban, Zypp, Everest Fleet etc. |

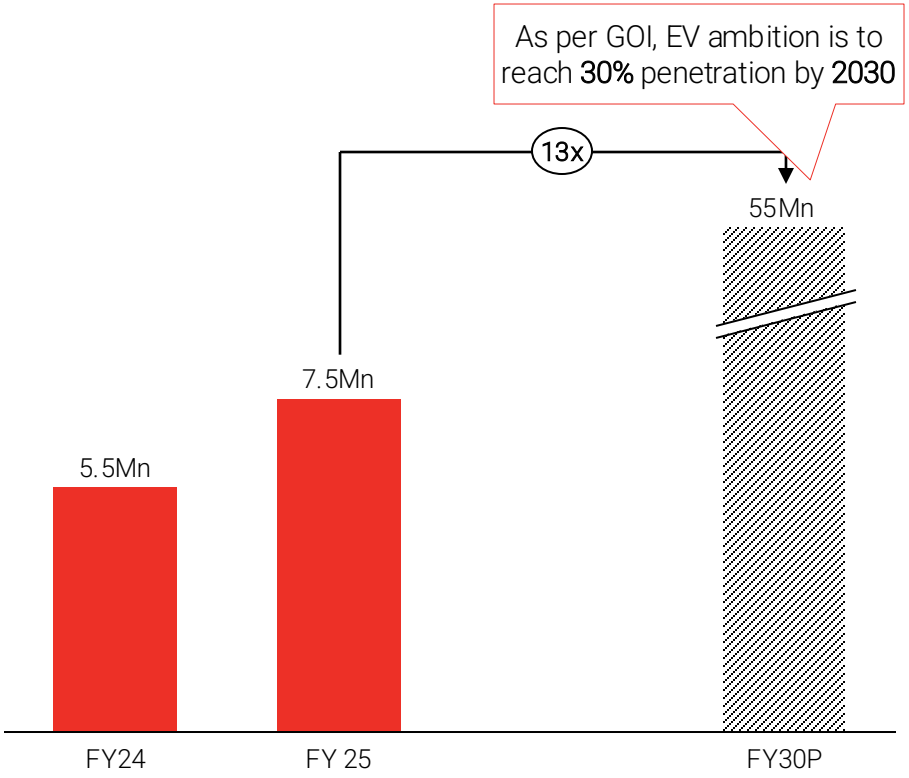
Note(s): (1) EV100 is a global initiative by The Climate Group where member companies commit to transitioning their vehicle fleets to 100% electric by 2030.

Sources(s): Redseer Analysis, Desk Research

# Consequently, India's EV ambition hinges on a 44x Public Charger Scale-Up

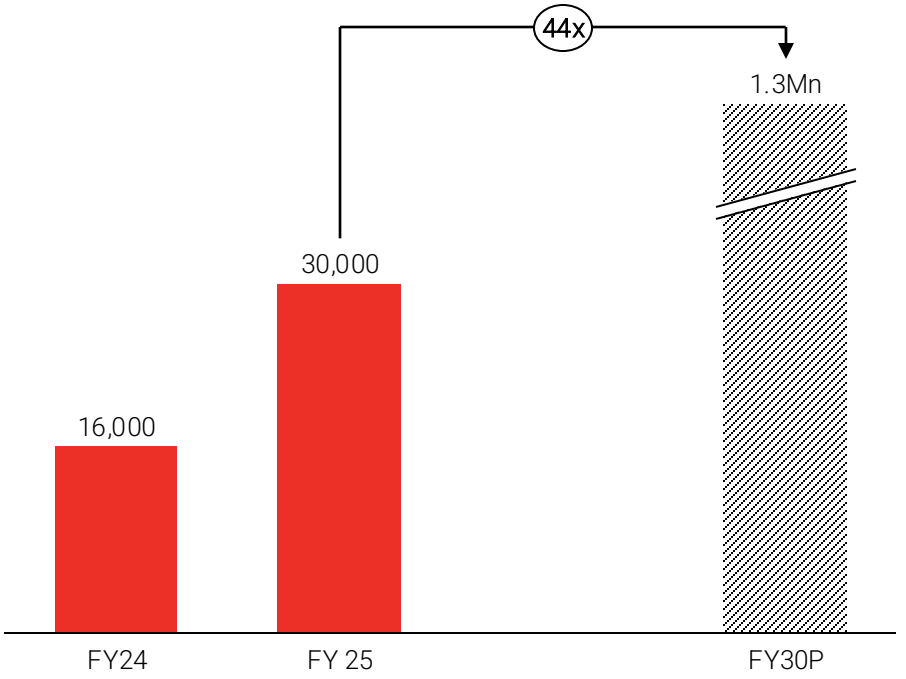
## Demand Projection: Cumulative EV Fleet Growth to 2030P

# in million, FY24, FY25, FY30P



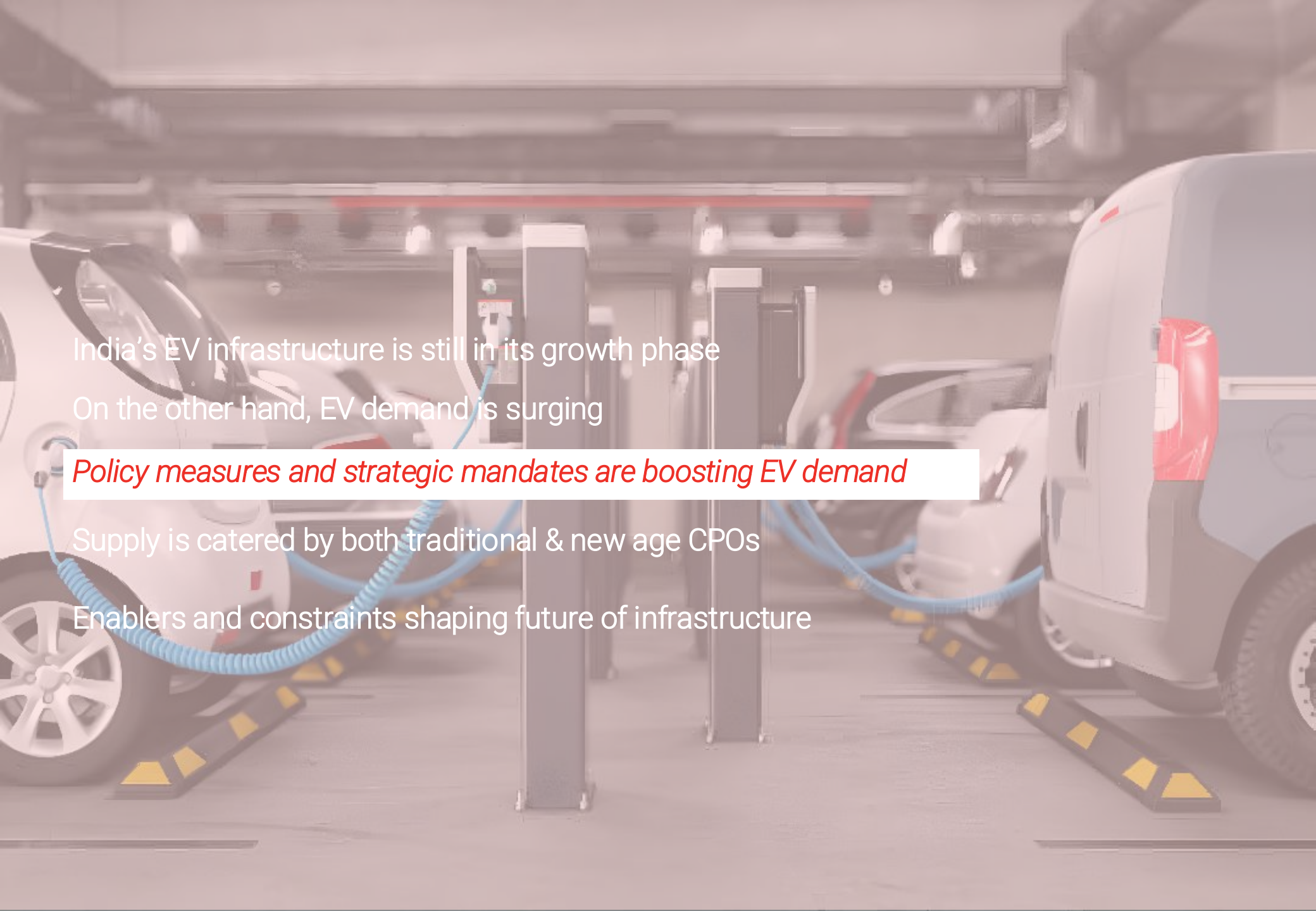

## India's Public Charging Infrastructure Growth Path (2025–2030)

# in thousand, FY24, FY25, FY30P




- India needs to install **1.32 million** public EV charging Infra by 2030
- By 2030, ensuring a minimum of **45-50** chargers per **1,000 EVs**, aligned with global accessibility benchmarks
- To stay on track, India must **double** its charger count every **14-15 months**

Sources(s): Redseer Analysis, NEMMP 2020, NITI Aayog



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*Policy measures and strategic mandates are boosting EV demand*

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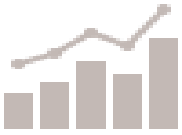
Enablers and constraints shaping future of infrastructure

# Strategic mandates are bringing about a structural shift boosting EV adoption (1/2)

| | | |
|---|---|---|
|  | MoHUA + State EV Policies | • Malls, offices, and hospitals must provide EV chargers as per state/local bye-laws to ensure semi-public access |
|  | NITI EV Infra Implementation Handbook | • Urban Local Bodies (ULBs) and states to integrate EV infrastructure into planning, tenders, and local policies |
|  | MoP Charging Guidelines (Freight Corridors) | • For freight corridors, EV charging should be available every 100 km to support long-range heavy EVs like trucks and buses |
|  | NITI Implementation Roadmap | • Recommends phased charger rollout and annual percentage-based installation targets for strategic planning |

Note(s):(1) MoHUA: Ministry of Housing and Urban Affairs

Sources(s): Redseer Analysis, Desk research

# Moreover, strategic mandates are bringing about a structural shift boosting EV adoption (2/2)


**Mandatory EV-Ready Parking in Buildings**

- 2019 Model Building Bye-Laws require ~20% of parking spaces in new residential, commercial, and mixed-use buildings to support EV charging

**EV Charging at Highway Wayside Amenities (WSA)**

- MoRTH mandates EV charging stations at all WSAs every 40–60 km along national highways; targeting 700+ WSAs sites by FY 2028-29, integrating chargers with rest-areas and essential services

**Mass E-Bus Procurement via PM-eBus SEWA**

- Launch of PM e-Bus scheme with ₹3,435 crore allocated to deploy over 38,000 electric buses across India under Phase II

**E-DRIVE Scheme for Charging Infrastructure Scale-up**

- ₹2,000 crore earmarked under **PM E-DRIVE** scheme for nationwide installation of public EV charging stations, plus FAME-II subsidies supporting 7,400+ OMC-installed chargers

Note(s):(1) MoRTH: Ministry of Road Transport and Highways; WSA: Wayside Amenities, which are modern rest-stop facilities along highways.

Sources(s): Redseer Analysis, Desk research

# Policy push across standards, consumer access, and rollout is expected to drive interoperability in India

## Policy Drivers for Interoperability in India

*Guidelines*

### Interoperability

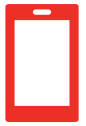


- Interoperability ensures any EV can charge at any public station, regardless of manufacturer or operator
- Enabled through common hardware & open protocols (OCPP/OCPI/UEI), enabling seamless discover–charge–pay access across network

### Standardization of Hardware & Protocols

- The Bureau of Indian Standards (BIS) IS-17017 series defines plug and communication standards (AC/DC connectors, CCS2, CHAdeMO, IS-15118) to ensure hardware-level compatibility.
- MoP's 2024 EV Charging Guidelines mandates adoption of open protocols (OCPP/OCPI/UEI) across all public chargers, making new capacity interoperable by design

### Unified Consumer Access



- Bureau of Energy Efficiency (BEE) National Online Database to integrate all public chargers (to show availability, type, tariff)
- MoP requires common digital payments (UPI, cards, Bharat BillPay) across networks, ensuring seamless consumer experience
- The e-AMRIT portal by NITI Aayog promotes awareness, integration, and access to EV infrastructure.

### Infrastructure Rollout Alignment

- National Highways Authority of India (NHAI) mandates charger installation every ~20 km on highways, increasing demand for interoperable coverage
- Govt. incentives under FAME-II and PM E-DRIVE link subsidies to compliance with open standards (OCPP/OCPI), ensuring interoperability at scale.

Note(s):(1)OCPP – One Charge Point Protocol and OCPI – Open Charge Point Interface, UEI – Unified Energy Interface

Sources(s): Redseer Analysis, BIS, MoP, NHAI

# Overall, India has seen large scale EV policy measures at the centre

## Policy & Regulatory Landscape Supporting EV Growth

Policy incentives available | Lapsed policy

| April 1, 2019 | September 15, 2021 | April 1, 2024 | October 1, 2024 |
|---|---|---|---|
| **FAME II** | **PLI scheme for Automobile and Auto Components** | **Phased Manufacturing Programme** | **PM E-DRIVE** |
| • **Capital outlay**: ₹11,500 cr. | • **Capital outlay:** ₹25,938 cr. | • Financial allocations are **not specified** | • **Capital outlay**: ₹10,900 cr |
| • **Objective:** Boost electric mobility by driving EV demand | • **Objective**: Boost local manufacturing & shift to advanced tech | • **Objective**: Localize EV parts, reduce imports | • **Objective**: Scale adoption, strengthen green mobility |
| • **Target Segments**: Supported 7,000 buses, 5 lakh 2Ws, 55,000 4Ws, 10 lakh e-3Ws; incentives for personal and commercial use | • **Target Segments:** Battery EVs, hydrogen fuel cells, 2W/3W/4W, drones, and components | • **Target Segments**: Focus on batteries, electronics, and job creation under Atmanirbhar Bharat | • **Target Segments**: Targets 24.7L 2Ws, 2.05L 3Ws, 1.10L e-rickshaws, 1,400+ buses; ₹7,171 Cr for infra + tech |

Sources(s): Redseer Analysis, PIB

# And state levels that are bolstering EV demand

| | Karnataka | Maharashtra | Tamil Nadu | Delhi | Gujarat |
|---|---|---|---|---|---|
| Launch Year | 2017 | 2018 (Updated in 2025) | 2019 (Updated in 2023) | 2020 (Extended till 2026) | 2021 |
| Supply Side Incentives | **Capital Subsidy:** 25% on fixed capital investment, capped at 10 cr. Interest Subsidy: 6% on loans for MSMEs, up to 10 lakhs annually for 5 years **Stamp Duty Exemption:** 100% in Zones 1 & 2, 75% in Zone 3, and 50% in Zone 4 | **Manufacturing Support:** Incentives for manufacturing and R&D in EV components, vehicle assembly, battery assembly, cell manufacturing, and recycling **Skill Development:** Training programs for EV workforce development | **Tax Benefits:** 100% SGST reimbursement for 15 years and 15%-20% capital subsidies for EV/battery manufacturing Electricity & Land 5-year electricity tax exemption and discounted land rates in designated districts | - | **Gujarat Industrial Policy 2020** and related government resolutions apply to EV sector manufacturing setups and upgrades **EV start-ups are supported** with research, incubation, and training via GERMI |
| Demand Side Incentives | **Exemptions:** Full road tax and registration fee waivers for all EVs in Karnataka. | **Subsidies** 25,000/kWh, up to ₹ 20 lakh for e-buses & ₹2 lakh for four-wheelers and transport EVs **Waivers**: 100% road tax, registration fee and renewal fee exemptions | **Exemptions:** 100% waiver on road tax, registration. and permit fees till Dec 25 Subsidies Incentives up to ₹10,000/kWh for e-buses, e-3Ws, and light goods carriers | **Subsidies:** ₹30,000 for e-autos, e rickshaws, and goods carriers. Road tax & registration fee waivers for all EVs during policy period | **Subsidies:** ₹10,000/kWh for 2Ws, 3Ws, and 4Ws, limited to 40% of ex-factory price |
| Charging Infrastructure | **Capital Subsidy.** 25% subsidy (up to 10 lakh) for EV charging stations **PPP:** Promoting infrastructure development through public-private partnerships | **Incentives:** Up to ₹5 lakh for 50–250 kW and ₹10 lakh for >250 kW chargers, prioritising underserved areas; chargers every 25 km on highways and 3 km in cities. | **Subsidies:** 25% capital subsidy for charging stations; 2 lakh for battery-swapping stations | **Subsidies**: Mandate for charging points **every 3 km in urban areas;** plan for **fast chargers every 5 km** in high-density corridors and ₹6,000 for charging points in spaces residential/commercial | **Subsidies:** 25% capital subsidy (up to 10 lakh) **Exemptions & Tariff:** 100% electricity duty waiver & subsidized charging rates under GERC guidelines |

Sources(s): Redseer Analysis, Desk Research

# Even private OEMs are developing proprietary EV charger ecosystem

OEMs proprietary EV ecosystems

Electric 2 Wheelers

## Ola Electric

- **200+** Hyper chargers across India (free for S1 users), ~50 km in 15 mins.
- Plans to scale to **100,000+** points across **400+** cities.
- Manufacturing via Future Factory; **Gigafactor**y in pipeline.
- Hyper chargers integrated with **Ola app** for real-time availability, route planning, and remote diagnostics.

## TVS Motors

- Access to **Tata Power (since 2021)** and **Jio-BP (since 2022)** networks.
- TVS ecosystem support through dedicated **iQube** infrastructure
- **iQube 3.1 kWh** variant (IDC 123 km) launched **July 2025.**
- **iQube** app includes charger locator and connected vehicle insights for seamless EV experience.

Electric 4 Wheelers

## MG Motors

- Battery-as-a-Service at **₹3.5/km**, lowering upfront costs
- One-year free charging for **Windsor EV** early buyers via **eHub**.
- Charging network supported by **JSW partnership**.
- Offers **eShield** program with extended warranty, RSA, and resale value to enhance ownership experience.

## Hyundai

- Targeting **600** public fast chargers by 2031; ~**50** installed.
- Chargers **(60–180 kW)** at dealerships/highways
- Partners: **Charge Zone & Statiq**; accessible via **myHyundai**
- Expanding public charging via **Shell** & **IOCL** fuel stations under strategic partnership rollout.

Sources(s): Redseer Analysis, Desk Research

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# Overall, charging infrastructure is presently being built with both public & private participation

Charging Models – EV Charging Infrastructure and Solutions

Charge Point Operators

## Captive Fleet Charging

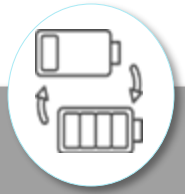
Provides charging solutions for own fleet of ride-hailing services such as public transport e-buses, taxis and freight vehicles

## EV Charging-as-a-service

Provides integrated EV charging solutions for residential and workplace environment

## Green Public EV Charging

Eco-friendly charging points for public use of electric vehicles, includes kerb side charging facilities



## Battery Swapping for Light EV Charging

Allowing users to quickly exchange depleted batteries for fully charged ones

## DRE based Mini/Microgrid powering EVs

Uses sources like solar and biogas or even hybrid source of energy to charge EVs primarily in rural areas

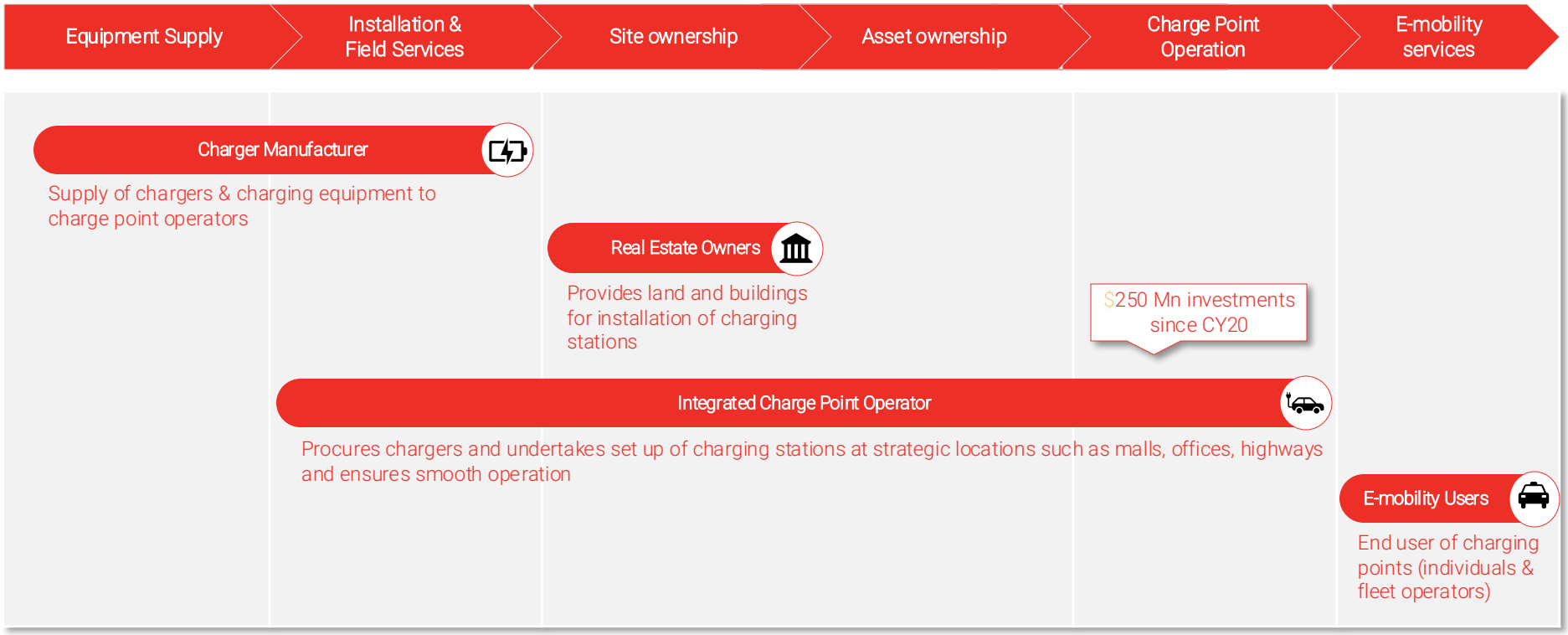
Private + Public Charging Models

Note(s): (1) DRE - Decentralized Renewable Energy

Sources(s): Redseer Analysis, Desk Research

# Charge Point Operators (CPOs) offer the most comprehensive solutions for end users

## EV Charging Landscape – Value Chain




Note(s): (1) Equipment supply relates to manufacturing of chargers and charging equipment (2) Installation & field services enable set up of charging stations at multiple locations for public use (3) Asset ownership refers to ownership of chargers and charging equipment (4) Charge point operation relates to maintenance an upkeep of installed charging stations (5) E-mobility services include ride hailing services, employee transportation, fleet management etc. (6) In India, there are limited business models of site ownership for integrated CPOs

Sources(s): Redseer Analysis, Desk Research

# Most CPOs provide both slow and fast charging solutions, with competition intensifying across fast charging

## Charging types – key players

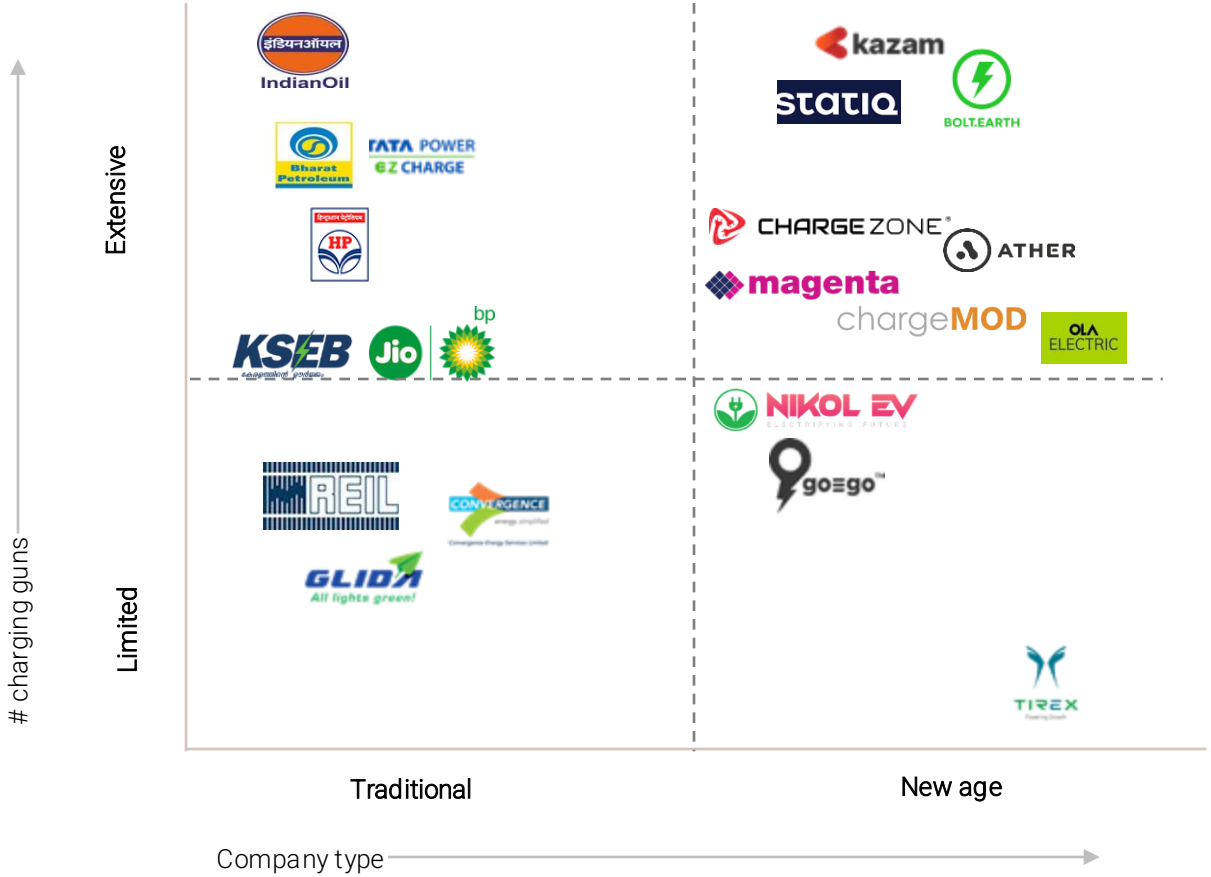
| | |
|---|---|
| **Fast Charging (DC)** | |
| **> 60 KW** | • Chargers >60KWH are usually placed at highways, high-end hotels and malls<br>• Cost of such chargers are typically 8-10x more than slow chargers |
| **30-60 KW** | • Usually installed at malls or in the basements of residential societies |
| **<30 KW** | • Largely used in hubs and residential societies |
| **Slow Charging (AC)** | • Support upto 22 KW/h charging for four wheelers<br>• Installed mostly at hubs, societies, basement of malls, hotels, hospitals, etc. |

Note(s): (1) For fast charger installations, CPOs need to work with discoms to install additional transformers owing to a higher load requirement and hence costs are higher

Sources(s): Redseer Analysis, Desk Research

# Both traditional and new age companies are addressing the need for CPOs in the value chain

CPOs - # charging guns




## Remarks

- Across both new age and traditional play, companies largely adopt a **multi model approach** which means adoption of either the **PPP model** or the **Managed model**
- While players like **Jio, BP, Tata EZ Charge, Statiq** have opted for the multi model approach, **ChargeZon**e has largely built a business using the **Managed model**
- We have selected 5 key players to explore the EV charging spectrum through business models and their respective revenue generation practices

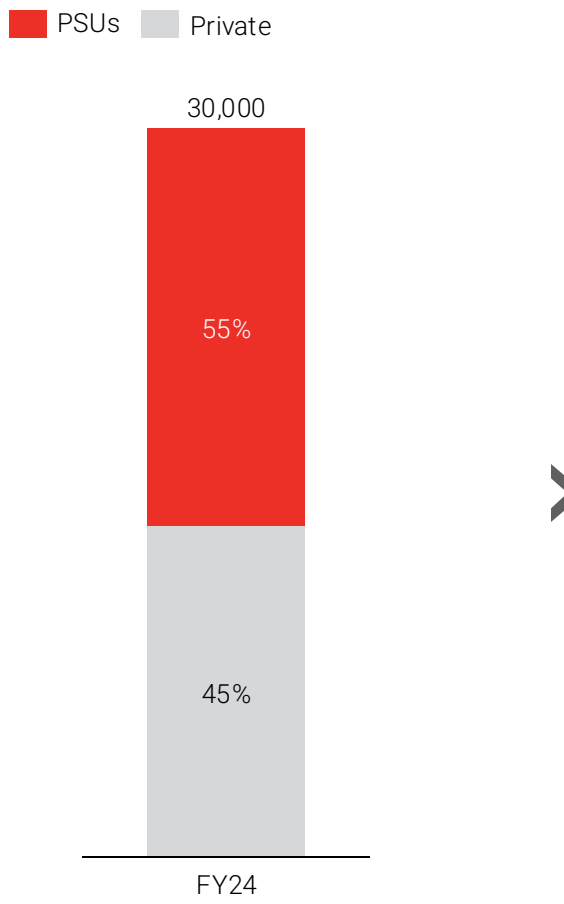
Note(s): (1) Traditional companies refers to businesses backed by large conglomerates either in India or overseas (2) New age refers to modern companies with technological capabilities in EV charging (3) PPP is Public Private Partnership (4) Limited charging guns refers to <500 guns while extensive refers to >5000 charging guns

Sources(s): Redseer Analysis, Desk Research, Company Website

# PSUs dominate India's public charging landscape, operating >50% of stations

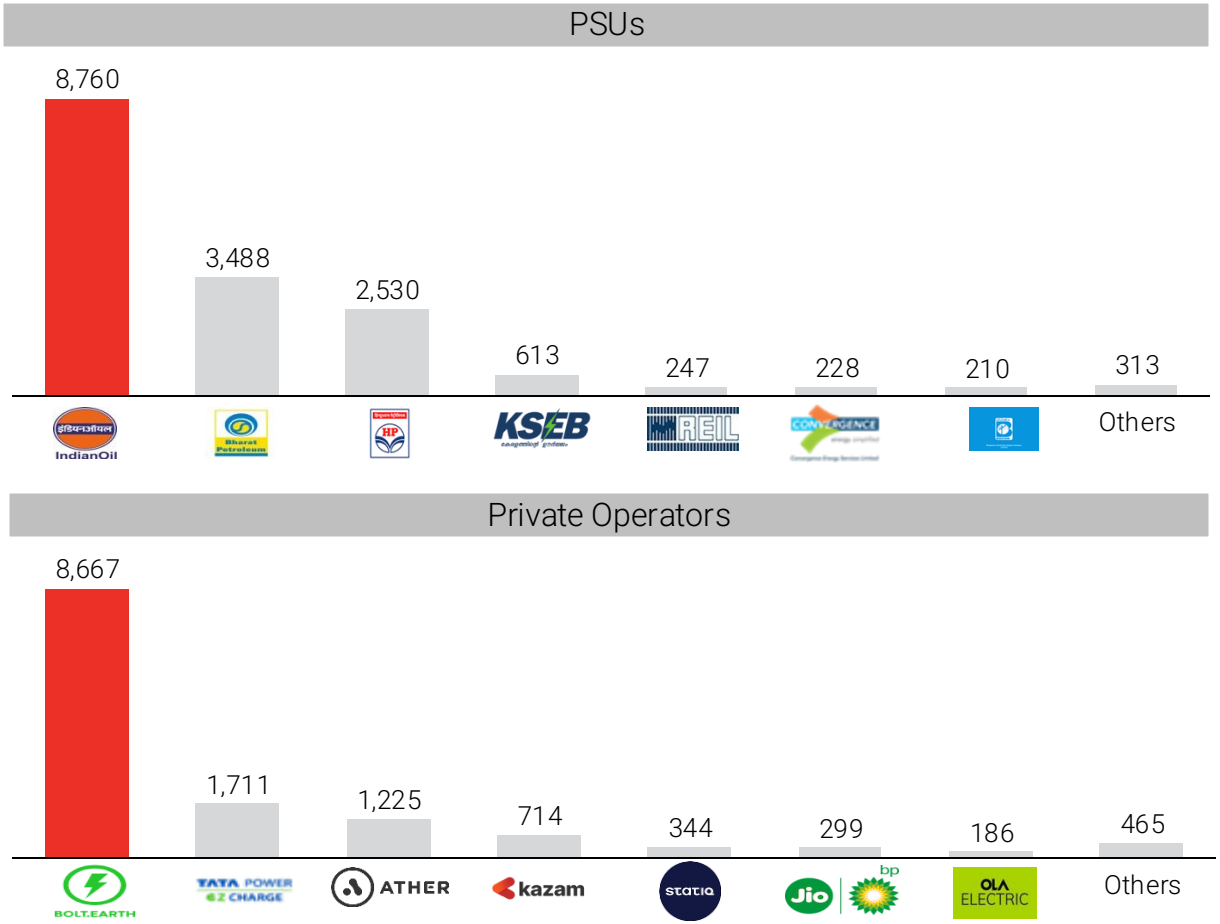
## EV charging station

#, FY25



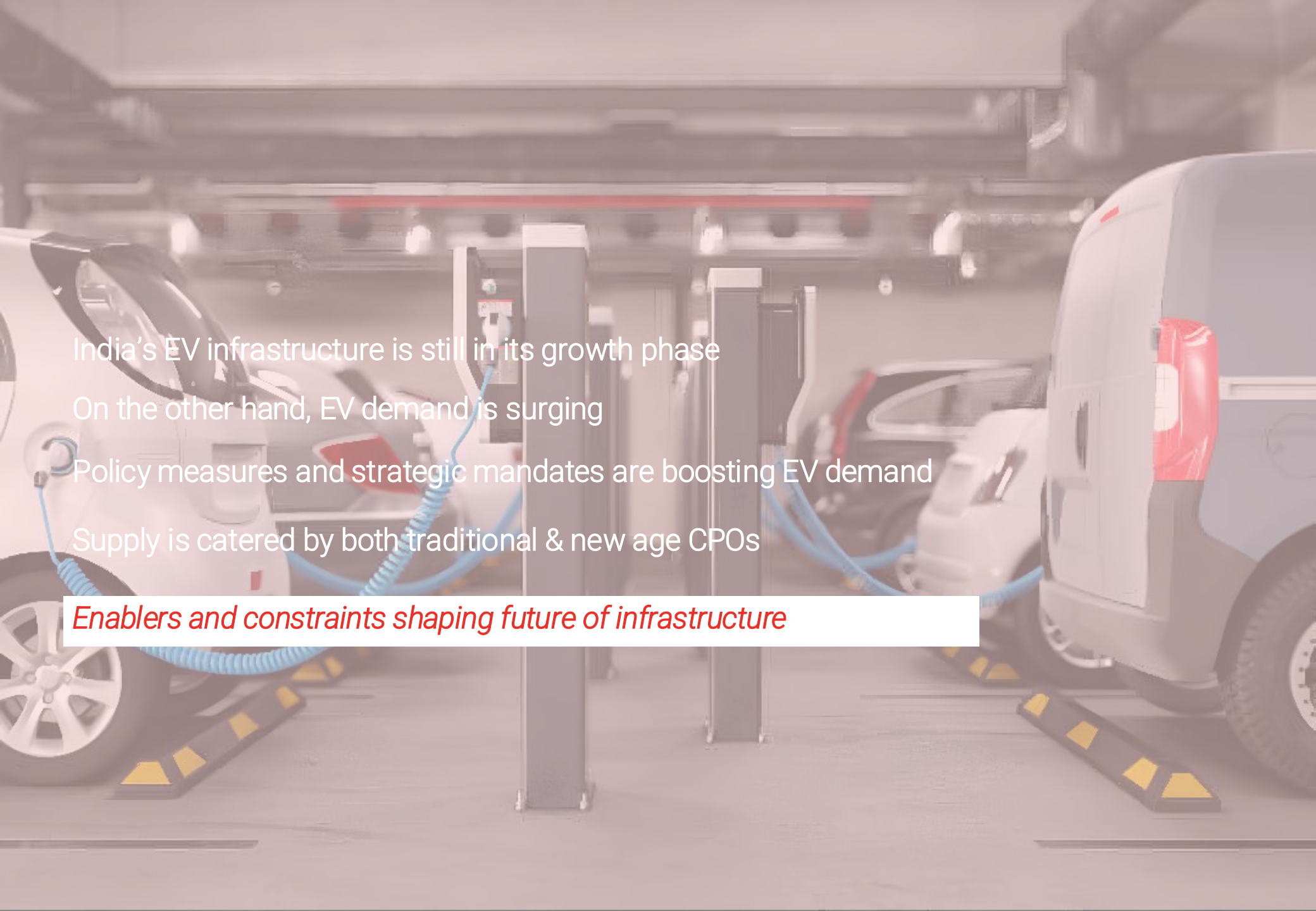

## Charging Station operators

(Non- Exhaustive)




Note(s): (1) PSUs are government-owned entities (2) Private operators include startups and private firms managing EV charging stations

Sources(s): Redseer Analysis, Desk Research, Company Website



India’s EV infrastructure is still in its growth phase

On the other hand, EV demand is surging

Policy measures and strategic mandates are boosting EV demand

Supply is catered by both traditional & new age CPOs

*Enablers and constraints shaping future of infrastructure*

# Technology standards are evolving more towards fast chargers requiring special guns

## Types of chargers

| Parameters | Level 1 | Level 2 | Level 3 | |
|---|---|---|---|---|
| | | | AC | DC |
| Voltage | 120-240 | 240-400 | 200-1000 | |
| Power (kW) | <=3.5 kW | <=22 kW | 4.3 to 22 kW | Up to 400 kW |
| Time required | 8-10 hours (depends on battery size) | 6-8 hours (depends on battery size) | Less than an hour | |
| Preferred for vehicle type | 2W, 3W, 4W | 2W, 3W, 4W | 4W | |
| Additional hardware requirement | No | Yes | Yes | |
| Convenience of charging | Convenient charging by plugging in cord to a three-pin wall socket | Requires installation of an AC wall-box charger, some OEMs offer home/ workplace installation | Hardware is expensive, making installations a significant investment | |
| Location | Home/ Workplace | Home/ Workplace installation, Public charging stations | Public charging stations only | |
| Type of Compatible charger | Type 1, Bharat AC-001, Bharat DC-001 | Type 1, Type 2, GB/T, Bharat AC-001 | Type 2 | Type 2, CHAdeMO, CCS1, CCS2 |
| Illustrative images |  Type 1 |  Type 2 |  CHAdeMO  CCS1  CCS2 | |

Sources(s): Redseer Analysis, Desk Research

# For charging infrastructure to scale, there are some systemic challenges that must be addressed

Key Barriers to EV Charging Infrastructure Expansion

1. **Land Access:**
   Dense urban land constraints limit new charger sites. Procurement tends to fail repeatedly in states

2. **Grid Delays:**
   Grid upgrade and connection delays of 90-120 days for high-power chargers challenge fast deployment; DISCOM capacity misalignment

3. **RWA Pushback:**
   >80 % of gated-community RWAs deny private charging access citing safety, wiring cost and billing complexity

4. **Repair and Maintenance Gaps:**
   Many public charging stations suffer from poor maintenance, causing frequent breakdowns, low uptime, and underutilization

Note(s): (1) DISCOM – Distribution Company; RWA – Resident Welfare Association. (2) Barriers listed reflect key on-ground challenges to scaling public and private EV charging in Indian cities.

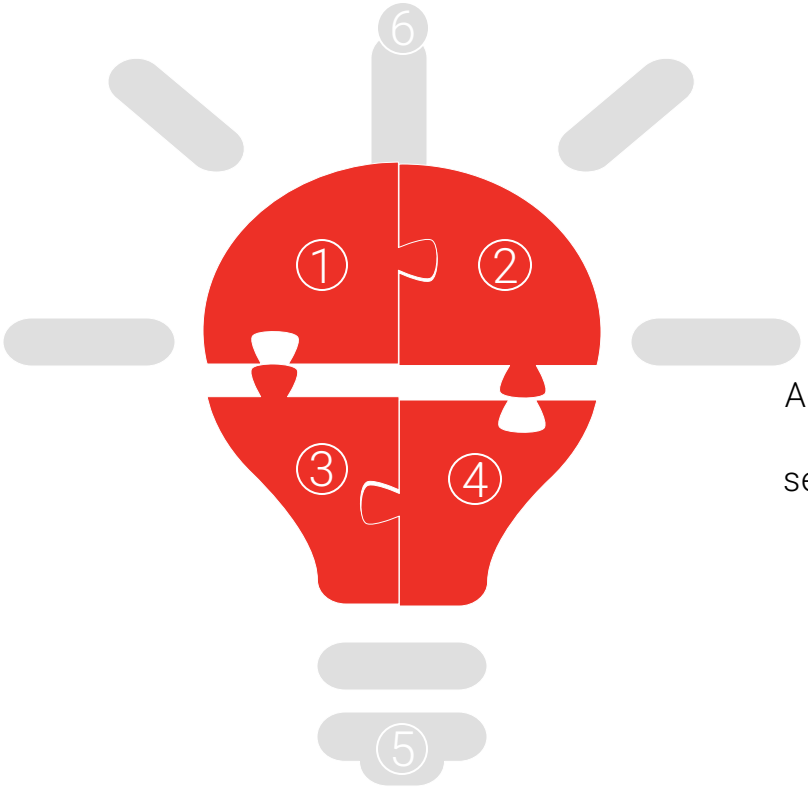
Sources(s): Redseer Analysis, Desk Research

# As solutions are developed, we expect 6 key enablers to lead EV infrastructure expansion

Potential solutions for EV charging expansion

**1. Infrastructure Expansion**
Ramp up public + highway fast charging; bridge metro vs. non-metro disparity

**2. Private Sector-Led Ecosystems**
Leverage OEM-CPO partnerships (e.g., Tata Power, Jio-BP) to scale faster




**3. Fiscal & Policy Support**
Expand policies, introduce Viability Gap Funding (VGF) for Tier-2/3 cities, and mandate EV-ready norms in new residential and commercial buildings

**4. User-Centric Interoperability**
Adopt open protocols (OCPI, OCPP) to standardize chargers; enable seamless roaming, unified payment & uptime info

**5. Tech Innovation**
Encourage deployment of battery swapping (2W/3W), solar-charging, and V2G integration. Invest in R&D for faster chargers and resilient grid solutions

**6. Smart Planning & Data**
Use EV usage data to plan optimal site locations; integrate real-time tracking

Note(s): (1) OCPI stands for Open Charge Point Interface; OCPP stands for Open Charge Point Protocol; VGF stands for Viability Gap Funding; V2G refers to Vehicle-to-Grid.
(2)These six pillars form a comprehensive framework of policy, technology, and business model levers required to enable a scalable, EV charging ecosystem in India.

Sources(s): Redseer Analysis, Desk Research

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# Thank You!

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