

Agility
Care
Ethics
Safety
Diligence
Respect



Electric Vehicles and Distribution Grid

Tata Power New Business Services
2nd Nov 2018



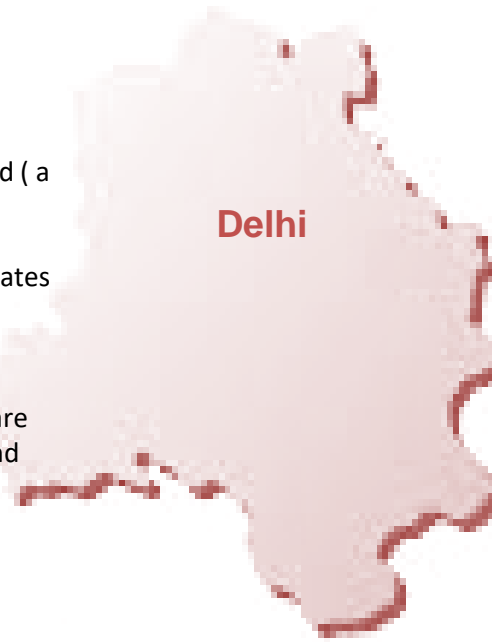
Tata Power has installed and managing a network EV Charging stations in Mumbai, Delhi & Hyderabad...



- Launched Mumbai's first public EV charging station at Vikhroli in Aug'2017
- Launched nine EV Charging Stations at an event organized on World Environment Day at Mantralay
- Operates 12 EV Charging stations across the city and suburbs



- Its subsidiary Tata Power Delhi Distribution Limited (a JV between Tata Power & Delhi Government) operates 5 Public Charging stations in Delhi
- Charging stations are located in or around Rohini, Pitampura, Todapur and Delhi University areas

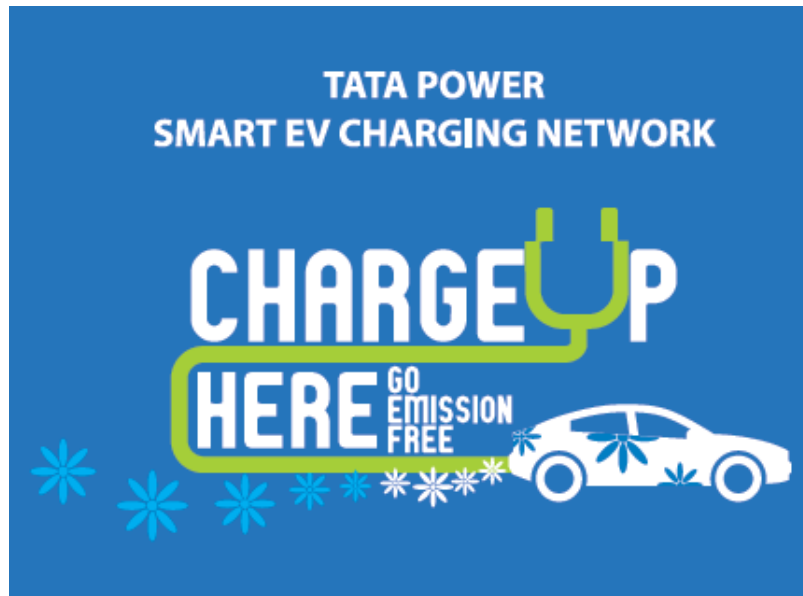


- Tata Power installed captive Charging stations at customer's premises in Hyderabad
- Tata Power is providing its customers end-to-end EV Charging Infrastructure solutions



EV charging network is being expanded in other cities as well...

Tata Power EV Charging Stations....



Mumbai's first public charging station



Image: Electric car charging at a Tata Power Public Charging station



Image: Electric car charging at Tata Power DC Fast Charging points



Tata Power, with more than 100 years of demonstrated world class capabilities in managing power systems, provides EV Charging infra network for growing EV ecosystem in India.

Tata Power EV Charging Solution - Facilitating journey towards emission free e-mobility by smart EV charging solutions...



Tata Power Customized End-to-End EV Charging Solutions

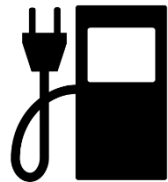
A



Software

- Charger Management
- Load Management
- Customer Mobile App – Locate, Book, Charge & Pay
- Customized recommendations

B



Charging Infrastructure

- Dedicated Charging Infra for fleets
- Public Charging Infra
- Charging Infra for residential & commercial spaces
- Project Design & Execution

C



Power Supply

- Optimize Electricity Cost
- Optimize Demand
- Maximize ToD benefits
- Backend Infra optimization
- Energy Efficiency
- Dynamic Network Planning

D



Battery Reuse

- Utility scale applications:
- Renewable Energy integration / storage
- DDG
- Capex deferral in T&D

Impact of EV on Grid (Simulations @ TPDDL Network)

Definition:
As per Ministry of Power, the definition of Charging station includes

A
1 Fast DC Charging point
50Kw

B
2 Type AC Charging point
(22kw &43kw)

C
1AC-001 Bharat Charging
Point (3.3kw)

D
1DC-001 Bharat Charging
Point (15kw)

	A	B	C	D
Low	1	0	5	2
High	1	1	15	5

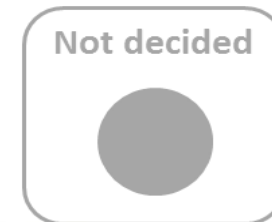
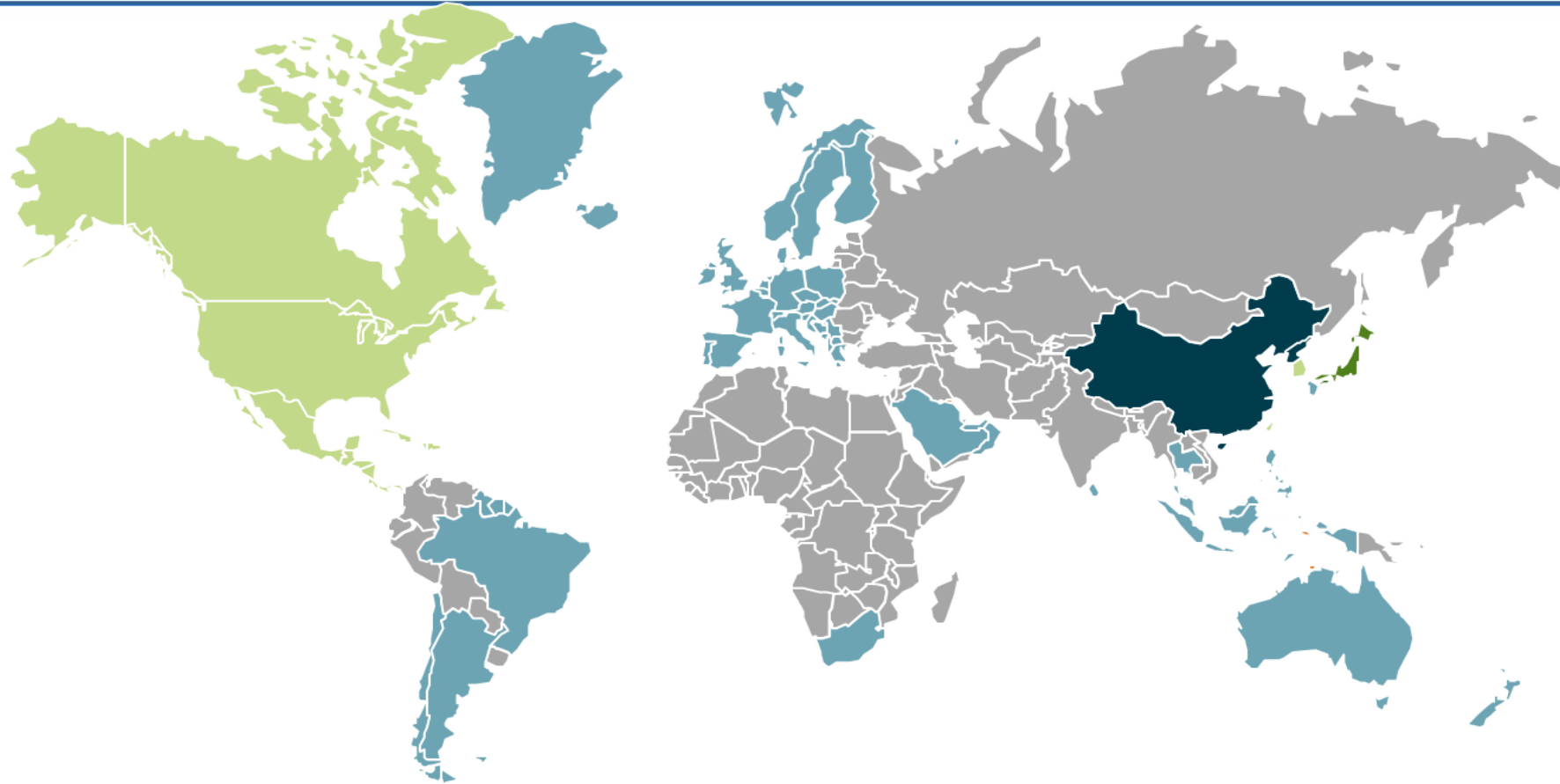
Stimulations: Analysis of 2 scenarios of charging stations of 11kv feeder

Scenario		Loading	Remarks
A	Low	5% consumers have EV	.No overloading of any 11kv section or DT was observed
	High	10% consumers have EV	
B	Low	5% consumers have EV+10% residential growth load	Overloading of 11kv & 2 DTs observed
	High	10% consumers have EV+10% residential growth load	

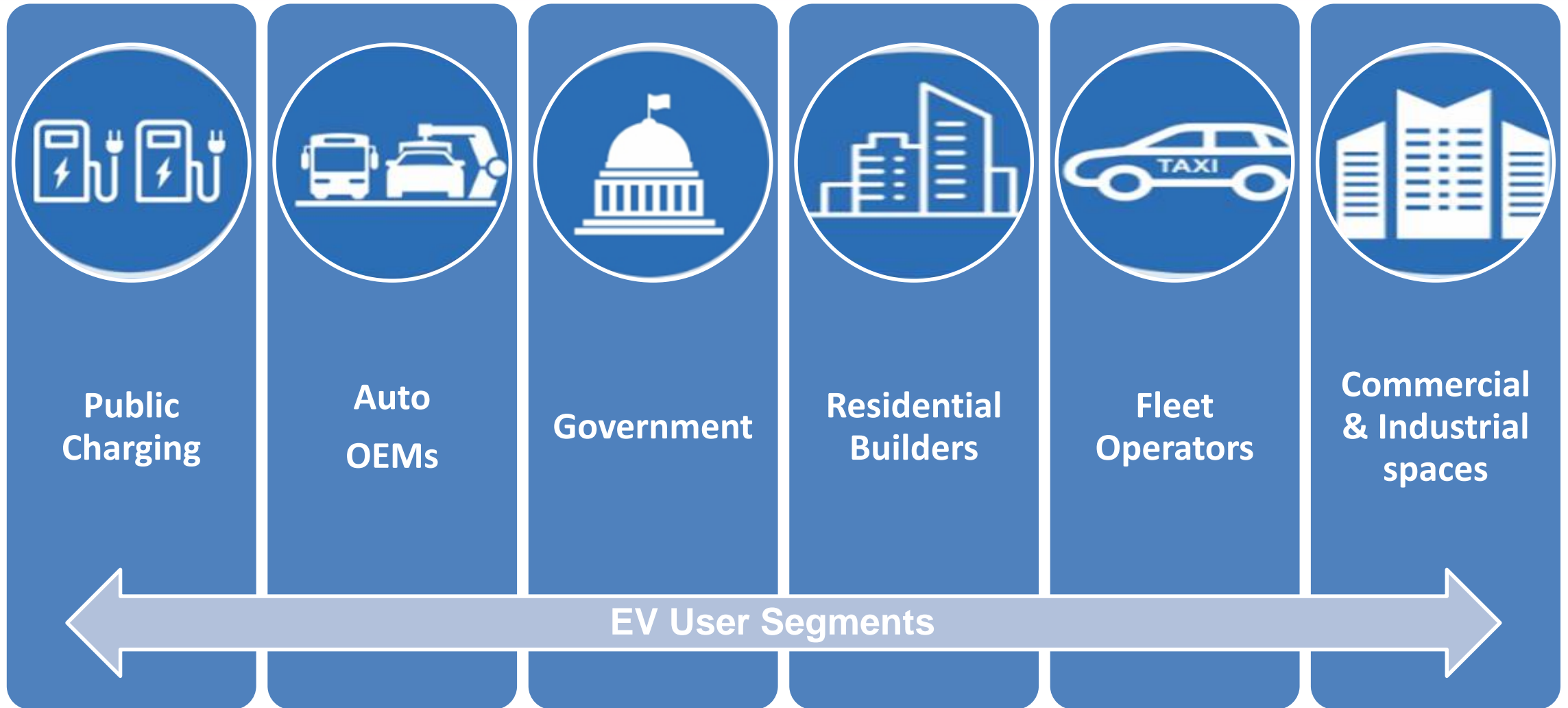
Scenario		Loading	Remarks
C	Low	5% consumers have EV+10% residential growth load+2DC Fast Chargers@50KW each	Loading of 11kw increases & Network Augmentation becomes a concern
	High	10% consumers have EV+10% residential growth load+2DC Fast Chargers@50KW each	
D	Low	5% consumers have EV+10% residential growth load+3DC Fast Chargers@50KW each	Sectional Overloading was observed with high capacity charging
	High	10% consumers have EV+10% residential growth load+3DC Fast Chargers@50KW each	

- Managed Charging:
 - TOD Tariff moving to Dynamic Pricing with increase in vehicle penetration
 - Services like intimation of Day Ahead Pricing can aid consumers to plan their charging
- Energy Usage Data Management
- Shift from static Network Planning tool to dynamic network planning tool
- Charging infrastructure development process to be aligned with utility

Charging Standards Across The Globe



Customised Business Models needed for serving different segment of EV customers...



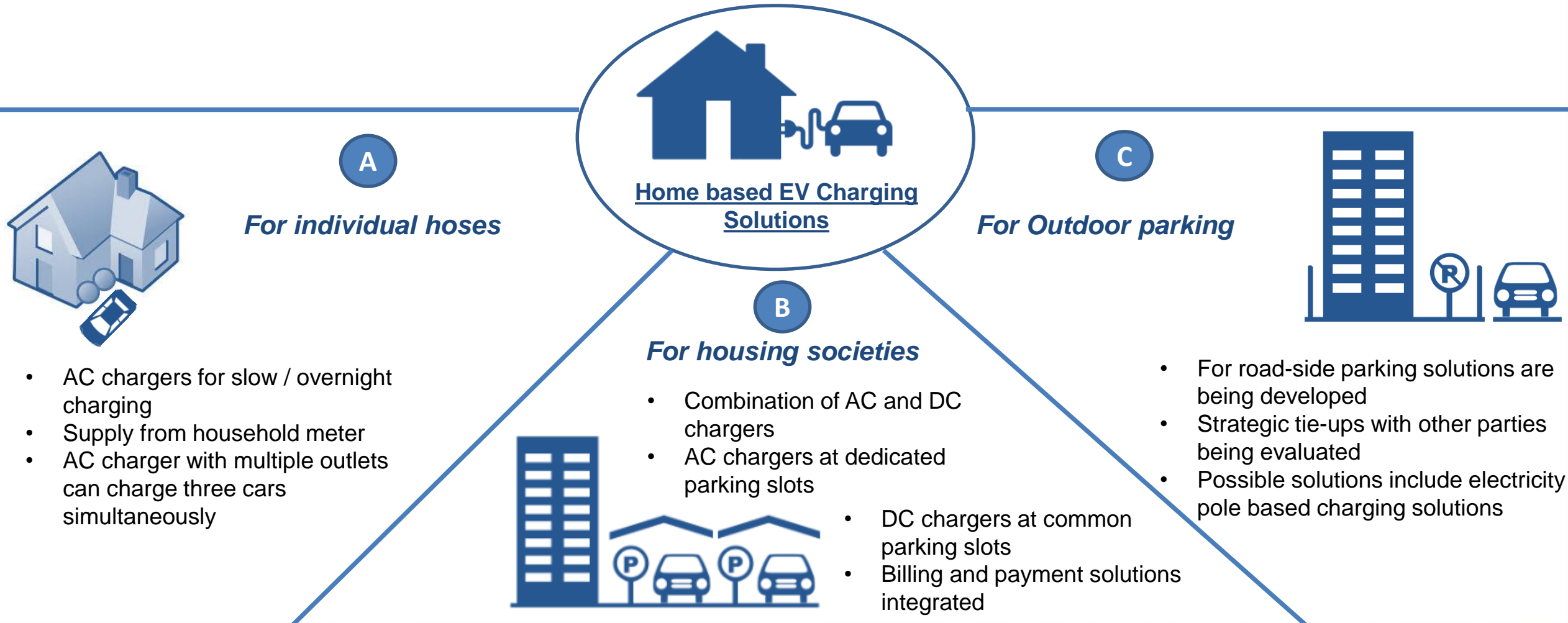
Car Parking Survey

- PARKING TREND AT HOME – RELEVANT FOR DEVELOPING HOME CHARGING
 - **About 50% of respondents park their vehicle on street when at home, around 40% use home apartment to park their vehicle and only 10% people use shared parking.**
 - There are considerable space for Home Charging . **However unlike West there is a huge scope for On –Road charging (it is expected to be 30% against 5-10% in West)**
- PARKING TREND AT PUBLIC SPACE- RELEVANT FOR DEVELOPING ON ROAD / PUBLIC CHARGING
 - **About 52% of respondents park their vehicle in office parking**
 - 15% use public parking space to park their vehicle
 - 10% parks vehicle at Metro station
 - 16% respondents park their vehicle on street
 - This reflects potential to tie up with Office buildings, Municipal Land and Metro Station

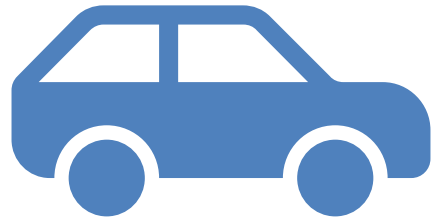
3rd party study in TPDDL Licensed Area
550+ Residential consumers

EV charging solutions for homes

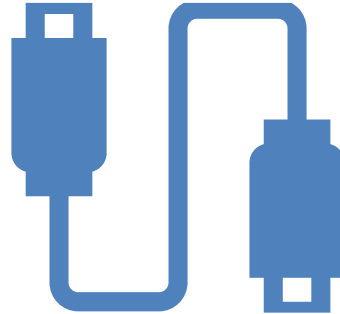
- 85% of EV charging happens at home, as per an EAI report on consumer behaviour.
- Home charging provided significant comfort to EV owners, reducing dependence on public charging infra.



Vehicle 2 Grid - Key Elements needed for successful implementation



Vehicles / Batteries
complying to V2G



Bi-directional
chargers



Smart bi-
directional Meters



Dynamic Grid
Management



Structured
Ancillary Market

**“Journey Continues..
We value your inputs, suggestions and
critique.”**

We take pride in Lighting up Lives!

For any queries email us at manasvimanas.sharma@tatapower.com

Assumptions for the Network Impact Study



Keeping in view of definition of Charging Station as per the Draft Paper of MOP-

- 1 Fast DC Charging Point (50 kW)
- 2 Type-2 AC Charging Points (22 kW & 43 kW; total 65 kW)
- 1 AC-001 Bharat Charging Point (3.3 kW)
- 1 DC-001 Bharat Charging Point (15 kW)

we have analysed the following 2 scenarios of charging stations per 11 kV feeder.

Scenario No	1 Fast DC Charging Point (50 kW)	2 Type-2 AC Charging Points (22 kW & 43 kW)	1 AC-001 Bharat Charging Point (3.3 kW)	1 DC-001 Bharat Charging Point (15 kW)
1	1 Nos	0 Nos	5 Nos	2 Nos
2	1 Nos	1 Nos	15 Nos	5 Nos

SI No	Feeder Name	Current Peak Load (Amp)	Percentage Loading	No of Consumers
1	GTK Grid to CC Colony	219	84%	2841
2	Tripolia Grid to DVB colony	130	50%	2807