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3rd Edition

2022 India Electric Vehicle Charging Infrastructure & Battery Swapping Market Overview Report

2021-2030

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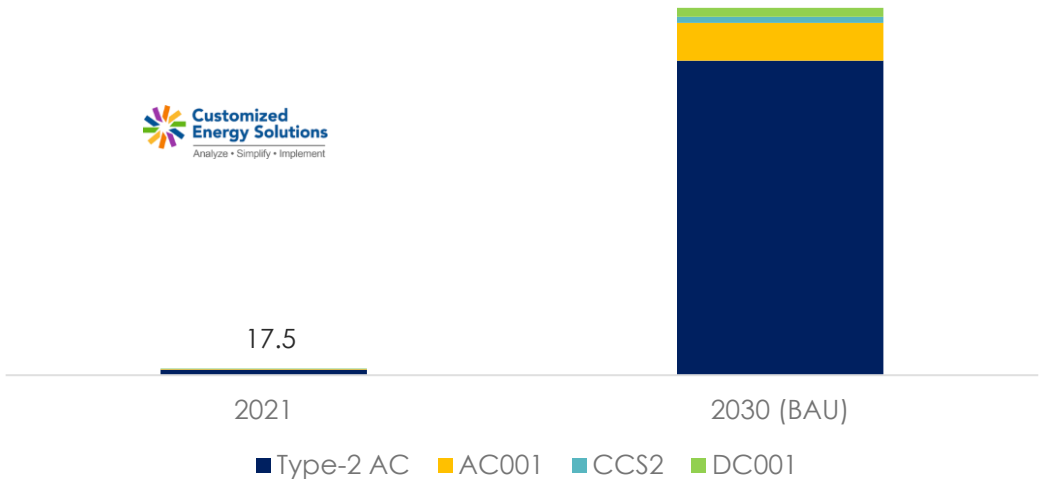
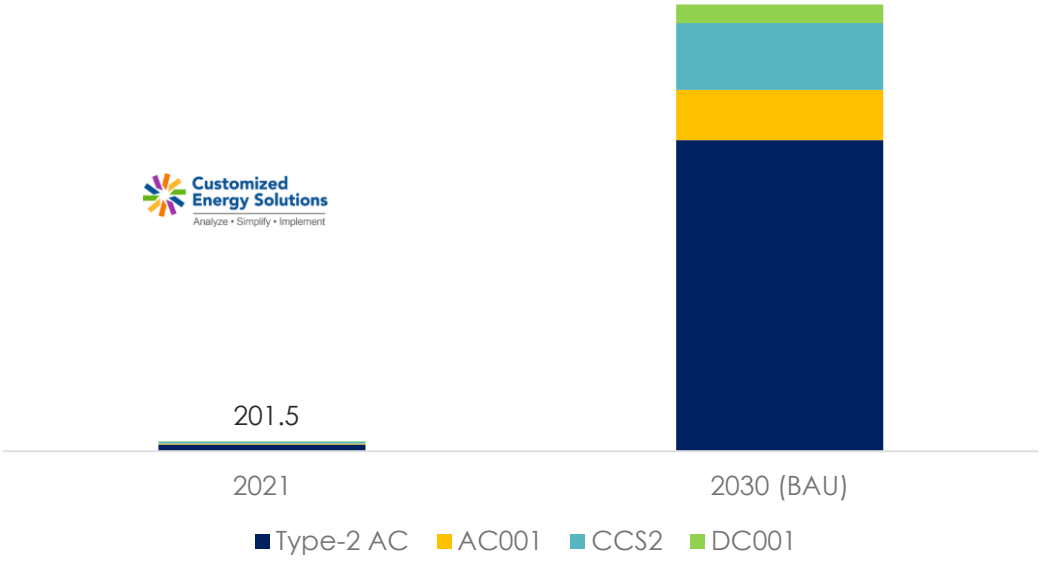
EV CHARGING MARKET OVERVIEW 2021 & 2030

India EV Charging Market 2021 & 2030 (Thousand Units)



India EV Charging Market 2021 & 2030 (MW)



- The EV charger market represents public, captive and private (e-4W) charge points installed in the country in 2021. Type-2 AC held a dominant share in 2021 in terms of unit & capacity which is expected to hold its dominance in 2030 owing to sales of type-2 AC charger with each sales of a personal e-4W
- AC001 charger held second largest share in terms of units in 2021 which is expected to retain its position in 2030 owing to its lower cost as well as compatibility with 2-wheeler, 3-wheeler, and low-end e-4-wheeler
- CCS chargers hold second largest share in terms of capacity in 2021 as well as in 2030 owing to rise in deployment in public stations to support electric cars and e-buses by state transportation utilities. DC001 charger sales growth is expected on account of its capability to provide fast charge for 2-wheeler and 3-wheeler

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* Includes public, captive & private (E-4 Wheeler) charge points
Excludes <3.3kW chargers such as those sold with 2W, 3W.

Source: CES Analysis

EV CHARGING MARKET DRIVERS

Market Drivers	Description	Driver Impact		
		2022-2024	2025-2027	2028-2030
Rise in sales of EVs	• Rising fuel prices & attractive total cost of ownership of electric vehicles are gaining buyer's confidence resulting in a switch towards EVs • Rise in awareness regarding tail pipe emissions is also making end users look for cleaner alternatives for transportation. • EV sales in 2021 were recorded at 0.47 million units which is expected to reach 16 million units (annual) in business as usual scenario for 2030			
Presence of supportive policies & regulations	• The Indian government has set a target to achieve 30% EV sales penetration by 2030. The Department of Heavy Industries (DHI) has announced FAME subsidies for INR 10,000 Crores to support EV adoption. Government has laid special emphasis to charging infrastructure in FAME II by allotting Rs 1,000 Crores & sanctioned 2,877 EV charging stations across India. • State governments such as Maharashtra, Gujarat and Delhi are currently providing incentives for setting up of charging infrastructure to boost adoption of EVs			
Collaboration among EV OEMs & charge point operators	• Availability of public charge points for EVs is a deciding factor for EV buyers before making a purchase. EV original equipment manufacturers (OEMs) are collaborating with charge point operators for providing existing and upcoming buyers assurance with respect to public charge points • Vehicle OEMs such as Hero Electric, BYD India and Ather Energy have tied up with charge point operators (CPO) such as Charge Zone, Magenta ChargeGrid • With increase expected in user base of CPOs will boost to set up of new charging stations in forecast period			

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Source: Secondary, CES Analysis

EV CHARGING MARKET CHALLENGES

Market Challenges	Description	Challenge Impact		
		2022-2024	2025-2027	2028-2030
Limited number of charging stations	• EV sales witnessed a rise of 168% in 2021 as compared to 2020. However, number of PCS set up by PSUs saw an increase only by 39% during the same period • Currently, majority of the charging stations are located in tier-1 cities resulting in lack of adoption in tier-2 & tier-3 cities. Active efforts need to be taken to reduce this gap between EVs on road and charge point availability to increase EV adoption			
Requirement of power grid upgradation	• Electrification of transport will lead to rise in demand in energy and hence grid capacity • By 2030, as per business-as-usual scenario adoption rate of EVs, deployment of around 28 GW charger capacity is required from 2022 to 2030. Current annual installed capacity in 2021 stands at 201.5 MW. The challenge lies in containing the tariff rates within affordable limits amidst such grid investments for power generation and supply			
Need of interoperability of charging stations	• As the EV industry matures, and more vehicles are on road across the country, a robust e-Roaming model will be the need of the hour. • EV drivers may find it challenging to charge their vehicles on different charging networks with the same account, until the networks are interoperable. • The CPOs will be required to join hands and remove this barrier to provide seamless charging experience to the drivers			
Low returns owing to lower utilization of PCS	• Majority of EV owners in India rely on home or captive chargers over public charging stations (PCS). PCS to light duty EV ratio in the country is around 1: 32. Further, current utilization rate of PCS in India is in the range of 10-15% • Measures such as advertising at stations, refreshment outlets, and other steps need to be taken to make business case of PCS more economically viable			

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Low Medium Moderately High High

Source: Secondary, CES Analysis

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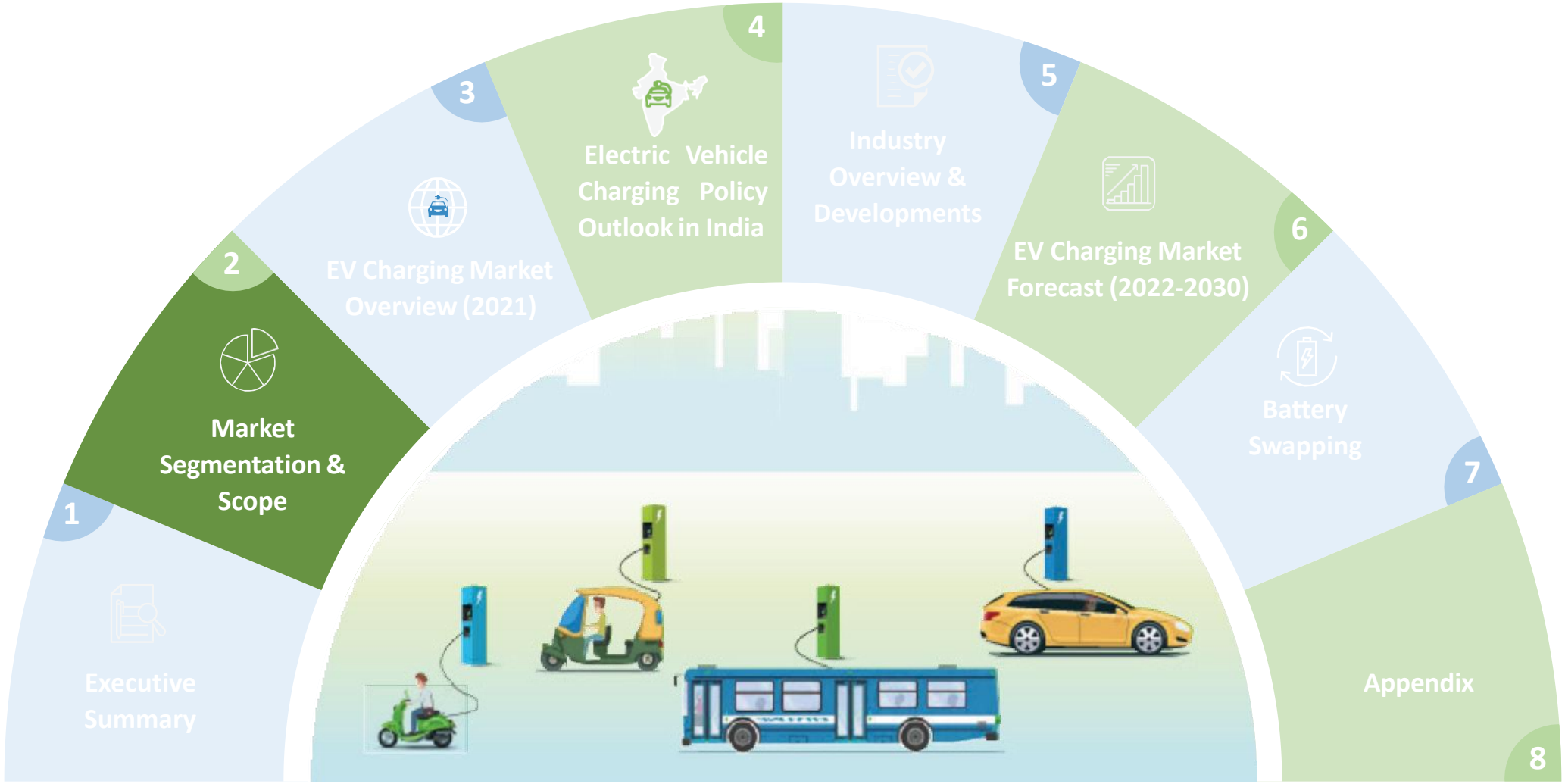

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ELECTRIC VEHICLE CHARGING INFRASTRUCTURE MARKET SEGMENTS

The four major **modes of charging electric vehicles** are as below.

A) EV Private Charging

- EV battery charging at home or apartments is termed as private charging.
- This report covers base year market estimation of private charging infrastructure.

B) EV Public Charging

- Public charging refers to EV chargers open to public for use For instance, by charge point operators.
- This segment is dealt in detail in this report covering present status, trends, and forecasts.

C) EV Captive Charging

- Chargers installed at government offices, corporate houses, captive chargers operated by commercial fleets like cars and e-buses.
- This segment is dealt in detail in this report covering present status, trends, and forecasts.

D) Battery Swapping

- Replacing discharged electric battery with a charged battery.
- Trends and installations of swapping stations are covered in the report, however, forecast and further analysis will be dealt in the next edition of this report, when the market matures.

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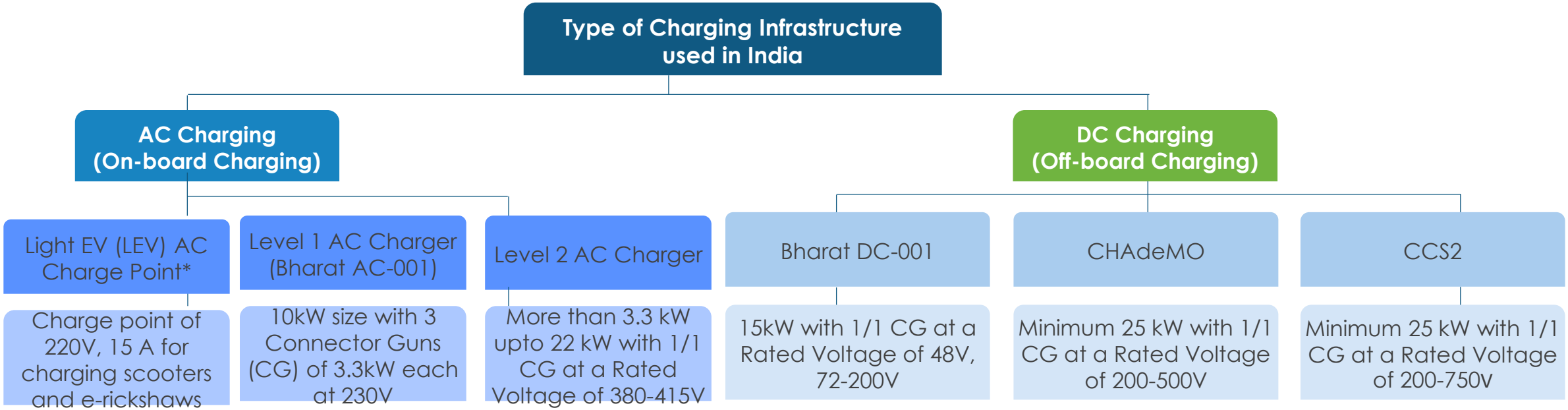
* Excludes LEV AC chargers & <3.3kW chargers such as those sold with 2W, 3W

Source: Secondary, CES Analysis

SCOPE OF THE REPORT

Electric vehicle charging stations can have one or a combination of the below indicated chargers, supported by a transformer and a substation as required by the station.



Charging kiosk for e-2W and e-3W can have chargers not mentioned in the chart as well, subject to compliance of technical and safety standards.

All public charging infrastructure to have tie-ups with at least one Charging Network Service provider and be marked on their information system for EV owners to locate and access. However, this is not applicable to captive chargers.

All public charging stations will be enlisted in an online database managed by CEA.

In case of a long distance /heavy duty EVs (trucks and buses), chargers of minimum size 50 kW of types CHAdeMO and CCS2 specification are to be installed.

* LEV AC charger is not considered under the scope of the study for market estimates & forecasts

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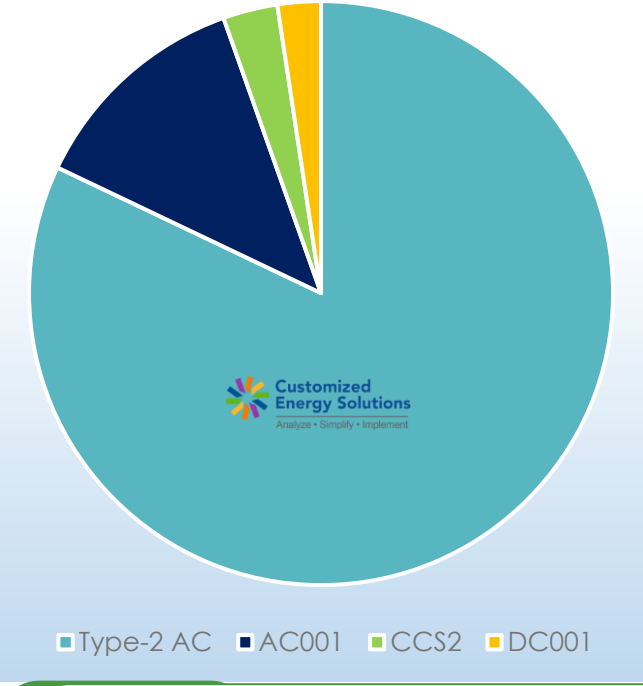
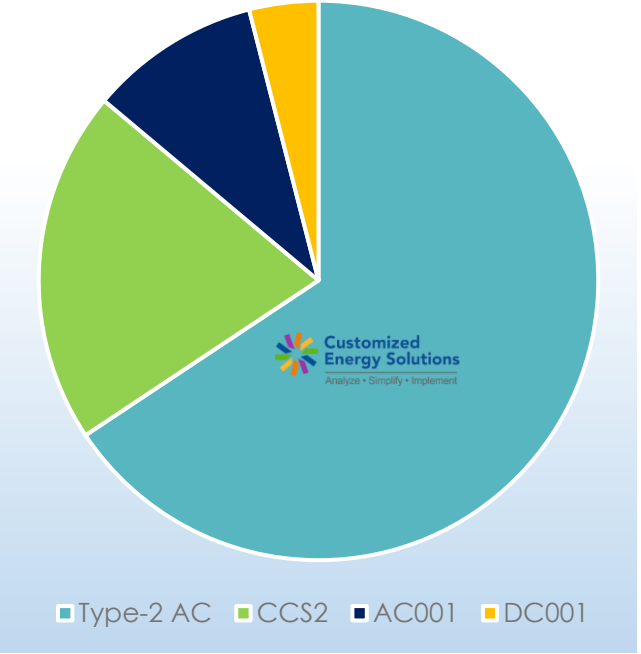
EV CHARGER MARKET OVERVIEW - 2021

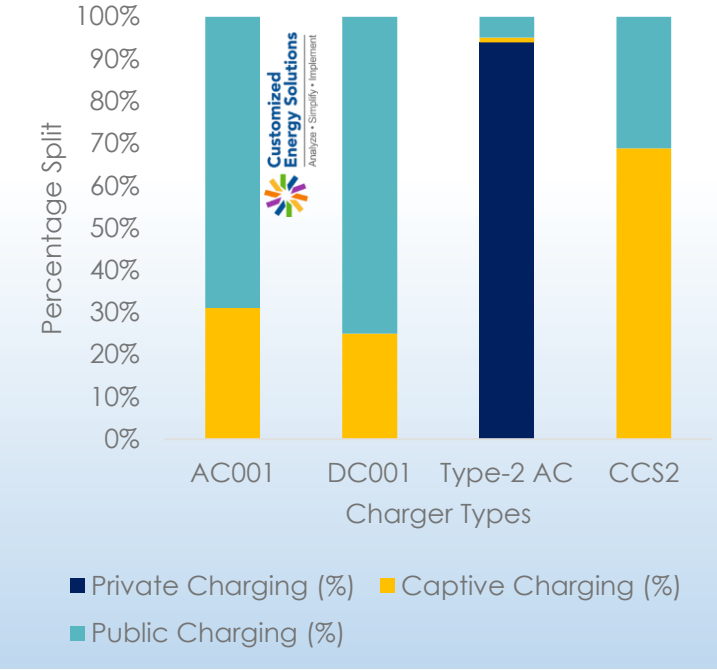
Installed EV Charger Units, 2021



Installed EV Charger Capacity MW, 2021*



Charger Segmentation by Mode of Charging, 2021



- During 2021, the total EV chargers supplied was 17,520 units, totaling to 201.5 MW in India. This includes chargers supplied by EV OEMs to be sold along with EVs, procurement by public sector undertaking (PSU) for public or semi-public installations, by commercial fleet operators and bus operators and charging service providers.
- Type-2 AC was majorly used by EV OEMs for supplying with passenger e-4W and by PSUs & CPOs for public charging installations.
- CCS chargers were majorly deployed for captive charging for e-buses and for public charging stations by PSUs and CPOs for providing fast charging for e-4Ws
- EV charger market in India has been driven by rise in sales of e-2W, e-3W, e-4W and e-buses along with need of robust charging infrastructure

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* Excludes <3.3kW chargers, such as those sold with 2W, 3W.

Source: CES Analysis

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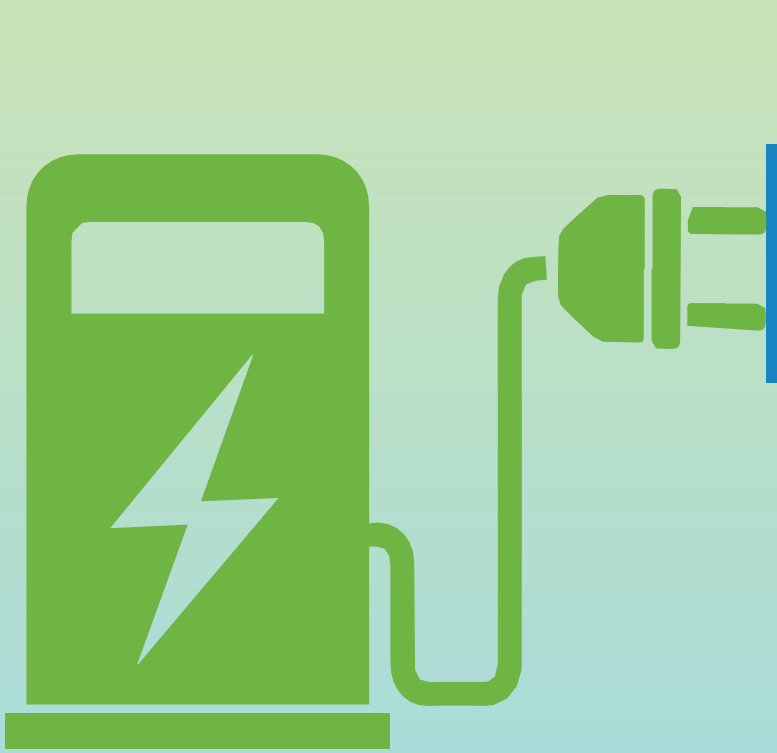

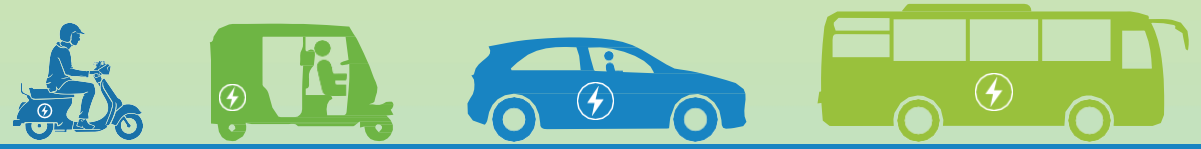

CENTRAL GOVERNMENT DEVELOPMENTS ON EV CHARGING

FAME INDIA SCHEME OVERVIEW – Department of Heavy Industries (DHI)

FAME India Scheme

- FAME India scheme was launched in 2015 to promote and incentivize the production of electric and hybrid vehicles in the country.
- Phase I of the scheme ended in March 2019, whereas Phase II was planned from April 2019 to March 2022, however, the Department of Heavy Industries (DHI) in June 2021, extended the scheme for a period of another two years till FY 2023-24.

FAME I

- Initially launched for a period of two years with an approved outlay of INR 795 Cr. Further the scheme got extended till March 2019, with a total budget outlay of INR 895 Cr.
- Incentive Support of ~ INR 359 Cr. to 2.8 lakh hybrid and EVs and ~ INR 280 Cr. to 425 hybrid and e-buses. **Approx. INR 43 Cr. for ~ 500 Charging stations/ infrastructure.**

FAME II

- FAME II was launched in April 2019 with a total budget outlay of INR 10,000 Crore. The **key objective** of the scheme was **electrification of public transport** along with the **establishment of network of charging stations**.
- Funds disbursement over five years are as follows – INR 818 Cr. (till 2021), INR 1,893 Cr. (2021-22), INR 3,775 Cr. (2022-23) and INR 3,514 Cr. (2023-24).
- Demand incentives are applicable based on battery capacity (i.e., energy content in kWh) of the vehicle. The scheme is mainly applicable to vehicle used for public transport or those registered for commercial purposes in 3W, 4W and bus segments. However, privately-owned registered 2Ws are also covered under the scheme as a mass segment.

Source: Secondary Data, CES Analysis

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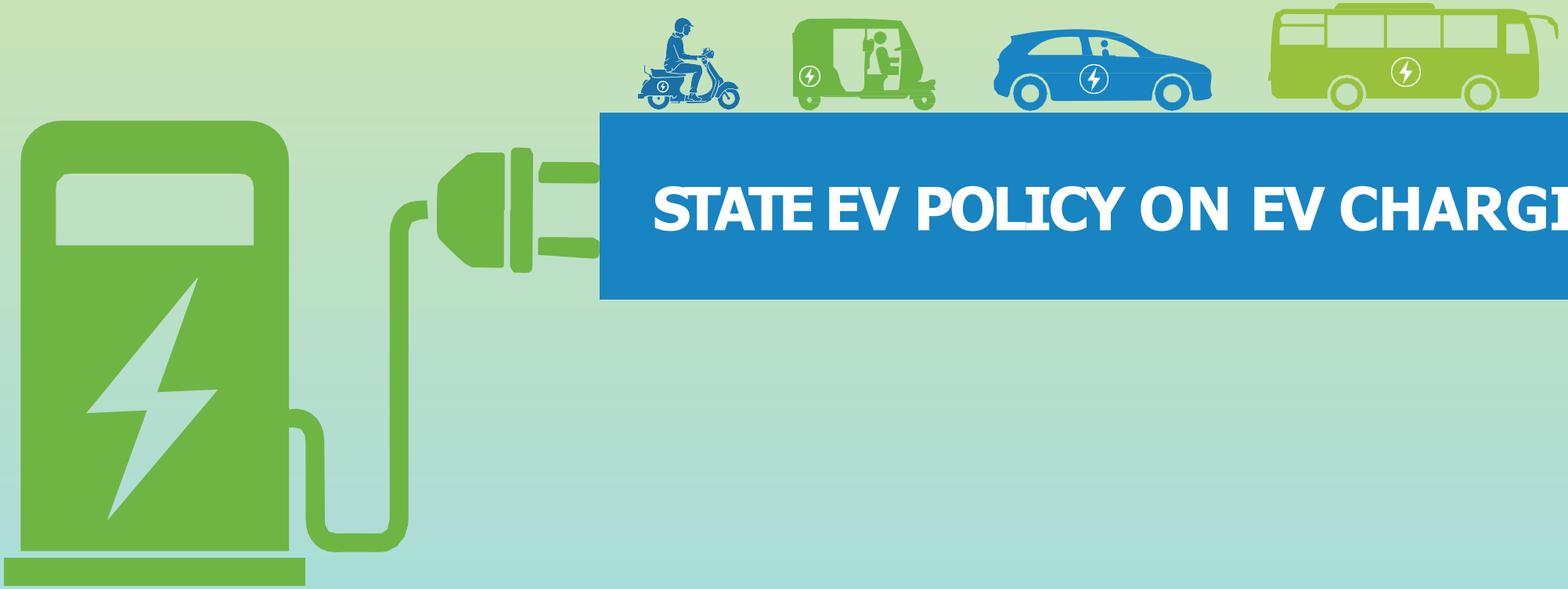


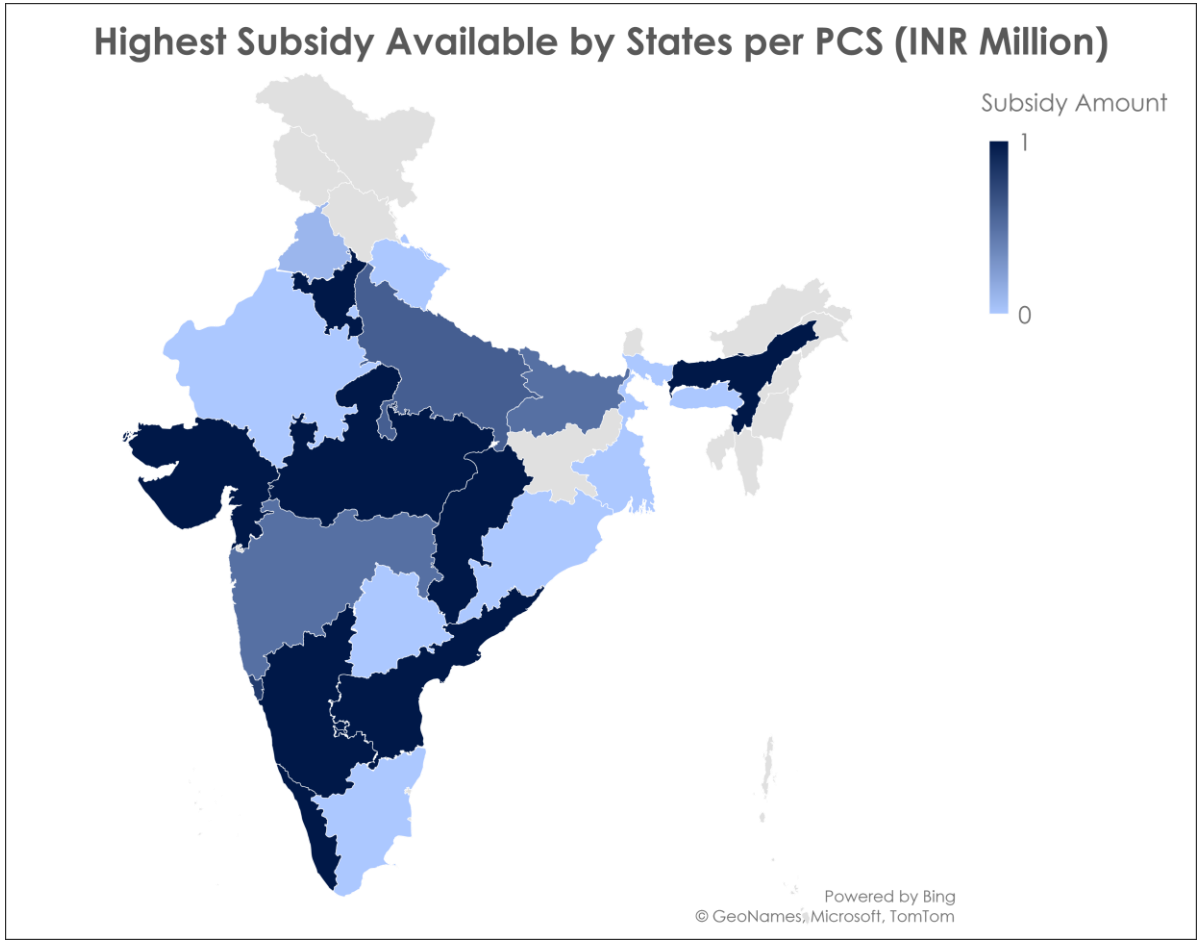
STATE EV POLICY ON EV CHARGING

Note* - This chapter covers the recent policies released in 2021 & till mid August 2022.
For state EV policies released before 2021, kindly refer to Appendix

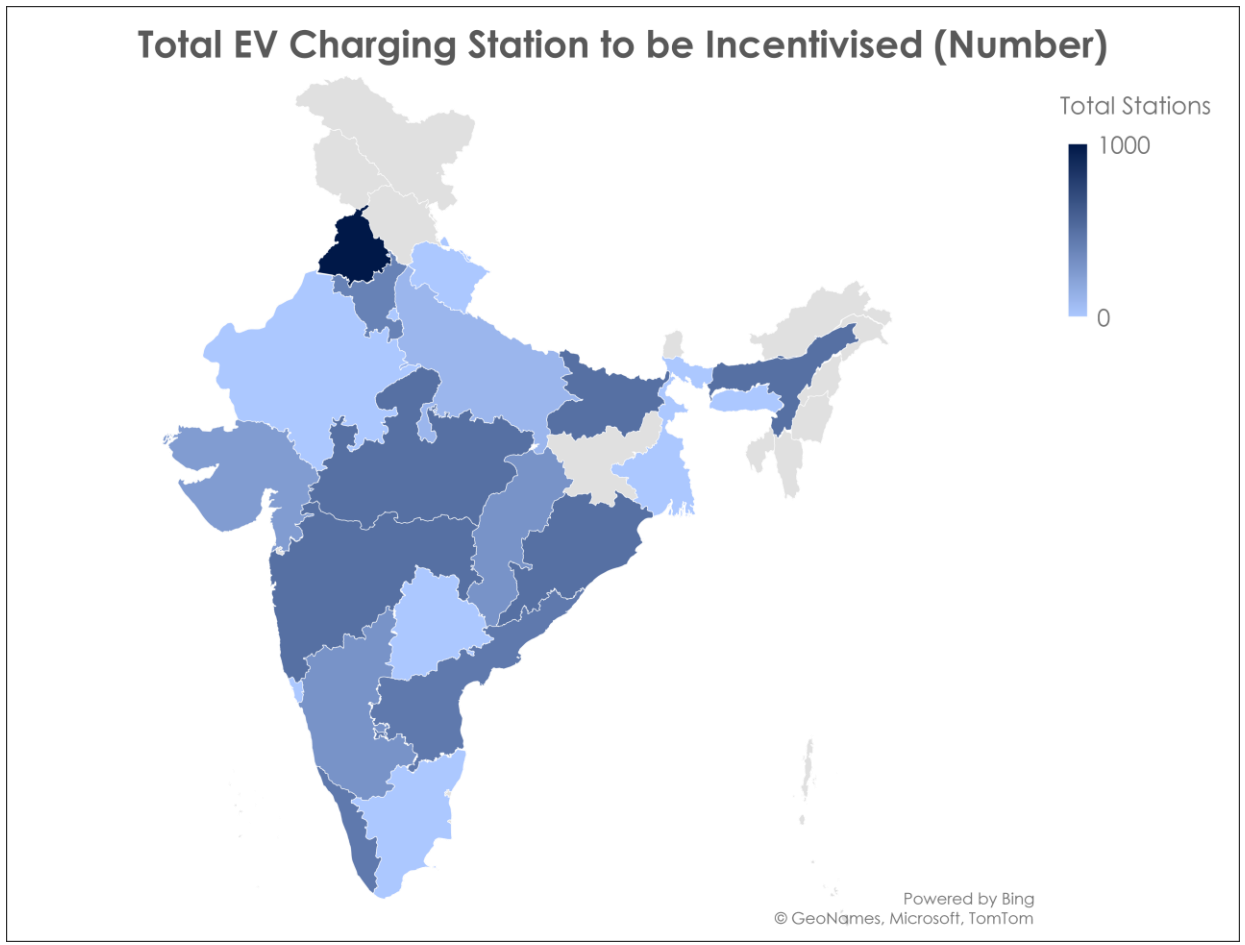
STATE EV POLICY STATUS

- States like Haryana, Kerala, Madhya Pradesh and Andhra Pradesh provide attractive capital subsidy for deployment of fast and slow EV chargers
- Delhi (subsidy on private charge points) and Maharashtra (tax rebates) emerge to be favourable locations for private charging
- Chhattisgarh, Haryana, Odisha, Delhi and Andhra Pradesh provides 100% net State Goods and Services Tax (SGST) reimbursement for charging stations

Highest Subsidy Available by States per PCS (INR Million)



Total EV Charging Station to be Incentivised (Number)



Source: Secondary Data , State EV Policy, CES Analysis

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COMPARISON OF STATE EV POLICIES FOR CHARGING INFRA

State	Charging Infra Targets	Type	Points for Charging Infrastructure
Maharashtra (2021 – 2026)	• **Target of public and semi-public charging stations** in **Greater Mumbai** (1500), **Pune** (500), **Nagpur** (150), **Nashik** (100), Aurangabad (75), Amravati (30) & Solapur (20) by **2025** • **4 fully EV-ready highways by 2025** on routes: Mumbai-Nagpur, Mumbai-Pune, Mumbai-Nashik and Nashik-Pune	**Incentives**	• **Public and semi-public charging stations** will be eligible for **demand incentives of 60%** of the cost for **15,000 slow chargers** max up to **INR 10,000** and **50% of the cost for 500 moderate/fast chargers** max up to **INR 5,00,000** • **Urban local bodies** to provide **property tax rebates** to **residential** owners for installing **private charging** infrastructure
		Points	• **New residential buildings** will be mandated to have **at least 20%** of the total **parking spaces** as **EV ready** • All **government office** complexes shall convert **100%** of their total parking spaces to be **EV ready by 2025** • All **dedicated off-road public parking** spaces shall convert **at least 25%** of their total capacity to be **EV ready by 2023** • All **institutional and commercial complexes** shall convert **at least 25%** of their total parking spaces to **be EV ready by 2023** • **Tariff applicable** for all the **EV charging stations** and battery swapping stations shall be **as per state order**

Note: Similar analysis is done for all the states which have cleared state EV policy or in draft stage.

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Color Code:
Draft Policy
Cleared Policy

Source: Secondary Data, State EV Policy, CES Analysis

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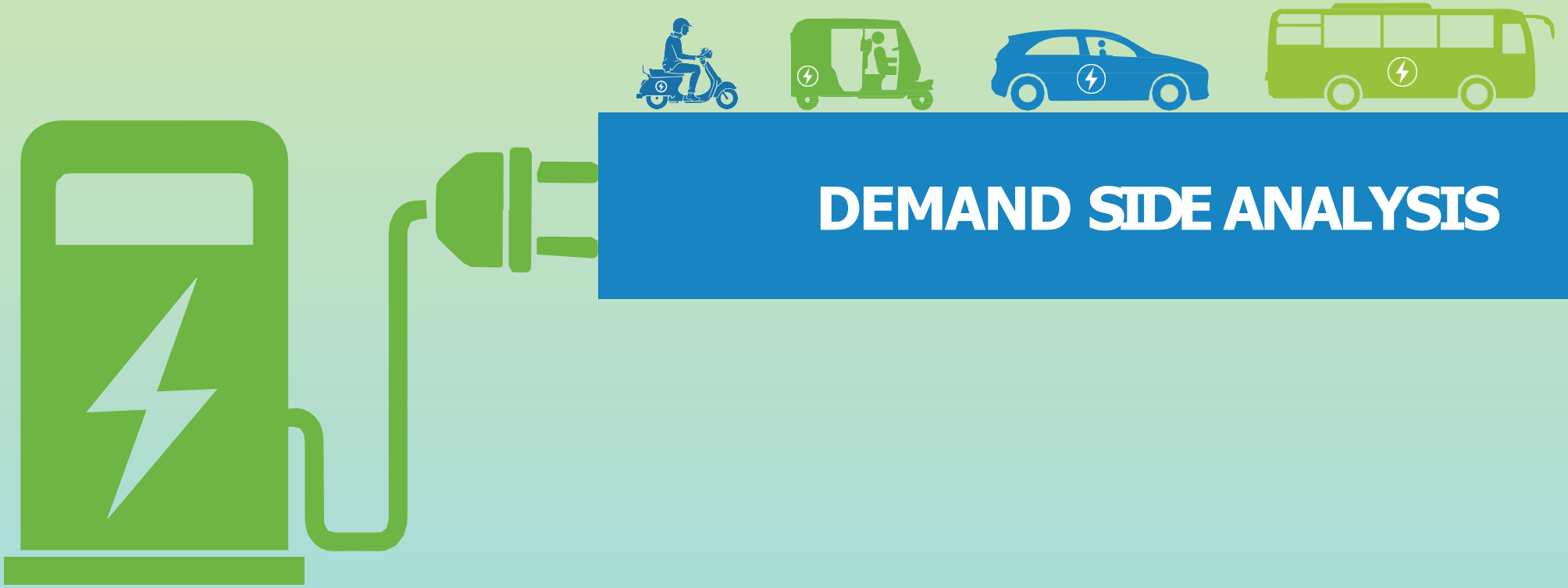

DEMAND SIDE ANALYSIS

DEMAND AGGREGATORS – STRATEGIC JUNCTION POINTS FOR EV CHARGING INFRASTRUCTURE

DEMAND AGGREGATORS

DISCOMs	• DISCOMs are the nodal agencies in most of the states, helping the state government implement their EV charging infrastructure roll outs. • DISCOMs also participate in the tenders to build and operate charging stations, working with private players in different business models, including PPP and EPC models.
Convergence Energy Services Limited (CESL)	• CESL works as demand aggregator, and works closely with landowners, be it municipality, ULB, Metro corporations, DISCOMs, development authorities, trying to work with them on revenue sharing model, and CESL makes investment in charging infrastructure.
Oil PSUs	• Oil PSUs are seen to be in a strategic position to build charging infrastructure, specially on highways and expressways across the nation, by letting the CPOs set up their charging stations at the retail outlets. • Oil marketing companies (OMC) like Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL) & Hindustan Petroleum Corporation Limited (HPCL) have already pledged to use their outlets to set up cumulatively 22,000 EV charging centers by 2025.
Fleet Operators	• Fleet operators are the most attractive market segment for charging stations in the current scenario, offering an attractive utilization rate of the charging points, thus making the investment viable.
NHAI	• The National Highways Authority of India (NHAI) is closely working in-line with the Govt. vision to build the charging infrastructure on National Highways by providing land as part of wayside amenities to the CPOs and inviting them to build and operate the charging stations. • NHAI targets to install charging stations every 40 to 60 kilometers on national highways, planning to cover 35,000-40,000 km of national highways with charging stations by 2023. In all, 700 charging stations will come up over the next two years.
Buildings / Real Estate Developers	• The real estate developers, gated communities, corporate offices, and commercial buildings are expected to be the most suitable use case of Semi Public and Public Charging Stations soon, making use of their available parking spaces, as the EV Charging perfectly fits in their business model.

Source: Secondary Sources, CES Analysis

REAL ESTATE EV CHARGING COLLABORATIONS

Real Estate Company	EV Charging Station Collaborator	MoU Signed	Details
OMAXE Turning dreams into reality	Jio bp	Jun-22	• Charging infrastructure deployment for e-2W and e-4W at Omaxe properties across Delhi, Noida, Greater Noida, Faridabad, Ghaziabad, New Chandigarh, Ludhiana, Patiala, Amritsar, Jaipur, Sonipat and Bahadurgarh in a phased manner
KOLTE • PATIL Creation, not Construction	TATA TATA POWER	Jun-22	• Charging stations would be deployed across Kolte-Patil Developers properties in Pune, Mumbai and Bengaluru
NAREDCO	TATA TATA POWER	Apr-22	• Memorandum of Understanding signed to install up to 5,000 EV charging points across National Real Estate Development Council member's developer properties in Maharashtra
Rustomjee®	TATA TATA POWER	Mar-22	• Charging infrastructure to be deployed for residents of Rustomjee Group properties in Mumbai Metropolitan region
MyGate	BOLT	Nov-21	• Plan to install BOLT EV charging solution in gated communities of MyGate across India
LODHA	TATA TATA POWER	Sep-21	• Charging solutions across residential and commercial projects of Lodha Group across Mumbai Metropolitan region and Pune

Source: Secondary Sources, CES Analysis

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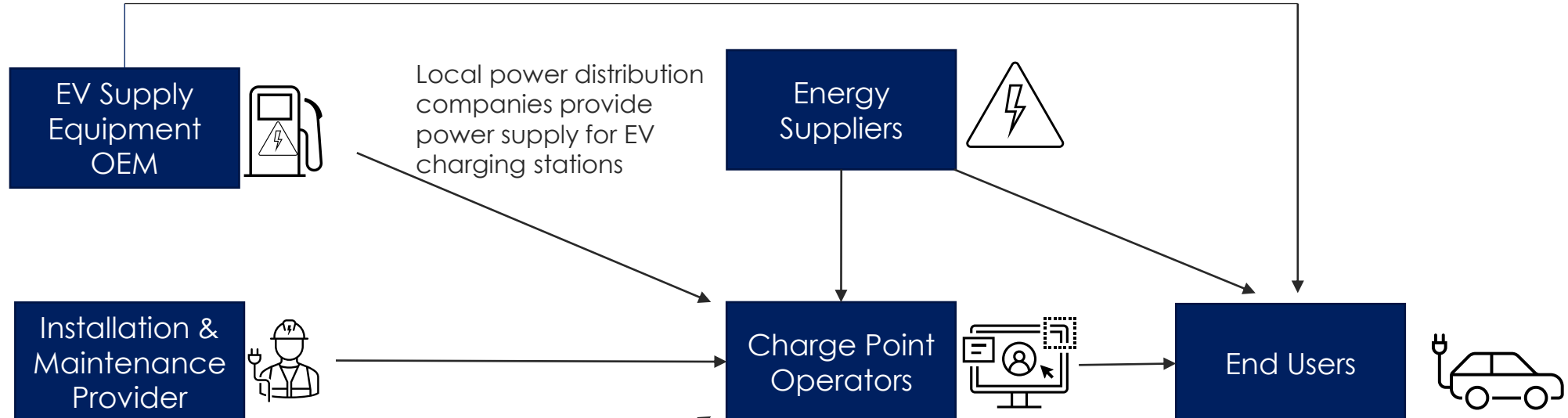
SUPPLY SIDE ANALYSIS

EV CHARGING INFRASTRUCTURE VALUE CHAIN OVERVIEW



OEMs involved in design & development of charging station equipment such as EV charger, connecting cables

Local power distribution companies provide power supply for EV charging stations

Players working for site inspection, installation & maintenance

Companies working for operating charging station including setting up of pricing structure

- Personal & Fleet Wheelers
- E-buses

Provides software platform to monitor station remotely for CPO.
App depicting station of CPO for users to check available slots, charge their vehicle along with billing & payment services

Source: CES Analysis, Secondary Sources, Primary Interviews

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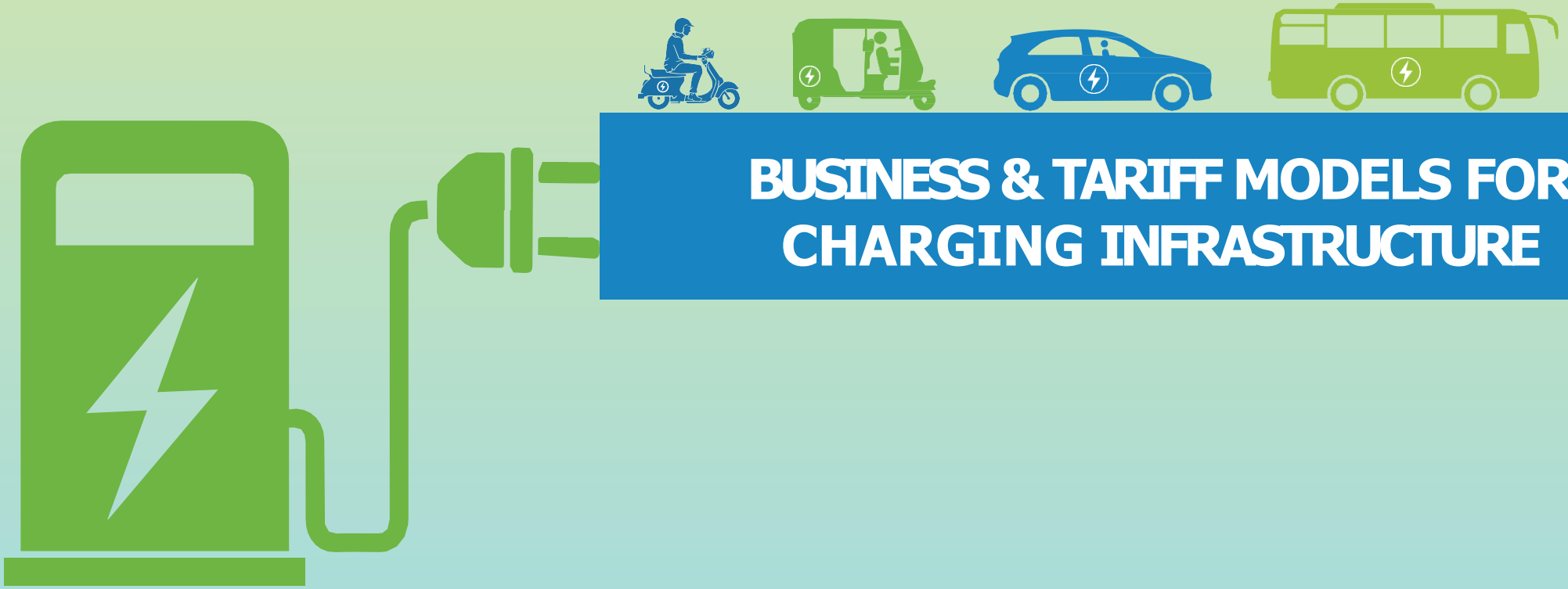


BUSINESS & TARIFF MODELS FOR CHARGING INFRASTRUCTURE

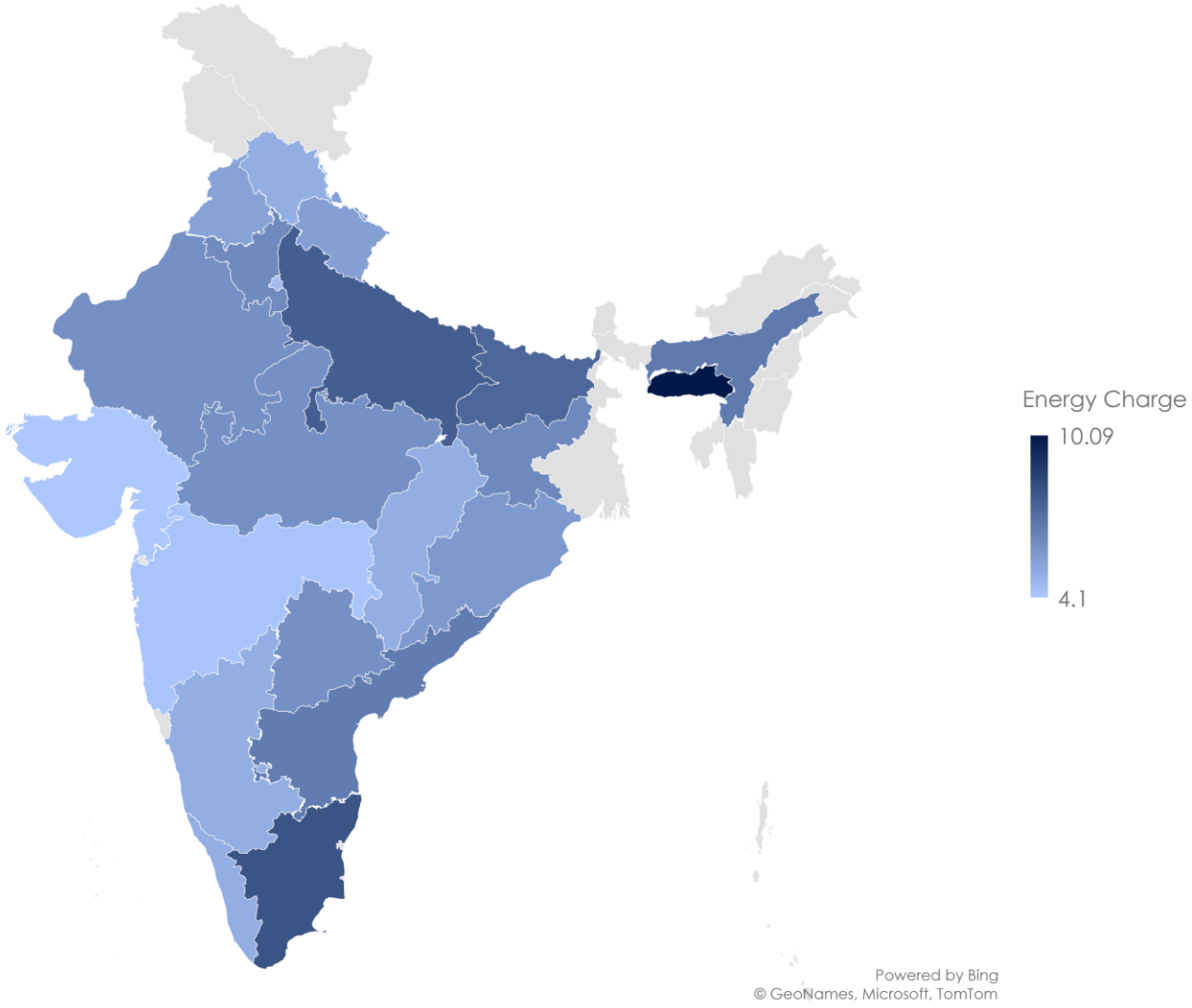
EV CHARGING TARIFF BY INDIAN STATES

Demand Charge by States

State	Low Tension (Per Month)	High Tension (Per Month)
Himachal Pradesh	-	• Rs 130/connection • Rs 140/kVA
Haryana	Rs 100/kW	-
Rajasthan	Rs 40/HP*	Rs 135/kVA
Gujarat	-	Rs 25 - 50/kVA
Maharashtra	-	Rs 70/kVA
Karnataka	Rs 60/kW	-
Kerala	Rs 75/kW	Rs 250/kVA
Tamil Nadu	Rs 70/kW	-
Madhya Pradesh	-	Rs 100 - 120/kVA of billing demand
Jharkhand	Rs 40 - 150/connection	-
Assam	Rs 130/kWh	Rs 160/kVA
Meghalaya	Rs 100 – 230/connection	Rs 100 - 230/connection

Note: States not mentioned in above table do not have any demand charges for EV charging.
***1 HP = 746 W**

Energy Charge by States (Rs/kWh)



Source: Secondary, e-AMRIT Portal, CES Analysis

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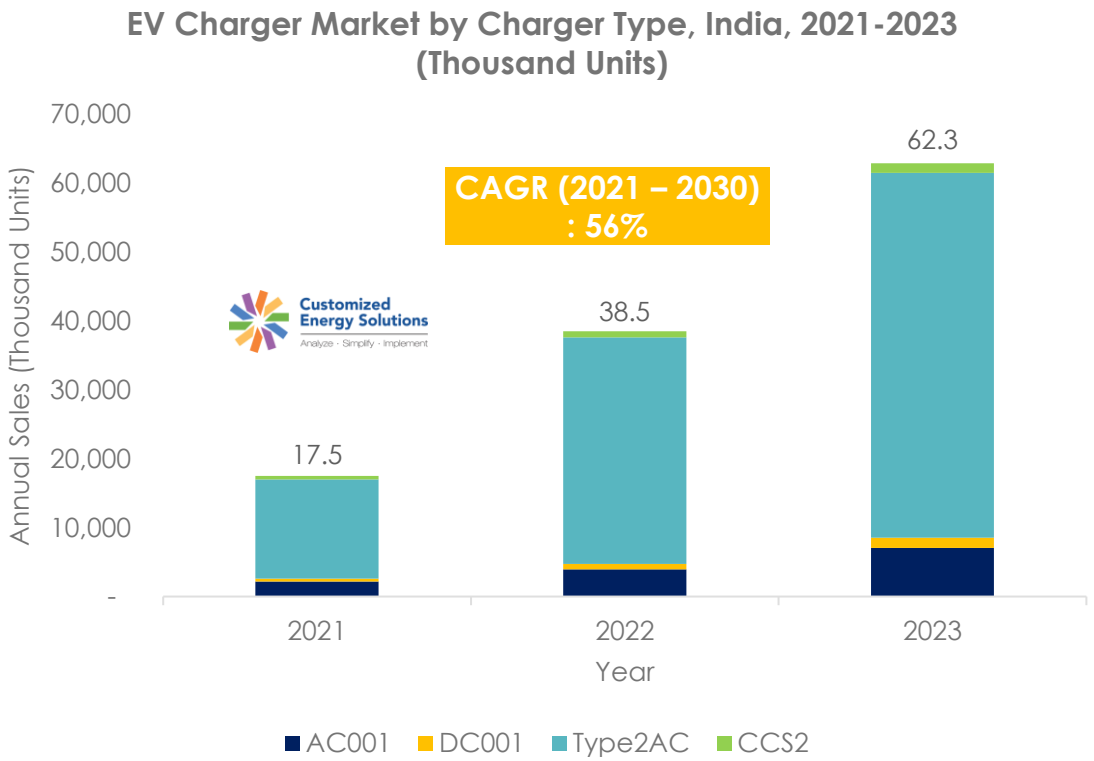
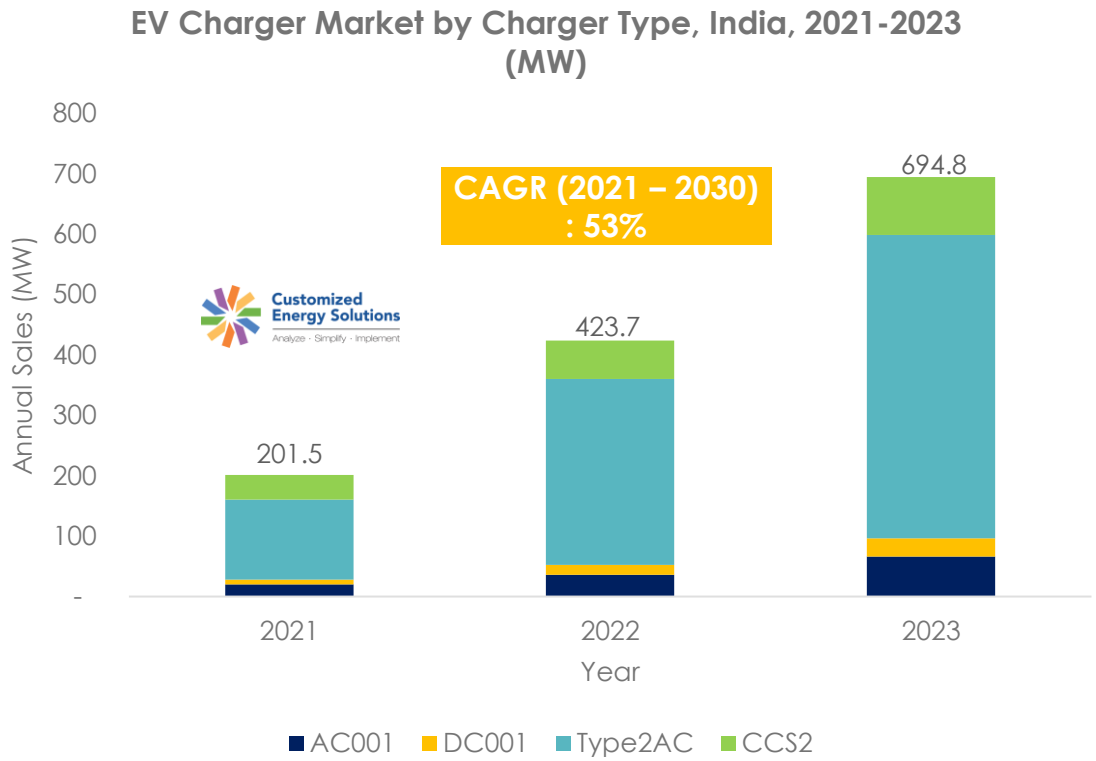
EV CHARGER MARKET FORECAST – BAU SCENARIO

- India's EV charger market by 2023 is expected to witness deployment of EV chargers across selected expressways & highways whose tendering process was completed in 2022.
- Further, deployment of type2AC would still hold dominance as it is majorly used by EV OEMs for supplying with sale of passenger e-4W





Source: CES Analysis

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- Battery Swapping Stations, 2020-21
- Battery Swapping Vendors Analysis in India
- Global Case Study

8 APPENDIX

- State EV Policy Released before 2021
- Major Tender Results/Current Status

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