

# ELECTRIC VEHICLES

Green Roads Ahead: Steering Through  
India's Electric Mobility Journey!

---

BDO India Publication  
2025



## PREFACE

India has embarked on an ambitious journey towards electric mobility, envisaging 80% penetration for electric two-wheelers and three-wheelers, 70% for electric commercial vehicles and 30% for electric private cars by 2030. This initiative not only represents alignment with global trends but also a decisive commitment towards cleaner and sustainable mobility. As the world increasingly gravitates towards carbon neutral practices, clean mobility has become a defining pillar of this transformative movement.

Electric vehicles have emerged as the pivotal pathway to realising this vision. The remarkable success of industry leaders underscores the immense potential and profitability of this sector. Unlike global narratives that predominantly spotlight electric cars, India is carving a distinctive path by fostering electric two-wheelers and three-wheelers; while also accelerating the transition to electric four-wheelers and electric buses.

The automotive sector contributes approximately 7.5% to India's GDP and constitutes a staggering 50% of its manufacturing GDP. With aspirations to achieve a USD 7tn economy by 2030, the automotive industry - especially as it pivots towards electric vehicles - presents an opportunity of ~USD 500bn.

For a country that has historically been a net importer, the automotive industry has diligently worked over decades to transform into a net exporting industry. However, with the rise of electric vehicles, the sector is now facing a regression challenge amidst its heavy import dependency for EV components. This scenario accentuates the critical importance and urgency of developing a resilient EV ecosystem in India.

The Government of India has demonstrated an unwavering commitment to accelerate EV adoption. Over the past decade, EV stakeholders have been beneficiaries of incentives worth USD 12bn.

Navigating through all the ups and downs, the EV sector is currently in a phase where the ecosystem is being built with sustainable pillars. Numerous partnerships are forming, capital is being mobilised and new technologies are catering more effectively to the needs of the market, making this sector exciting.

This publication aims to assist businesses and investors seeking to navigate the EV industry and explore the opportunities it presents. It aims to deliver valuable insights that will facilitate informed decision-making in this fast-evolving industry.



**ASHISH BAGADIA**

PARTNER  
CORPORATE FINANCE &  
INVESTMENT BANKING



## GLOSSARY

| Abbreviation | Full Form  |
|--------------|--|
| BaaS         | Battery as a Service   |
| BEST         | Brihanmumbai Electricity Supply and Transport Undertaking                        |
| BEV          | Battery Electric Vehicle   |
| Bn           | Billion  |
| CAGR         | Compound Annual Growth Rate  |
| CY           | Calender Year  |
| CCS          | Combine Charging System  |
| e2W          | Electric 2-Wheeler   |
| e3W          | Electric 3-Wheeler   |
| e4W          | Electric 4-Wheeler   |
| e-Bus        | Electric Bus   |
| EMPS         | Electric Mobility Promotion Scheme   |
| EV           | Electric Vehicle   |
| EVaaS        | Electric Vehicle as a Service  |
| FAME         | Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India       |
| FY           | Financial Year   |
| Gol          | Government of India  |
| GWh          | Gigawatt Hours   |
| HEV          | Hybrid Electric Vehicle  |
| ICE          | Internal Combustion Engine   |
| IOCL         | Indian Oil Corporation Limited   |
| INR          | Indian Rupee   |
| kWh          | kilowatt Hours   |
| LRV          | Lunar Revolving Vehicle  |
| LiB          | Lithium Ion Battery  |
| M&A          | Mergers and Acquisitions   |
| Mn           | Million  |
| MSTRC        | Maharashtra State Road Transport Corporation                                     |
| MW           | Megawatt   |
| NTPC         | National Thermal Power Corporation Limited                                       |
| OEM          | Original Equipment Manufacturer  |
| PCI          | Per Capita Income  |
| PHEV         | Plug-in Hybrid Electric Vehicle  |
| PE           | Private Equity   |
| SLIM         | Smart Lander for Investigating Moon  |
| SPECS        | Scheme for Promotion of Manufacturing of Electronic Components and Semiconductor |
| STU          | State Transport Undertaking  |
| Tn           | Trillion   |
| USD          | United States Dollar   |
| VaaS         | Vehicle as a Service   |
| VC           | Venture Capital  |

## Fun Facts

Plugged In: The World Goes Electric!



### 1830 WATT'S OLD IS NEW!

The first Electric Vehicle was created in the 1830s. In fact, EVs<sup>1</sup> were more popular than gasoline cars in the early 20th century!



### MAXIMIZING EVERY WATT!

EVs use about 80% of their battery energy for propulsion, while gasoline vehicles use only 15%.



### OIL CRISIS? EVs TO THE RESCUE!

As on date, EVs have already displaced ~1.9 million barrels of oil per day - 2% of daily global consumption



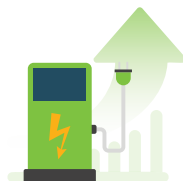
### GO ELECTRIC, BREATHE EASY!

An ICE<sup>2</sup> SUV emits 429 grams of carbon per mile, while use of EV results into just 223 grams, achieving a 48% reduction



### TWO WHEELS, ONE REVOLUTION!

Electric two-wheelers globally were late to embrace electric technology but have rapidly become India's top-selling vehicle segment



### ELECTRIFYING STATS!

Netherlands has 20x more charging stations (~80k) than the number of fuel stations (~4k)



### EVs ON THE MOON!

NASA's LRV<sup>3</sup>, Japan's SLIM<sup>4</sup> have made their mark on the moon demonstrating the effectiveness of electric vehicles in extreme environments

# AGENDA

|                       |    |
|-----------------------|----|
| Global EV Landscape   | 05 |
| Indian EV Landscape   | 11 |
| OEMs                  | 17 |
| Break-up of Materials | 28 |
| EV Motors             | 31 |
| Charging Ecosystem    | 37 |
| Batteries             | 45 |
| Battery as a Service  | 52 |
| Battery Recycling     | 61 |
| EV as a Service       | 67 |
| Key Acquisitions      | 76 |
| Closing Remarks       | 78 |





# GLOBAL



# EV



# LANDSCAPE

# EV Industry Is Showing Rapid Strides...

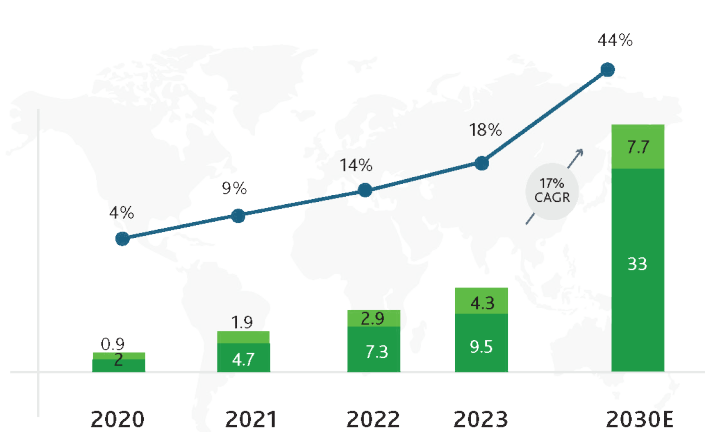
## 15%

Share of Automobiles in Global Carbon Emissions



- ▶ EVs were once more popular than gasoline cars, but its low practicality back then led to a decline in their adoption
- ▶ Today, with increasing emphasis on reducing carbon footprints, there is now a strong renewed interest in EVs to address environmental concerns

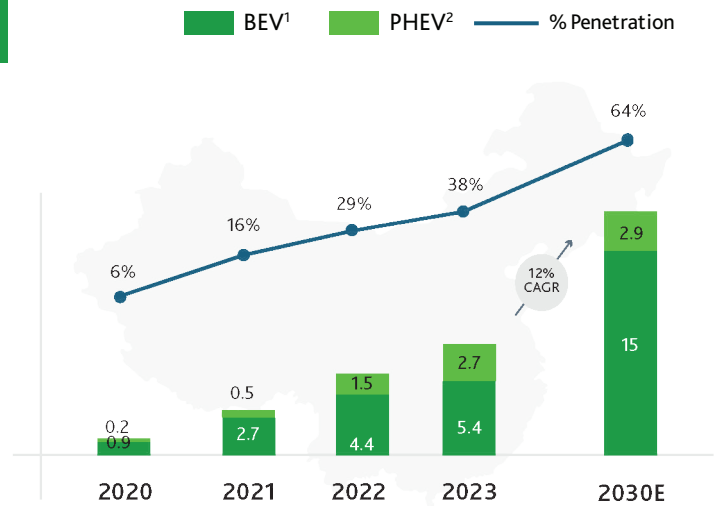
### BEV<sup>1</sup> & PHEV<sup>2</sup> volumes across the World (in Mn)



#### WORLD

Sales Value 2023: USD 656 Bn  
Sales Value 2030E: USD 2.5 Tn

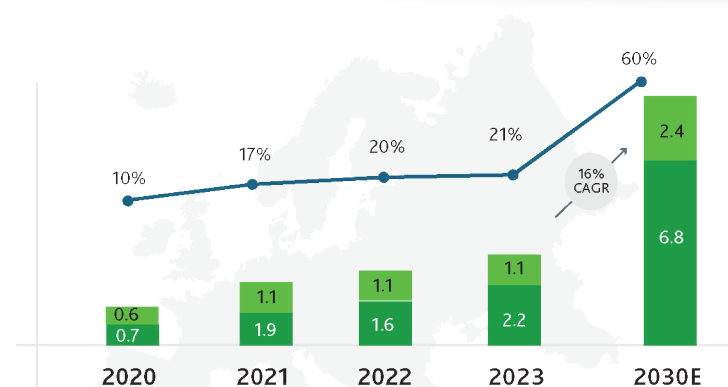
31% of the world's population, accounting for ~60% of global GDP, drives a remarkable 92% of global E4W sales!



#### CHINA

Sales Value 2023: USD 365 Bn  
Sales Value 2030E: USD 1.1 Tn

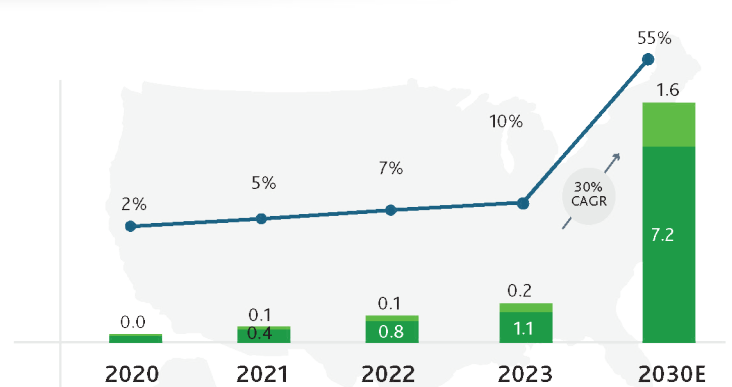
In July 2024, EVs & PHEVs surpassed 50% of all vehicle sales in China for the first time!



#### EUROPE

Sales Value 2023: USD 192 Bn  
Sales Value 2030E: USD 703 Bn

Average price of EV in Europe = 3 x average price of EV in China!



#### USA

Sales Value 2023: USD 71 Bn  
Sales Value 2030E: USD 588 Bn

Tesla Model Y alone comprised one-third of all EVs sold in USA in 2023!

While the perception is that US is at the forefront in EV industry; it surprisingly represents only 10% of global EV sales

1 BEV: Battery Electric Vehicle      2 PHEV: Plug-in Hybrid Electric Vehicle

Source: IEA, Industry Research, BDO Analysis

# ...with EV adoption rising globally but countries charting divergent growth paths



Half of the world's electric cars are in China!

## ↑ CHINA – PRICE COMPETITIVENESS HAS BOOSTED EV SALES

1 out of every 3 vehicles sold



China processes highest volumes of critical EV minerals

**65% Lithium | 35% Nickel | 75% Cobalt**

Supply Chain dominance + Cost Efficiencies

In 2023, 65% of 4W models in China had an EV variant that was cheaper than the ICE variant (10% in 2018)

## ↑ EUROPE – GOVERNMENT IMPETUS IS DRIVING EV SALES

1 out of every 5 vehicles sold



| EV Sales/ Total Sales (2023)* |      |
|-------------------------------|------|
| Norway                        | >80% |
| Sweden                        | >60% |
| Netherlands                   | >35% |

\*BEVs and HEVs

Europe has witnessed significant penetration due to tax benefits, incentives like free parking, concession on tolls.

EVs outsold diesel vehicles in Europe in August 2024

## ↑ USA – HIGH WILLINGNESS, LOW AFFORDABILITY

1 out of every 10 vehicles sold



Tesla is the lead EV OEM<sup>1</sup> in USA. With a 33% higher pricing for EV models, affordability remains an issue for the consumers.

Vehicle Pricing

**1.33 : 1  
EV : ICE**

Buzz about EV adoption in the USA is more than real adoption because of Tesla's listed nature and global expansion plans.

## ↑ JAPAN – DOMESTIC AUTOMAKERS SIGNIFICANTLY IMPACTED THE MARKET

1 out of every 50 vehicles sold



Japanese Market

- ▶ High per capita income
- ▶ Frequent new car purchases
- ▶ Strong auto industry
- ▶ Tech-savvy culture

Why low EV adoption?

- Japanese OEMs invested heavily in hydrogen fuel-cell technology
- Select OEMs advocating against EV policies

<sup>1</sup> OEM: Original Equipment Manufacturer

Source: BBC Survey, Industry Research, BDO Analysis



## Despite Their Late Entry, Traditional ICE OEMs Are Now Charging Ahead With Ambitious Electrification Target

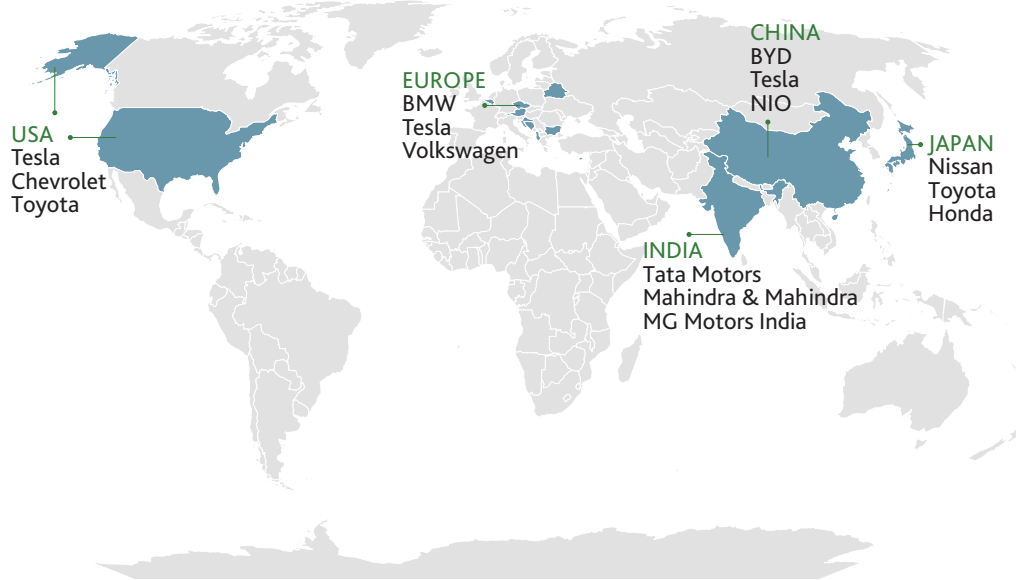
If these manufacturers meet their targets, annual sales of electric cars could reach **~40 million** by 2030, representing 40% of the global car sales market.

| OEMs <sup>1</sup>   | EV Target (Electric Cars)   |
|---------------------|---|
| Ford                | 0.6 Mn BEV sales by 2026  |
| GM                  | 1 Mn EV production capacity in 2025                                   |
| Volkswagon          | Fully electric line-up by 2033  |
| Toyota *            | 1.5 Mn BEV sales by 2030  |
| Honda *             | Increase production to >2 Mn units annually by 2030                   |
| Nissan              | 44% EV sales by 2026, 55% EV sales by 2030                            |
| Mitsubishi Motors   | 100% of EV sales by 2035, 50% EV sales by 2030                        |
| Porsche             | 80% of sales to be electric by 2030                                   |
| BMW                 | Cumulative sales of 2 Mn+ EVs by 2025; 30% share by 2025, 50% by 2030 |
| Mini<br>Rolls Royce | Fully electric line-up by 2030  |
| Land Rover          | Fully electric line-up by 2036  |
| BYD                 | Fully electric line-up since 2022                                     |

**\*Interestingly, Honda and Toyota, who had initial reservations about EV adoption, have now embraced the shift and moving forward with EV product launches**

# Supportive Policies For Local EV Makers Worldwide Have Restricted Any Single Manufacturer From Asserting Global Supremacy

Top EV OEMs in key regions



Japanese OEMs are transitioning to EVs via hybrids, allowing their ICE platforms to retain a strong market presence in new fuel vehicles.

## OEMs Are Leveraging Their Strengths To Craft Compelling USPs That Resonate With Their Audiences

Representative mapping of strengths of various leading players in the EV space

| OEMs       | TCO | Basket | Tech | Appeal | Distribution | Trust |
|------------|-----|--------|------|--------|--------------|-------|
| Tesla      | ●   | ●      | ●    | ●      | ●            | ●     |
| BYD        | ●   | ●      | ●    | ●      | ●            | ●     |
| BMW        | ●   | ●      | ●    | ●      | ●            | ●     |
| Hyundai    | ●   | ●      | ●    | ●      | ●            | ●     |
| Volkswagen | ●   | ●      | ●    | ●      | ●            | ●     |

Disclaimer: This analysis is based on insights from various research publications and market feedback. It is representative and subjective in nature.

**Tesla and BYD have seen the highest success in terms of establishing presence across global markets**



Negotiations for favorable policies in new markets

Partnerships with domestic OEMs to facilitate entry



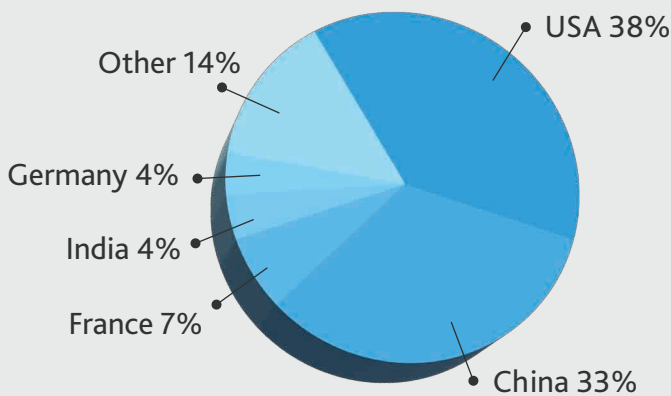
## E4W Has Been The Highest Funded Segment, Attracting 36% Of The Total Funding

**9.8K+**  
Companies

**2K+**  
Funded Companies

**400+**  
Acquisitions

**150+**  
IPOs



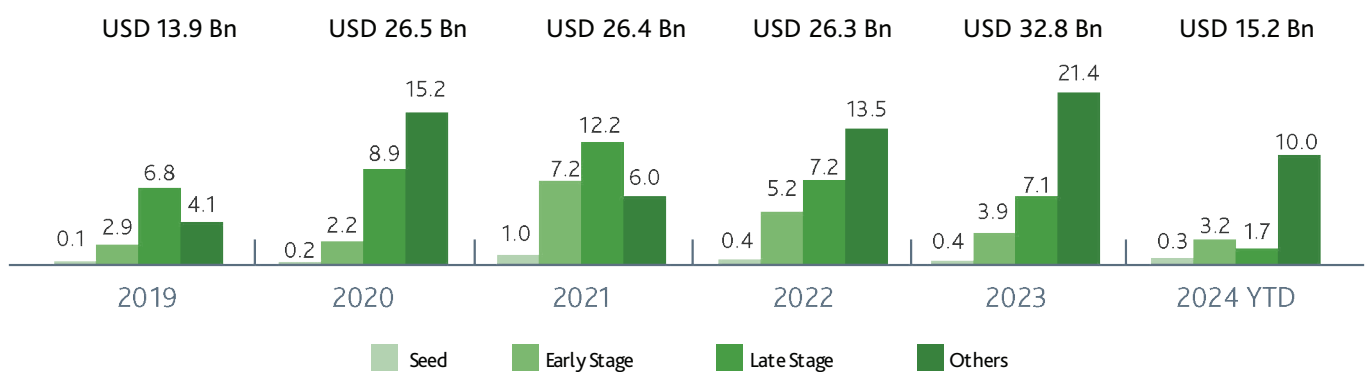
Companies in Shanghai and Beijing have attracted 20% of the global EV funding!

- ▶ Investor interest is shifting towards upstream and downstream segments of the EV supply chain, including battery technologies and charging infrastructure
- ▶ In 2023, India surpassed Germany to become the third-largest recipient of EV funding

China's massive investments in the battery supply chain have resulted in a global capacity of 2.2 TWh<sup>1</sup>, far exceeding the 750 GWh<sup>2</sup> demand in 2023

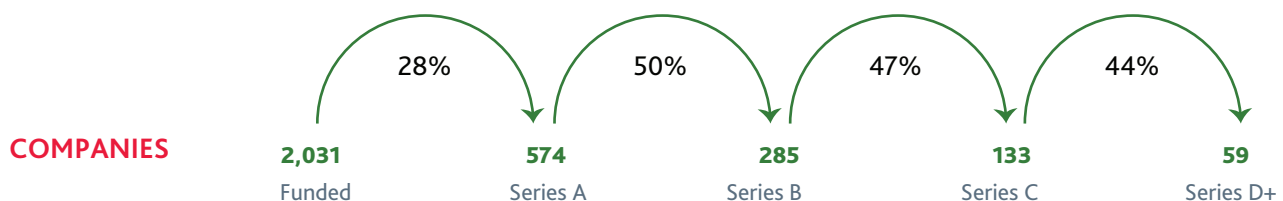
### EV Industry Funding Over The Years (USD Bn)

As of November 2024



Funding ratio has remained high for the global EV industry with one in every four companies receiving funding

As of November 2024



<sup>1</sup> TWh: Terawatt hours <sup>2</sup> GWh: Gigawatt hours  
Source: Tracxn, Industry Research, BDO Analysis

# INDIAN



# EV



# LANDSCAPE

# EV Industry Has The Potential To Impact The GDP Targets Of India

Auto and Auto Components Industry Drives A Significant Portion Of India's GDP While Also Supporting Over 30 Million Jobs

## AUTO INDUSTRY

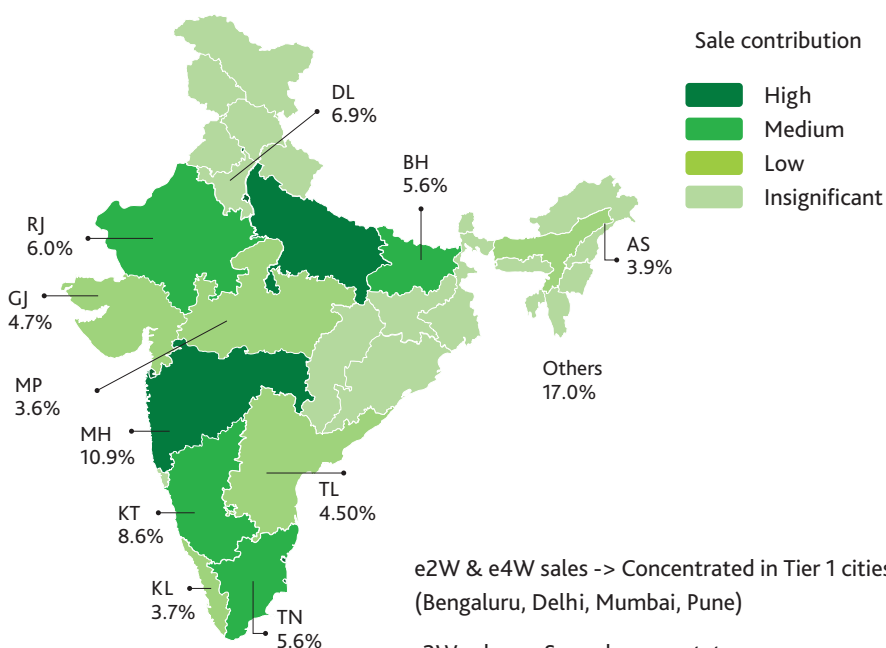
**7.5%**  
Contribution to GDP

**49%**  
Contribution to Manufacturing GDP

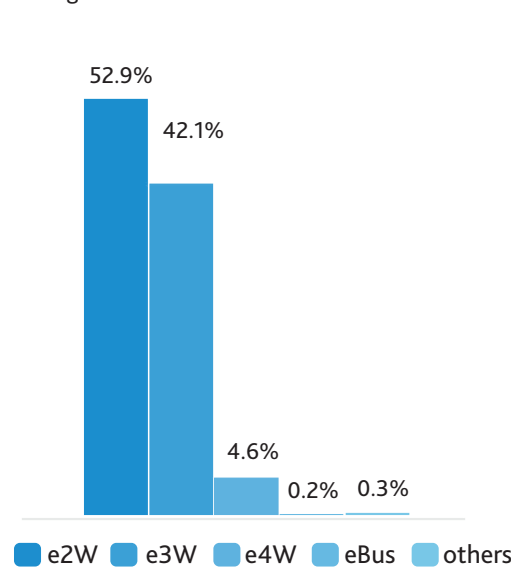
**4th**  
Largest automotive market globally (value terms)

### EV Sales Have Surged By An Impressive 45% YoY, Reaching 1.8 Million Vehicles Sold In FY24

Cumulative EV sales distribution across states (till FY24)\*



Segment-wise share in EV sales



e2W & e4W sales -> Concentrated in Tier 1 cities (Bengaluru, Delhi, Mumbai, Pune)

e3W sales -> Spread across states (Uttar Pradesh, Rajasthan, Bihar, Assam, Madhya Pradesh)

► Uttar Pradesh, Maharashtra, Karnataka, Delhi and Rajasthan account for **50% of all EV sales**

#### DEMAND SIDE

E-commerce adopting EV fleets:  
Highest last-mile delivery cities

Bengaluru | Mumbai | Delhi

#### SUPPLY SIDE

OEMs target for EV sales:  
High per capita income cities

Mumbai | Pune | Kolkata | Bengaluru

#### GOVERNMENT

Government's primary target for EV adoption: Cities

Delhi | Mumbai | Bengaluru

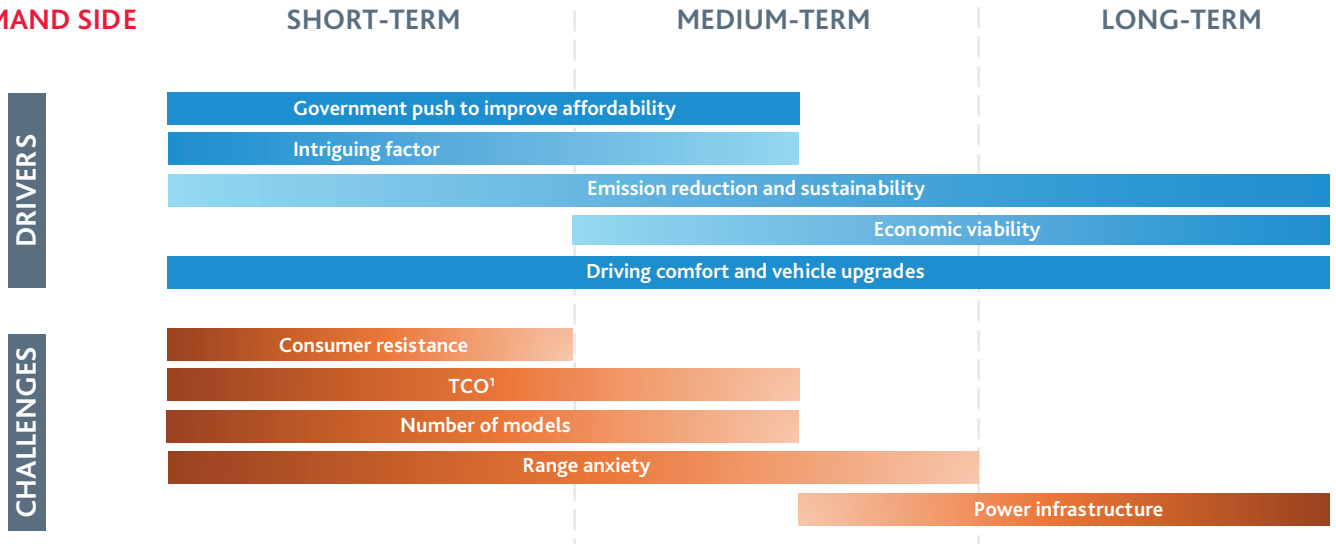
#### TOP CITIES BY EV SALES

(1) BENGALURU (2) DELHI (3) MUMBAI (4) PUNE

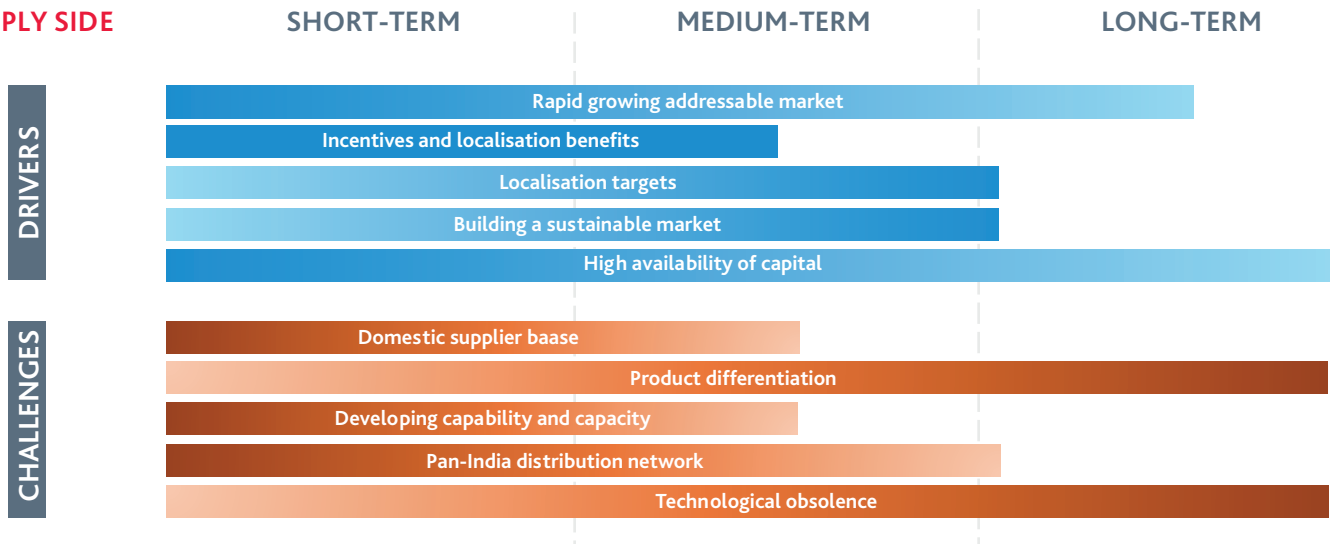
# Balancing Advanced Technology With Cost Effectiveness Is Necessary To Build A Sustainable EV Ecosystem



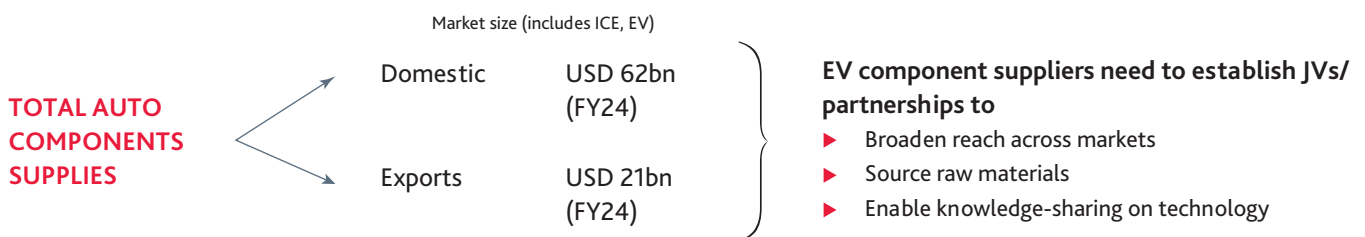
## DEMAND SIDE



## SUPPLY SIDE



### Cultivating A Local Supply Chain Is Crucial For Maintaining A Steady EV Manufacturing Process In This Rapidly Expanding Industry



<sup>1</sup> TCO: Total Cost of Ownership

## EV Is Among The Few Industries With Several State-Level Policies Alongside A National Policy

Government target: 30% EV adoption by 2030 (7.7% in FY24)

The Government aligned the planned EV adoption rate by increasing the subsidy per kWh<sup>1</sup> and increasing the vehicle cap on subsidies in Phase 2

### DEMAND-SIDE ENABLERS

#### FAME<sup>2</sup> India Scheme 1

April 2015 - March 2019

Budget outlay: INR 895 crores

Subsidy: INR 10,000 per kWh (capping at 20% of the vehicle cost)

#### FAME India Scheme 2

Apr 2019 - July 2024

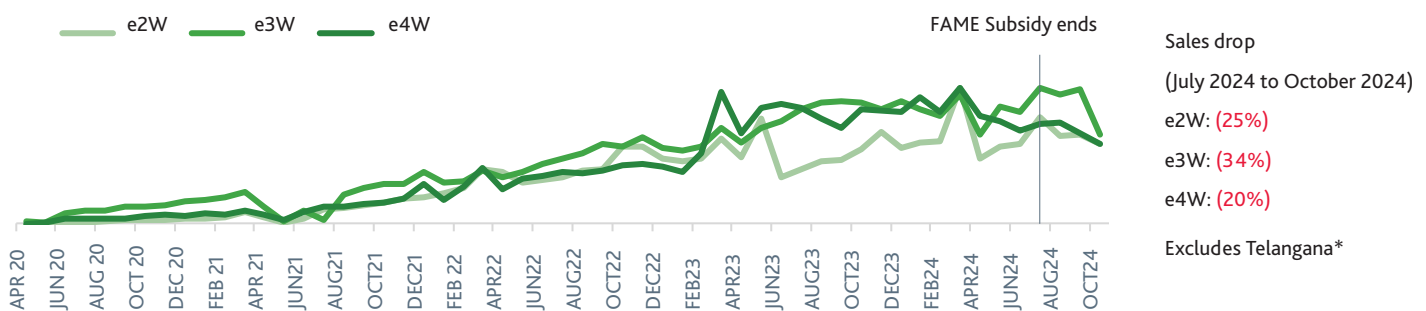
Budget outlay: INR 10,000 Crores + **INR 500 Crores EMPS<sup>3</sup> Scheme** → (Additional outlay to maintain the EV momentum)

Subsidy: INR 15,000 (+5000) per kWh for e2W (40% (+20%) vehicle cost cap)

INR 10,000 per kWh for e3W & e4W (20% vehicle cost cap)

INR 20,000 (+10,000) per kWh for e-bus (40% (+20%) vehicle cost cap)

### Electric vehicles sales in India (M-o-M)



The impact of FAME subsidies is evident, with sales declining after the scheme ended in July 2024.

Way ahead:  
Level of inclusivity of FAME 3 will be vital for driving EV growth in India.

### PM E-DRIVE scheme

Budget outlay: INR 10,900 Crores

Subsidy: INR 5,000 per kWh for e2W & e3W

INR 2,500 per kWh for e2W & e3W

Procurement of ~14,000 E-Buses

Install 22,100 fast chargers for e4W

### Supply-Side Enablers

#### ► Production-Linked Incentives (PLI)

INR 18,100 Crs Advanced Cell Chemistry (ACC)

INR 57,942 Crs Auto and auto components

INR 5,000 Crs Electronics

#### ► Phased manufacturing programme: To promote indigenous manufacturing of EVs

► SPECS<sup>4</sup>: Reimbursement of 25% capex

► New India EV policy: INR 41.5bn worth of incentives to companies meeting the Domestic Value Add criteria

1. kWh: kilowatt hour 2. FAME: Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India

3. EMPS: Electric Mobility Promotion Scheme

4. SPECS: Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors

## OEMs Have Accounted For >75% Of The Total EV Funding

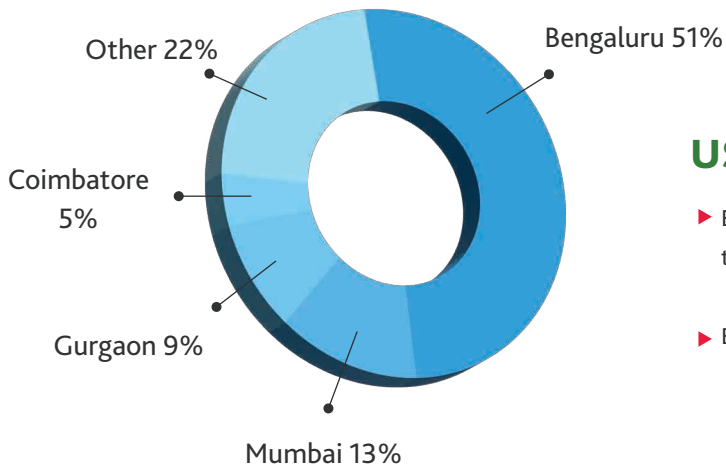
**1.3K+**  
Companies

**361+**  
Funded Companies

**20**  
Acquisitions

**6**  
IPOs

As of November 2024



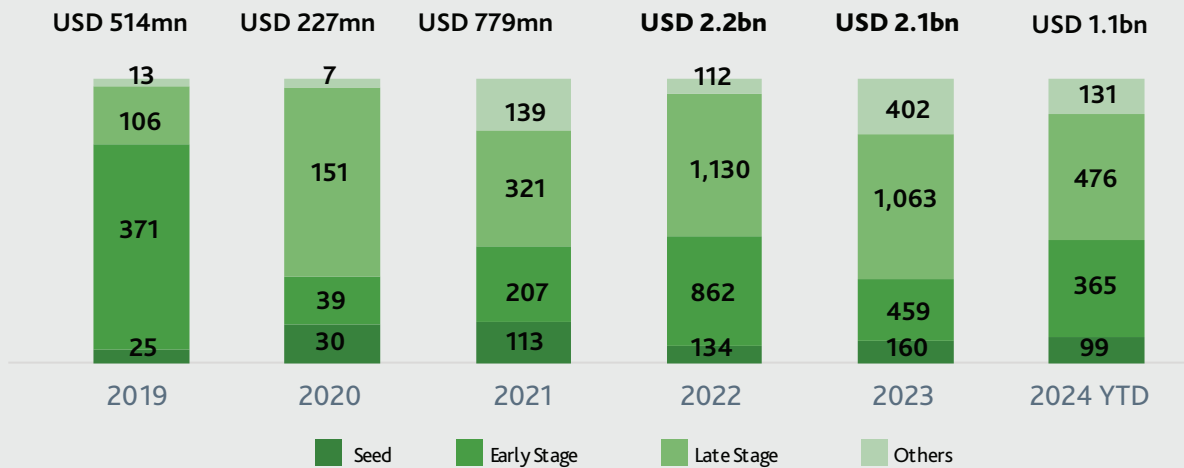
## USD 7.2bn Cumulative funding

- ▶ EVs go beyond traditional manufacturing by placing a strong emphasis on technology and innovation
- ▶ Bengaluru, being India's "tech hub", has witnessed the highest funding

100% FDI permission in EV industry by GoI<sup>1</sup> has attracted global funds and corporates to invest in India's EV story

### EV Industry Funding Over The Years

As of November 2024



### Top VC Investors

| Investor               | Number of cheques |
|------------------------|-------------------|
| We Founder Circle      | 21                |
| Blume Ventures         | 20                |
| AdvantEdge             | 12                |
| Venture Catalysts      | 12                |
| Micelio                | 11                |
| Green Frontier Capital | 11                |

### Top PE Investors

| Investor                         | Number of cheques |
|----------------------------------|-------------------|
| Baring Private Equity Partners   | 9                 |
| Anicut Capital                   | 7                 |
| Tiger Global Management          | 7                 |
| Venture Catalyst                 | 6                 |
| Forum Synergies                  | 6                 |
| British International Investment | 6                 |

1.GoI: Government of India

Source: Tracxn, Industry Research, BDO India Analysis



## Global Funds Are Leading Investments In India's EV Industry, Inspired By Success In Other Nations

### 8 Companies Have Accounted For >50% Of The Total Funds Raised In The Industry

(Amounts in USD mn)

As of November 2024

| Investor                         | 2019       | 2020       | 2021       | 2022         | 2023         | 2024 YTD   |
|----------------------------------|------------|------------|------------|--------------|--------------|------------|
| Tata Passenger Electric Mobility |            |            |            | 460          | 496          |            |
| Ola Electric                     | 267        |            | 300        | 330          | 380          |            |
| Mahindra Electric Automobile     |            |            |            |              | 145          |            |
| Ather Energy                     | 40         | 46         | 17         | 184          | 109          | 102        |
| Ampere Vehicles                  |            |            |            | 220          |              |            |
| T1 Clean Mobility                |            |            |            |              | 145          | 359        |
| EKA Mobility                     |            |            |            |              | 100          |            |
| Bounce Infinity                  |            | 111        |            |              |              |            |
| <b>Total</b>                     | <b>307</b> | <b>157</b> | <b>317</b> | <b>1,194</b> | <b>1,375</b> | <b>461</b> |
| <b>% of total funding</b>        | <b>60%</b> | <b>69%</b> | <b>40%</b> | <b>53%</b>   | <b>66%</b>   | <b>47%</b> |

### Global Funds Have Served As Anchor Investors For These Large Fundraises

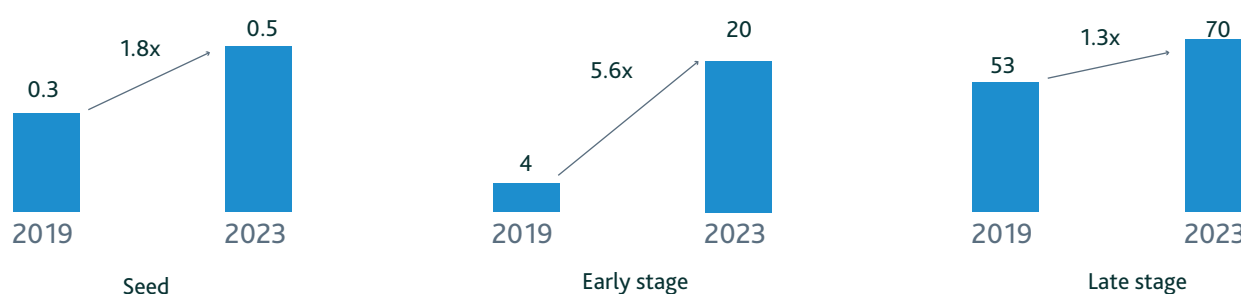
|                 |  |                                  |                 |
|-----------------|--|----------------------------------|-----------------|
| Ola Electric    | } Temasek<br>SoftBank Vision Fund<br>Tiger Global Management | Tata Passenger Electric Mobility | } The Rise Fund |
| Ampere Vehicles |  | Mahindra Electric Automobile     |                 |

### Investor Confidence And Perceived Future Growth Is Driving Valuations

| Rounds    | Median round size (USD) | Median valuation (USD) | Median revenue multiple | Median time to round |
|-----------|-------------------------|------------------------|-------------------------|----------------------|
| Seed      | 0.5mn                   | 5mn                    | 50.1x                   | 2 years 5 months     |
| Series A  | 5mn                     | 34mn                   | 29.8x                   | 1 year 10 months     |
| Series B  | 17mn                    | 115mn                  | 31.9x                   | 1 year 9 months      |
| Series C  | 31mn                    | 206mn                  | 51.2x                   | 1 year 4 months      |
| Series C+ | 105mn                   | 581mn                  | 28.5x                   | 8 months             |

### Funding rounds are evolving to favour leading players, signaling a trend of larger investments being made into potential market winners

Median round size (USD mn)





# OEMs IN INDIA

# E2W Segment Is Being Turbocharged By E-Commerce Companies Electrifying Their Large Fleets!

## ELECTRIC TWO WHEELERS (E2W)



India is the largest two-wheeler market globally

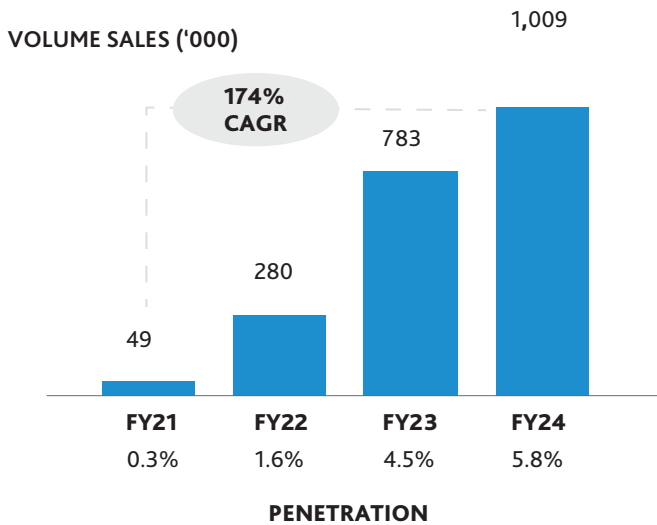
**2nd**  
Largest e2W market

**2.2 million+**  
Cumulative sales till FY24

**18%**  
Maharashtra

**14%**  
Karnataka

Top states (in terms of market share)



TOTAL COST OF OWNERSHIP (INR PER KM)

|            | ICE | EV         |
|------------|-----|------------|
| Private    | 3.4 | 1.6 (-25%) |
| Commercial | 3.1 | 1.4 (-57%) |

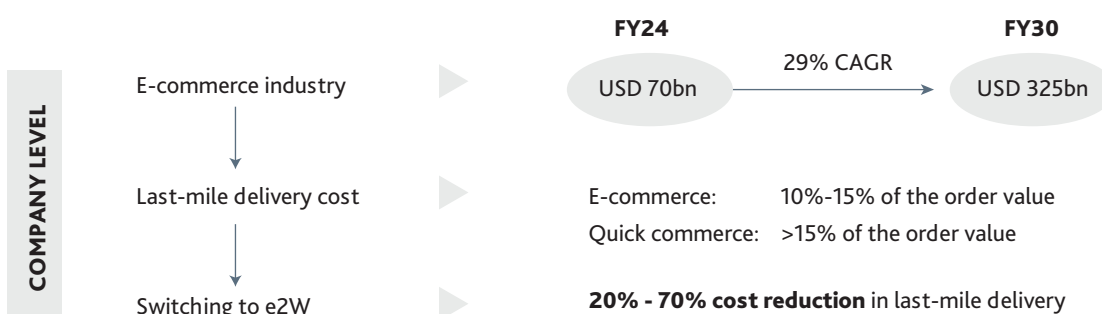
The substantial difference in TCO has significantly accelerated the transition in the B2B space

Disclaimer: TCO calculation is for informational purposes only. While we aim for accuracy, the figures are based on assumptions that may vary by individual circumstances and market conditions.

## With India's PCI<sup>1</sup> Being Just 1/8th Of The Global Average, Low-Cost 2W Play A Crucial Role In The Country's Transportation Landscape



## In The Booming E-Commerce Landscape, Companies Are Increasingly Turning To EVs For Last-Mile Delivery To Reduce Costs And Boost Profitability



<sup>1</sup> PCI: Per Capita Income  
Source: Annual Report Card 2024 – JMK, Industry Research, BDO India Analysis

## While Incumbent Japanese ICE 2W Players Are Lagging In E2W Space, They Have An Opportunity Of Scaling Up Rapidly

Market Leadership Has Dramatically Shifted With Ola Electric Taking The Most Advantage Of Hero Electric And Okinawa's Subsidy Cuts

### TOP OEMs IN E2W SEGMENT

| COMPANIES        | FY22  | FY24  | CHANGE |
|------------------|-------|-------|--------|
| Ola Electric     | 6.3%  | 34.3% | 28.0%  |
| TVS Motors       | 3.7%  | 19.9% | 16.2%  |
| Okinawa Scooters | 17.6% | 2.1%  | -15.5% |
| Hero Electric    | 28.1% | 1.9%  | -26.2% |
| Others           | 44.3% | 41.8% | -2.5%  |

Despite Not Offering Any Electric Two-Wheeler Models In India, Japanese OEMs Are Still Increasing Their Market Share In Overall Sales

Japanese 2W OEMs market share in overall 2W sales

32% (2019)



36% (2023)

### KEY STRENGTHS OF JAPANESE OEMs

- ▶ Strategic partnerships and joint ventures
- ▶ Established distribution network
- ▶ Product localisation
- ▶ Abiding by the Government regulations
- ▶ Focus on quality control

These Are The Areas That Some Of The E2W Indian OEMs Are In The Process Of Addressing

- ▶ Ola Electric is working on quality control and after sales service
- ▶ Hero Electric and Okinawa are working on improving compliance with government norms

For non-auto entrants, breaking into the mass market will be tough, but application-specific products like performance bikes and e-cycles will offer sizable room for growth

## E3Ws Segment Saw The Highest EV Penetration Due To Strong State Policies Boosting Sales In The Northern Region

### ELECTRIC THREE-WHEELERS (E3W)



India is the largest 3W market & the top exporter of 3Ws globally

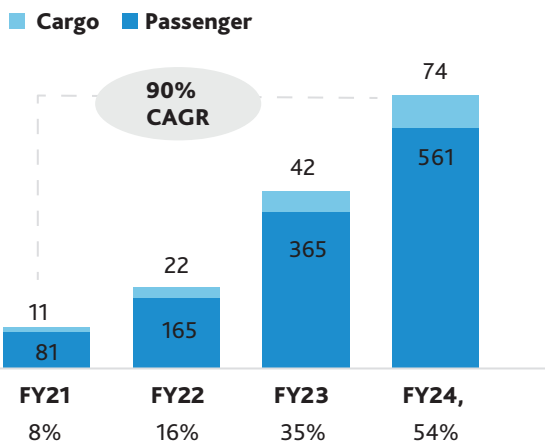
**60%**  
Share in global sales

**1.7 million**  
Cumulative sales till FY24

**39%**  
Uttar Pradesh

**12%**  
Bihar

VOLUME SALES ('000)



PENETRATION

Top states (in terms of market share)

Note: Uttar Pradesh historically has been highest ICE three-wheeler selling state in India (12% market share)

TOTAL COST OF OWNERSHIP (INR PER KM)

|            | ICE | EV         |
|------------|-----|------------|
| Commercial | 4.7 | 3.0 (-37%) |

With nearly 20% cost savings, e3Ws have become the smarter choice

Disclaimer: TCO calculation is for informational purposes only. While we aim for accuracy, the figures are based on assumptions that may vary by individual circumstances and market conditions.

### Three-Wheelers Have Emerged As A Significant Segment In India, Providing Time-Saving Commutes For Passengers And Cost-Effective Logistics For Businesses

#### PASSENGER FLEETS

Bridging the gap between public transportation and personal mobility.

3W ride service

4W ride service

Better alternative to navigate through congested streets and narrow lanes

#### CARGO FLEETS

Ideal for logistics business as most of the logistics transport weighs 200 kg – 600 kg.

3W cargo

4W cargo/HCVs

Logistics value

Logistics cost

High

Interestingly, E3W Face Fewer Charging Infrastructure Challenges Due To Their Compatibility With Standard Home-Plug Charging

## While ICE 3W Segment Is Concentrated Among A Few Players, The E3W Industry Has Remained Highly Fragmented

### TOP OEMs IN E2W SEGMENT

#### Passenger E3Ws

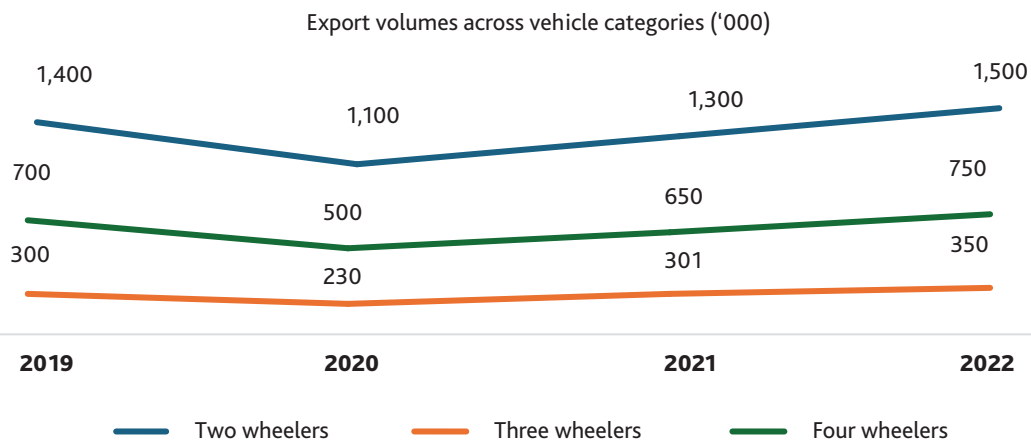
| COMPANIES                   | FY22  | FY24 | CHANGE |
|-----------------------------|-------|------|--------|
| Mahindra Last Mile Mobility | 7.5%  | 9.0% | 1.6%   |
| YC Electric                 | 9.5%  | 7.1% | -2.4%  |
| Saera Electric              | 4.7%  | 5.1% | 0.4%   |
| Dilli Electric              | 3.6%  | 4.1% | 0.5%   |
| Others                      | 72.6% | 71%  | -1.6%  |

#### Cargo E3Ws

| COMPANIES                   | FY22  | FY24  | CHANGE |
|-----------------------------|-------|-------|--------|
| Mahindra Last Mile Mobility | 16.8% | 14.9% | -1.9%  |
| Omega Seiki                 | 8.5%  | 6.9%  | -1.6%  |
| Piaggio                     | 11.4% | 6.5%  | -4.9%  |
| Euler Motors                | 2.5%  | 5.0%  | 2.5%   |
| Others                      | 60.8% | 66.7% | 5.9%   |

Bajaj Auto, holding a 35% market share in domestic ICE 3W sales and 26% in ICE exports, has recently entered the e3W segment, gaining 4.4% market share

### During Covid, 3W Export Segment Encompassing Both ICE And EVs Proved To Be The Least Volatile, With Sales Being Fully Recovered By 2021



### Large Opportunity Size And Low Entry Barriers Allowed New Players To Enter The Market

Kinetic Green

Product range and innovation (passenger transport, goods delivery)

Ampere Vehicles

Attractive financing options

YC Electric

Competitive pricing and low maintenance cost

# India Plays A Significant Role In Global Automotive Industry And Is A Key Focus For The E4W Market

## ELECTRIC FOUR-WHEELERS (E4W)

**83%**

YoY growth

**189K**

Cumulative sales till FY24

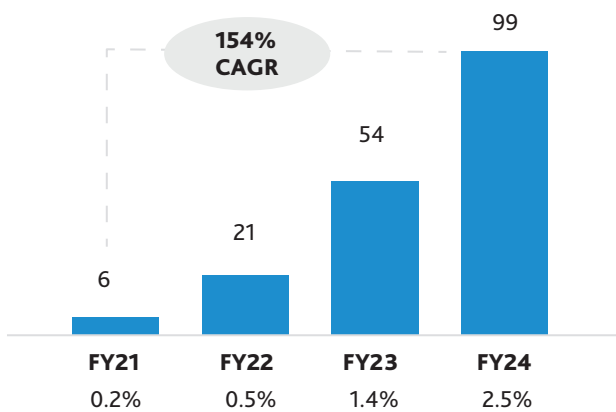
**18%**

Maharashtra

**13%**

Karnataka

VOLUME SALES ('000)



PENETRATION

Top states (in terms of market share)

Sales are soaring in Mumbai and Bengaluru due to high purchasing power and robust charging infrastructure development.

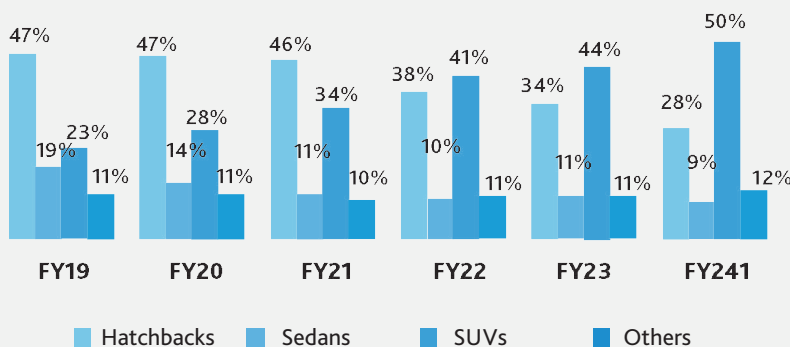
TOTAL COST OF OWNERSHIP (INR PER KM)

|            | PETROL | CNG | EV         |
|------------|--------|-----|------------|
| Private    | 15.4   |     | 15.6 (+2%) |
| Commercial |        | 6.4 | 5.2 (-19%) |

TCO is currently favourable for commercial fleets

Disclaimer: TCO calculation is for informational purposes only. While we aim for accuracy, the figures are based on assumptions that may vary by individual circumstances and market conditions.

## India's Four-Wheeler Market Is Rapidly Shifting From Hatchbacks And Sedans To SUVs, Driven By Consumer Demand For More Space, Comfort And A Sense Of Commanding Road Presence



In EVs, batteries are positioned underfloor for improved stability, making SUVs ideal for this design

Growing consumer preference for SUVs is easing the sales process for EV manufacturers

Offering Global Features At Affordable Prices Has Been A Hallmark Of India's Automobile Industry And Will Remain Central To Its EV Narrative

### Tata and Mahindra

OEMs with a five-star safety rating in less than USD 10,000 vehicle price category



## INR 10-20 Lakh Price Range Is Key For Mass E4W Penetration In India, Striking A Balance Between Affordability And Quality

### Industry Leaders In E4W Segment

| TOP PLAYERS         | FY22  | FY24  | CHANGE |
|---------------------|-------|-------|--------|
| Tata Motors         | 86.0% | 69%   | -17.0% |
| MG Motors           | 11.3% | 13.7% | 2.4%   |
| Mahindra & Mahindra | 0.7%  | 6.9%  | 6.2%   |
| BYD Auto            | 0.3%  | 2.2%  | 1.9%   |
| Others              | 1.7%  | 8.2%  | 6.5%   |

BYD launched its electric SUVs in the premium price segment of the market, allowing them to position themselves in a less competitive space

### Major OEMs Are Implementing Various Strategies To Gain Market Share In This Segment

#### Tata Motors

- ▶ First mover advantage
- ▶ Focusing on delivering competitive TCO

#### BYD Auto

Focusing on aspirational purchases through premium offerings

#### Mahindra & Mahindra and MG Motors

Following the suit and launching vehicles in the compact SUV segment

#### Toyota and Honda

Emphasising on playing through hybrid models

### All Major OEMs In India Have Established Clear EV Targets, With Plans To Launch Over 20 New Models By 2025

| COMPANIES           | NUMBER OF EV MODELS | NUMBER OF EV MODELS TO BE LAUNCHED BY 2025 | PLANS AHEAD  |
|---------------------|---------------------|--|--|
| Tata Motors         | 5                   | 5  | Invest ~USD 2bn for EV production, 100K public charging points and 50% solar home charging by 2030 |
| Mahindra & Mahindra | 1                   | 4  | Invest ~USD 1.45bn for 18K EV production volumes by 2026   |
| BYD Auto            | 4                   | 1  | Import-only strategy with a focus on premium vehicles  |
| MG Motors           | 3                   | 5  | Invest ~USD 600mn for EV and ICE vehicle production  |
| Hyundai Motors      | 1                   | 4  | Invest ~USD 750mn to set up EV plant and USD 84mn for battery production                           |
| Maruti Suzuki       | 0                   | 3  | Invest ~USD 400mn to produce 250K EVs and ~USD 900mn for battery production by 2026                |



# Despite Government Support For EVs, HEVs Are Likely To Coexist And Compete Due To Its Superior Efficiency

HEVs<sup>1</sup> Are Providing Advantage To Consumers As Well As OEMs Making Them A Better Choice Even Over Pure EVs



Better fuel efficiency



Lower operating costs



Lower upfront cost compared to pure EVs



Eliminates charging infrastructure challenge

ADVANTAGE TO CONSUMERS

## KEY HYBRID MODELS IN INDIA

Suzuki Grand Vitara  
Toyota Hyryder

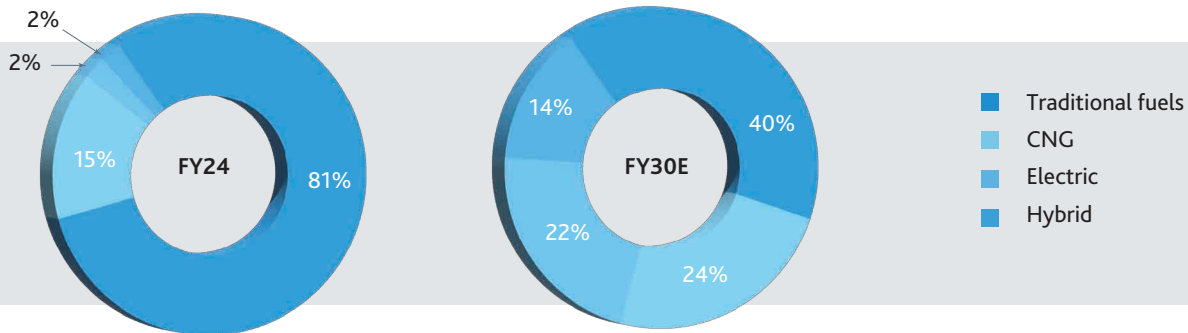
## NEW ENTRANTS

Suzuki Fronx  
Kia Clavis

OEMs can produce HEVs with less integration of their assembly lines compared to EVs

ADVANTAGE TO OEMS

With The Significance Of CNG And Traditional Vehicle Types, India Will Have A Balanced Automotive Landscape



The Many Benefits Of HEVs Have Resulted In Their Sales Reaching Levels Comparable To Those Of Pure EVs

|                     | H1 CY23 | H1 CY24 | % change |
|---------------------|---------|---------|----------|
| Pure EV sales       | 49,028  | 54,118  | +10.4%   |
| Strong hybrid sales | 40,811  | 51,897  | +27.2%   |

## HEVs are currently receiving limited policy support from the Government

### COUNTRY-WIDE RATES ON DIFFERENT FUEL-TYPE VEHICLES

| VEHICLE TYPE             | GST RATE | ADDITIONAL CESS |
|--------------------------|----------|-----------------|
| Pure electric vehicles   | 5%       | 0%              |
| Hybrid electric vehicles | 28%      | Up to 15%       |
| ICE vehicles             | 28%      | 1% to 22%       |

### INITIATIVES BY STATE GOVERNMENTS

- ▶ Uttar Pradesh: Waived registration taxes on hybrid vehicles priced below INR 10 lakhs
- ▶ Karnataka: Planning to implement tax waivers for hybrid vehicles

<sup>1</sup> HEVs: Hybrid Electric Vehicles

Source: FADA Journal, CRISIL Research, Industry Research, BDO India Analysis

# Partnerships Like Olectra Greentech - BYD Are Driving Innovation In E-Buses, Opening Doors For New Entrants



India is the second largest bus market globally

## ELECTRIC BUS (eBus)

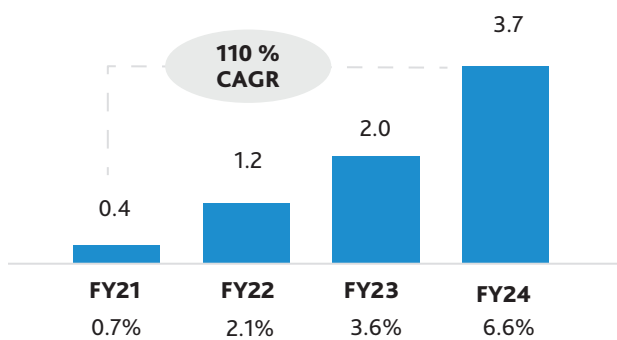
**85%**  
YoY growth

**7.8K**  
Cumulative sales till FY24

**23%**  
Maharashtra

**22%**  
Delhi

### VOLUME SALES ('000)



### PENETRATION

### Top states (in terms of market share)

Maharashtra: Historic highs in bus sales  
Delhi: Strong central and state support for EV adoption

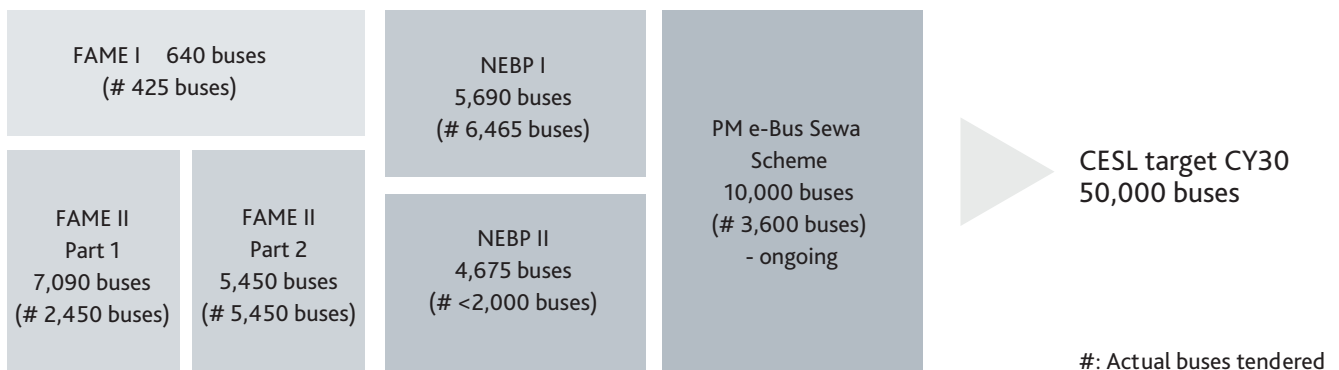
### TOTAL COST OF OWNERSHIP (INR PER KM)

| Diesel | EV (without subsidy) | EV (with subsidy) |
|--------|----------------------|-------------------|
| ₹37.6  | 66.1 (+76%)          | 53.4 (42%)        |

TCO is currently unviable for e-buses (both with and without subsidy)

Disclaimer: TCO calculation is for informational purposes only. While we aim for accuracy, the figures are based on assumptions that may vary by individual circumstances and market conditions

## A Series Of Targeted Schemes Have Been Launched For Subsidising Electric Public Buses To Support The Government's Ambitious Electrification Target



## The Government Is Yet To Introduce Schemes To Support The Private Bus Market, Which Accounts For ~2x The Sales Volume Of The Public Bus Sector

Annual bus sales in India



Public buses  
15-20K

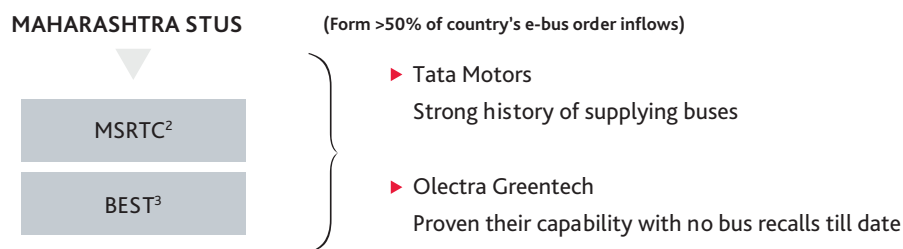
Private buses  
30-35K

## Tata Motors And Olectra Greentech; Securing 65% Of The E-Bus Orderbook, Are Emerging As Leaders In The Segment

### INDUSTRY LEADERS IN E-BUS SEGMENT

| TOP PLAYERS          | FY22  | FY24 | CHANGE |
|----------------------|-------|------|--------|
| Tata Motors          | 23.6% | 48%  | 24.4%  |
| JBM Auto             | 20.8% | 14%  | -6.7%  |
| Olectra Greentech    | 18.7% | 14%  | -4.6%  |
| PMI Electro Mobility | 33.5% | 10%  | -23.2% |
| Others               | 3%    | 13%  | 10.1%  |

### Tata Motors And Olectra Greentech Have Emerged As The Primary Beneficiaries Of The Majority Of GCC Tenders From STUs<sup>1</sup> In Maharashtra For Electric Buses

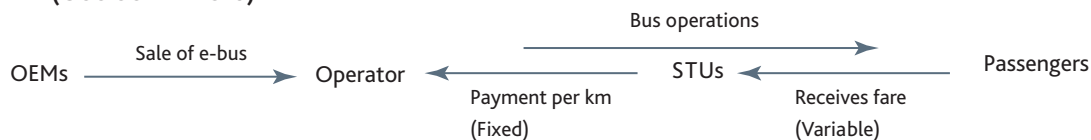


### E-Buses, Priced At Twice That Of ICE Buses, Have Led To The Emergence Of Wet Leasing In The Segment

#### INITIAL MODEL



#### NEW MODEL (GCC CONTRACTS)



With GCC model:

- ▶ STUs with weak balance sheets can also deploy e-buses
- ▶ Operational inefficiencies are mitigated by operators managing the fleet

### PARTNERSHIPS AMONG PSUs, OEMs AND THE ARMED FORCES ARE DRIVING HYDROGEN BUS INNOVATION, POSING A POTENTIAL CHALLENGE FOR E-BUSES

NTPC<sup>4</sup> – Indian Army , IOCL<sup>5</sup> – Tata Motors -> Replacement risk for e-bus industry

1 STUs: State Transport Undertaking

3 BEST: Brihanmumbai Electricity Supply and Transport Undertaking

5 IOCL: Indian Oil Corporation Limited

2 MSRTC: Maharashtra State Road Transport Corporation

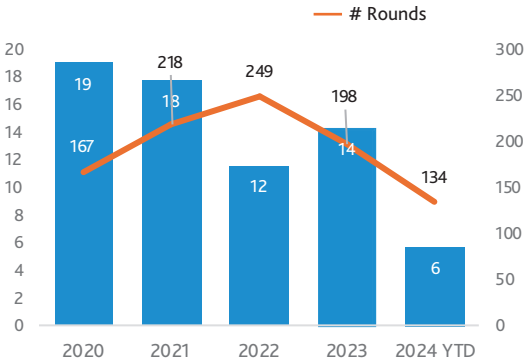
4 NTPC: National Thermal Power Corporation Limited

## New-Age OEMs Are Making Significant Leaps In Their Financial Traction And International Appeal

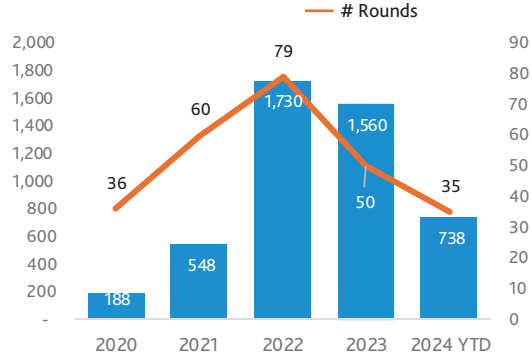
### OEMS

As of November 2024

#### GLOBAL FUNDING (USD BN)



#### INDIA FUNDING (USD MN)



### INDIA AS A PERCENTAGE OF TOTAL FUNDING

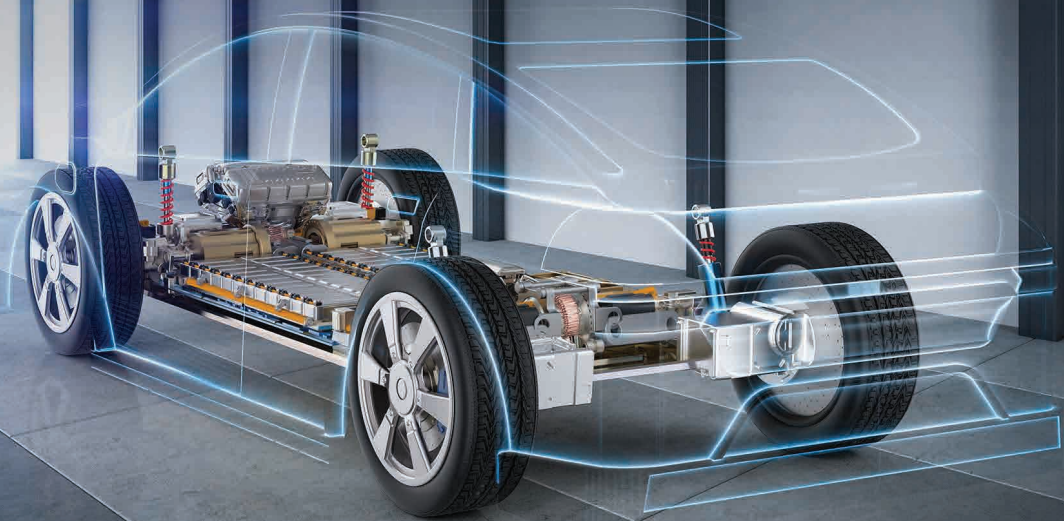
- 2020-2021: 1-3% OF GLOBAL FUNDING
- 2022 ONWARDS: >10% OF GLOBAL FUNDING

### RECENT FUNDING ROUNDS IN INDIA

| DATE          | COMPANY                        | DESCRIPTION         | STAGE    | LATEST REVENUE (USD) | FUND RAISED (USD) | INVESTORS   |
|---------------|--------------------------------|---------------------|----------|----------------------|-------------------|---|
| November 2024 | ePlane                         | E4W                 | Series B | 0.1mn (2023)         | 14mn              | Speciale Invest, Antares Ventures                                 |
| August 2024   | Ather Energy                   | E4W                 | Series E | 225mn (2024)         | 71.5mn            | NIIF  |
| August 2024   | Kinetic Group                  | E2W,E4W             | Series A | 38mn(2023)           | 8mn               | Greater Pacific Capital   |
| July 2024     | Simple Energy                  | E2W                 | Series A | 0.3mn(2023)          | 20mn              | Vasavi Green Tech, Iheart Properties                              |
| June 2024     | EKA Mobility                   | E-buses, LCVs       | Seed     | 0.4mn(2023)          | 24mn              | Mitsui  |
| May 2024      | Euler Motors                   | E3W                 | Series A | 8.2mn(2023)          | 24mn              | British International Investment, Blume Ventures, Alteria Capital |
| February 2024 | AutoNxt Automation             | E-Tractor, E-Cycles | Seed     | 0.1mn(2023)          | 3mn               | Saama Capital, Bluehill Capital                                   |
| February 2024 | 3evi                           | E3W                 | Series A | 2.5mn(2023)          | 12mn              | Mahanagar Gas   |
| February 2024 | River Mobility                 | E-Bikes             | Series B | NA                   | 40mn              | Lowercarbon Capital, Toyota Ventures, Maniv Mobility              |
| November 2023 | Emotorad                       | E-Cycles            | Series B | 16mn (2023)          | 20 mn             | Panthera, Alteria Capital, Green Frontier Capital                 |
| October 2023  | PMI Electro Mobility Solutions | E-Buses             | Series C | 5.5mn (2023)         | 30 mn             | Piramal Group   |

# Break-up of Materials

ICE vs EV



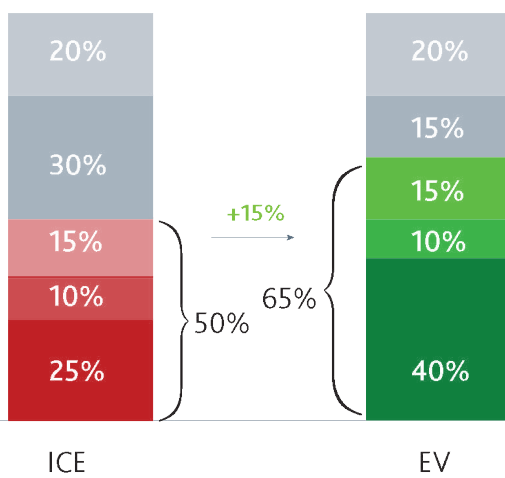
# EVs Consist Of Different Components, Resulting In A Pricing Structure That Differs From That Of ICE Vehicles

## COMPARISON OF VARIOUS COMPONENT COSTS IN ICE AND EV

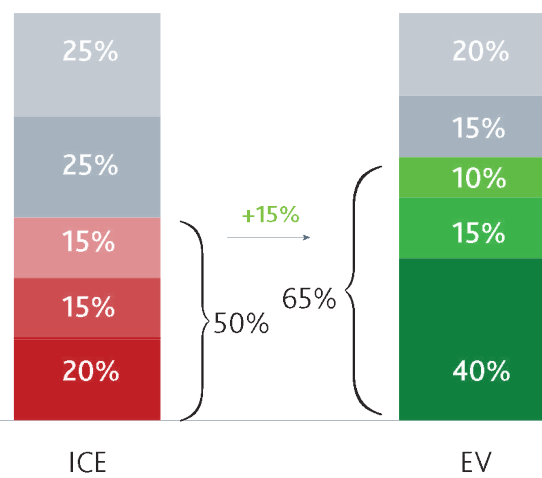
- Battery
- Powertrain (motors)
- Power electronics
- Chassis and body
- Engine
- Drive transmission
- Gearbox
- Others



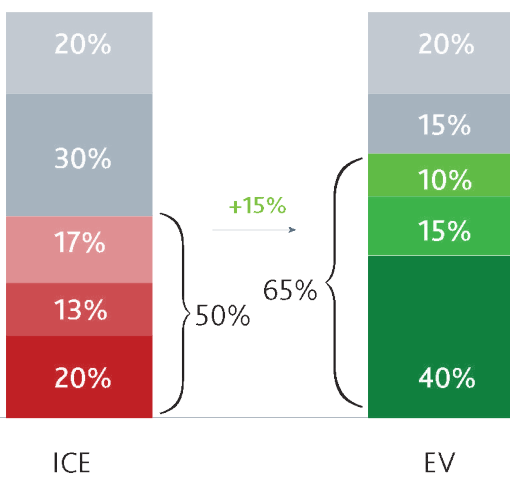
Electric two-wheelers



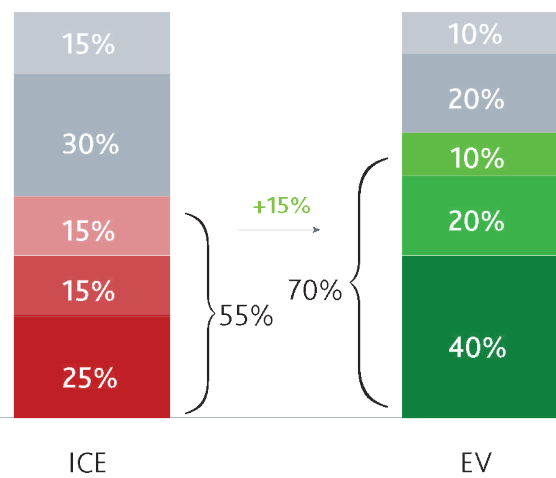
Electric three-wheelers



Electric four-wheelers

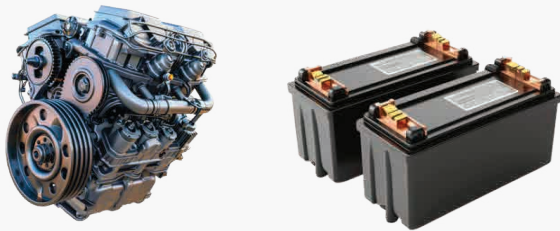


Electric buses



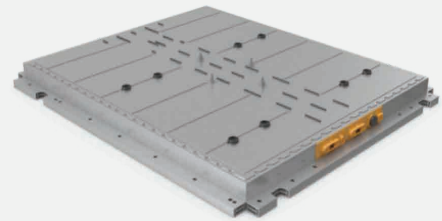
### Batteries Contribute To Both The Cost And Weight Of An EV

#### ICE VEHICLE ENGINE + BATTERY



WEIGHT: 140 KGS

#### EV BATTERY



WEIGHT: 300-600 KGS

### While Lightweighting Initially Increases The Costs Of EVs, It Ultimately Enhances The Vehicle's Economic Feasibility In The Long Run



10% REDUCTION IN VEHICLE WEIGHT CAN RESULT IN A 6-8% RANGE IMPROVEMENT

# EV Motors



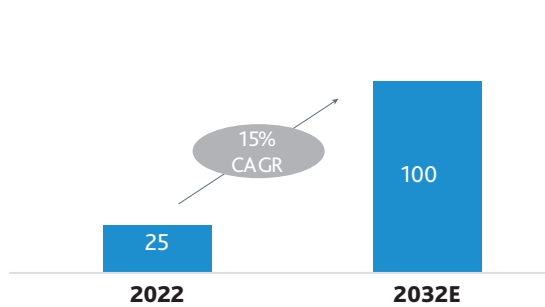


# EV OEMs And Traditional Electric Motor Companies Are Driving Rapid Product Development

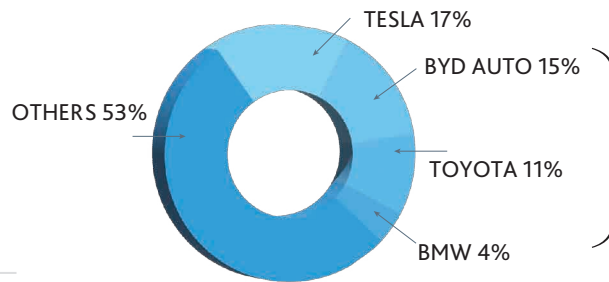
EV OEMs are concentrating on designing motors with the needs of vehicle owners in focus, whereas traditional motor companies are prioritising technological advancements.

## GLOBAL MARKET SIZE (IN USD BILLION)

Includes BEV, PHEV, HEV four-wheelers



## TOP EV MOTOR MANUFACTURERS GLOBALLY (SEPTEMBER 2023)



EV OEMs are the leaders worldwide, primarily producing motors for their own vehicles (except BYD)

## With E4Ws Comprising Over 75% Of The EV Market, The Emphasis Is On Advancing Motor Technologies In This Segment

| MOTOR TYPE                                | CHARACTERISTICS |             |        | MARKET SHARE<br>(In terms of volumes) | APPLICATIONS         |
|---|-----------------|-------------|--------|---------------------------------------|----------------------|
|   | EFFICIENCY      | POWER RANGE | COST   |                                       |                      |
| Induction Motor (IM)                      | Low             | Low         | High   | Low                                   | Outdated             |
| Brushless Direct Current Motor (BLDC)     | Medium          | Medium      | Medium | Medium                                | e2W, e3W             |
| Permanent Magnet Synchronous Motor (PMSM) | High            | Medium      | Low    | Medium                                | LCVs, e3W, e4W, HCVs |
| Switched Reluctance Motor (SRM)           | Medium          | Low         | Medium | Medium                                | LCVs, e3W, e4W, HCVs |

## Due To Widespread Range Anxiety, PMSM Motors Are Gaining Preference

### TOP NON-OEM MOTOR MANUFACTURERS

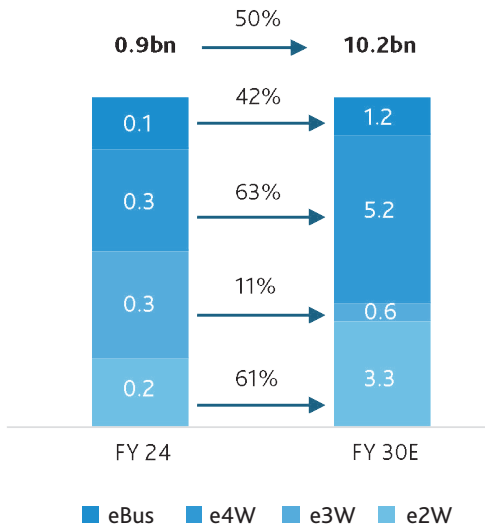
| TOP PLAYERS            | SEGMENTS CATERING | OEM PARTNERSHIPS          |
|------------------------|-------------------|---------------------------|
| Bosch                  | Across segments   | Tesla, Toyota, Volkswagen |
| ABB                    | Across segments   | Mercedes, BMW, Volkswagen |
| Nidec Corporation      | E4W               | GAC, Geely                |
| Siemens                | Across segments   | Mercedes, BMW, Ford       |
| Johnson Electric Group | Across segments   | General Motors, Ford      |

Global OEMs are collaborating on design and technology while opting to manufacture these motors in-house

# EV Motor Manufacturers Have Directly And Indirectly Benefited From Numerous Government Initiatives

## EV MOTORS MARKET SIZE IN INDIA (USD BILLION)

basis EV sales penetration forecast by NITI Aayog



## MOTOR TYPE SEGMENTATION

| VEHICLE CATEGORY | POWER RANGE    | HIGHEST-USED MOTOR TYPE |
|------------------|----------------|-------------------------|
| e2W              | 1 kW - 5 kW    | BLDC                    |
| e3W              | 2 kW - 10 kW   | BLDC, PMSM              |
| eCargo           | 5 kW - 10 k    | PMSM, BLDC              |
| e4W              | 50 kW - 200 kW | PMSM                    |
| eBus             | 50 kW - 300 kW | PMSM                    |

TO FORM 85% OF THE INDIAN MOTOR INDUSTRY BY 2030 (VALUE TERMS)

## The Indian Government Is Focusing On Indigenous Development Of EV Motors

### PRODUCTION LINKED INCENTIVE SCHEME (PLI)

- ▶ Outlay of INR 57,942cr (USD 7.2bn) to auto OEMs and component manufacturers
- ▶ OEMs can receive government grants ranging from 13% - 18% of the annual sales value

### EV POLICY 2022

- ▶ Aims to attract investments of at least INR 41,500cr (USD 5.6bn) in the EV manufacturing sector
- ▶ Companies must achieve 25% Domestic Value Addition by the 3<sup>rd</sup> year and 50% by the 5<sup>th</sup> year of operations to qualify for a 15% reduced custom duty on completely built units (CBUs) of EVs, down from previous rates of 70% to 100%

### MEITY'S<sup>1</sup> SPECS<sup>2</sup> SCHEME

25% Capex subsidy for manufacturing of BLDC motors, printed circuit boards, semiconductors.

<sup>1</sup> MeitY: Ministry of Electronics and Information Technology

<sup>2</sup> SPECS: Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors

## Domestic EV Motor Manufacturers Need Product Linked Incentives (PLI) Or Significant Volumes To Achieve Profitability

### KEY EV MOTOR MANUFACTURERS IN INDIA

| COMAPNY                                  | CATEGORIES    |                   |   |                              |
|--|---------------|-------------------|---|------------------------------|
|  | E2W           | E3W               | E4W   | E-Bus                        |
| Mahindra Electric                        | Hero Electric | Mahindra Electric |   |                              |
| Tata AutoComp Systems                    |               |                   | Tata Motors   | Tata Motors                  |
| Ashok Leyland                            |               |                   |   | Switch Mobility (subsidiary) |
| UQM Technologies India                   |               |                   |   | Ashok Leyland                |
| Bosch                                    |               | Mahindra Electric | Tata Motors<br>(Nexon and Tigor)<br>Mahindra & Mahindra |                              |
| Kinetic Green Energy and Power Solutions |               | Kinetic Green     |   |                              |

Note: Sona Comstar is partnering with Enedym Inc. to produce magnet-less SRMs

### MARKET DYNAMICS

- ▶ **Indian strategy**  
Indian companies are prioritising BLDC motors for e2W and e3W due to their low cost and higher durability, making them ideal for delivery fleets
- ▶ **Cost efficiency challenge**  
While the global focus has shifted towards advanced versions of PMSM motors, Indian motor manufacturers are still concentrating on achieving cost efficiencies with their standard PMSM motor

### 50 KW PMSM MOTOR

| MODEL          | VOLUMES (2023)   | PRICE/ MOTOR |
|----------------|------------------|--------------|
| Tesla Model 3  | 37k units/ annum | USD 624      |
| Chevrolet Bolt | 29k units/ annum | USD 685      |
| BMW i3         | 23k units/ annum | USD 830      |

As production volumes increase, price per motor drops significantly

As E4W volumes pick up in India, Indian OEMs are expected to follow suit

## While Industry Leaders Mass-Produce Radial Flux PMSMs, New-Age Companies Are Differentiating With Axial Flux PMSMs And SRMs

Note: Axial Flux Motors have higher torque and power density compared to radial flux motors

### NEW-AGE MOTOR COMPANIES

| COMPANY                     | CAPABILITY |      |       |     | PARTNERSHIPS        |
|-----------------------------|------------|------|-------|-----|---------------------|
|                             | IM         | BLDC | PMSM  | SRM |                     |
| Chara Technologies          |            |      |       |     |                     |
| Entuple E-Mobility          |            |      |       |     | JV with Aditya Auto |
| Tsuyo                       |            |      |       |     | Greaves Cotton      |
| Revoh Innovations           |            |      |       |     |                     |
| Physics Motors              |            |      | Axial |     |                     |
| Agni Motors                 |            |      | Axial |     |                     |
| Torus Robotics              |            |      | Axial |     |                     |
| Quanteon World              |            |      | Axial |     |                     |
| Elecnovo                    |            |      |       |     |                     |
| Compage Automation System   |            |      |       |     |                     |
| Aditya Avartan Technologies |            |      |       |     |                     |
| Bhorzvan Motors             |            |      | Axial |     |                     |
| Matel                       |            |      |       |     |                     |
| C Electric Drives           |            |      |       |     |                     |
| Naxatra Labs                |            |      | Axial |     | Joy e-Bikes         |

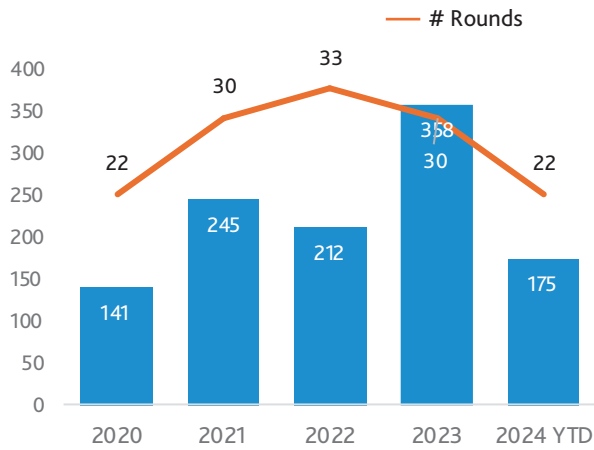
- ▶ Companies with SRM capabilities are attracting interest from VCs and corporate investors
- ▶ Most start-ups are focusing on e2W and e3W segments due to a larger customer base and simpler technology
- ▶ **Bhorzvan Motors** and **Entuple E-Mobility** are two notable startups with high-power EV motor manufacturing capabilities

## However, The Segment Is Still Nascent, With Companies Focused On Developing Efficient Motors And Securing Early-Stage Funding

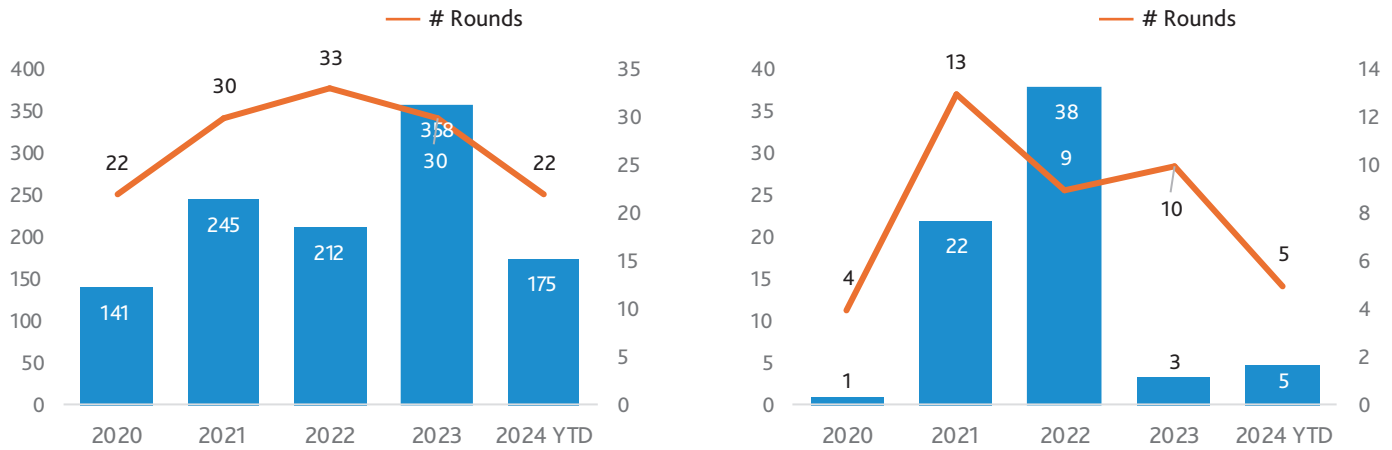
### MOTOR AND MOTOR CONTROLLERS

As of November 2024

#### GLOBAL FUNDING (USD MILLION)



#### INDIA FUNDING (USD MILLION)



### KEY FUNDRAISES IN INDIA

| DATE           | COMPANY                    | DESCRIPTION        | STAGE    | LATEST REVENUE (USD) | FUND RAISED (USD) | INVESTORS                                  |
|----------------|----------------------------|--------------------|----------|----------------------|-------------------|--|
| May 2024       | Matel                      | PMSM Motors        | Series A | 4.1mn (2024)         | 4mn               | Transition VC                              |
| January 2024   | Physics Motors             | PMSM Motors        | Seed     | 158K (2023)          | 0.7mn             | KPI Physics Motors                         |
| June 2023      | Revolv Innovations         | BLDC Motors        | Seed     | 16K (2023)           | 0.6mn             | Whiteboard Capital, Nexzu Technologies     |
| June 2023      | Quanteon World             | PMSM Motors        | Seed     | 48K (2023)           | 1.5mn             | GAIL                                       |
| December 2022  | Chara Technologies         | SynRM Motors       | Seed     | 188K (2023)          | 5.6mn             | Kalaari Capital, Exfinity Venture Partners |
| December 2022  | Tsuyo                      | BLDC Motors        | Seed     | 1.6mn (2023)         | 0.1mn             | Individuals                                |
| March 2022     | Compage Automation Systems | PMSM & BLDC Motors | NA       | 720K (2022)          | 0.3mn             | Steer Advisory Services                    |
| December 2021  | Elecново                   | PMSM & BLDC Motors | Seed     | 28K (2023)           | 0.8mn             | Sk & FI Investments LLC                    |
| September 2019 | Bhorzvan Motors            | PMSM Motors        | Seed     | 10K (2021)           | 0.1mn             | RMZ Management                             |

#### INVESTMENT THESIS:

- ▶ As the EV industry in India expands, motors are projected to represent 3% of the automotive sector, creating a USD 10bn opportunity
- ▶ The focus will gradually shift from manufacturing capability to efficiency and cost-effectiveness
- ▶ New-age companies emphasising these aspects are well-positioned for partnerships with OEMs to share innovations
- ▶ With funding still in its early stages for these firms, early identification of such companies presents a significant opportunity for investors

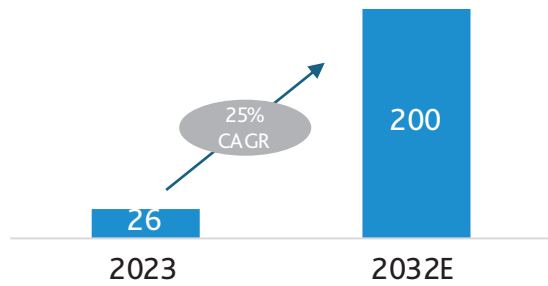
# Charging Ecosystem



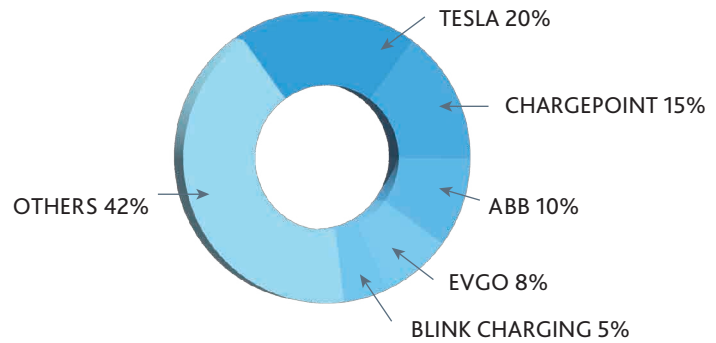
# Despite China Boasting The Highest EV Penetration, Its Charger Companies Do Not Rank Among The Top Global Charging Operators

- ▶ The charging industry in China is highly fragmented
- ▶ Major markets in the USA and Europe are favouring domestic companies for charging infrastructure due to their long history of operations in those countries

## GLOBAL MARKET SIZE (IN USD BILLION)



## TOP EV CHARGING NETWORKS GLOBALLY (AS OF AUGUST 2023)



| REGIONS             | CHINA   | USA    | EUROPE | INDIA   | OPPORTUNITY |
|---------------------|---------|--------|--------|---------|-------------|
| EV-to-charger ratio | 3.5 : 1 | 10 : 1 | 6 : 1  | 135 : 1 | ←           |

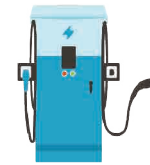
## TYPES OF CHARGERS



LEVEL 1 (L1)



LEVEL 2 (L2)



LEVEL 3 (L3)

| POWER                    | 120V AC                                   | 208 - 240V AC                                      | 400V - 800V DC                      |
|--------------------------|---|--|-------------------------------------|
| DISTANCE PER CHARGE HOUR | 5 - 8 KM/ HR                              | 16 - 100 KM/ HR                                    | >100 KM/ HR                         |
|                          | ↓   | ↓  | ↓                                   |
|                          | Provided as home chargers for E2W and E3W | Provided as home chargers for E4W and used by CPOs | Used by CPOs and e-bus fleet owners |

## PRICE OF L3 CHARGERS = 5 X PRICE OF L2 CHARGERS

- ▶ Advanced chargers with faster charging times are being rapidly introduced, posing a significant risk for CPOs<sup>1</sup> having the previous charger versions
- ▶ Higher asset sweating of chargers for quick capex recovery has become even more critical

<sup>1</sup> CPO: Charge Point Operators

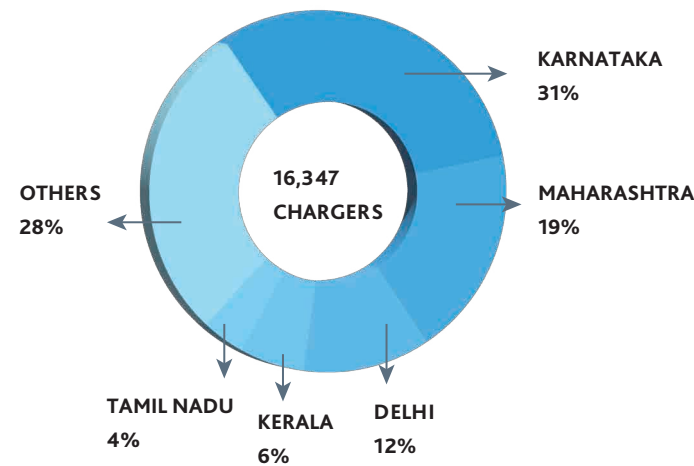
# India's EV Charging Infrastructure Is Urban-Focused, Prompting The Government To Ensure Broader Accessibility Across The Country

## EV CHARGING MARKET SIZE IN INDIA



Although charging stations are growing, the distribution is demographically skewed towards urban areas

### STATE-WISE SPLIT OF PUBLIC/ SEMI-PUBLIC EV CHARGERS (MARCH 2024)



### MAJOR CHARGING INFRA PROJECTS ARE FOCUSING ON TIER-1 CITIES

- ▶ DELHI: Government planning to roll out 18,000 chargers in the city
- ▶ MUMBAI: Adani Electricity and Tata Power planning to install 9,200 chargers in housing societies
- ▶ BENGALURU: JOULE<sup>1</sup> Project (co-founded by Amazon and Global Optimism) planning to provide charging support to 5,500 EVs by 2030

The Government is aiming to address both the issues – the uneven distribution of chargers and low charger availability per vehicle

- ▶ The Ministry of Power (MoP) is looking to address the challenge of geographic charger distribution
  - At least one charger in a grid of 3 km x 3 km
  - One charging station to be set up every 25 km on both sides of highways and roads



- ▶ The Ministry of Housing and Urban Affairs (MoHUA) is aiming for ideal charging penetration
  - Provision norms for charging points in buildings
    - E2W: 1 slow charger per 2 vehicles
    - E3W: 1 slow charger per 2 vehicles
    - E4W: 1 slow charger per 3 vehicles
    - 1 fast charger per 10 vehicles (not compulsory)

1.3 million public chargers would be required by 2030 based on the target ratio set by the Government

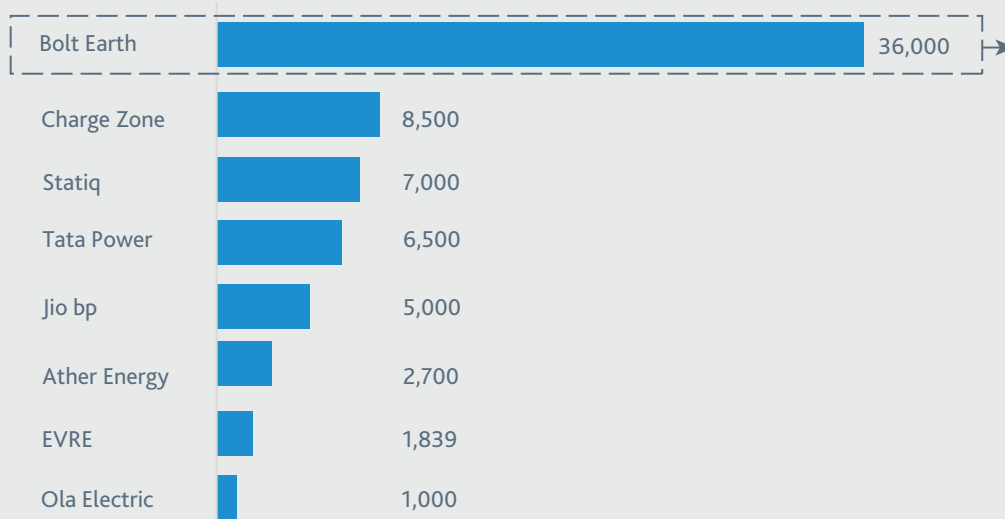
<sup>1</sup> JOULE: Joint Operation Unifying Last-Mile Electrification  
Source: Ken Research, Industry Research, BDO India Analysis



## As Chargers Are Vital For EVs, A Service Ecosystem Is Emerging To Provide Comprehensive Charging Solutions

Bolt and ChargeZone are effectively addressing location and penetration challenges, enabling them to surpass larger competitors

### TOP CHARGE POINT OPERATORS (CPOS) IN INDIA



Peer-to-peer charging networks: Partners with EV owners to share their private charging stations with other customers under revenue-sharing basis

MoUs with Hyundai, Mahindra, Tata to install chargers at their dealership locations

Asset-light, profitable B2B service models are gaining traction as companies seek to enter the expanding EV market without incurring heavy infrastructure capex costs

#### 1) AGGREGATORS

Streamline the CPO services offered under one unified brand to customers

Challenges Indian charging aggregators are facing:

- ▶ Data inconsistency: Platforms are struggling with incomplete or outdated data
- ▶ Competition from established players: Major companies have started providing aggregator services

#### 2) SOFTWARE DEVELOPERS

Handling software, providing add-ons such as data analytics, maintenance, and security

Companies

Kazam

Numocity

BrightBlu

#### 3) OTHERS

Ionage

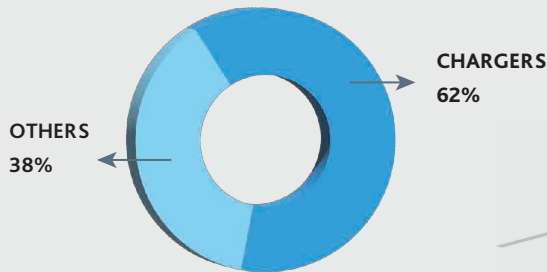
Software for CPO set-up location

Mobec Innovations

Portable chargers for EVs

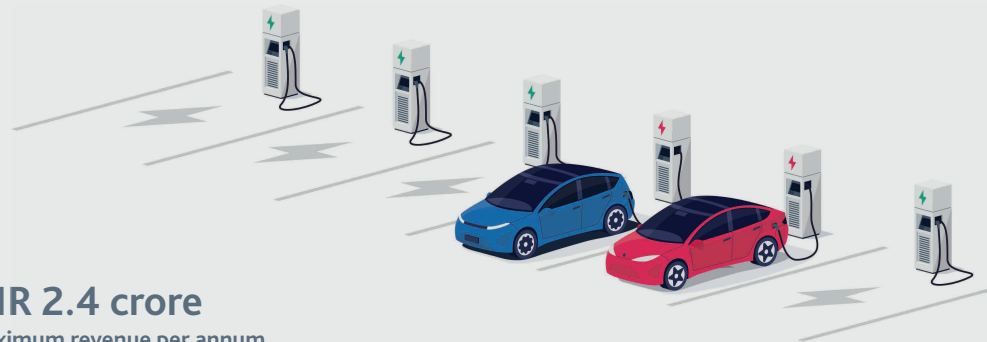
# A Highway Charging Station Needs To Achieve ~50% Utilisation Rate To Generate A 15% Return On Investment

**CAPEX: INR 58 LAKHS**



**OPERATIONAL COST PER ANNUM**

**INR 47 lakhs**



**CHARGING STATION CAPACITY**

**INR 17 lakhs**

Maximum kwh discharged per annum

**INR 2.4 crore**

Maximum revenue per annum

**DISCHARGE REQUIRED PER ANNUM FOR 15% ROI: 8.4 LAKH KWH**

**ASSUMPTIONS:**

- ▶ Charging station life: 5 years
- ▶ Number of days of operations per year: 360 days
- ▶ Charging station has eight chargers: 2 L2 AC chargers (e2W, e3W), 4 L2 DC chargers (e4W), 2 L3 chargers (e-Bus)
- ▶ Selling price per kwh: ₹14, cost price per kwh = ₹7
- ▶ Land rental: 6,000 sq ft x ₹50 per sq ft
- ▶ Employee expense: ₹25,000 per month x 3 employees
- ▶ Repair and maintenance: 5% of Capex
- ▶ Other costs: ₹10,000 per month

Disclaimer: Unit economics calculation is for informational purposes only. While we aim for accuracy, the figures are based on assumptions that may vary by individual circumstances and market conditions.

**Key challenges**

**1) INTEROPERABILITY**

**CHARGERS**



**CHARGING NETWORK**



**PAYMENT NETWORK**



Users are juggling between different apps for availing charging services  
 Eg: Tata Power and Ather Energy have different applications to avail their charging services

# Establishing Viability Will Be A Crucial First Step To Create A Sustainable Charging Ecosystem

## 2) TECHNOLOGICAL OBSOLESCENCE AND LIMITED AVAILABILITY

AC: <=2.5 kW  
DC: <=15 kW  
Slow chargers  
Bharat DC-001  
Public chargers installed initially

AC-DC: <=400 kW  
Fast chargers  
CCS  
Charge type in new models rendered by OEMs

In New Delhi, 39 out of 100 EV charging stations in prime locations are non-operational, with theft and poor maintenance worsening the issue.



3) LOW PENETRATION



4) URBAN AREA-DRIVEN



5) HIGH DOWNTIME %

## Optimising several business domains will be essential to steer CPOs toward profitability

### OPERATING REVENUE EFFICIENCY

- ▶ Location selection: Urban cities and major road networks
- ▶ Higher uptime: Using reliable chargers
- ▶ Dynamic pricing

### ESTABLISHING NON-OPERATING REVENUE STREAMS

- ▶ Land rental
- ▶ Retail partnerships
- ▶ Advertising

### GOVERNMENT INITIATIVES

- ▶ Include charging infrastructure under priority sector lending
- ▶ Provide electricity at charging points at concessional rates
- ▶ Public-private partnership (provide land at subsidised rates for setting up charging stations)

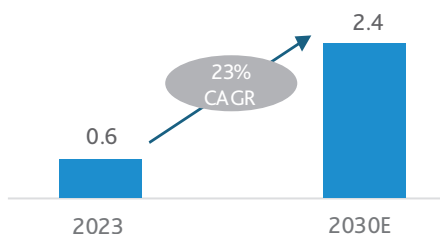
## With charging infrastructure being set up across the country, the energy sector has started brimming with opportunities

### SMART GRIDS

Optimise EV charging based on real-time energy availability



India market size (USD billion)



### ENERGY STORAGE SYSTEMS

Store excess energy during low-demand periods and release it during peak times

### VEHICLE-TO-GRID (V2G)

EVs act as distributed energy storage units, providing additional grid stability during outages

## CPOs Are Engaging In Backward Integration By Manufacturing Chargers To Gain Control Over Their Equipment

- ▶ CPOs aim to control charger quality and standards while adapting to the evolving charging industry
- ▶ Advanced modules can be quickly developed and integrated in their chargers

### COMPANY LANDSCAPE

| COMPANY                 | CHARGER MANUFACTURER | CPO | SOFTWARE | AGGREGATOR | OEM PARTNERSHIP                                |
|-------------------------|----------------------|-----|----------|------------|--|
| Tata Power              | Yes                  | Yes |          |            | Tata Motors, TVS, MG Motors, Bajaj Auto        |
| E-Fill Electric         | Yes                  | Yes |          |            | Kia  |
| Fortum India (GLIDA)    | Yes                  | Yes |          |            | Tata Motors, MG Motors                         |
| Exicom Tele-Systems Ltd | Yes                  | Yes |          |            | Mahindra & Mahindra                            |
| Ather Energy            | Yes                  | Yes |          |            | Ather Energy                                   |
| Chargezone              | Yes                  | Yes |          |            | Tata Motors, Kia, Hyundai, Mahindra & Mahindra |
| EV Motors India         | Yes                  | Yes |          |            | Hero   |
| Bolt.Earth              | Yes                  | Yes |          |            |  |
| Volttic                 | Yes                  | Yes |          |            |  |
| Kazam                   | Yes                  |     | Yes      |            |  |
| Brightblu               | Yes                  |     | Yes      |            |  |
| Statiq                  | Yes                  | Yes |          | Yes        | Tata Motors, Kia, Mahindra & Mahindra          |
| Delta Electronics India | Yes                  |     |          |            | Mahindra & Mahindra, MG Motors                 |
| Ola Electric            | Yes                  |     |          |            | Ola Electric                                   |
| ABB India               | Yes                  |     |          |            |  |
| Magenta Power           | Yes                  |     |          |            |  |
| Servotech Power Systems | Yes                  |     |          |            |  |
| Adani Total Energies    |                      | Yes |          |            | MG, Mahindra & Mahindra                        |
| Jio-bp                  |                      | Yes |          |            | TVS, Mahindra & Mahindra, Bajaj Auto, Blusmart |
| ElectricPe              |                      |     |          | Yes        |  |

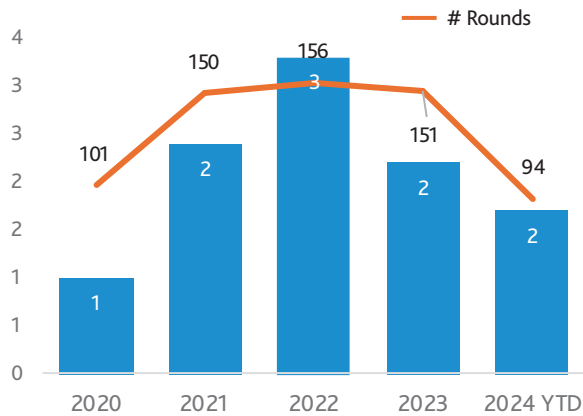
The EV charging segment is experiencing the entry of both major players and emerging start-ups

## Domestic Funds Are Focusing On Aggregators And Software Players, While Foreign Funds Are Targeting CPOs

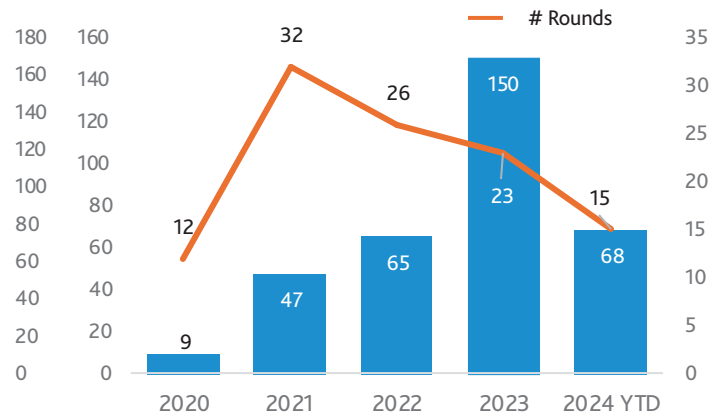
- ▶ Domestic funds are focused on optimising existing infrastructure by prioritising business models that expedite profitability
- ▶ International funds are cutting big cheques to use scale as a future advantage

As of November 2024

GLOBAL FUNDING (USD BILLION)



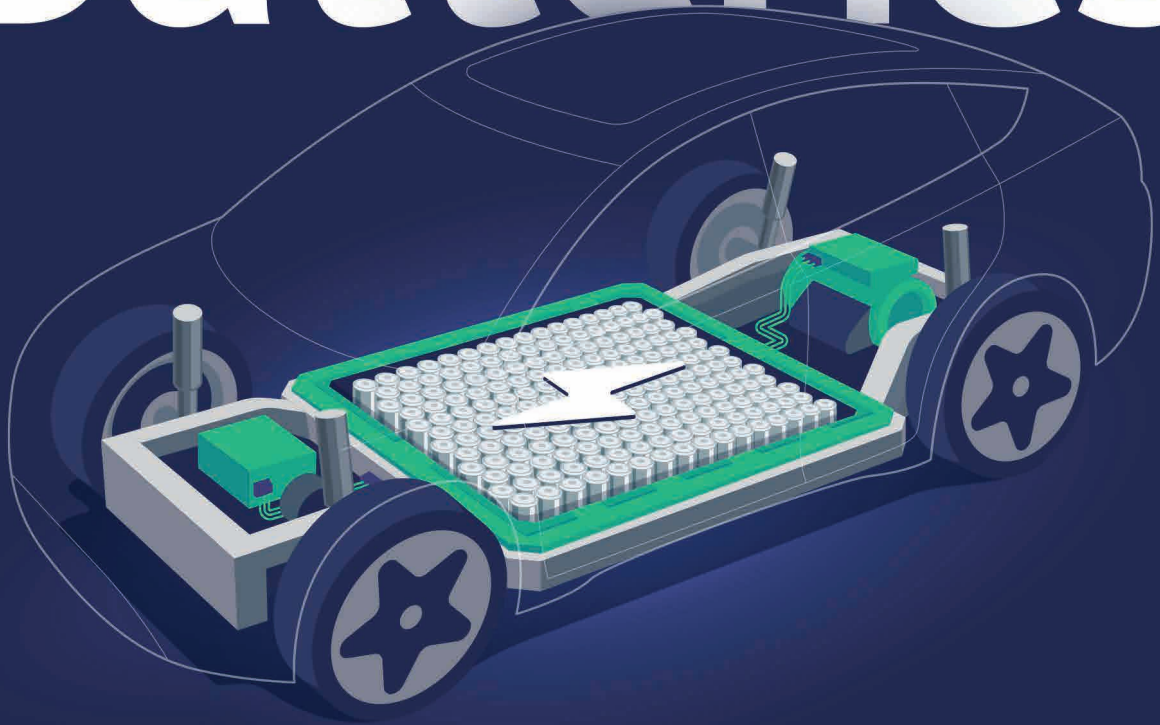
INDIA FUNDING (USD MILLION)



### RECENT FUNDRAISES IN INDIA

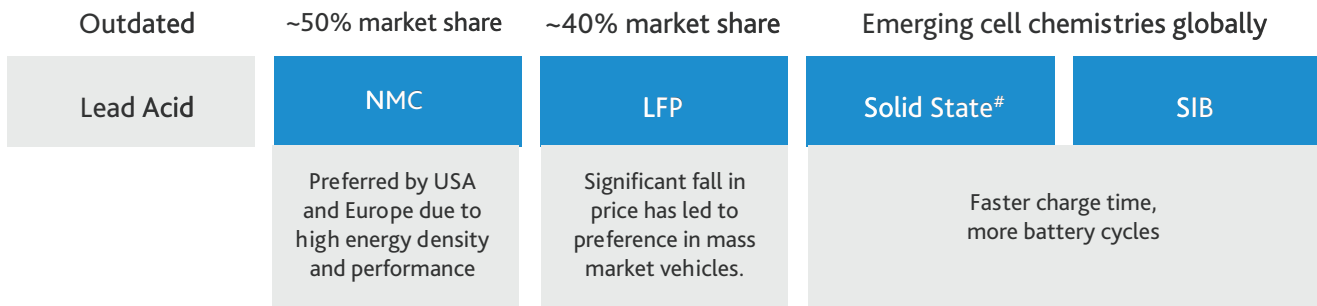
| DATE           | COMPANY          | DESCRIPTION       | STAGE    | LATEST REVENUE (USD) | FUND RAISED (USD) | INVESTORS   |
|----------------|------------------|-------------------|----------|----------------------|-------------------|---|
| August 2024    | Kazam            | Software for CPOs | Series A | 144K (2022)          | 8mn               | Avaana Capital Advisors, Vertex Ventures, Alteria Capital |
| July 2024      | ElectricPe       | Aggregator        | Seed     | 83.5K (2023)         | 3mn               | Green Frontier Capital, Blume Ventures, Micelio           |
| April 2024     | Charge Zone      | CPO               | Series A | 5.9mn (2023)         | 19 Mn             | British International Investment                          |
| February 2024  | EVRE             | Aggregator        | Series A | 1.3mn (2023)         | 1.6mn             | Jakamputi Nithin Kumar                                    |
| September 2023 | Pulse Energy     | Aggregator        | Seed     | 14.9K (2023)         | 1.5mn             | AdvantEdge, Peak XV Partners                              |
| August 2023    | Charge Zone      | CPO               | Series A | 5.9mn (2023)         | 20.7mn            | Macquarie Group, Capri Global Capital                     |
| April 2023     | EVRE             | Aggregator        | Series A | 1.3mn (2023)         | 1mn               | Banyan Tree Facilities, VVAG Partners                     |
| March 2023     | Charge Zone      | CPO               | Series A | 5.9mn (2023)         | 46mn              | BlueOrchard   |
| February 2023  | Magenta Mobility | CPO               | Series A | 2.3mn (2023)         | 22mn              | BP Ventures, Morgan Stanley                               |
| October 2022   | ElectricPe       | Aggregator        | Seed     | 83.5K (2023)         | 5mn               | Green Frontier Capital, Blume Ventures, Micelio           |

# Batteries



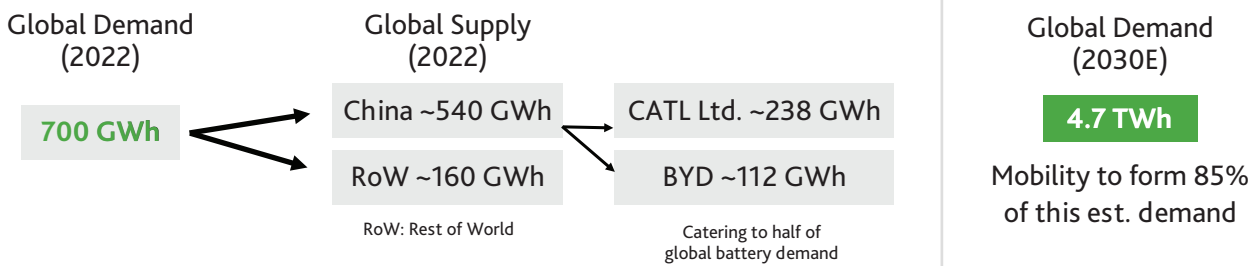
# With Contemporary Amperex Technology Co., Limited (CATL) Initiating Battery Price Reductions, Asian Countries Are Experiencing Immediate Benefits Due To Fewer Anti-China Policies

Globally, NMC and LFP chemistries are the most dominant battery technologies



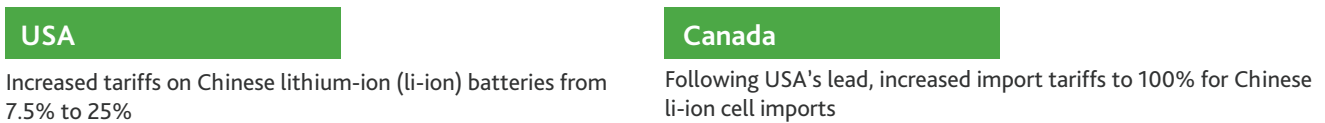
NMC: Nickel Manganese Cobalt LFP: Lithium Iron Phosphate SIB: Sodium Ion Battery  
 #Solid State: Uses a solid electrolyte for ionic conductions between the electrodes, instead of the liquid or gel polymer electrolytes found in conventional batteries

China has been processing largest volumes of NMC and LFP chemistry components, solidifying its dominance in this sector

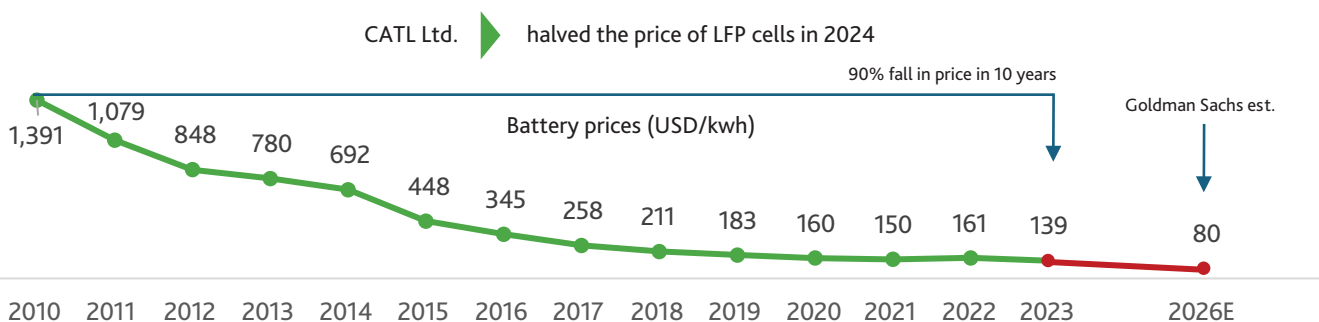


China: 77% of global production, 6/10 top battery producers

Countries around the world are taking decisive steps to reduce their Chinese import dependence



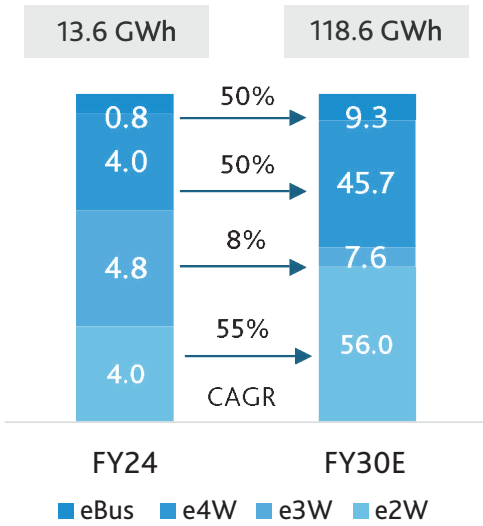
However, Chinese battery producers are countering hard to maintain their position as industry leaders



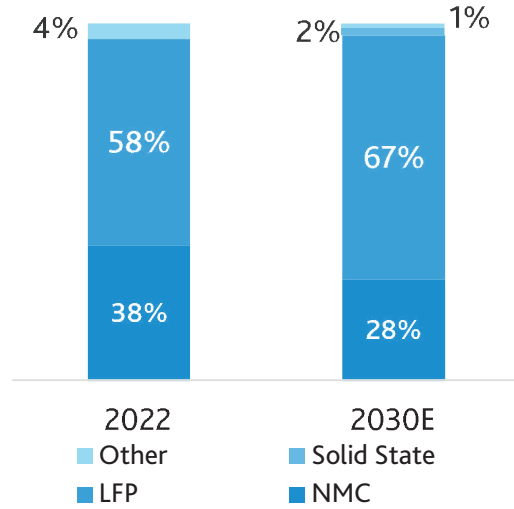
# LFP Chemistry Will Largely Prevail In India, Given OEMs' Preference For Its Lower Cost...

## India's EV Battery Demand (in GWh)

Based on EV Sales penetration forecast by NITI Aayog



## Mix of Cell Chemistries in India



Note: With Reliance entering Solid State chemistry, this chemistry is anticipated to gain a small market share.

India's Li-ion battery imports: 2018 USD 0.4bn → 2023 USD 2.8bn

Indian companies are focusing on in-house manufacturing, JVs and collaborations with domestic suppliers to reduce import reliance challenges

| OEMs                  | Battery Suppliers   |                    |
|-----------------------|---|--------------------|
|                       | Current   | Going ahead        |
| Ola Electric          | LG Energy Solution (South Korea)  | In-house           |
| Ather Energy          | Amara Raja (India)  |                    |
| Bajaj Auto            | Exide, Tata Green Batteries   |                    |
| YC Electric           | JV - Jiang Li and Xue Jian Nan (China)  | Domestic Suppliers |
| Dilli Electric        | Domestic suppliers  |                    |
| Euler Motors          | In-house  |                    |
| TVS Motors            | Tata Green Batteries  |                    |
| Mahindra and Mahindra | BYD (China), Farasis Energy (China), LG Energy Solutions (South Korea)        | Domestic suppliers |
| Tata Motors           | Octillion Power Systems (USA), EVE Energy (China), Gotion High-Tech (own sub) | In-house           |
| MG Motors             | JV - SAIC Motors (Parent Co.) CATL (China)                                    | JV - JSW           |
| Olectra Greentech     | BYD (China)   |                    |
| JBM Auto              | In-house  |                    |

■ Indicates locally manufactured batteries



## ...And Manufacturers Too Are Making Capex Announcements For LFP Cell Chemistry

Achieving the below planned capacity will require ~USD 22bn in capex, placing batteries among the top capex industries in India

| COMPANY                                      | EXISTING CELL CHEMISTRY | NEW CELL CHEMISTRY   | MANUFACTURING CAPACITY  |
|--|-------------------------|----------------------|---|
| Ola Electric                                 | NMC , LFP               |                      | Plans: 100 GWh  |
| Reliance Industries                          |                         | LFP, Solid State     | Plans: 40 GWh   |
| Agratas Energy Storage (sub. Tata Chemicals) |                         | LFP                  | Plans: 20 GWh   |
| Amara Raja Batteries                         | Lead acid               | LFP, NMC             | Plans: 16 GWh - LFP , 2 GWh - NMC<br>5 GWh - Battery Assembly                       |
| Ather Energy                                 | NMC , LFP               |                      | Plans: Produce cells in collaboration with Amara Raja Battery pack plant ~USD 238mn |
| Lucas TVS                                    |                         | NMC, LFP, Semi Solid | Plans: 10 GWh   |
| Exide Industries                             | Lead acid               | LFP                  | Existing: 1.5 G Wh - Li-ion<br>Plans: 12 GWh - Li-ion                               |
| GODI India                                   | LFP, NMC, Silicon Anode | SIB, Solid State     | Plans: 12.5 GWh   |
| Rajesh Exports                               |                         | LFP                  | Plans: 5 GWh  |
| Nsure Reliable Power Solutions               | LFP                     |                      | Plans: 5 GWh  |
| Luminous Power Technologies                  |                         | LFP                  | Plans: Capacity to be announced   |
| HBL Power Systems                            |                         | LFP                  | Plans: Capacity to be announced   |
| Su-Kam Power Systems                         | Lead acid               |                      | Plans: Capacity to be announced   |
| Coslight India Telecom                       |                         | NMC                  | Plans: Capacity to be announced   |

Established lead-acid battery manufacturers and large corporate entrants are both eyeing the battery market, with a strong emphasis on li-ion chemistries.

### KEY GOVERNMENT POLICY

Beneficiaries

PLI ACC Scheme (To boost domestic battery manufacturing)

**20 GWh**

Ola Electric

**5 GWh**

Reliance New Energy Solar

**5 GWh**

Rajesh Exports

## Smaller Players Are Facing Negative Operating Margins

Lower government incentives for new-age players, combined with smaller operating scale is hindering their scale-up

| COMPANY                     | DESCRIPTION                               | TARGET SEGMENTS                            | BATTERY CHEMISTRY | ROAD AHEAD   |
|-----------------------------|---|--|-------------------|--|
| Log9 Materials              | Battery Manufacturer and Energy Storage   | e2W<br>e3W<br>e4W LCVs                     | Li-ion            | <b>Plans</b><br>1 GWh - Cell manufacturing<br>2 GWh - Battery pack manufacturing   |
| IBC                         | Battery Manufacturer                      | NA   | NMC Existing      | 50 kWh pilot plant in South Korea<br><b>Plans</b><br>USD 1bn capex in Karnataka to set up an NMC battery manufacturing plant |
| Cygni Energy                | Battery Manufacturer & Energy Storage     | e2W<br>e3W                                 | Li-ion, SIB       | <b>Plans</b><br>1.2 GWh battery manufacturing plant;<br>480k battery packs per annum   |
| Clean Electric              | Battery Manufacturer and Energy Storage   | e2W<br>e3W                                 | Li-ion            | <b>Plans</b><br>60k battery packs per annum  |
| Indigrid                    | Battery Manufacturing and Battery Storage | e2W<br>e3W                                 | Li-ion            | <b>Plans</b><br>500 MW battery storage   |
| Grinntech Motors & Services | Battery Manufacturing and BMS             | e2W<br>e3W                                 | Li-ion            | <b>Plans</b><br>24k battery packs per annum  |
| EMO Energy                  | Battery Manufacturing                     | e2W  | Li-ion            | <b>Plans</b><br>10k battery packs per annum  |
| Trontek                     | Battery Manufacturing & Chargers          | e2W<br>e3W                                 | LFP, NMC          | 0.6 GWh plant<br><b>Plans</b><br>Expand to 2 GWh   |
| Neuron Energy               | Battery Manufacturer & Battery Leasing    | e2W<br>e3W<br>LCVs eTractors<br>Golf Carts | Lead Acid, Li-ion | <b>Plans</b><br>NA   |

**Companies are focusing on e2W and e3W segments, which offer a larger customer base**

## Battery Management System (BMS), Once Bundled With Batteries, Is Now Emerging As A Distinct And Profitable Segment

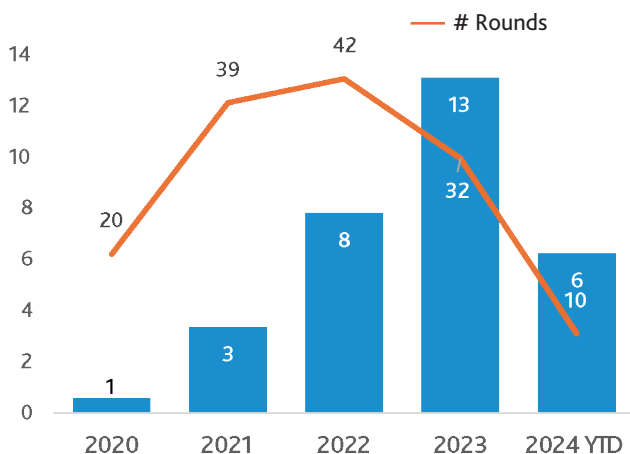
### USE CASES ARE DEVELOPING ACROSS:

- ▶ OEMs
- ▶ E-Comm companies
- ▶ Charge point operators
- ▶ Financing companies
- ▶ Battery swapping companies
- ▶ Fleet operators

| COMPANY            | DESCRIPTION  | KEY CUSTOMERS                                     |
|--------------------|--|---|
| Altergo            | BMS to OEMS & Fleets                                   | 75+ OEMS  |
| Lithion Power      | Provides BMS up to 72V in domestic and foreign markets | e2W, e3W  |
| igrenEnergi        | BMS includes 100 parameters                            | Tata Motors, Shell, Siemens                       |
| Electrifuel        | BMS  | JP Minda, Okinawa, Rewamp Moto, EMO, Lohum        |
| ReVx Energy        | BMS  | Big Basket, Log9                                  |
| Webber ElectroCorp | BMS for L3, L5   | Ampere, Kinetic Green, Cygni, Redon, Terra Motors |

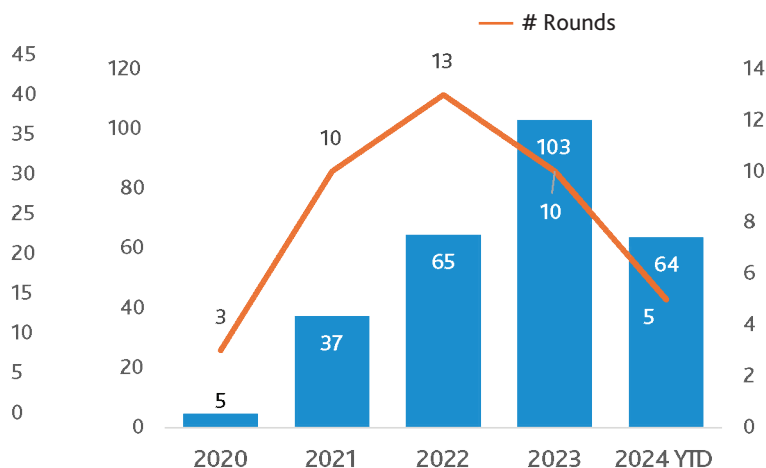
## Despite Fluctuations In EV Funding In India, Investments In The EV Battery Segment Are Steadily Rising

GLOBAL FUNDING (USD BN)



INDIA FUNDING (USD MN)

As of November 2024



| DATE          | COMPANY               | DESCRIPTION               | STAGE    | LATEST REVENUE (USD) | FUNDS RAISED (USD) | INVESTORS  |
|---------------|-----------------------|---------------------------|----------|----------------------|--------------------|--|
| November 2024 | Vecmocon Technologies | Battery Management System | Series A | 0.6mn ('23)          | 10mn               | Ecosystem Integrity Fund, Blume Ventures                         |
| August 2024   | Clean Electric        | Battery Pack Manufacturer | Series A | 73K ('23)            | 5.8mn              | pi Ventures, Kalaari Capital                                     |
| May 2024      | Indigrid              | Battery Pack Manufacturer | Series A | 8.8mn ('23)          | 5mn                | Cactus Venture Partners  |
| January 2024  | IBC                   | Battery Pack Manufacturer | Seed     | NA                   | 35mn               | RTP Global, Beenext  |
| December 2023 | Exponent Energy       | Battery Pack Manufacturer | Series B | 29K ('22)            | 26mn               | Eight Roads Ventures, Lightspeed Venture Partners, 3one4 Capital |
| October 2023  | Log9 Materials        | Battery Pack Manufacturer | Series B | 9.3mn ('23)          | 73mn               | TCI Ventures   |
| April 2023    | EMO Energy            | Battery Pack Manufacturer | Seed     | 48K ('23)            | 1.2mn              | Transition VC  |
| October 2022  | Clean Electric        | Battery Pack Manufacturer | Seed     | 73K ('23)            | 2.2mn              | Kalaari Capital, Climate Angels                                  |
| August 2022   | Cygni Energy          | Battery Pack Manufacturer | Series A | 13mn ('23)           | 6.6mn              | Lightspeed Venture Partners, YourNest, 3one4 Capital             |

# Battery as a Service (BaaS)

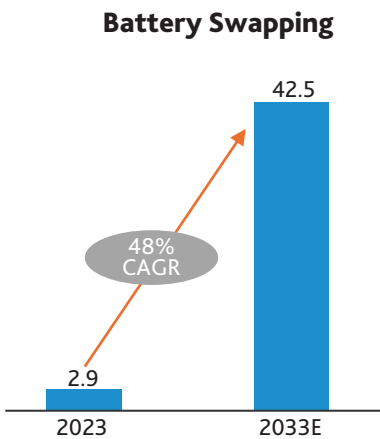


# In The Context Of EVs, Battery As A Service (BaaS) Is Provided Through Battery Leasing And Battery Swapping

Both models aim to lower upfront costs; with battery swapping enhancing vehicle's operational time by reducing the time to ready a charged vehicle

## Battery as a Service

**Market Size of Battery Swapping in EV**  
(USD bn)



**Meaning:** Users exchange a discharged battery for a fully charged one

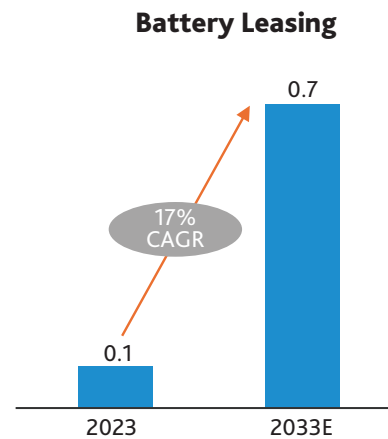
**Benefit to Customer:** Eliminates upfront battery cost, reduces charge time

**Target Customers:** Commercial vehicle users

**Supporting Infrastructure Required:** Battery swapping stations

- ✓ Most prevalent BaaS model in EV

**Market Size of Battery Leasing in EV**  
(USD bn)



**Meaning:** Users pay a fee to lease the battery separately

**Benefit to Customer:** Eliminates upfront battery cost

**Target Customers:** Private Vehicle Users

**Supporting Infrastructure Required:** Charging stations

- ✓ Majorly utilised in Energy Storage and Industrial Applications
- ✓ Recent use case being developed in EV

## Battery Swapping Is Largely Used By Businesses On A Subscription Basis To Optimise Logistics For A Fixed Operational Fee

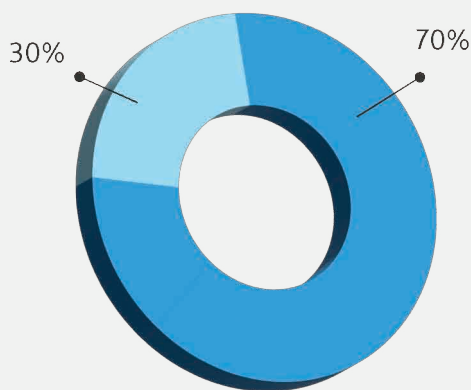
### GLOBAL INSIGHTS ON BATTERY SWAPPING

**73%**  
Subscription Model

**27%**  
Pay-per-use Model

- Fleet operators and private vehicle owners benefit from predictable monthly expenses, making budgeting easier.
- The model also enhances customer retention and increases repeat rates for the battery swapping companies.

### China leads the battery swapping market globally



Chinese companies are implementing battery swapping for commercial vehicles, catering to vehicles from e2Ws to e-trucks; enhancing the availability of swapping stations in urban areas and along highways.

| TOP BATTERY SWAPPING COMPANIES | # SWAPPING STATIONS |
|--------------------------------|---------------------|
| Gogoro                         | 11,000              |
| NIO Inc                        | 2,250               |
| Ample                          | NA                  |
| Kandi Technology               | ~1,000              |
| Aulton New Energy              | 460                 |

In regions like China, USA and Europe, multiple smaller-sized batteries can be loaded in an OEM, making these batteries fit across different types of vehicles.

## Both BaaS Models Have Succeeded Globally, And Are Receiving A Promising Response In India

The two models will co-exist with battery swapping focusing on commercial fleets and battery leasing making EVs more accessible to private users.

### BATTERY LEASING IN INDIA

#### MG is the first major OEM to adopt the battery leasing concept

| PARTICULARS               | MG WINDSOR EV (EXCITE)      | MARUTI GRAND VITARA (SIGMA)     |
|---------------------------|-----------------------------|---------------------------------|
| Full charge / full tank   | INR 380 per charge (38 kWh) | INR 4,500 (45 litres petrol)    |
| Range / Mileage (claimed) | 331 Km                      | 872 km (19.38 kmpl x 45 litres) |
| BaaS cost                 | INR 3.50 / Km               | Nil                             |
| Running cost / Km         | INR 4.64 per Km             | INR 5.16 per Km                 |

- ▶ MG allows customers to lease the battery for its vehicles at INR 3.5 per kilometer, bringing the vehicle cost down significantly.
- ▶ Result: MG achieved **15,000 pre-bookings** on the first day – (This forms 15% of total e4W sold in FY24 in India!).
- ▶ However, the issue of range anxiety persists.

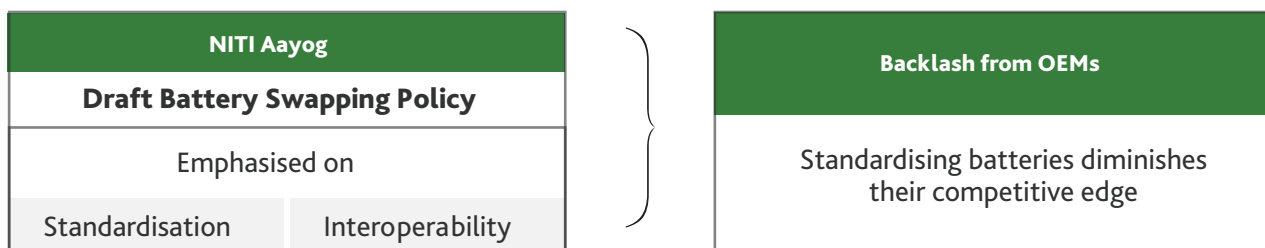
This positive response will prompt other OEMs to introduce battery leasing in their models

### BATTERY SWAPPING IN INDIA



As companies focus on e2W and e3W, battery swapping is less attractive to private owners in e2W segment, where affordability is less of a concern; leading to a focus on commercial fleets.

#### The Indian government is in the process of finalising its battery swapping policy





## Battery Swapping Providers And Their E-Commerce And Logistics Customers Are In A Symbiotic Relationship

### EACH RELIES ON THE OTHER FOR ENHANCED EFFICIENCY

Establishing a battery swapping station at an e-commerce warehouse:

#### Mutual Benefits of standardised vehicles & batteries:

Battery swapping service provider

Capex incurred is effectively sweated

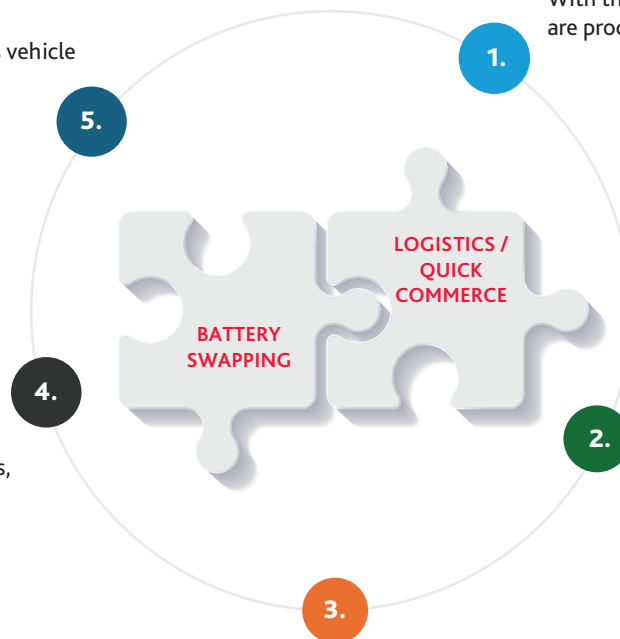
Logistics company

Eliminates the hassle of finding compatible batteries for various vehicle types in their fleet

#### Makes cost-effective procurement possible:

With the elimination of battery cost, vehicles are procured and financed at lower rates

**Operational efficiency:**  
Minimises buffer stock, leakages, damages & man movement in warehouses



#### Reduced risk of new model launches:

Delivery partners will opt for vehicles that are compatible with battery-swapping stations in their warehouses

#### Reduces the number of vehicles required

Fewer vehicles are required for deliveries due to increased vehicle efficiency

| PARTICULARS  | CHARGING | BATTERY SWAPPING |
|--|----------|------------------|
| Total daily work hours required in the warehouse   | 3,000    | 3,000            |
| Daily availability of a delivery partner (hours) A | 12       | 12               |
| Time spent readying a charged vehicle B            | 2        | 0                |
| Net operational hours per delivery partner A – B   | 10       | 12               |
| Number of delivery partners needed                 | 300      | 255              |

## A Battery Swapping Station Needs To Perform ~1.9 Swaps Per Battery Slot To Achieve A 15% Roi

### A) Capital Expenditure

| PARTICULARS                       | #  | UNIT COST | TOTAL COST       |
|-----------------------------------|----|-----------|------------------|
| Swappable Battery Cost            | 50 | 25,000    | 12,50,000        |
| Cabinet Cost                      | 1  | 5,00,000  | 5,00,000         |
| Power Cost                        |    | 2,75,000  | 2,75,000         |
| Vehicle Battery                   | 50 | 25,000    | 12,50,000        |
| <b>Total Capital Expenditure:</b> |    |           | <b>32,75,000</b> |

### B) Annual Business Expenses

| PARTICULARS                            | #   | UNIT COST | TOTAL COST       |
|--|-----|-----------|------------------|
| Depreciation                           |     |           | 16,37,500        |
| Manpower cost                          | 36  | 25,000    | 9,00,000         |
| Payment Infrastructure / Software Cost |     | 60,000    | 60,000           |
| Land Rent                              | 250 | 600       | 1,50,000         |
| Repairs & Maintenance                  |     |           | 65,500           |
| Less: Subscription Income              | 50  | 12,000    | 6,00,000         |
| <b>Total Annual Expenses:</b>          |     |           | <b>22,13,000</b> |

**C) 15% ROCE requirement:** (Surplus to be generated on the expenses occurred) **4,91,250**

### Unit Economics

| PARTICULARS   | UOM      | FIGURES    |
|---|----------|------------|
| Revenue per battery swap                                | INR      | 16,37,500  |
| Charging cost per battery                               | INR      | 9,00,000   |
| Gross Proceeds per swap                                 | INR      | 60,000     |
| Number of swaps per annum (To cover A+ B + C)           | #        | 1,50,000   |
| Swaps required per day for the battery swapping station | #        | 65,500     |
| <b>Breakeven swaps per day per battery slot</b>         | <b>#</b> | <b>1.9</b> |

Disclaimer: Unit Economics calculation is for informational purposes only. While we aim for accuracy, the figures are based on assumptions that may vary by individual circumstances and market conditions.

## Partnerships And High Utilisation Levels Are Vital For Battery-Swapping Providers To Sustain A Profitable Business

### CHALLENGES IN BATTERY SWAPPING

#### 1. Early mover advantage is crucial

Companies entering this segment early are securing large enterprise customers (who form a significant portion of the target market)

#### 2. OEMs shifting away from removable batteries

Few OEMs are discontinuing the concept of detachable batteries in new vehicle launches due to heightened safety concerns

#### 3. Minor downtime can significantly impact partnerships for battery swappers

Operational lags of swapping stations in e-commerce warehouses during peak demand hours or battery failures can materially affect the e-commerce company's operations, magnifying reputational risk

#### 4. Development of Modular Battery Systems

Modular Battery Systems enables efficient exchanges by replacing smaller modules instead of battery packs, reducing costs and simplifying integration

Multiple actions are needed to make battery swapping economically viable

#### FOCUS ON LAND RENTAL IN UNIT ECONOMICS

- ▶ Land rental / lease significantly impacts the unit economics of a battery recycling company
- ▶ The cumulative cost over a 10-year period may exceed the initial setup costs of a swapping station

#### TARGETING LOCALITIES AROUND COLLEGES AND TRAINING INSTITUTIONS

- ▶ As the younger generation increasingly favours private fleets over public transport, rickshaw footfall peaks in the afternoon and evening during college hours

#### REGIONS HAVING LEAD-ACID BATTERY FLEET

- ▶ Lead-acid batteries generally last 1-2 years
- ▶ These fleet will transition to retrofitted swappable batteries, creating a new market opportunity

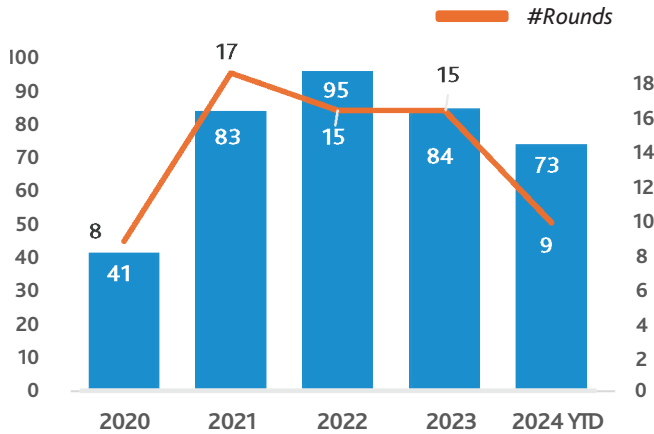
## Delhi, With Its Lead-Acid Rickshaws, And Bengaluru, Home To E-Commerce Warehouses, Boast India's Largest Swapping Networks

### COMPANY LANDSCAPE

| COMPANY       | IN-HOUSE BATTERY MANUFACTURING | SEGMENTS CATERING         | SWAPPING STATIONS | KEY PARTNERSHIPS  |
|---------------|--------------------------------|---------------------------|-------------------|---|
| Battery Smart | No                             | E2W, E3W                  | 650               | Quantum Energy (for batteries)<br>Customers - Zepto   |
| Sun Mobility  | Yes                            | E3W, E-BUS                | 630+              | Partnership with Indian Oil Corporation Limited (IOCL)  |
| ChargeUp      | No                             | E3W                       | 200               | Greenfuel Energy Solutions (battery vendor)   |
| Yuma Energy   | No                             | E2W planning to enter E3W | 125               | Municipal Corporation of Delhi, BSES Rajdhani Power Limited - Battery Swapping Infra Yulu - Key customer          |
| Mooving       | No                             | E2W, E3W                  | 100               | Group Companies Livguard (Batteries) Lectrix (e2W, e3W)   |
| Bijliride     | No                             | E2W, E3W                  | 100               | Quantum Energy (OEM partner and batteries)  |
| Batterypool   | No                             | E2W, E3W                  | 55                | -   |
| RACE Energy   | Yes                            | E2W, E3W                  | 30                | Lohum (Battery Recycling)   |
| Esmito        | Yes                            | E2W                       | 320 ports         | Jitendra EV, Tunwal E-vehicles, Bounce Infinity (OEM Partners)  |
| Gogoro India  | No                             | E2W                       | 6                 | Foxconn (battery)<br>Government of Maharashtra (swapping station set-up)  |
| VoltUp        | No                             | E2W, E3W                  | 5                 | HPCL, BPCL, Adani Electricity for station set-up<br>Hero Electric<br>LIB India (for battery)<br>Zomato (customer) |

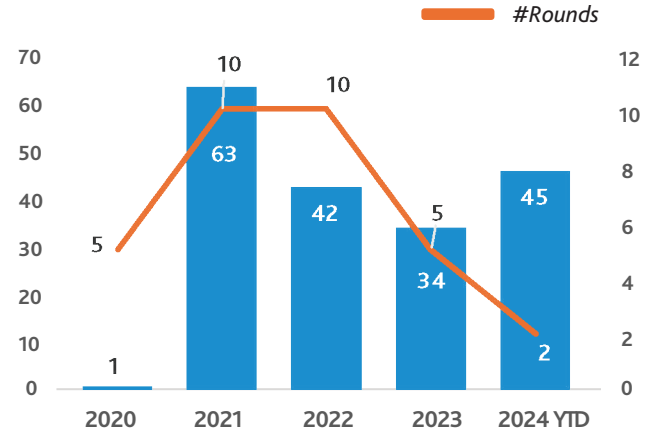
## Investors Are Funding Companies' High Capex Needs, Emphasising The Importance Of Capturing Prime Market Share

### GLOBAL FUNDING (USD MN)



### INDIA FUNDING (USD MN)

As of November 2024



In India, companies are rapidly partnering with large fleet operators, attempting to create high entry barriers

### RECENT FUNDRAISES IN INDIA

| DATE         | COMPANY       | DESCRIPTION                | STAGE    | LATEST REVENUE (USD) | FUNDS RAISED (USD) | INVESTORS   |
|--------------|---------------|----------------------------|----------|----------------------|--------------------|---|
| August 2024  | Urja Mobility | Battery Leasing            | Seed     | NA                   | 11.9mn             | Mufin Green Finance, Hindon Mercantile                                  |
| May 2024     | Battery Smart | Battery Swapping Solutions | Series B | 7.9mn ('23)          | 45mn               | LeapFrog Investments, Blume Ventures, British International Investments |
| April 2024   | Battery Pool  | Battery Swapping Solutions | Seed     | 129K ('23)           | 360K               | First Port Capital, Inflection Point Ventures                           |
| May 2023     | RACE Energy   | Battery Swapping Solutions | Seed     | 359K ('23)           | 33mn               | GrowX Ventures, Micelio, Huddle Ventures                                |
| March 2023   | Battery Smart | Battery Swapping Solutions | Series A | 7.9mn ('23)          | 33mn               | Tiger Global Management, Blume Ventures                                 |
| October 2022 | Moving        | Battery Swapping Solutions | Series A | 2.2mn ('23)          | NA                 | NA  |

# Battery Recycling



Battery Recycling: Global Outlook

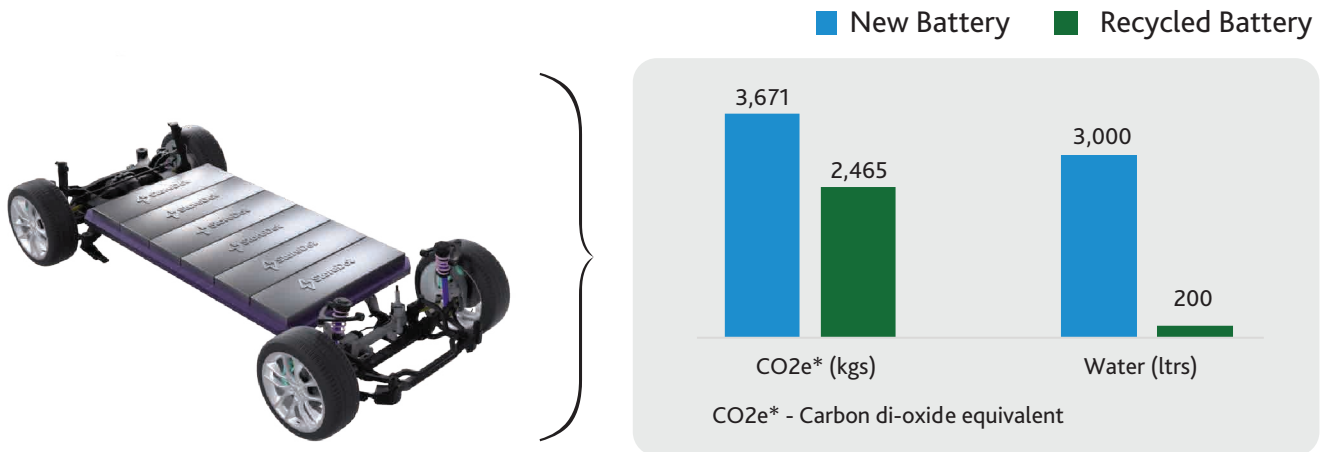
# Battery Recycling Is Crucial For Establishing A Sustainable Circular EV Ecosystem



Production scrap accounts for 30% of the raw materials used in recycled batteries worldwide.

## BATTERY MANUFACTURING IS ONE OF THE MOST CARBON INTENSIVE PROCESS

Comparison of emissions generated to produce a battery for a mid-size SUV.

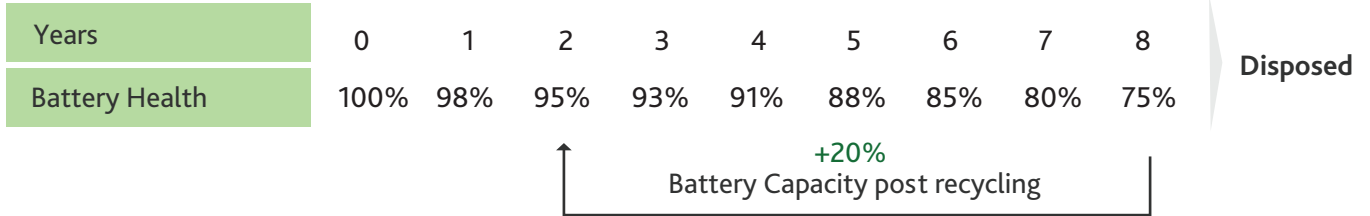


Picture credits: ai-online

Battery recycling reduces carbon emissions by ~33% and consumes ~93% less water

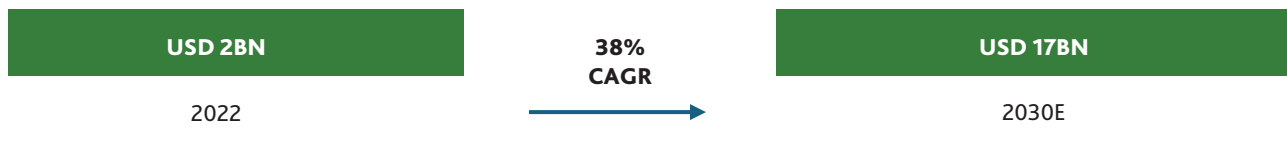
## BATTERY RECYCLING CAN REVERSE A BATTERY'S AGE BY UP TO 6 YEARS!

8 years of electric car usage



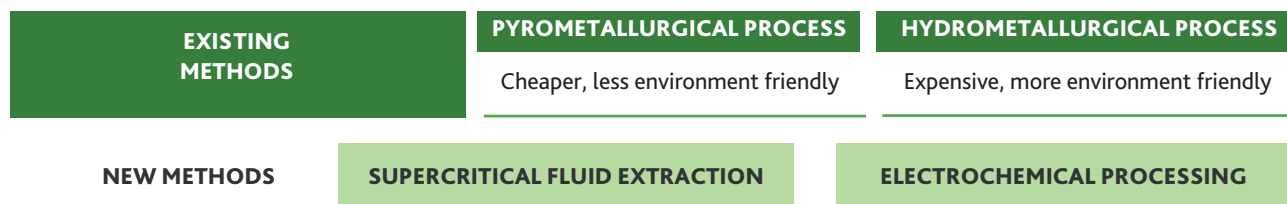
Opting for a battery with 95% efficiency at half the price of a new one is a worthwhile trade-off!

## Battery Recycling Global Market Size (in USD bn)



Lithium-ion battery recycling, once viewed as a future prospect, is now a reality, expected to comprise 78% of the battery recycling market by 2024.

The industry is actively exploring more cost-effective and environment friendly methods for battery recycling



Note:

Pyrometallurgical: Heating in the absence of oxygen for key metals to melt and vaporise

Hydrometallurgical: Soaking in a chemical solution to dissolve the key components

Source: Grand View Research, Industry Research, BDO India Analysis

# Battery Recycling Offers Import Substitution And Strategic Raw Material Security For India

Battery recycling sector will be vital to the India's EV narrative and is anticipated to receive substantial support from industry stakeholders!

## INDIAN RECYCLING INDUSTRY WILL COMPRISE OF LEAD ACID BATTERIES ALONGSIDE LI-ION BATTERIES

In the initial phase of EV, large volumes of lead acid battery-powered e3Ws were sold!



Based on the target set by the Government; EVs will generate a minimum of 24 GWh of annual battery demand by FY31

### Battery Waste Management Rules, 2022



With each GWh generating ~USD 10mn in revenue, the demand for recycled batteries will reach ~USD 240mn.

## KEY CHALLENGES IN INDIAN BATTERY RECYCLING INDUSTRY

### 1) Lack of an organised recycling market

90% of the used batteries end up in

|              |                               |
|--------------|-------------------------------|
| Trash        | Unorganised Recycling Process |
| No recycling | Low recovery percent          |

### 2) Limited domestic battery scrap

Dependence on imported battery scrap for recycling

### 3) High capex cost

Cost to set up lead-acid battery recycling plant: USD 6mn (1 GWh)

Cost to set up lithium-ion battery recycling plant: ~USD 50mn (1 GWh)

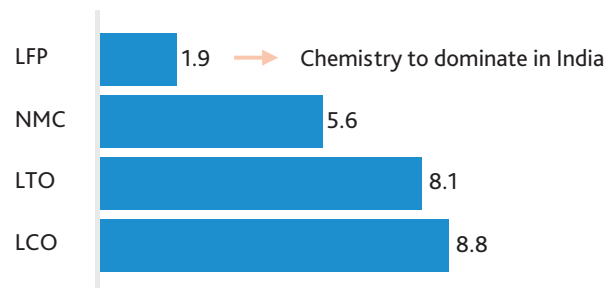


## Cost Optimization And Margin Expansion Will Be Crucial For Companies In This Segment

### 4) Low NMC Chemistry

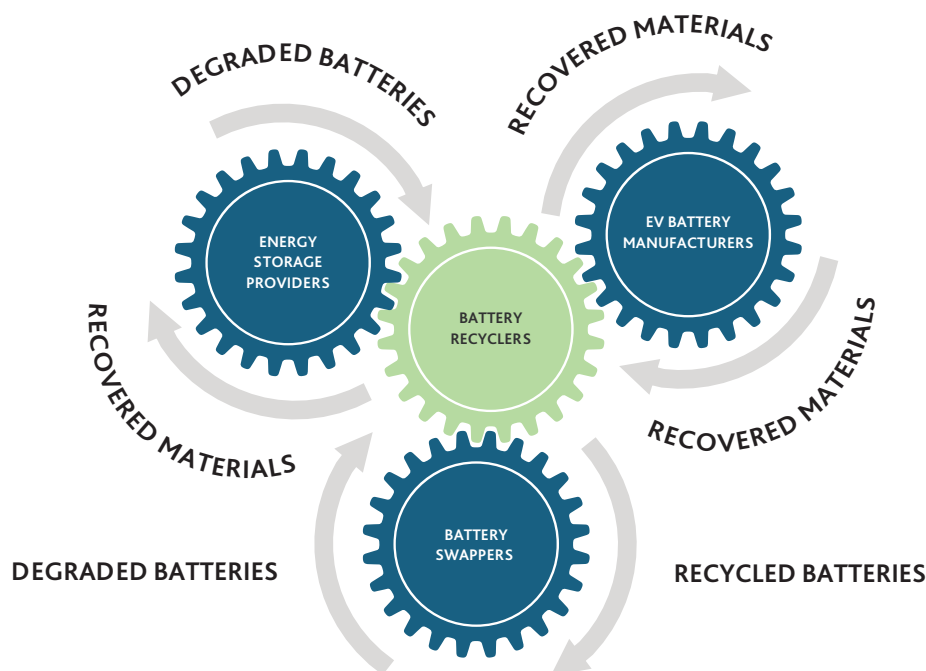
- ▶ Profitability in NMC: USD 10-20 per kwh
- ▶ Profitability in LFP: Thin Margins (sometimes even negative)

Economic Value Extracted from Recycling (USD/Kg)



### Battery recycling companies in India will emerge as key local suppliers of cells!

The circular value chain of battery recyclers will make them prime targets for investment and acquisition within the battery ecosystem



### Ways to increase profitability for Battery Recycling Companies in India

#### Tolling Model

Recycle batteries for third parties, charging a fee for their services.

- ▶ Reduces sales price risks
- ▶ Reduces working capital tied up in inventory

#### Tie-up with OEMs, Battery Manufacturers

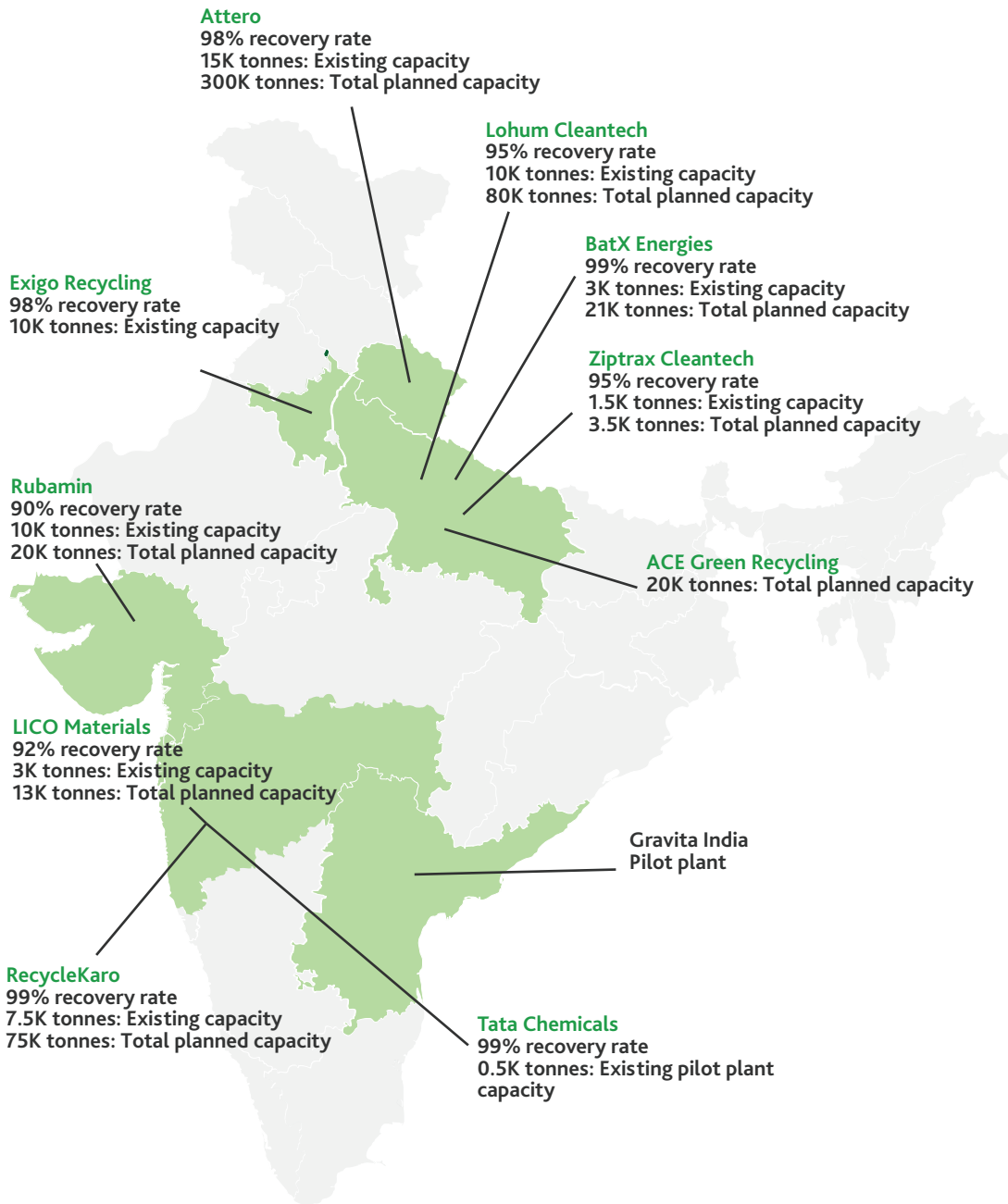
As mandated by the Government, OEMs are required to monitor their batteries for proper disposal. Recyclers can collaborate with these companies to source used batteries effectively.

- ▶ Increased Raw Material Supply; increasing the utilisation of their capacity
- ▶ Leads to an organised market

# Based On The Capex Plans Set By Key Players, ~48% Of India's LiB<sup>1</sup> Demand Can Be Met Through Domestic Recyclers By 2030

Domestically recycled LiB can meet ~93% of India's EV battery demand by 2030!

## KEY COMPANIES HAVING LiB RECYCLING SEGMENT IN INDIA



**Total LiB recycling capacity:** 61K Tonnes / 15 GWh CY24      543K Tonnes / 136 GWh CY30E



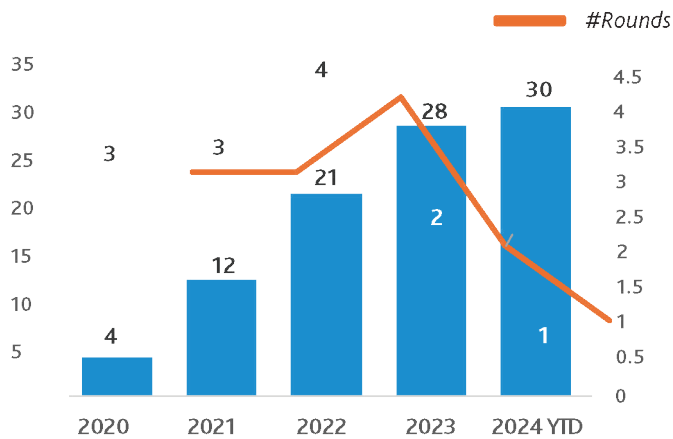
<sup>1</sup> LiB: Lithium Ion Battery

Source: Grand View Research, Industry Research, BDO India Analysis

\*Map is for representative purpose only

## Existing Industry Participants Are Expected To Raise Significant Capital, With An Increase In Average Cheque Sizes

India Funding (USD mn) *As of November 2024*



- ▶ With EV sales surging for the past 2 years, the battery recycling industry is set to pick up pace in the next 4-5 years.
- ▶ The set-up time for recycling facilities is under a year, for which significant funds are expected to be raised over the next 5 years.
- ▶ A few investors have already made early commitments and have been instrumental in investing on their bets periodically.

### Recent Fundraises in India

| DATA                           | COMPANY            | STAGE    | LATEST REVENUE (USD) | FUNDS RAISED (USD) | INVESTORS   |
|--------------------------------|--------------------|----------|----------------------|--------------------|---|
| January 2022<br>– October 2024 | Lohum<br>Cleantech | Series B | 38.4mn ('23)         | 61.3mn             | Cactus Venture Partners,<br>Baring Private Equity Partners,<br>Singularity Ventures |
| November 2021<br>– April 2023  | BatX Energies      | Seed     | 2.7mn ('23)          | 7.0mn              | Zephyr Peacock,<br>JITO Incubation & Innovation<br>Foundation, Survam Partners      |
| October 2021<br>– March 2022   | RecycleKaro        | Series A | 12.8mn ('23)         | 2.5mn              | Ascent Capital,<br>J M Global Equities  |

# EV as a Service (EVaaS)



# EV Adoption In Various VaaS<sup>1</sup> Segments Is Quickly Advancing In Regions With Established Infrastructure And Government Support

Global companies based out of USA are significantly enhancing their delivery operations by adopting EVs for their fleets

This is leading to a notable EV presence across all the regions they operate in

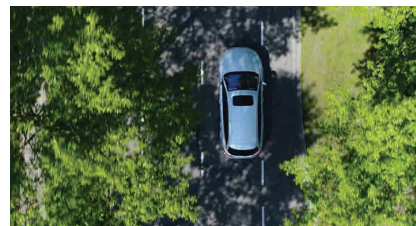


Amazon      UPS      FedEx

- ▶ Lower Operational Costs
- ▶ Enhances Brand Image

## European countries are at the forefront of adopting EVs for ride-hailing and car rentals

- ▶ Adequate charging infrastructure in major cities
- ▶ Benefits in Kind (BIK) rate of 2% for EV adoption
- ▶ Quieter and smoother ride experience



### GOVERNMENT PUSH FOR CLEAN ZONES



Electric Vehicles

- ▶ 30% of all miles driven by Uber in London
- ▶ 25% of ride-hailing vehicles in Italy
- ▶ 21% of ride-hailing vehicles in Germany

Cities like London, Oslo, and Amsterdam have implemented low-emission zones (LEZs) for ride-hailing services.

## China leads the EV logistics and freight service industry

Developed battery swapping capabilities for heavy commercial vehicles supported by several swapping stations across the country.



China accounts for 70% of global e-trucks sales

- 49.5% of these trucks have battery swapping

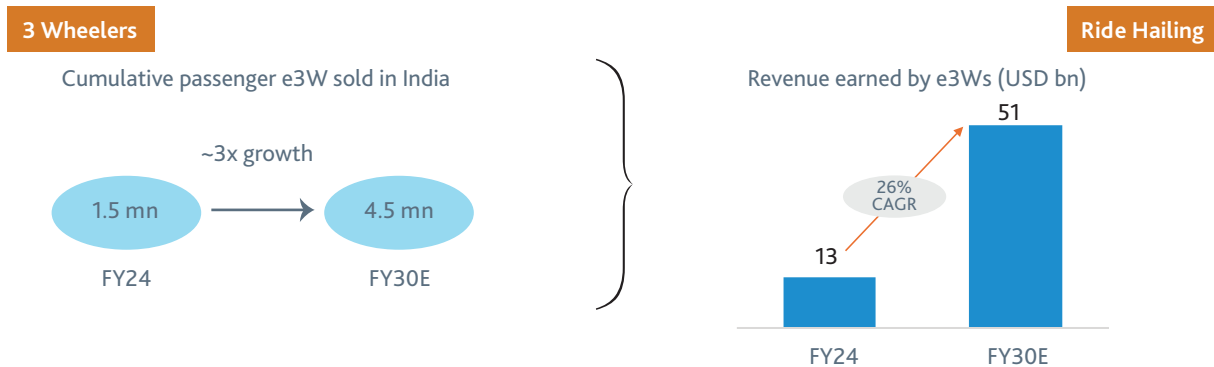
<sup>1</sup> VaaS: Vehicle as a Service. VaaS is the broader vehicle service category. EVaaS is a sub-category of VaaS.

# E3W Ride Hailing Is Leading The Charge In India, Followed By Last-Mile Delivery

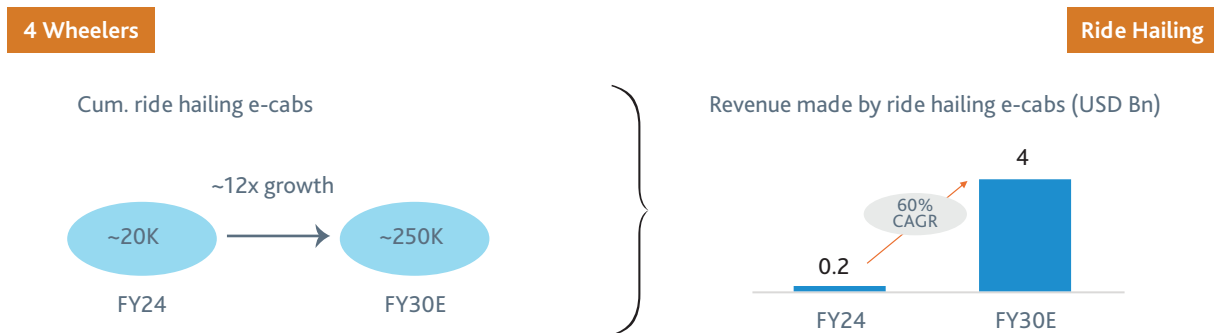
## Major Categories in Electric Vehicle as a Service (EVaaS)



### RIDE HAILING SERVICES



The capex incurred to buy an e3W can be fully recovered from the cash profits generated in 1.5 – 2 years of stable operations



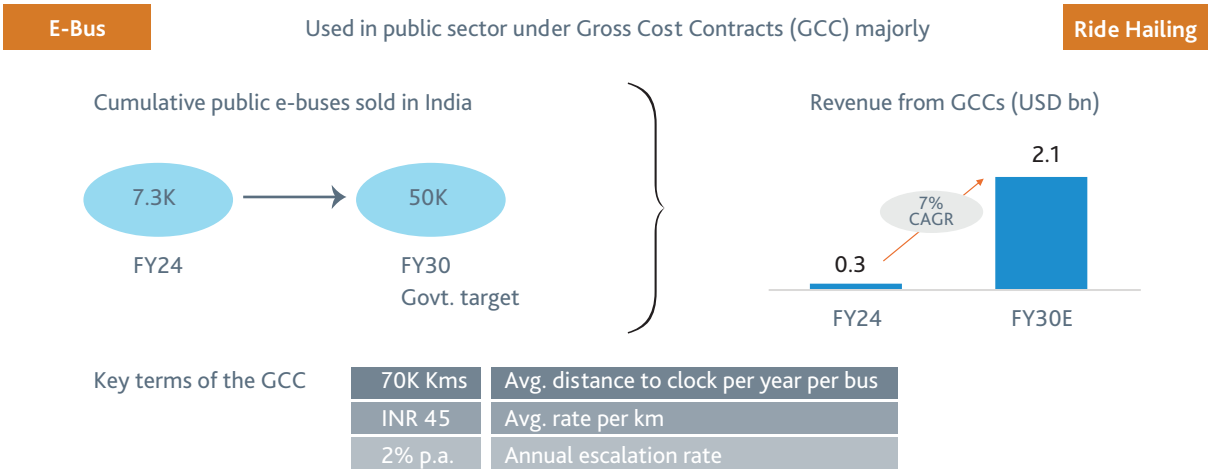
### TOP E-CAB SERVICE PROVIDERS

| Traditional Ride Hailing Companies                                  |   | Pure EV Ride Hailing Companies                                 |   |                                    |
|---|---|--|---|------------------------------------|
| OLA CABS<br>Present: NA<br>Plan: In process of deploying 10K e-cabs | UBER INDIA<br>Present: NA<br>Plan: In process of deploying 25K e-cabs | BLUSMART MOBILITY<br>Present - 7K e-cabs<br>Plan - 100K e-cabs | LITHIUM ION TECHNOLOGIES<br>Present - 1K e-cabs<br>Plan - 5K e-cabs | EVEREST FLEET<br>Prsent: 2k e-cabs |

### The payback period for e4W in ride-hailing is 4 - 4.5 years

In traditional ride hailing companies' business model; drivers control vehicle choice. When CNG options emerged, drivers quickly adopted them after evaluating fuel price differences. In the case of EVs, with multiple factors affecting Total Cost of Ownership (TCO), the benefits are not instantly observed, leading to slower adoption.

# Use Of EVs In Leasing And Rentals Is Generating Higher Returns For All Parties Involved

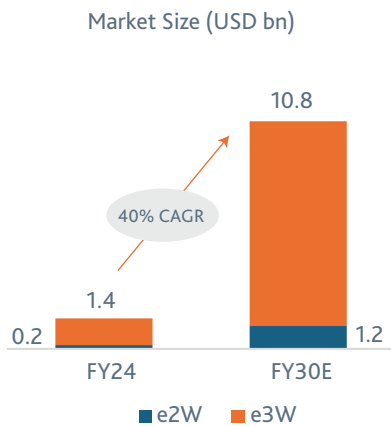


- ▶ Loss-making State Transport Undertaking (STU) units have reduced their losses by implementing GCC contracts.
- ▶ Bus operators are enjoying lower operating expenses due to a significant reduction in fuel costs.

**Govt. subsidies are effectively increasing PAT margins by ~7% for e-bus operators, making this segment attractive in present times**

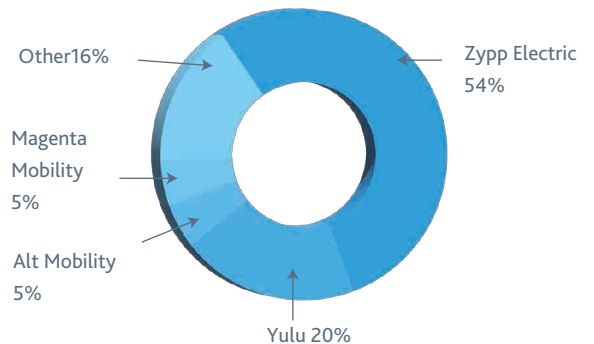
**RENTAL SERVICES** (e2Ws and e3Ws only)

**Rental**



~71 mn Market Size

New-age businesses in the organised market currently account for ~5% of the overall industry.



E2W rental vehicles are primarily utilised for last-mile delivery while a majority of rented e3Ws are passenger vehicles utilised for ride-hailing services

**EV rental companies are enjoying higher valuations compared to traditional rental firms**

## Challenges faced by EV rental companies

**HIGHER RENTAL RATES**

Difficult to offer competitive rates due to higher upfront EV cost compared to ICE.

**LIMITED VEHICLE OPTIONS**

Range of EV options available is lesser than ICE vehicle options

**FAMILIARITY OF ICE**

Customer's limited exposure to EV technology has led to low confidence in operating EVs.

# India, The Sixth-Largest Trucking Market Globally, Has Significant Untapped Opportunity In E-Trucks

## 3) LOGISTICS AND FREIGHT

Trucking

Largest segment in VaaS

Logistics

Customers are showing a surprising preference for heavy-duty trucks right from the start

Unlike global trends where light- and medium-duty trucks lead the way

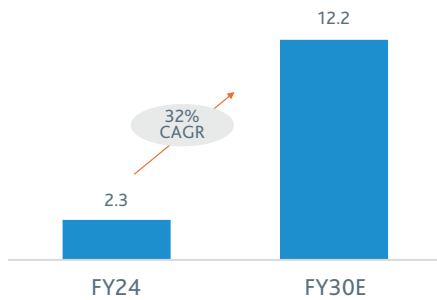
### E-TRUCKS ORDER BOOK

| COMPANY                            | # E-TRUCKS    | CUSTOMER    |
|------------------------------------|---------------|-------------|
| Volvo Eicher Commercial Vehicles   | 1,000         | Amazon      |
| BYD Auto                           | 400           | Adani Group |
| Infraprime Logistics Tech Electric | 5             | Ultratech   |
|                                    | 5 - completed | JSW Cement  |

## 4) LAST MILE DELIVERY (e2Ws and e3Ws only)

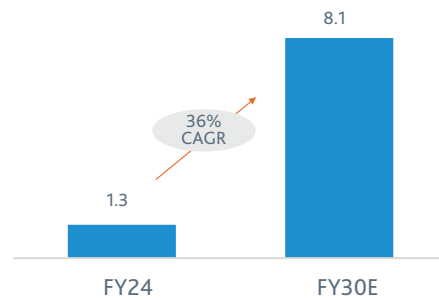
Last Mile

Market size of e2W in last-mile delivery (USD bn)

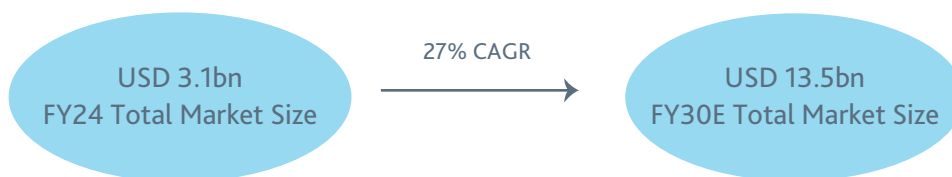


Food delivery and quick commerce companies are expected to drive the rapid growth and will represent > 75% of the e2W enabled deliveries

Market size of e3W in last-mile delivery (USD bn)



Adoption of e3W cargo vehicles for last-mile supply chain will rapidly grow due to their application across various B2B verticals





# EV In Logistics Is Driven By ESG Commitments Of Consumer Brand Owners

## FOOD DELIVERY PLATFORMS

|                 | Zomato | Swiggy |
|-----------------|--------|--------|
| EV fleet target | 100%   | NA     |

## DELIVERY COMPANIES

|                 | Delhivery                         | Ecom Express                    | Blue Dart |
|-----------------|-----------------------------------|---------------------------------|-----------|
| EV fleet target | Electrify fleets in Tier 1 cities | Electrify fleets in 2.4K cities | NA        |

## OTHERS

### Nestlé

Mix of diesel, CNG fleet in India. 100% EV fleets in Europe and Thailand. Plans to introduce electric fleets in India as well

### Hindustan Unilever Ltd

Doing a mix of CNG, LNG, EV fleets across all cities

- ▶ **Two-Wheelers for Food Delivery:** Food delivery partners predominantly use 2Ws. With e2W sales achieving lower TCO; these vehicles are a right fit for delivery partners
- ▶ **Organised Delivery Market:** Delivery companies are increasingly transitioning to electric fleets, driven not only by cost efficiencies but also by brand image and customer demand for clean mobility.
- ▶ **Slow EV Adoption in Retail:** The remaining 45% of last-mile delivery fleets are owned by enterprises, wholesalers and retailers. EV adoption is expected to grow at a slower pace.

Low-speed EVs are replacing streamlined e2Ws in last-mile delivery, further reducing vehicle procurement costs and operational expenses



Note: There is an overlap in market size between last-mile delivery, ride-hailing and rental / leasing services.

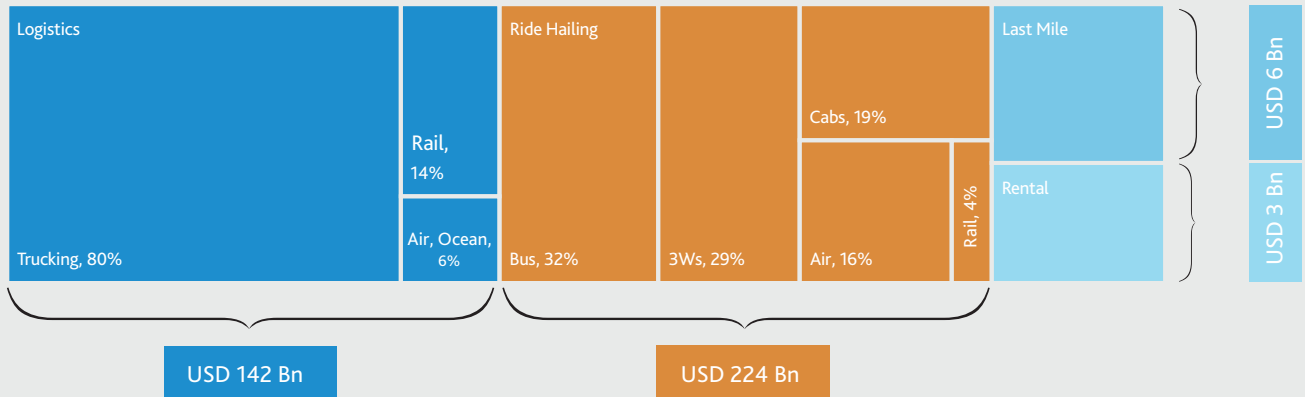
Eg: Last-mile delivery vehicles are frequently acquired on a rental or leasing basis. As a result, a portion of the revenue generated from last-mile deliveries is allocated to cover the rental expenses of these vehicles.

# While Both Business And Consumer Economies Influence VaaS, The Latter Is The Primary Driver In EVaaS

Trucking and bus service segment form ~50% of the VaaS market

VaaS market size in India (2024)

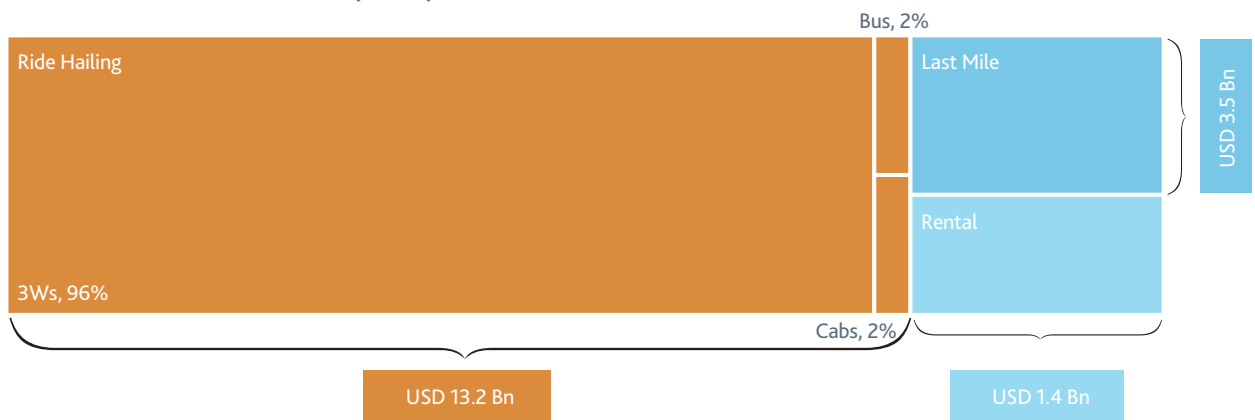
Logistics Last Mile Ride Hailing Rental



EVaaS segment offers a larger market potential than the product segment

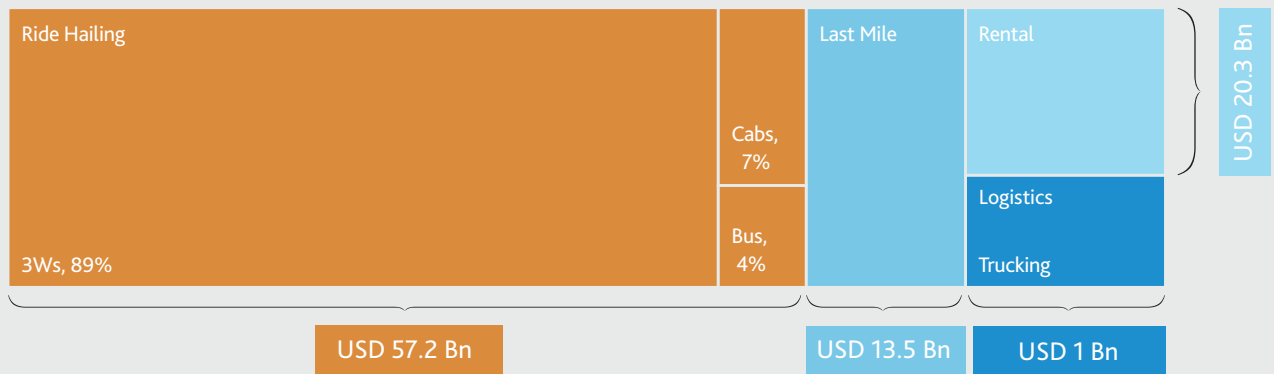
EVaaS market size in India (FY24)

Excluding Railways



EVaaS market size in India (FY30E)

Excluding Railways



Disclaimer: The analysis presented herein is based on available data and information as of November 2024. While efforts have been made to ensure accuracy, we do not guarantee completeness or correctness. The opinions expressed may not reflect the views of any organisations mentioned. Readers are encouraged to conduct their own research before making decisions based on this analysis. BDO India is not liable for any errors or outcomes resulting from the use of this information.

## Too Many 2W And 3W EVaaS Players Are Currently Riding On Growth Potential Of Select Few Companies

This has resulted in a concentrated customer base

### NOTABLE INDIAN EVAAS COMPANIES

| COMPANY                    | BUSINESS MODEL                     |          | SOURCES VEHICLES FROM                         | CUSTOMERS  |
|----------------------------|------------------------------------|----------|---|--|
| Yulu                       | E2W Renting, Battery Swapping      | B2B, B2C | Hero  | Zomato, Swiggy, Shadowfax, Zepto                 |
| BluSmart Mobility          | E4W Cab service, Charging Stations | B2B, B2C | Multiple OEMs (Tata majorly)                  | Individuals, Corporates                          |
| Zypp Electric              | E2W renting / leasing              | B2B, B2C | Hero, Ampere                                  | Zepto, BigBasket                                 |
| Lithium Urban Technologies | E4w rental, cab service            | B2B      | Multiple OEMs                                 | Uber, Synchrony                                  |
| Alt Mobility               | E2W, E3W, E4W, eCargo leasing      | B2B, B2C | Multiple OEMs                                 | Logistics Cos - LetsTransport, CABT Logistics    |
| Fyn Mobility               | E2W, E3W Leasing                   | B2B      | Altigreen (e2w)<br>Exponent Energy (Charging) | Flipkart, Amazon, BigBasket                      |
| Baaz Bikes                 | E2W Renting, Battery Swapping      | B2B      | Own Manufacturing                             | Zomato, Zepto, Amazon                            |
| Eveez                      | E2W Rental                         | B2B      | NA  | Swiggy, Zepto, Flipkart, Zomato                  |
| Hala Mobility              | E2W Renting, EV Financing          | B2B      | NA  | Blinkit, Swiggy, Zomato                          |
| FAE Bikes                  | E2W Rental                         | B2B, B2C | NA  | BigBasket, Zomato Swiggy                         |
| Eprakriti                  | E4W Cab service, Charging Stations | B2B, B2C | Multiple OEMs (Tata majorly)                  | Delhi Government, MakeMy Trip, Airport Transfers |
| SWYTCHD                    | E2W Subscription                   | B2C      | Ola, Ather, Tata, MG, Hyundai                 | Individuals                                      |

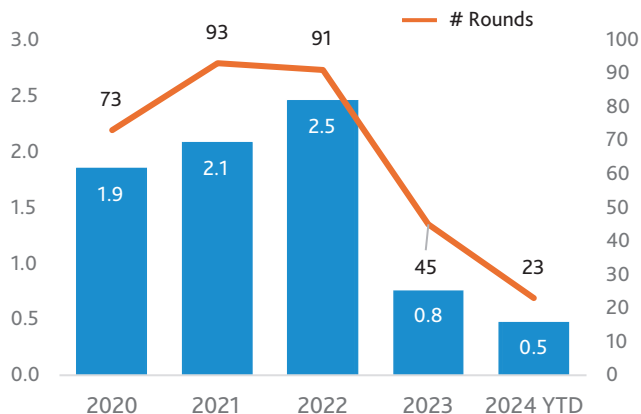
EVaaS players are making substantial investments in charging and swapping solutions, highlighting the importance of addressing range anxiety and ensuring vehicle uptime in their business

## A Diverse Range Of Global And Domestic Investors, Including PEs And VCs Have Shown Strong Funding Interest

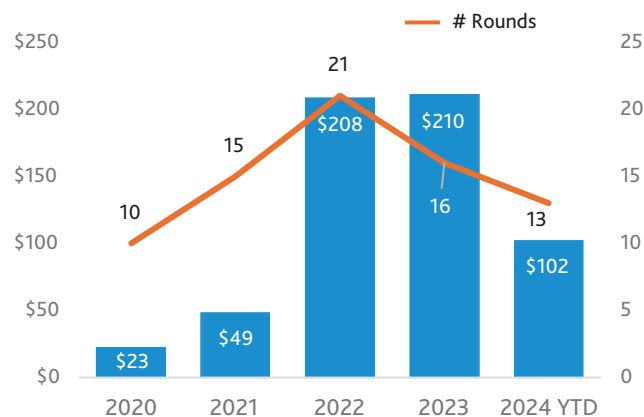
Investors are acknowledging the vast opportunities presented by EVaaS sector in India

As of November 2024

GLOBAL FUNDING (USD BN)



INDIA FUNDING (USD MN)



### RECENT FUNDRAISES IN INDIA

| DATE           | COMPANY           | DESCRIPTION                       | STAGE    | LATEST REVENUE (USD) | FUND RAISED (USD) | INVESTORS  |
|----------------|-------------------|-----------------------------------|----------|----------------------|-------------------|--|
| June 2024      | BluSmart Mobility | E4W taxi services                 | Series A | 9mn ('23)            | 144mn             | Global Founders Capital                            |
| April 2024     | Zypp Electric     | E2W rentals                       | Series C | 37mn ('24)           | 49mn              | TSM Ventures, Venture Catalysts, We Founder Circle |
| February 2024  | Yulu              | E-Cycle/ eBikes rental            | Series B | 6mn ('23)            | 102mn             | Bajaj Auto, Magna                                  |
| September 2023 | Alt Mobility      | EV rentals                        | Series A | 630K ('23)           | 6mn               | Trifecta Capital, Alteria Capital                  |
| June 2023      | BillionE          | E2W rentals                       | Seed     | 68K ('23)            | 10mn              | Transition VC, The Capital One Lab                 |
| October 2022   | Eprakriti         | E4W rentals & charging services   | Series A | 768K ('23)           | 2mn               | Catapult Mobility Consultants                      |
| May 2022       | Hala mobility     | E2W rentals for delivery platform | Seed     | 610K ('23)           | 1mn               | Magnifiq Capital Trust                             |
| February 2022  | Baaz Bikes        | E2W for delivery partners         | Seed     | 640K ('24)           | 2mn               | Kalaari Capital, AdvantEdge                        |

# Acquisitions in India



## Acquirers Are Recognising Significant Growth Potential In Companies Across Diverse EV Sub-Segments

### KEY ACQUISITIONS

As of November 2024

| COMPANY        | TARGET                     | SEGMENT                         | STAKE ACQUIRED | ACQ. PRICE (USD) | ACQUIRER                |
|----------------|----------------------------|---------------------------------|----------------|------------------|-------------------------|
| September 2024 | Greenfuel Energy Solutions | Batteries                       | 60%            | 26.3mn           | Lumax Auto Technologies |
| December 2023  | Emuron Technologies        | Software for EV Fleet operators | -              | -                | Livguard                |
| August 2023    | Tirex Chargers             | Chargers                        | 51%            | 12.5mn           | Gulf Oil                |
| December 2022  | Autovert                   | EV Financing                    | -              | -                | Ecofy                   |
| October 2022   | Revolt Motors              | E-Bikes                         | 66%            | 9.2mn            | RattanIndia Enterprises |
| July 2022      | Stripes Motors             | E-Scooters                      | 100%           | -                | e-Ashwa Automotive      |
| July 2022      | IPLTech Electric           | E-Trucks                        | 65%            | 30.8mn           | TI Clean Mobility       |
| July 2022      | Maxwell Energy Systems     | Battery Management System       | 51%            | 17.1mn           | Endurance Technologies  |
| May 2022       | Numocity                   | Software for EV Chargers        | 72%            | -                | ABB                     |

## CLOSING REMARKS

“The era of experimentation with various business models is drawing to a close; future funding will hinge on the ability to enhance offerings, improve the defensibility through collaborations and deliver operational economics.”

In the EV sector, conviction has been evident among investors, demonstrated by the rising cheque sizes across funding stages, aimed at securing significant stakes and accelerating the growth of promising businesses.

Rapid scaling has become paramount in the EV industry, where companies must increasingly validate accelerated scalability and sustainability of their business model even before reaching the Series A funding round. While rapid scaling is essential, retaining market share in the target market is equally critical. Companies across segments within the EV space are required to prioritise their geographic penetration to solidify their positions in targeted regions, before targeting pan-India presence.

The EV landscape is evolving with each segment witnessing 3-4 players consistently scaling their operations, demonstrating growth in line with expectations and, as a result, securing regular funding. Maintaining a dominant market share also allows these companies to transition to favourable unit economics swiftly.

The acceleration of advancements in technology is reshaping consumer/ user preferences, as newer versions are significantly outperforming older ones, prompting consumers/ users to gravitate toward these innovations. A critical focus for companies now lies in “quicker asset sweating”, especially in businesses that require significant asset creation (for example: energy solutions), to maximise efficiency and payback on investments. By developing strategic moats such as forging key partnerships and capturing prime locations, companies can create robust interlinked activities with their customers, increasing their stickiness.

The OEM segment has now started showing significant entry barriers and increasingly become a consolidated market, like the ICE segment. As partnerships/ collaborations play an important role, participants in the EV space need to pay special attention to the partnerships with OEMs emerging as market leaders.

Effective cash flow management has become essential for these companies, enabling them to operate smoothly while also serving as a justification for future funding rounds. With shortened capital expenditure cycles, companies will increasingly seek investors who are willing to support their regular financing needs.

Funding has also been increasingly directed toward R&D initiatives that foster unique technological capabilities, enabling Indian companies to develop moats as well as explore export markets. In India's EV narrative, innovation is particularly vital. Innovator companies will be better placed to gain market leadership. Innovation in this context will not be limited to newer or better technology but will involve solving basic day-to-day challenges across use cases.

ESG considerations are playing a dual role in this transformation. They are driving demand for EVs as business customers strive to meet sustainability targets, as well as attracting ESG-focused funding for companies within the sector. As the industry matures, substantial volumes of batteries will become available for recycling, presenting what could be the next significant opportunity in the coming decade.



## ABOUT BDO

### ABOUT BDO GLOBAL

BDO is a leading professional services organisation and are global leaders of the mid-tier, with a presence in 166 countries and 119,611 people working out of 1,800 offices. We endeavor to deliver an exceptional client experience through a tailored solutions approach, while partnering with our employees and clients globally



### ABOUT BDO INDIA

BDO in India offers Assurance, Tax, Advisory, Business Services & Outsourcing, and Digital Services for both domestic and international clients across industries. The team at BDO in India consists of over 10,000 professionals led by more than 350 partners and directors operating out of 19 offices, across 14 key cities.



\*Includes employees from our Global Capability Centres in India

ACTUARIAL SERVICES  
 EXECUTIVE SEARCH  
 TAX & REGULATORY SERVICES  
 RESEARCH AND INSIGHTS  
 MANAGED SERVICES  
 INDIRECT TAX

ASSURANCE  
 DEAL ADVISORY SERVICES  
 BUSINESS ADVISORY SERVICES  
 DIGITAL



## CONTACT US

For any content related queries, you may write in to [vcpeconnect@bdo.in](mailto:vcpeconnect@bdo.in) or get in touch with



### SAMIR SHETH

PARTNER & HEAD  
DEAL ADVISORY SERVICES  
INTERNATIONAL LIAISON PARTNER  
[SamirSheth@bdo.in](mailto:SamirSheth@bdo.in)



### ASHISH BAGADIA

PARTNER  
CORPORATE FINANCE &  
INVESTMENT BANKING  
[AshishBagadia@bdo.in](mailto:AshishBagadia@bdo.in)

Please note that the text, images, graphics, logos, trademarks, and any other intellectual property, may be protected by copyright, trademark, or other laws. Such Intellectual Property (IP) belongs to their respective owners and is used in BDO India's publication 'ELECTRIC VEHICLES -

Green Roads Ahead: Steering Through India's Electric Mobility Journey!', for illustrative, educational, or reference purposes only. BDO India does not claim ownership of any IP included in this publication, neither do we promote, endorse, benefit from or align with any brand / IP mentioned herein.

This publication has been carefully prepared, but it has been written in general terms and should be seen as containing broad statements only. This publication should not be used or relied upon to cover specific situations and you should not act, or refrain from acting, upon the information contained in this publication without obtaining specific professional advice. Please contact BDO India LLP to discuss these matters in the context of your particular circumstances. BDO India LLP, its partners, employees and agents do not accept or assume any responsibility or duty of care in respect of any use of or reliance on this publication and will deny any liability for any loss arising from any action taken or not taken or decision made by anyone in reliance on this publication or any part of it. Any use of this publication or reliance on it for any purpose or in any context is therefore at your own risk, without any right of recourse against BDO India LLP or any of its partners, employees or agents.

BDO India LLP, a limited liability partnership, is a member of BDO International Limited, a UK company limited by guarantee, and forms part of the international BDO network of independent member firms.

BDO is the brand name for the BDO network and for each of the BDO Member Firms.

Copyright © 2025 BDO India LLP. All rights reserved. Published in India.

Visit us at [www.bdo.in](http://www.bdo.in)