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Issue No. 25

WHAT'S INSIDE

Established in 1982, Poggenamp Nagarsheth Powertronics Pvt. Ltd. offers a wide range of custom-made stampings/laminations for e-mobility

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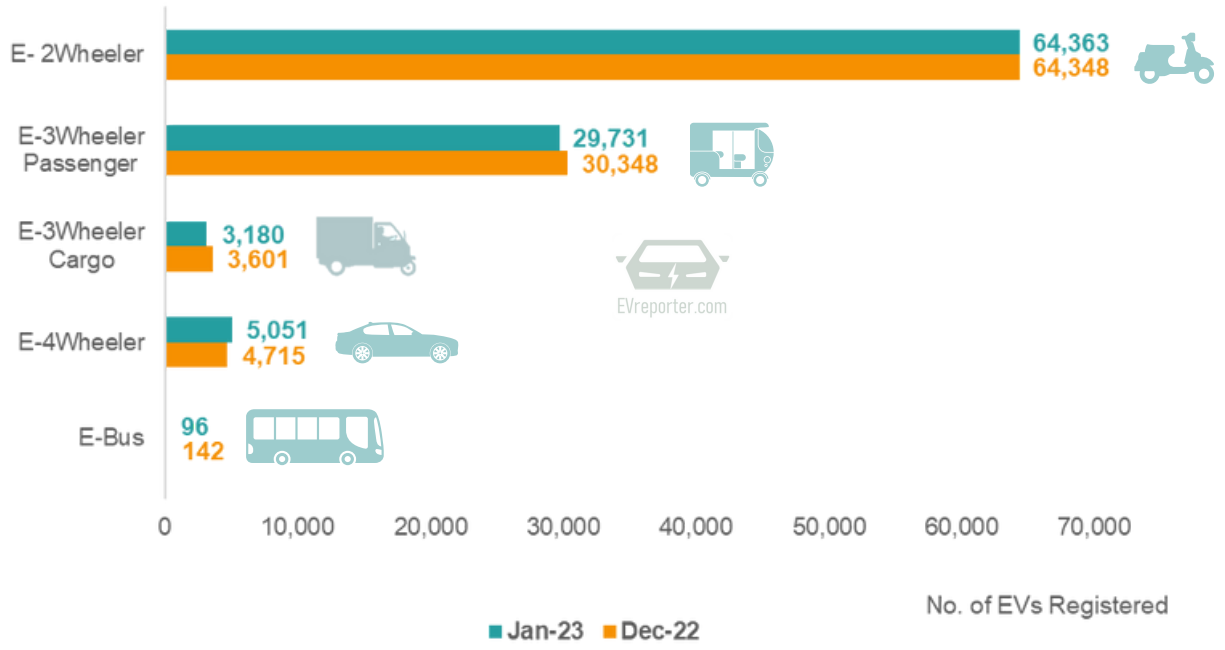
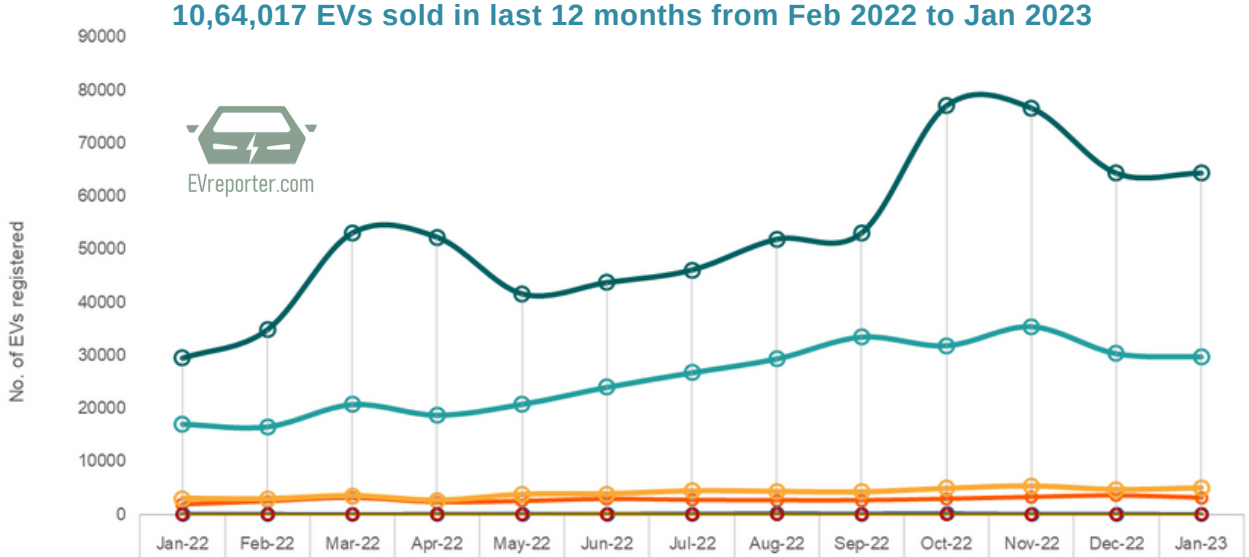
Category wise Electric Vehicle sales, Jan 2023

Total Registered Electric Vehicle Sales - **Jan 23 - 1,02,459** I Dec 22 - 1,03,188



Category wise-Sales Trend from Jan 2022 to Jan 2023

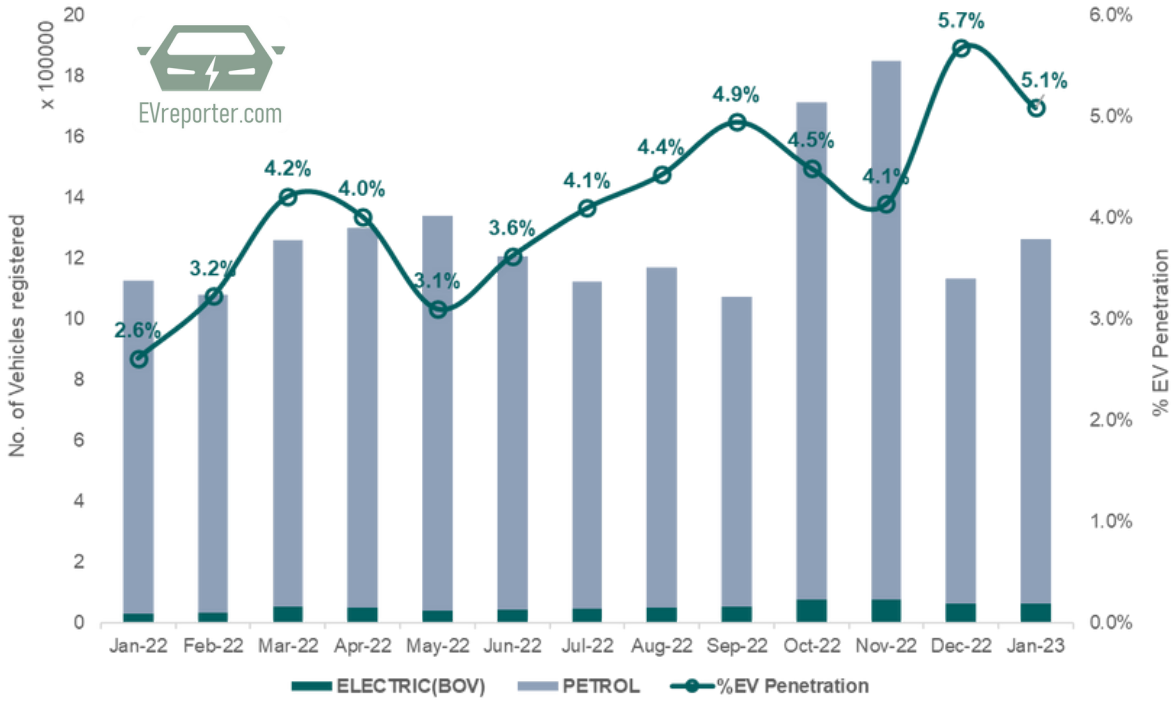
10,64,017 EVs sold in last 12 months from Feb 2022 to Jan 2023



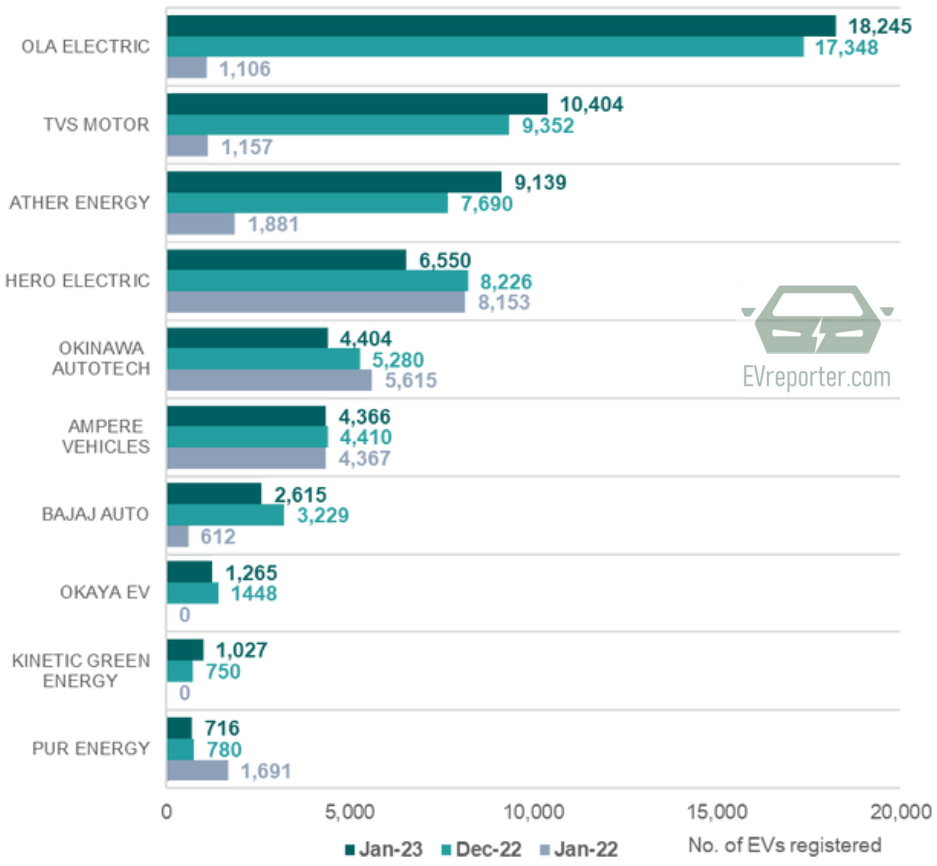
	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
E- 2Wheeler	29501	34873	53097	52283	41618	43755	46103	51900	53083	77024	76597	64348	64363
E-3Wheeler Passenger	17064	16575	20759	18775	20812	24018	26745	29354	33463	31850	35413	30348	29731
E-3Wheeler Cargo	1898	2516	3169	2322	2549	2930	2742	2695	2685	2962	3314	3601	3180
E-4Wheeler	3020	2933	3545	2668	3814	3891	4468	4346	4252	4935	5400	4715	5051
E-Bus	126	133	76	164	158	145	207	226	204	241	117	142	96
Others	36	32	44	54	43	82	48	50	37	34	42	34	38
	51,645	**57,062**	**80,690**	**76,266**	**68,994**	**74,821**	**80,313**	**88,571**	**93,724**	**1,17,046**	**1,20,883**	**1,03,188**	**1,02,459**

Source: Vahan Dashboard. Data as per 1342 out of 1429 RTOs across 34 out of 36 state/UTs.
Low speed 2Ws not included.

Fuel wise 2W Sales Trend, Jan 2022 - Jan 2023



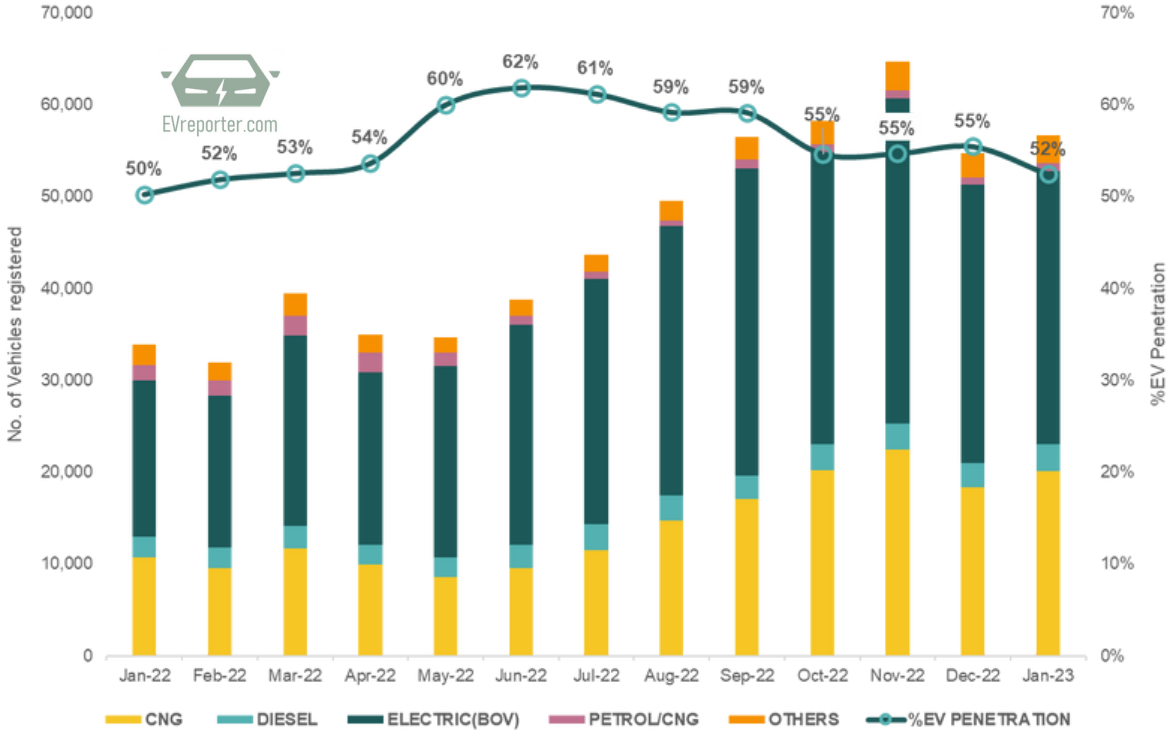
High Speed E-2W Sales Trend by OEM



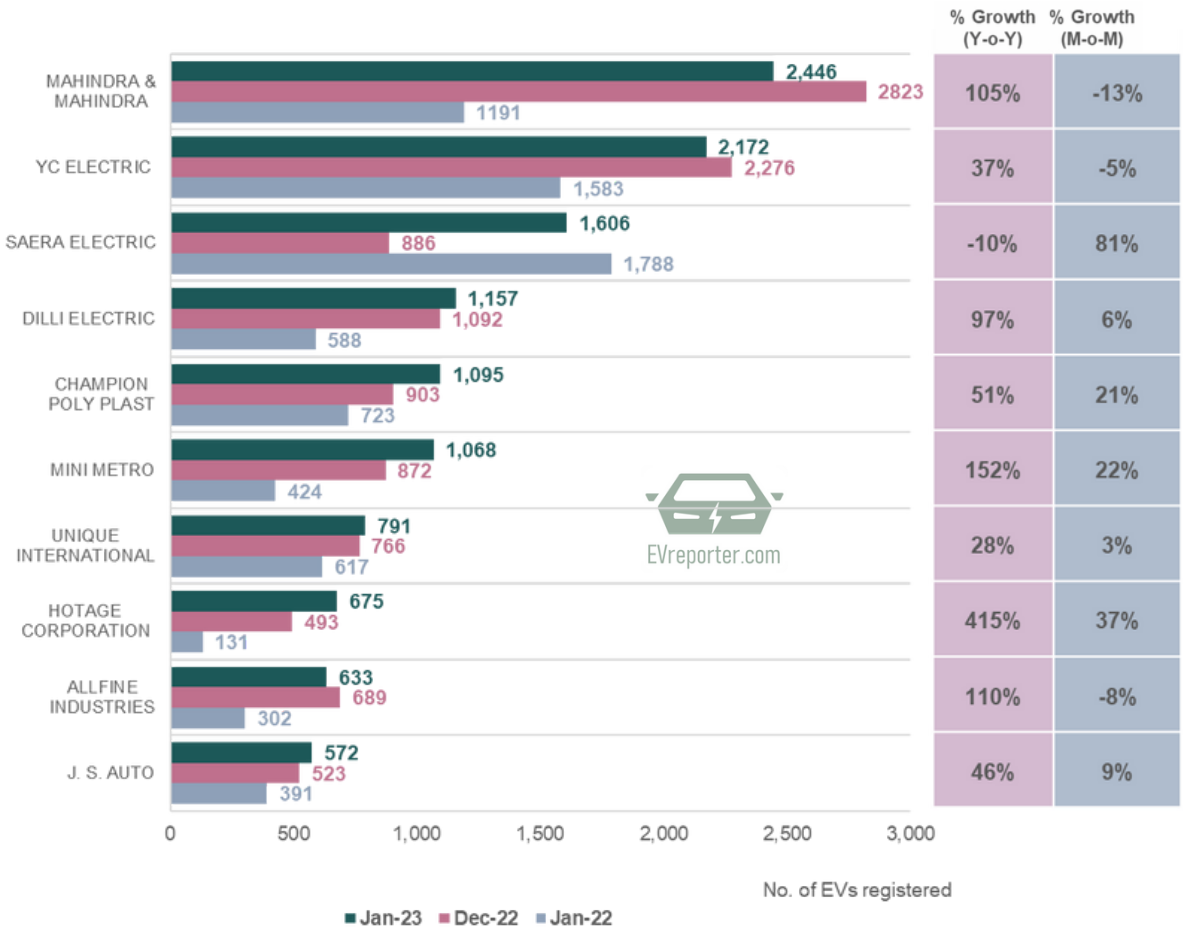
	% Growth (Y-o-Y)	% Growth (M-o-M)
OLA ELECTRIC	1550%	5%
TVS MOTOR	799%	11%
ATHER ENERGY	386%	19%
HERO ELECTRIC	-20%	-20%
OKINAWA AUTOTECH	-22%	-17%
AMPERE VEHICLES	0%	-1%
BAJAJ AUTO	327%	-19%
OKAYA EV	–	-13%
KINETIC GREEN ENERGY	–	37%
PUR ENERGY	-58%	-8%

Source: Vahan Dashboard. Data as per 1342 out of 1429 RTOs across 34 out of 36 state/UTs
Note: Low speed Electric 2 Wheelers data is not included

3W Passenger Sales Trend by Fuel Type, Jan 2022 - Jan 2023

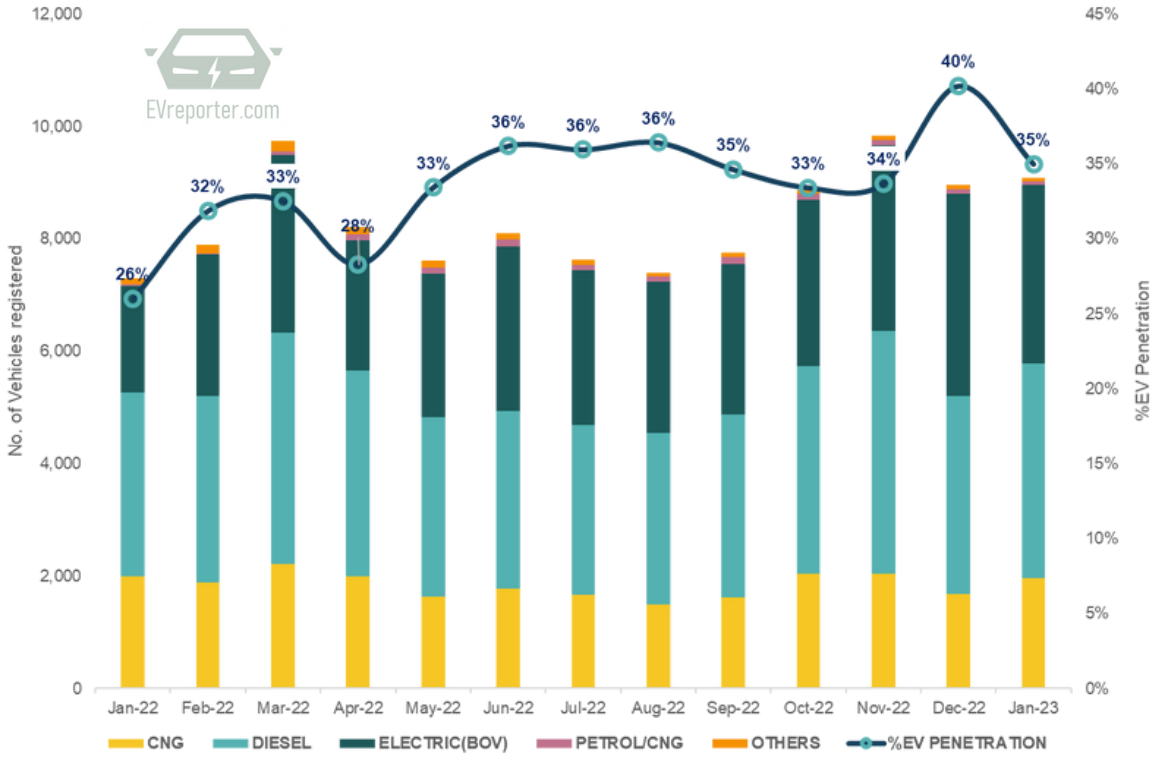


E-3W Passenger Sales Trend by OEM

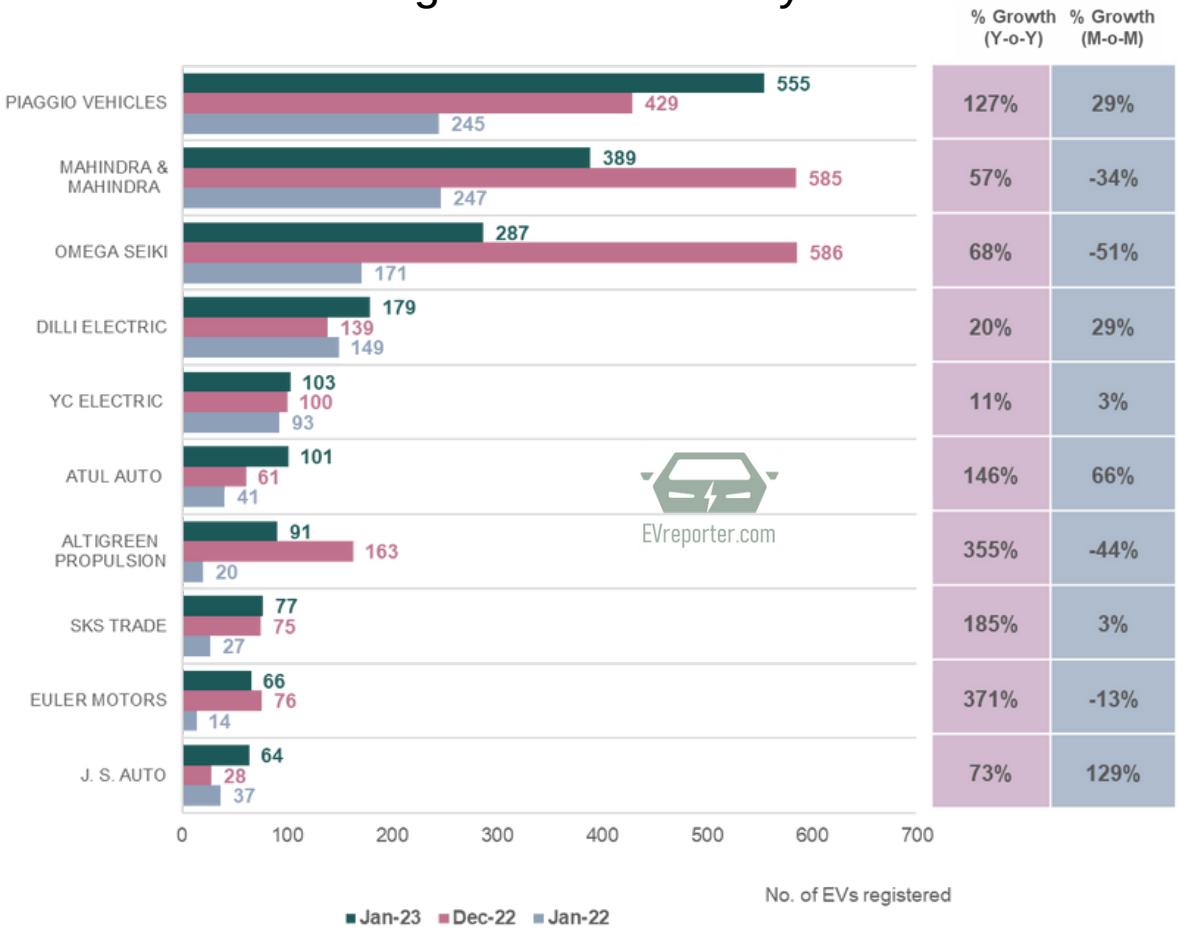


Source: Vahan Dashboard. Data as per 1342 out of 1429 RTOs across 34 out of 36 state/UTs. The aim of these graphs is to represent an overall trend of the new EV registrations in India.

3W Cargo Sales Trend by Fuel Type, Jan 2022 - Jan 2023



E-3W Cargo Sales Trend by OEM



Source: Vahan Dashboard. Data as per 1342 out of 1429 RTOs across 34 out of 36 state/UTs. The aim of these graphs is to represent an overall trend of the new EV registrations in India.

OEM wise E- 4Wheeler Sales Jan 2023

S.No.	OEMs	Jan-23	Dec-22	Difference	% Change	Jan 2023 Market Share
1	TATA MOTORS	4133	3868	265	7%	81.8%
2	MG MOTORS	425	501	-76	-15%	8.4%
3	BYD INDIA	132	51	81	159%	2.6%
4	BMW	123	37	86	232%	2.4%
5	HYUNDAI	111	94	17	18%	2.2%
6	KIA MOTORS	46	88	-42	-48%	0.9%
7	MERCEDES-BENZ	39	34	5	15%	0.8%
8	VOLVO	28	23	5	22%	0.6%
	Others	14	19	-5	-26%	0.3%
	Total	**5,051**	**4,715**	**336**	**7%**	**100%**

Others include JLR, Porsche, Audi etc.

OEM wise Electric Bus Sales, Jan 2023

S.No.	OEMs	Jan-23	Dec-22	Difference	% Change	Jan 2023 Market Share
1	PMI ELECTRO MOBILITY	48	63	-15	-24%	50.0%
2	SWITCH MOBILITY	35	27	8	30%	36.5%
3	MYTRAH MOBILITY	9	4	5	125%	9.4%
4	JBM AUTO	2	2	0	0%	2.1%
5	OLECTRA GREENTECH	1	31	-30	-97%	1.0%
6	ASHOK LEYLAND	1	0	1	-	1.0%
7	TATA MOTORS	0	15	-15	-100%	0.0%
	Total	**96**	**142**	**-46**	**-32%**	**100%**

Source: Vahan Dashboard. Data as per 1342 out of 1429 RTOs across 34 out of 36 state/UTs and Tata Motors website

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CATII 2000Vrms, CATIII 1500Vrms

NEW PW8001

NEW VT1005

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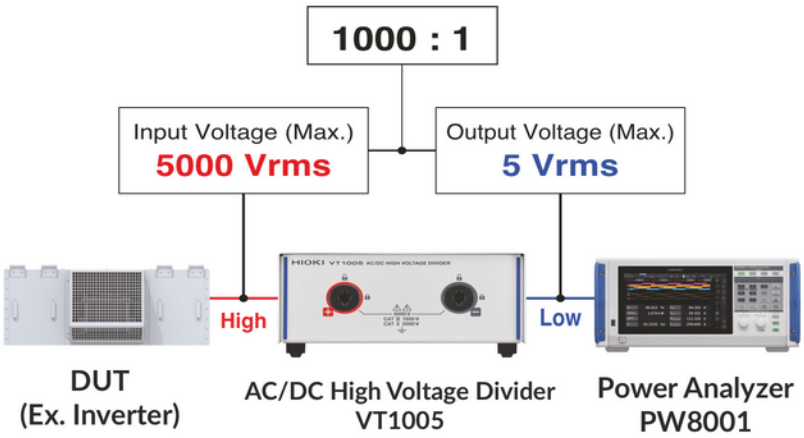
Safely Measurement Test



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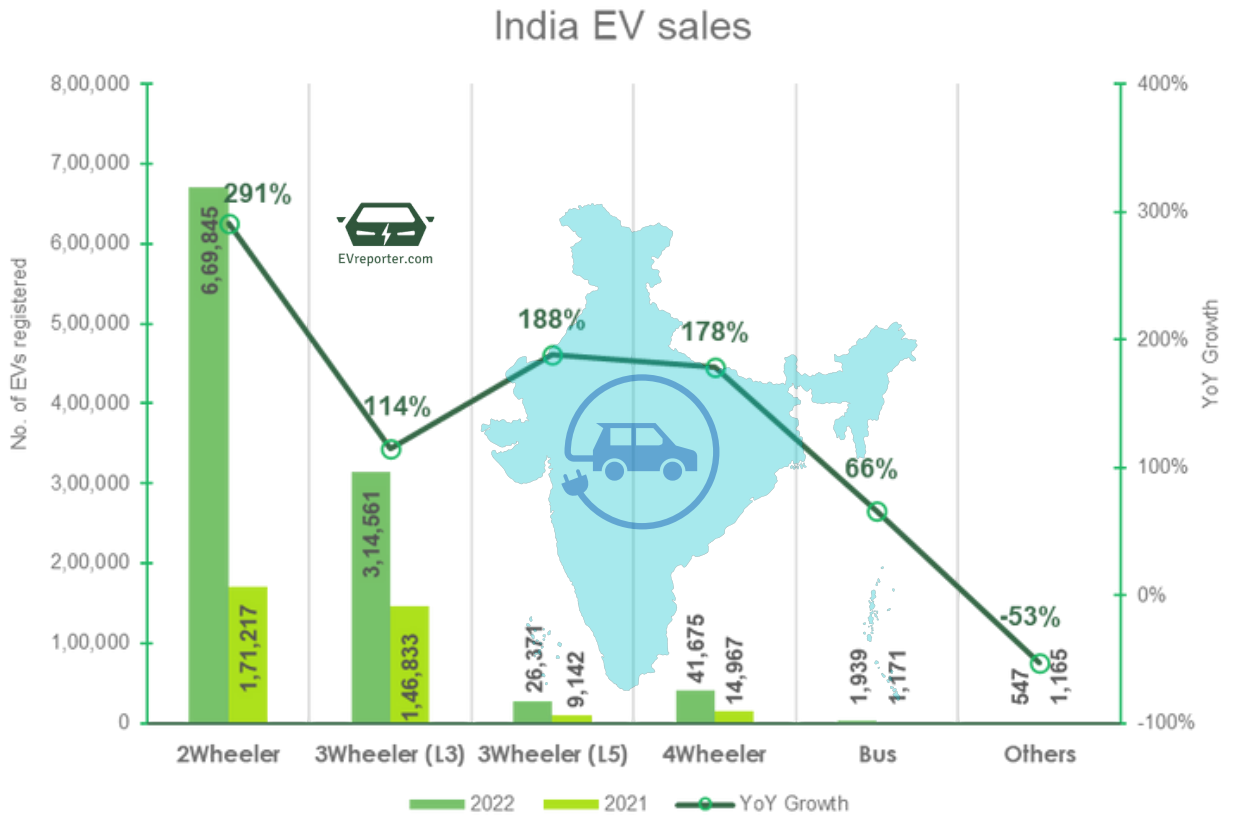
India EV Sales - Jan 2022 to Dec 2022



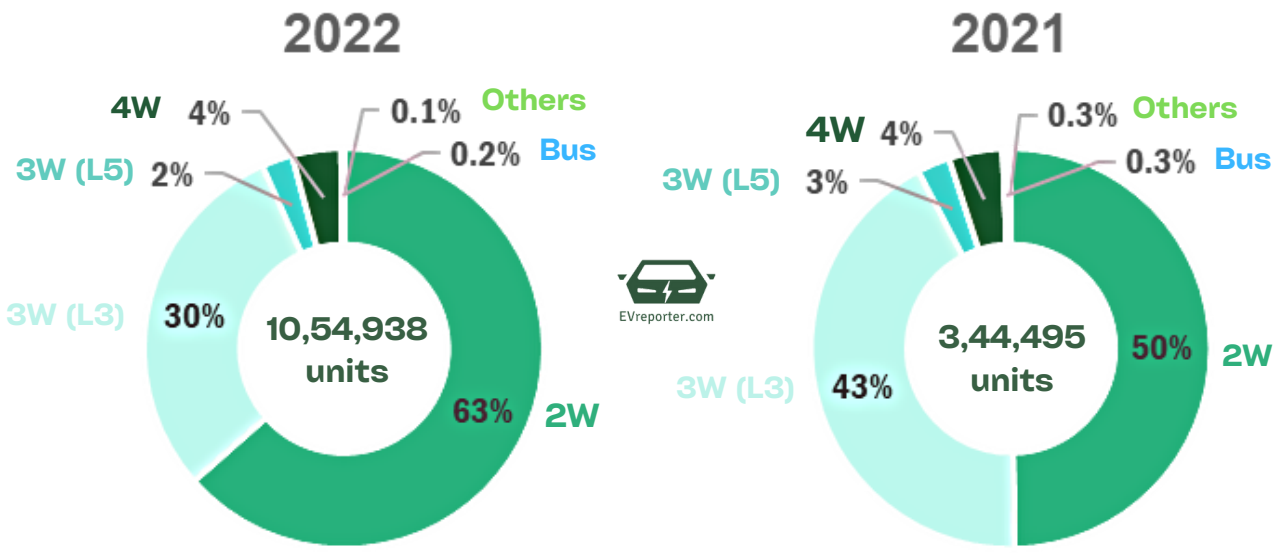
***Source**: Vahan Dashboard Data (Jan-Dec 2022) as per 1341 RTOs across 34 out of 36 state/UTs and **Telangana Regional Transport portal (Jan-Oct 2022).** Low-speed e2W data not included.*

Observations

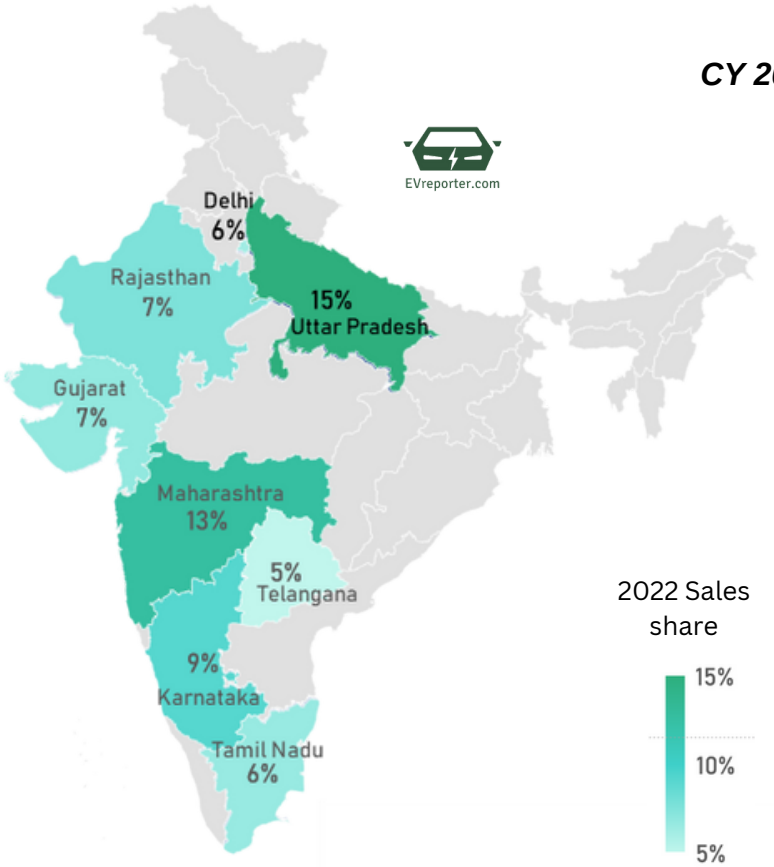
- In 2022, India's **EV sales surpassed one million units** for the first time, marking a record 206% year-on-year growth over 2021 EV sales numbers.
- With a total sales of 10,54,938 units of electric vehicles in 2022, India's EV industry hits record sales year across all vehicle segments, accounting for **4.7 per cent of overall automobile sales**.
- EV sales for 2022 show a more than threefold increase from 3,44,495 units sold in 2021.
- High-speed **e-2Wheelers, with sales of 6,69,845 units** in 2022, showed the highest segment share and a massive growth rate of 291% over CY 2021 numbers.
- 41,675 units of electric four-wheelers were registered in 2022, marking a year-on-year growth of 178%.

EVreporter annual report on 2022 EV sales + industry showcase - Click here

Vehicle Category-wise EV Sales and Penetration



2022 State wise EV sales in India

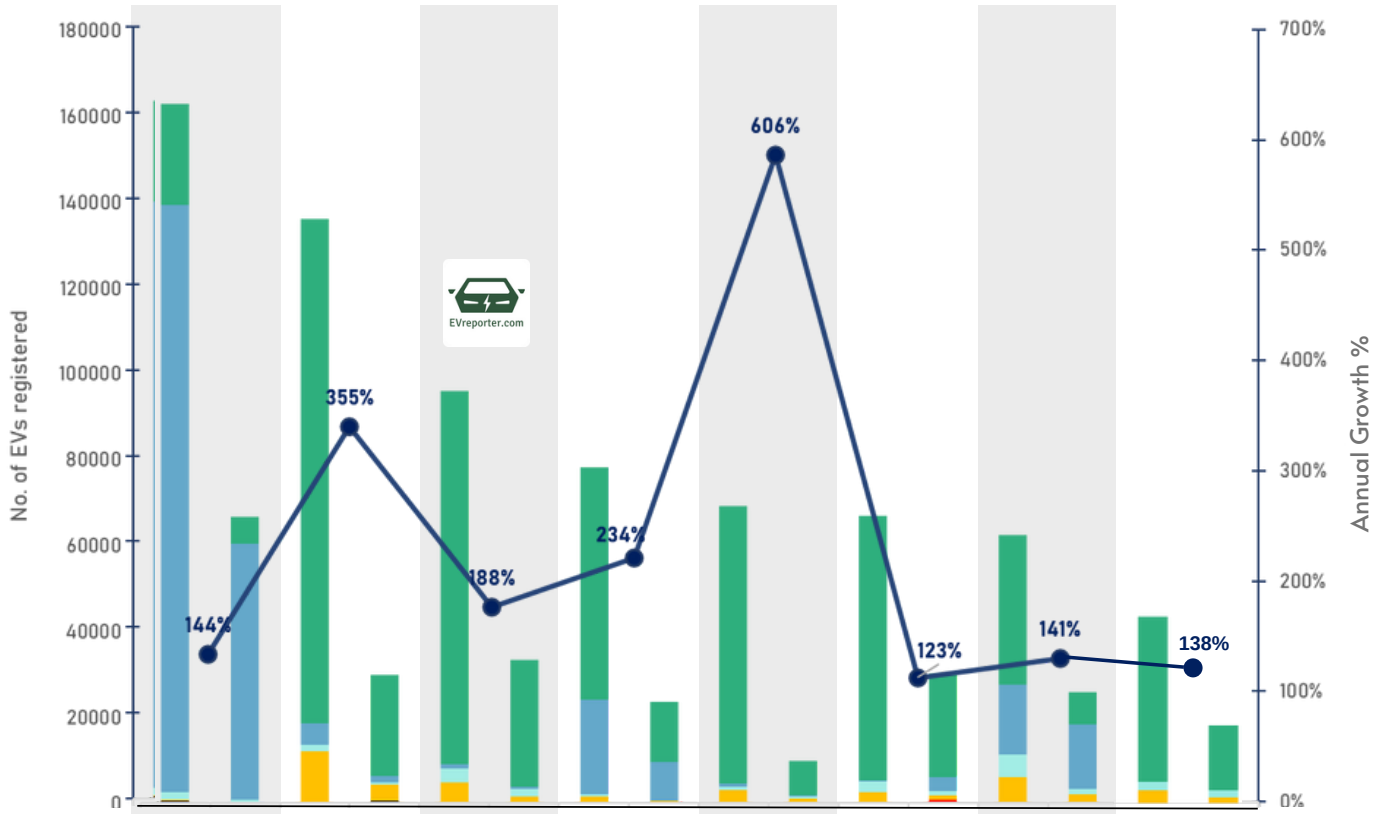


CY 2022 Top EV selling states in India

States	EVs sold
Uttar Pradesh	1,62,846
Maharashtra	1,36,016
Karnataka	95,878
Rajasthan	78,250
Gujarat	68,999
Tamil Nadu	66,958
Delhi	62,247
Telangana	48,822

***Source**: Vahan Dashboard Data (Jan-Dec 2022) as per 1341 RTOs across 34 out of 36 state/UTs and **Telangana Regional Transport portal (Jan-Oct 2022).** Low-speed e2W data not included.*

CY 2022 - Segment-wise sales in Top EV states in India



	Uttar Pradesh		Maharashtra		Karnataka		Rajasthan		Gujarat		Tamil Nadu		Delhi		Telangana	
	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021
2W	23563	6289	117526	23673	86888	29619	54137	13961	64581	7885	61629	23938	34589	7561	42755	16655
L3	136871	59703	5029	1572	1017	359	22021	8846	567	246	287	3397	16425	14956	26	73
L5	1706	418	1409	366	3282	1788	619	90	800	507	2404	865	5198	1292	2307	1736
4W	209	79	11692	3742	4317	1494	1467	554	2808	856	2456	948	5633	1958	3734	2035
Bus	465	192	336	552	364	27	5	0	183	216	0	0	399	31	0	0
Others	32	24	24	3	10	33	1	12	60	66	182	884	3	19	0	0
TOTAL	**1,62,846**	**66,705**	**1,36,016**	**29,908**	**95,878**	**33,320**	**78,250**	**23,463**	**68,999**	**9,776**	**66,958**	**30,032**	**62,247**	**25,817**	**48,822**	**20,499**

***Source**: Vahan Dashboard Data (Jan-Dec 2022) as per 1341 RTOs across 34 out of 36 state/UTs and **Telangana Regional Transport portal (Jan-Oct 2022).** Low-speed e2W data not included.*

Observations

Gujarat registered the highest annual EV sales growth in CY2022, with a 606% jump, registering a sale of 68,999 units compared to 9,776 units in 2021.

The majority of Gujarat EV sales are contributed by the e-2W segment, which makes up 93% (64,581 units) of total electric vehicles sold in the state. The state also had decent e-4W sales, with 2,808 units which is 7% of total e-4W sales in the country in CY 2022.

Maharashtra follows Gujarat with an annual growth rate of 355%, with sales coming majorly from the e-2W and e-4W segments.

CY 2022 - Top EV states in India

1. Uttar Pradesh continues to generate the largest electric vehicle sales.

- The majority (84%) of electric vehicles sold in the state are the low-speed L3 e-3Wheeler, followed by the e-2W with 14% of the state's EV sales. e-4W sales in the state are relatively low, with only 209 units (<1%) for CY2022.

2. Maharashtra saw promising EV sales with 1,36,016 units in CY 2022.

- e-2Ws accounted for the majority of sales in the state (86% of all EVs sold in Maharashtra), followed by the e-4W with a 9% share in the state.
- 7% of all e-2Ws sold in Maharashtra were electric.
- Of all the states in India, **Maharashtra ranks the highest for e-2W sales with 1,17,526 units, i.e. 17.5% of all e2Ws sold in India and e-4W segment with 11,692 units, i.e. 28% of all e4Ws sold in India** respectively.

3. Karnataka ranks 3rd with a total of 95,878 units, of which 91% (86,888 units) are e-2Ws.

- Karnataka is the second-highest e-2W-selling state in the country. 8% of all 2Ws sold in Karnataka in CY 2022 were electric.
- The state also ranks the 3rd highest in e-4W sales with 4,317 units, after Delhi with sales of 5,633 units.

More takeaways

57% of all e-2Ws sold in the country are sold in 5 states - Maharashtra (18%), Karnataka (13%), Gujarat (10%), Tamil Nadu (9%) and Rajasthan (8%).

68% of all e-4Ws sold in the country are sold in Maharashtra (28%), Delhi (14%), Karnataka (10%), Telangana (9%) and Gujarat (7%).

The high-speed e-3W (L5) models are best-selling in the states of Delhi with 5,198 units (20%), followed by Karnataka with 3,282 units (12%) and Tamil Nadu with 2,404 units (9%).

The bus segment registered a significantly higher EV penetration than other vehicle segments in all three top EV sales states, with 15% EV penetration in UP, 12% in Karnataka and 8% in Maharashtra.

NSURE SETS OUT TO MANUFACTURE LITHIUM-ION CELLS IN INDIA

MK Srivastava, VP Sales and Marketing at Nsure Reliable Power Solutions, *shares about Bangalore-based company's aspirations and plans to set up India's first lithium-ion cell manufacturing unit.*

Incorporated in the year 2016, Nsure Reliable Power Solutions is a **subsidiary of M/s. Ramalingam Construction Company Pvt Ltd (RCCL)**, which has over three decades of experience in infra projects for the urban sector. Nsure was spun up with the initiative to probe the opportunity in the energy sector six years back, and it is currently engaged in the business of implementation of prepaid energy meters on DBFOT for utility boards in the state of Karnataka.

RCCL's net worth stands at $52 Mn as of the year 2019-20, and our subsidiary, Nsure, has a net worth of $0.92 Mn (2019-20).

After a lot of contemplation and market study for 2 years, Nsure has ventured into Lithium-ion cell manufacturing and has taken several steps in the process, including starting a **trading vertical for Lithium-ion cells**, which has helped us understand market dynamics and becoming familiar with the various Lithium-ion cell chemistries and form factors.

The trading activity has also enabled us to deliver quality cells to lithium-ion battery pack manufacturers by establishing state-of-the-art testing and validating infrastructure in Bangalore. **Nsure will set up production for indigenous Lithium-ion cells in a phased manner.**

- The first phase involves setting up a pilot line and R&D lab, which is expected to be completed by August 2023, followed by setting up a manufacturing unit spread over **160 acres of land allocated in Mallur**, in Kolar District in the state of Karnataka.

- Nsure plans to invest **$113.3 million** to establish the manufacturing unit in the first phase from 2023-2025.

Planned production activity

The plant would be set up in stages as described below:

Phase 1: Commissioning of plant with an annual capacity of 1.5 GWh in 12 months.
Phase 2: Scaling up the production plant to annual capacity of 3.6 GWh in 48 months.

Phase 1 products

TECHNICAL SPECIFICATIONS

Product	:	LFP POUCH 3.2V- 30AH
Dimensions	:	11*133*202 mm
Nominal Capacity	:	30000 mah @0.3 C
Nominal Voltage	:	3.2V
Upper Charge Voltage	:	3.65V
Discharge end Voltage	:	2.50V
Initial Impedance	:	≤ 2.0 mΩ at AC 1 KHz
Max Charging current	:	1C
Max Continuous discharge Amps	:	60A
Cell weight	:	552 gms ± 10 gm
Cycle life	:	≥ 2000 cycles @0.3C/1.0C
Specific Energy	:	175 Wh/kg
Volumetric Energy density	:	325 Wh/Ltr

TECHNICAL SPECIFICATIONS

Product	:	LFP CYL 3.2V- 15AH
Dimensions	:	Dia -33.2 ⌀ Height -140 mm
Nominal Capacity	:	15000 mah @0.5 C
Nominal Voltage	:	3.2V
Upper Charge Voltage	:	3.65V
Discharge end Voltage	:	2.50V
Initial Impedance	:	≤ 3.0 mΩ at AC 1 KHz
Max Charging current	:	1C
Max Continuous discharge Amps	:	30A
Cell weight	:	295 gms ± 10 gm
Cycle life	:	≥ 2500 cycles @0.5C/0.5C
Specific Energy	:	164 Wh/kg
Volumetric Energy density	:	402 Wh/Ltr

Looking at the market of electric two-wheelers and three-wheelers in India, our plan is to **start with manufacturing LFP pouch cells** as they have better thermal stability and compaction ratio. The pouch cells will have a charge capacity of 30000 mAh, specific energy of 175 Wh/kg, and a volumetric energy density of 325 Wh/Ltr.

The second product in the line-up will be **33140 cylindrical LFP cells** with 15000 mAh capacity, specific energy of 164 Wh/kg and volumetric energy density of 402 Wh/Ltr. In the years following the first phase of manufacturing plant set-up, Nsure plans to increase the capacity to 5 GWh by the year 2028.

THE REAL COST OF AN EV CHARGING STATION - AC VS DC CHARGERS, PROFITABILITY ANALYSIS

***Devang Mistry, Co-Founder and Tech Lead at Pulse Energy**, breaks down the cost and revenue potential of AC and DC chargers and does the math behind determining the profitability of a charging station in the long run.*

There are two types of charging stations in India, AC chargers (slow charging and cheaper) and DC chargers (fast charging and expensive). Apart from the cheaper vs expensive debate, another thing that matters is the number of units that your charger can dispense. The more units (i.e. energy) that your charger dispenses, the more revenue you generate.

For example - If 1 unit (i.e. 1 kWh) equals INR 17, then a 15kW DC charger can dispense 15 units in one hour compared to a 3.3kW AC charger that can dispense only 3.3 units in one hour - A 4.5X more units and earning potential.

More units dispensed = More money

Comparing initial setup cost

AC chargers are cheaper, but your earning potential is 4.5 times less than a DC-001 charging station at equal utilization levels. The DC001 chargers are used predominately in the fleet operator business like BluSmart and for 3Wheeler EVs. 50 kW DC chargers are used in public places that charge private electric 4 Wheelers and heavy vehicles.

Below is a breakdown of the initial cost setup for AC and DC charging stations in Koramangala, Bangalore, and use over a period of 3 years.

Cost Breakdown of EV Chargers	15Amp (3.3kW) AC charger	15kW DC Charging Station (800 sq.ft plot)	50kW DC Charging Station (800 sq.ft plot)
One Time Cost			
Security deposit for land	₹0	₹1,50,000	₹1,50,000
BESCOM load approvals	₹0	₹1,50,000	₹7,50,000
Charger Hardware Cost	₹10,000	₹2,80,000	₹14,50,000
Civil Work Cost	₹1,000	₹50,000	₹50,000
Recurring Cost per month			
Land Rental	₹0	₹20,000	₹20,000
Software Monthly Cost for Charger Management	₹100	₹500	₹500
LTE sim card cost	₹100	₹100	₹100
Total Cost over period of 3 years	**₹18,200**	**₹13,71,600**	**₹31,41,600**

Source: Pulse Energy

For 15 Amp AC charger land rentals - the usual arrangement is a revenue share with 20% of revenue going to the land owner. For this reason, land rental per month has been taken as zero for this analysis.

In addition to these costs, there are taxes and charger efficiency losses that you incur on a recurring basis. The charger efficiency loss is the % delta between how many units the charger needs from the grid to offer 1 unit to your customer.

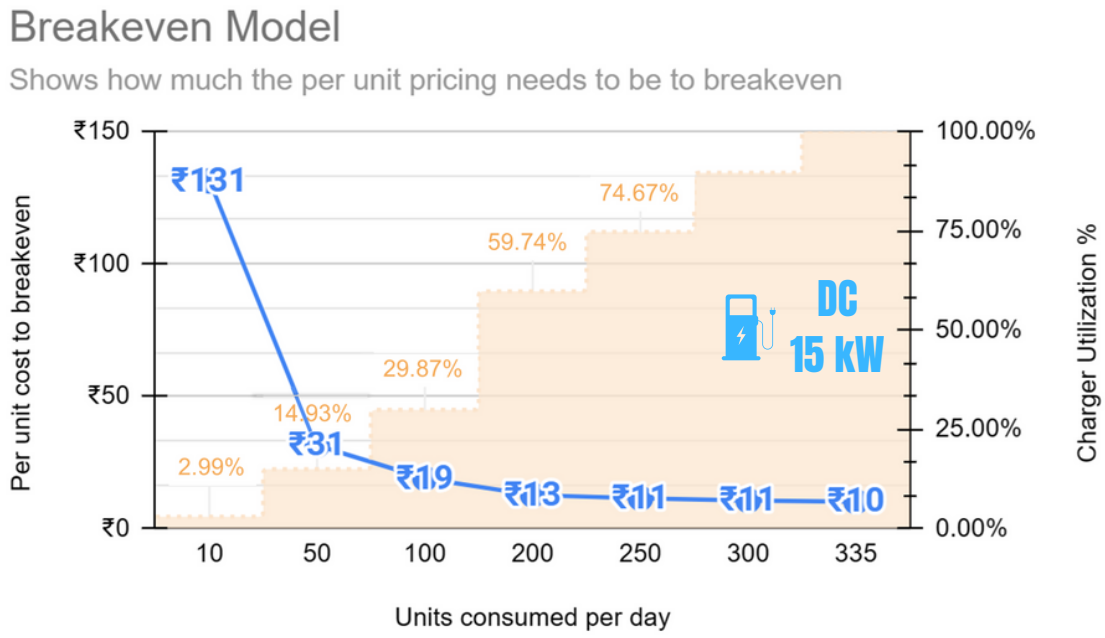
For example - A DC-001 charger has a Charger Efficiency Loss of 7%. (i.e. It will cost you ₹6.4 to deliver ₹6 worth of energy to your customer).

By including all these costs, breakeven graphs for AC and DC chargers are mapped to determine the minimum one should charge the customers based on the utilization rate of the charging station.

Breakeven models for AC and DC chargers

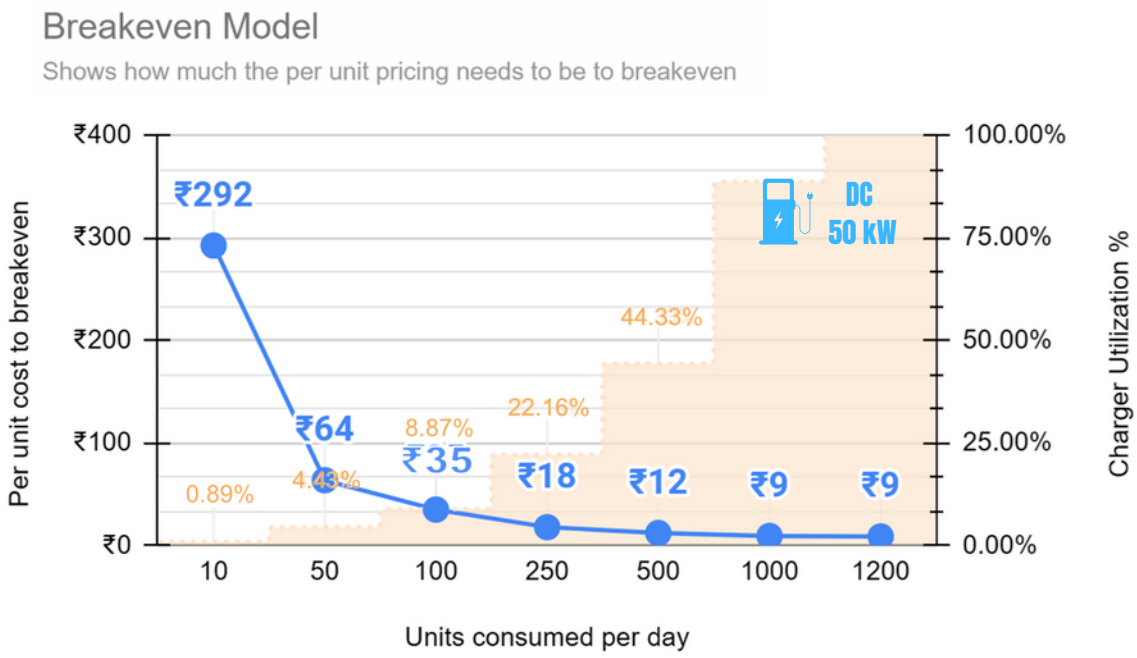
DC charging

For our breakeven model, we assumed that you have an EV meter for your charging station at the cost of ₹6 per unit. Now, if your usage is below 25%, then you should set the unit price to ₹31. However, this does not work out for customers as it will be more expensive for them to charge at your charging station than using their gas-powered vehicle. **According to Pulse Energy's customer research, the ideal price range is ₹13 to ₹11 per unit, which is the threshold at which electric driving becomes cheaper than ICE vehicles.**



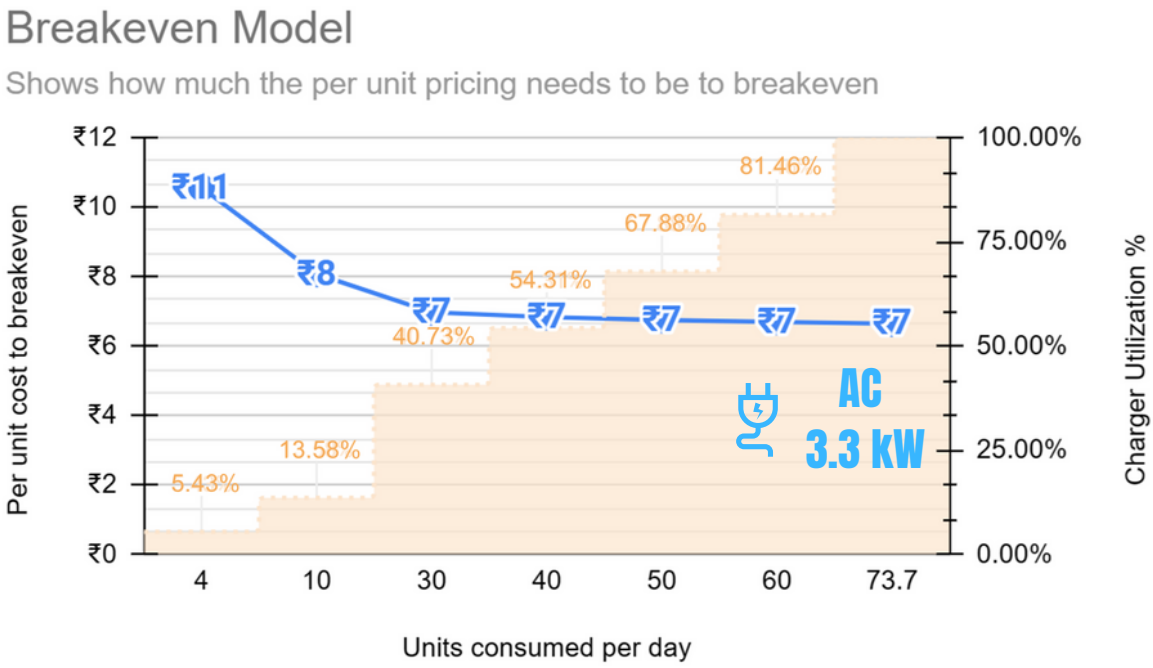
Source: Pulse Energy | Calculations assuming the chargers are deployed in Koramangla, Bangalore

For a DC001 charger at 70% usage, you should charge customers a minimum of ₹11 per unit. This is why private charging station operators typically price between ₹20 to ₹15 per unit. **However, most public stations today operate at less than 25% utilization, which means that even a ₹20 per unit price is ₹11 less than the minimum price to break even, resulting in a loss today.**



The ideal price for a 50kW DC fast charge is ₹18 per unit, and to achieve this target, the charger needs to be at over 20% utilization, which is not currently the case.

AC slow charging



Source: Pulse Energy | Calculations assuming the chargers are deployed in Koramangla, Bangalore

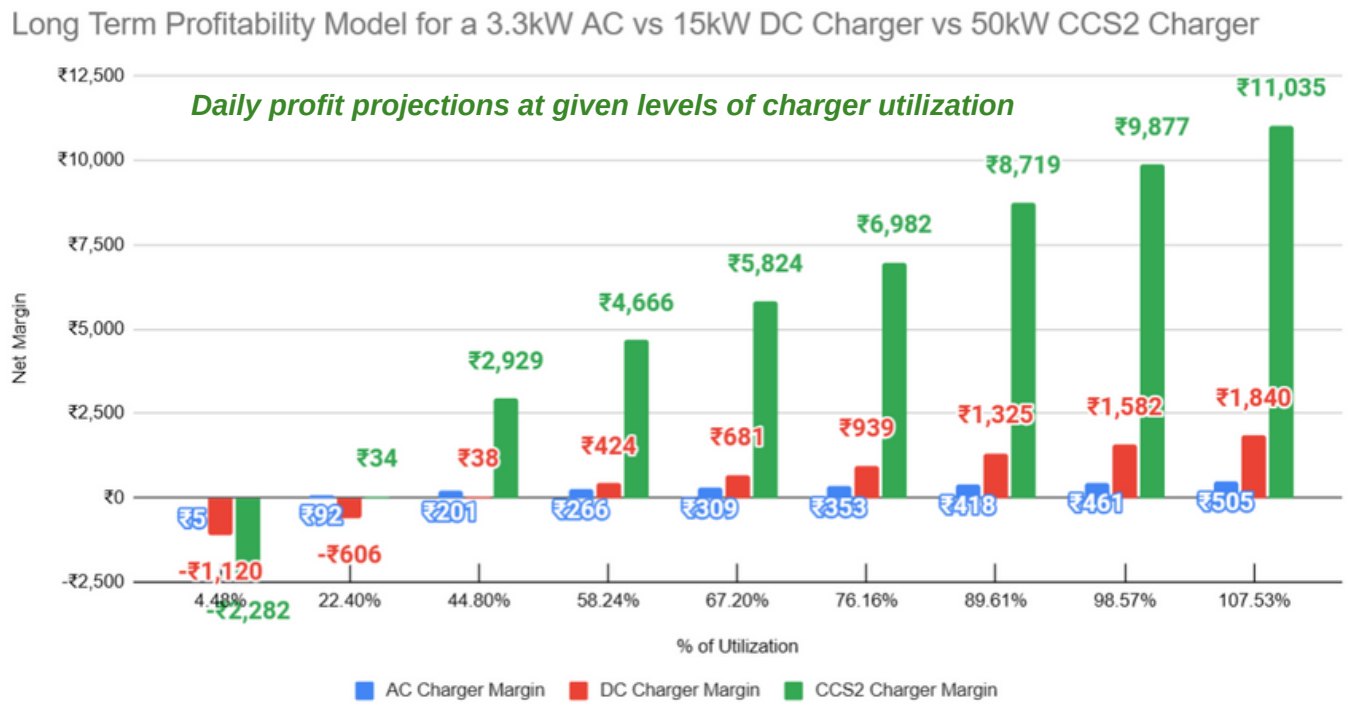
AC slow chargers are 75 times cheaper than DC 001 chargers by cost. At a 6% utilization rate, the minimum charge per unit is just ₹11 per unit, and the price goes too low as ₹7 per unit till 100% utilization.

Looking at the graph, AC chargers seem way more cost-efficient both for the CPO and the customer. i.e. You can charge users at the price point they prefer, even at 5% utilization.

However, the right question one should ask is - **What kind of chargers make more money in the long run with adequate utilization (~50% utilization rate)?**

Profitability model of AC and DC chargers

According to our profitability model, **DC fast chargers can generate much higher levels of revenue compared to AC slow chargers at higher utilization levels** (i.e. above 50% utilization). Positioned at the right place with the right density of electric vehicles, a DC charger will yield a higher return compared to a single AC charger. In addition, as the number of AC chargers in a location increases, the CPO incurs additional costs like upgrading the grid, land rental and deposits, efficiency losses, and more which will further reduce the margins you get from AC chargers. **A DC charger needs to just run at 50% utilization to churn out profit equivalent to an AC charger running at 100% utilization.**



Source: Pulse Energy
Excel sheet with the costing, breakeven model and profitability model

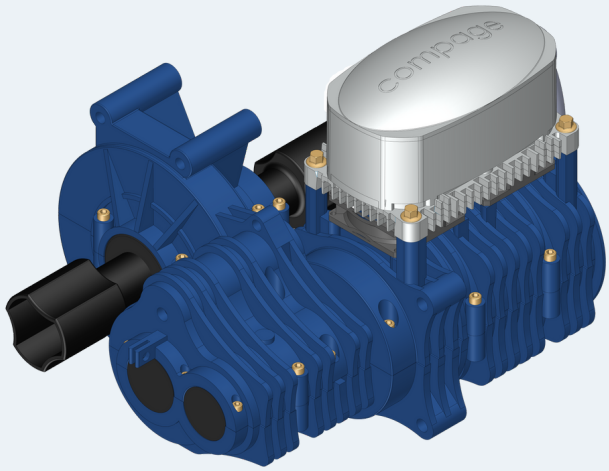
The final verdict, in my analysis, is that **DC charging station operators will generate copious amounts of profit in the long run**. In contrast, **AC charging station operators will need to diversify to other streams of revenue to increase their margins (like charging for parking, showing ads on chargers, etc.).**

Article contributed by Pulse Energy Technologies, which is an Electric Vehicle SaaS startup based in Bangalore, built by ex-Amazon engineers. Pulse Energy says that CPOs leveraging its platform have seen their charger utilization percentage increase from single digits to double digits (>20%) in less than 45 days. Currently, Pulse Energy's platform is connected with 554 DC chargers and 13,326 AC chargers.

COMPAGE AUTOMATION LAUNCHES AN INTEGRATED POWERTRAIN FOR E-3W

Faridabad-based Compage Automation has launched a new product - **IPT (Integrated Power Train)** for electric 3Ws in the **L5 category**. IPT by Compage is the first powertrain solution combining the **motor, gearbox, differential and controller into one package.**

This IPT is available in two versions, the first of which has a **4.5kW** continuous power output and a 9kW peak to serve city auto application vehicles up to **950 Kg GVW** and the second of which has a **6kW** continuous power output and an 11kW peak to serve the Maxima range of **1250 Kg GVW**. Both versions are available in 48V, 60 V, and 72 V configurations.



The maximum vehicle speed that can be reached is 55 kmph, with the best market **consumption economy of 83-95 watts per km** and the second step gear change **ratio of 5.8 to 15.5** that can be changed on the fly.

This is the result of the Compage team's experience from the electric Vikram project completed for M/S SIL, Lucknow.

Key features of Compage IPT

- 2-speed gearbox with on-the-fly clutch less shifting (patent applied)
- EMC/EMI compliant
- PMSM motor
- Peak output torque of 650Nm with maximum 1C discharge current from the battery
- IP67 compliant
- CAN enabled
- 100% Made in India

"The Compage team has been working on powertrain solutions for L5 electric 3Ws for the past 5 years, and IPT brings in the best of all our learning", **said Akshay Aggarwal - Director at Compage Automation**. *"A huge demand also exists for ICE autos to be converted to battery L5 vehicles, and Compage IPT can meet this demand as well",* **he adds**.

Compage has supplied **50,000 L3 category e-3W traction motors**, and its motors and controllers have been approved by ICAT for more than 35 OEMs. Compage counts OEMs such as **Escorts Kubota, Sonalika (ITL), Autonxt and ACE** among existing customers purchasing 600W to 32kW motors from the company.

As observed, retailers/e-commerce like Flipkart, Amazon, and Reliance are looking for reliable E-Auto L5 vehicles which have all the driver's needs for initial speed and torque, met and low demand on the battery. Compage also sees a huge demand for city autos to be converted to battery L5 vehicles.

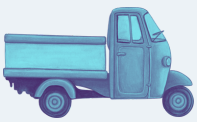
About Compage Automation

Compage has 20 years of experience in the design of PMSM motors with technology derived from Italian and German collaborations, alongside in-house capabilities in electronics and motor control design and development for the past 30 years.

E-mobility Powertrain Product line

1KW/48 VDC → **32KW/144 VDC**

Light power
1-2.5 KW



Loader power
2.5-4.5 KW

Heavy Loaded
6-8 KW

Motor vehicles
power upto 32 KW

Enquiries

anilaggarwal1309@gmail.com
akshay@compageauto.com
sales@compageauto.com

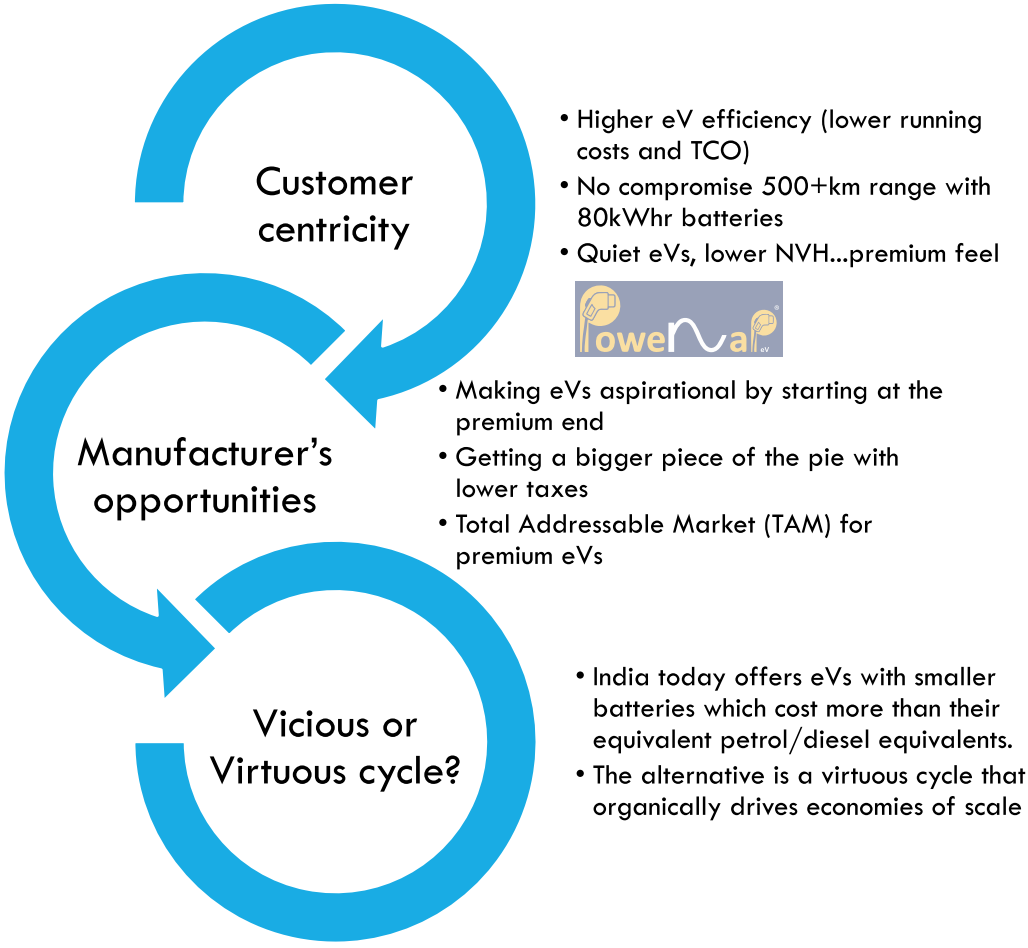
http://www.compageauto.com

+91 9999982595

BIGGER BATTERIES AND LONGER RANGE - WHY PREMIUM EVS WILL SPARK ELECTRIFICATION IN INDIA

Aditya Govindarajan *is a product manager, eV consultant and entrepreneur who has a passion for thinking differently. In this 2-article series, he presents his analysis on why premium electric vehicles (eVs) will better spark electrification in India.*

In this article, I bring together the justification why premium cars with bigger batteries resulting in longer range will seed the Indian electric vehicle (eV) market. In the last article (originally published in early 2021), I covered the existing tax incentives that position premium eVs for success in India with the example of the Tata Harrier SUV. **Tata unveiled the Harrier eV at Auto Expo 2023, validating the economic viability of larger battery premium eVs**. A bigger 80kWhr battery and 500+km range make the Harrier eV a no-brainer over their diesel variants as they recoup the difference in upfront cost within a few months. More importantly, these larger batteries will seed sufficient demand for domestically manufactured battery cells; thus, justifying Tesla style Gigafactories. This article covers the opportunity for manufacturers to build bigger battery eVs and how that benefits consumers. We talk about how the eV adoption challenges can be converted to opportunities.

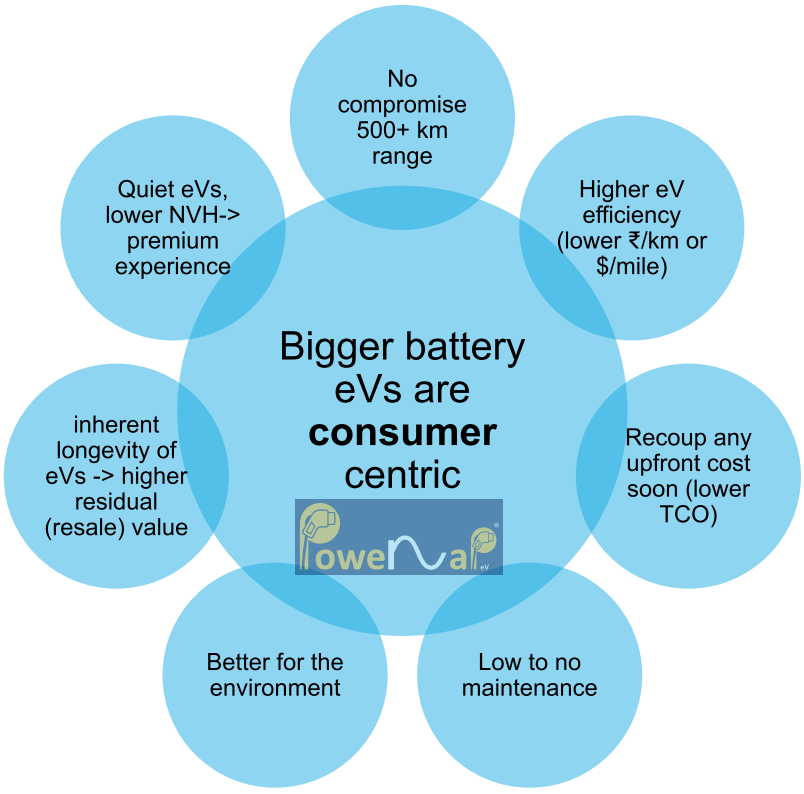


Customer centricity afforded by bigger batteries

What would a no-compromise eV look like to the customer? One that eliminates range anxiety (>500km on a full charge) without breaking the bank. After all the tax rebates and cash incentives go away, the electric vehicle needs to be preferred by customers over their internal combustion engine (ICE) alternatives. This can only happen if eVs are practical for everyday errands/commutes, they are more fun to drive, and cost less to own. The environmentally friendly aspect of eVs should just be a cherry on the cake if we are to expect eventual mass adoption.

There are many obvious positives with moving to eVs:

- eVs are far more fun to drive because of the instant torque of the electric motor.
- Longer life with far lesser parts to service.
- Environmentally responsible choice for densely populated Asian cities
- Much lower running costs and total cost of ownership (TCO) than fossil fuel cars.
- eV ride quality is comparable to much pricier luxury vehicles due to the absence of a noisy engine and related gear box and transmission systems.



By picking a car with a bigger battery, customers enjoy longer range without the need to charge regularly or look for charging infrastructure when away from home. Killing range anxiety is essential if we want customers to buy with the confidence that they will not get stranded before reaching their destination. We have already seen in the last article, the “affordable” Nexon eV is not really affordable being ~70% more expensive than its petrol cousin. By introducing premium eVs with 80kWhr battery packs we suddenly offer 500+ km range Harrier/XUV700 at a price point comparable to their diesel siblings by leveraging the existing tax code.

A smoother eV ride …NVH is lower than ICE vehicles.

Noise, vibration, and harshness (NVH) is a measure of how much unpleasant tactile & aural feedback the car delivers as you drive. Luxury cars are excellent at suppressing the NVH of their powerful petrol and diesel engines (ICE). Sound and vibration-suppressing material adds weight, which can spoil handling, acceleration, and fuel economy of an ICE car. The beauty of the eV is that it inherently has a much lower NVH, almost to the complaint of pedestrians that you cannot hear the cars driving by. This makes it easier for premium cars with good quality materials to be able to compete with luxury cars on NVH, thus upping their game and providing a comparable ride quality to the pricier luxury vehicles.

eV efficiency shines when compared to gas guzzling fossil fuel SUVs.

Beyond taxes and a thrilling ride, we must not forget how incredibly energy efficient eVs are compared to their fossil fuel-fed ICE counterparts.

Large diesel SUVs or luxury petrol sedans are notorious for terrible mileage and high monthly fuel costs. Bring in SUV eVs, and you get much lower running costs allowing people to break even on their total cost of ownership (TCO) in a far shorter time. Every economic incentive seems aligned to making sure the larger, more expensive cars go the eV route first. As battery prices continue to nosedive from the economies of scale from these top-tier cars, the sub-compact eV will become truly affordable. GM's notoriously diesel hungry Hummers have been relaunched as an eV brand, a markedly different approach because of the costly lessons learnt with the Chevy Bolt.

To reiterate our calculations of how inexpensive it was the operate an electric Harrier @ ~₹1/km v/s a diesel Harrier @ ₹7.7/km. By conservative estimates, a car is driven about 12,000 km (7500 miles) annually. After the break-even on the upfront cost is achieved, the electric variant saves the Harrier eV owner ₹75,600 in fuel costs every year! Once people sitting on the fence about buying a premium eV realize this incredible saving, the decision to go electric is automatic (no pun intended).

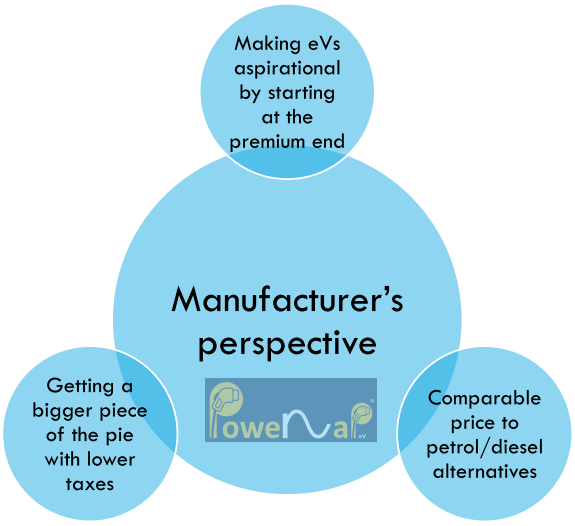
A diesel Harrier costs far more to maintain with oil changes and lubricants. Fewer parts in the car ensure a longer life, thus resulting in returning annual savings to the buyer for more years. Car manufacturers would be able to sell their idea of lower TCO more easily if they compared eVs with cars that already had high TCO, like large SUVs and premium sedans.

Manufacturer's opportunities

Making eVs aspirational by starting out with premium eVs

Cars are an emotional purchase decision. If the eV market is seeded with cars priced at the masses (with their range, performance, and creature comfort limitations), then we will attract just the early adopters. *Great marketing always changes the narrative and helps consumers realize their aspirations. By starting at the premium end of cars the adoption curve starts with nicer cars while using the purchasing power of the affluent to generate enough demand for battery prices to fall.*

Tesla knew they were catering to a quite different market segment: an affluent car buyer who cared about the environment and loved the latest in tech. One who loved discovering new features that came to the car with over the air software updates. There is no reason why domestic car manufacturers cannot use the same playbook albeit at a price point where premium cars are still priced well below what the western world can afford with Tesla & Lucid. The mindset of consumers will play out the same way, with the masses yearning to own and drive an electric car.



Raising unit revenues by keeping a bigger piece of the pie

We went at length in the last article showing how taxes were eating up the lion's share of the on-road price the customer pays. Getting to keep 91.6% of the on-road price instead of 55.6% is more than enough incentive for car manufacturers to grab this opportunity. With 80kWhr eVs, manufacturers make larger unit revenues. This means higher quarterly revenues and eventually higher profits once we hit giga-watt-hour scale.

Total Addressable Market (TAM) for premium eVs

eVs in India are a demand constrained market today because they are positioned with smaller batteries given the high unit cost (₹/kWhr). To bring scale, we need to leverage the demand from premium eVs which are not priced at a further premium just because they are electric.

The Tata Harrier sold 32,258 cars in CY 2022 (source: RushLane). Along with its nearest rivals the Jeep Compass, Mahindra XUV700, MG Hector and other premium mid-size SUVs, the market size was 181,585 in CY2022. Using the recipe described in these articles, we believe almost everyone would want the electric variants of their fossil-fuel premium cars. The eVs would just be better cars to own, drive, and maintain.

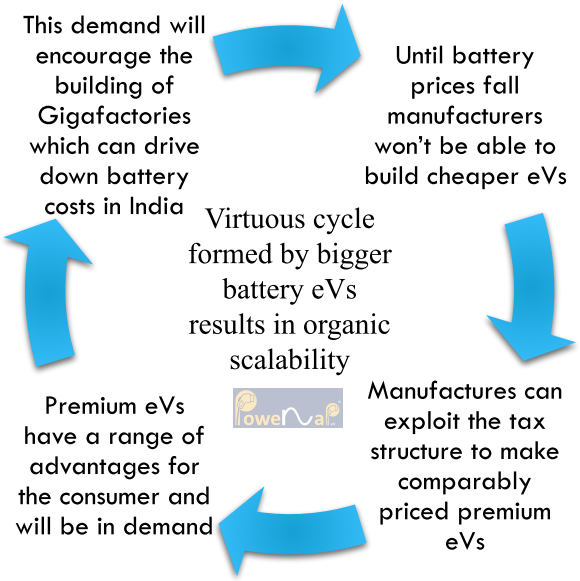
It is my conservative assertion that 60% of these premium 4W SUV sales would be electric if the 80kWhr battery was made standard. That would mean 108,951 premium eVs annually compared to the 41,538 sub-4metre Tata eVs sold in India (CY2022). The "affordable" eV approach is only attracting the early adopters willing to pay a 70% premium. The need for batteries for premium SUVs itself would skyrocket demand to 8.72 GigaWattHours, justifying 2 domestic Gigafactories!!

Now consider that these 80kWhr batteries are 2.65 times the size of the existing 30kWhr Nexon eV battery. That means the 108,951 mid-size SUV eVs is the equivalent of selling the battery capacity of 288,612 Nexon eVs annually. A staggering increase in battery production necessitating multiple Gigafactory in India to meet 2W, 3W and 4W demand.

Production floors at car companies will thus change their mindset to looking at eVs as a profit center rather than a cost center that relies on extensive marketing. This is the change we need for eVs in India to go mass market.

Choose the vicious or virtuous cycle?

Getting eVs to mass adoption presents the classic chicken and egg problem. Until we have sufficient eVs on the road, the infrastructure players will not see enough of an addressable market to make public charging ubiquitous. Until the battery prices don't fall, we won't have enough eVs. Until premium eVs are available, we won't have enough eVs. This dependency loop can only be broken with bigger battery premium eVs as we have been arguing in this series of articles.



There is a better option though that organically scales the demand for battery cells and justifies Indian Gigafactories which cause battery prices to plunge. All it needs is a shift in direction towards building premium eVs with bigger batteries.

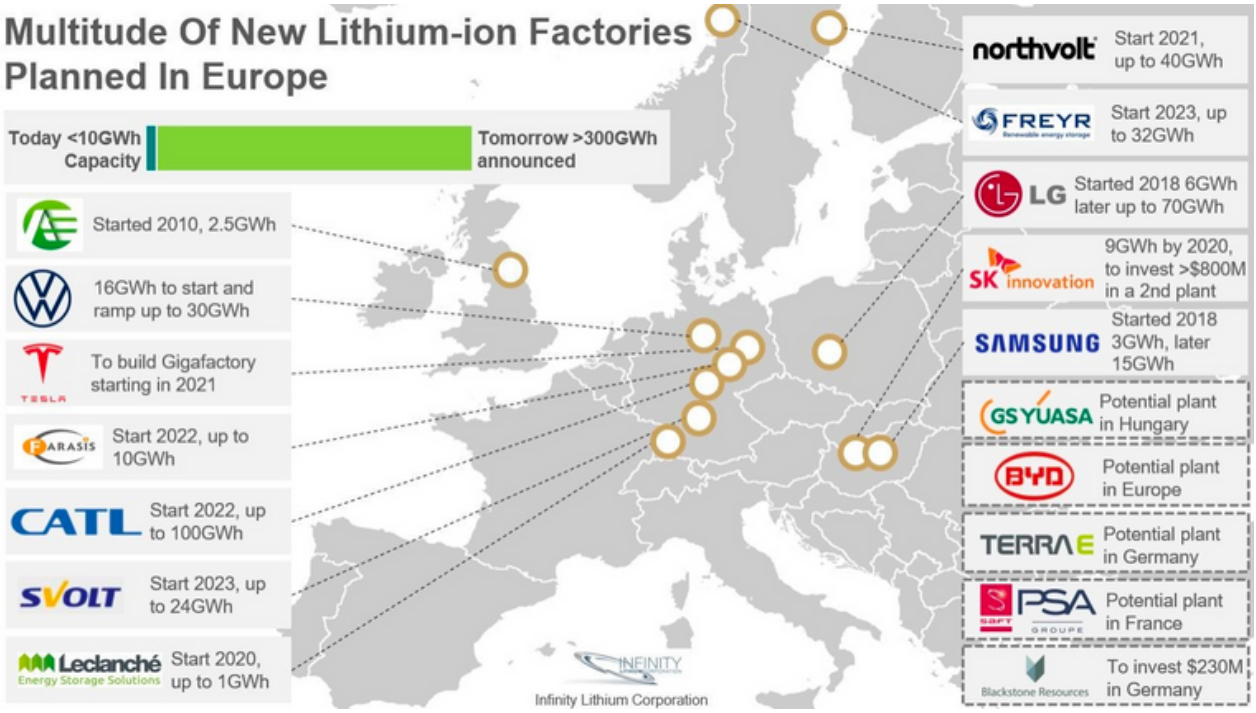
The choice is for the car manufacturers to make. The consumers and the demand will follow their cue.

Conclusion…sufficient demand needed for Indian Gigafactories

The US and China started large scale lithium-ion battery production for eVs and energy storage to keep up with the demand for electric cars. Europe is following suite. India and the rest of Asia is far behind in making such investments.

Europe's groundwork for the future of electric mobility.

While today Europe has < 10GWhrs of annual battery production their plan is to have about 300GWhrs of battery production. The investments from leading battery players worldwide does a great job of illustrating the seriousness.



This will lead a tipping point for gigafactories in Europe. We need to see this happening in India within the decade. Premium sedans and SUVs with bigger batteries is what will drive up the demand to get us there.

Closing remarks

Over these articles we have covered the eV landscape, taxation and the approaches in the West. We have explained how the obstacles could be converted to opportunities by manufacturers with the bigger battery go to market strategy for India. Battery prices need to fall drastically and that is unlikely to happen given the present slew of sub-4m cars that attract the lower GST, as they remain compromises on range while costing much more than their ICE equivalents. eVs need to be aspirational to begin with to help the consumer overcome the initial inconveniences, this will only happen when premium eVs flood the market. The total addressable market (TAM) exists, we just need better product market fit. This will force battery manufacturers to setup shop in India and cause the $/kWhr prices to come crashing. This is when we can expect a truly affordable eV for the Indian consumer that will significantly reduce India's dependence on oil imports and secure her energy future while preserving the environment for future generations.

Tata Motors, Mahindra and other domestic eV manufacturers along with the Hyundais and Kias of the world need to manufacture premium eVs with larger batteries to completely change the eV adoption curve. We need to end the conversation about how much extra one must pay for the eV version of a petrol/gasoline or diesel car by serving up a more compelling eV which takes advantage of the tax benefits and lower running costs. eVs need to become aspirational and preferred over their petrol and diesel counterparts, only then will they have mass appeal.

This article has been reproduced from Aditya Govindarajan's LinkedIn, which can be accessed here.

LITHIUM SULFUR (LI-S) BATTERIES – INSIGHTS ABOUT TECHNOLOGY

Lithium Sulfur battery, as the name suggests, is a type of battery consisting of a Lithium metal anode and Sulfur cathode. It uses a liquid organic electrolyte, which is similar to the traditional Lithium-ion batteries. This article by Rahul Bollini discusses the basics of a Li-S battery.

Working principle of Li-S batteries

Li-S works with a shuttling effect principle, where the Lithium metal anode oxidizes (loses electrons) and forms Lithium-ions, which travel through the electrolyte towards the Sulfur cathode. They form intermediate lithium polysulfides that shuttle between anode and cathode hence, the name **shuttling effect**.

Why Sulfur cathode?

Sulfur has high energy density, low cost, is abundantly available and is considered to have a lower environmental footprint. For better performance, Sulfur composite such as Sulfur-carbon material is used.

Why Lithium metal anode?

Lithium metal has very high theoretical specific capacity, which is **3860 mAh/g**. In comparison, graphite used in traditional Lithium-ion batteries has a theoretical specific capacity of 372 mAh/g.

Theoretical Wh/Kg and Wh/L possible in Lithium Sulfur vs Lithium-ion batteries

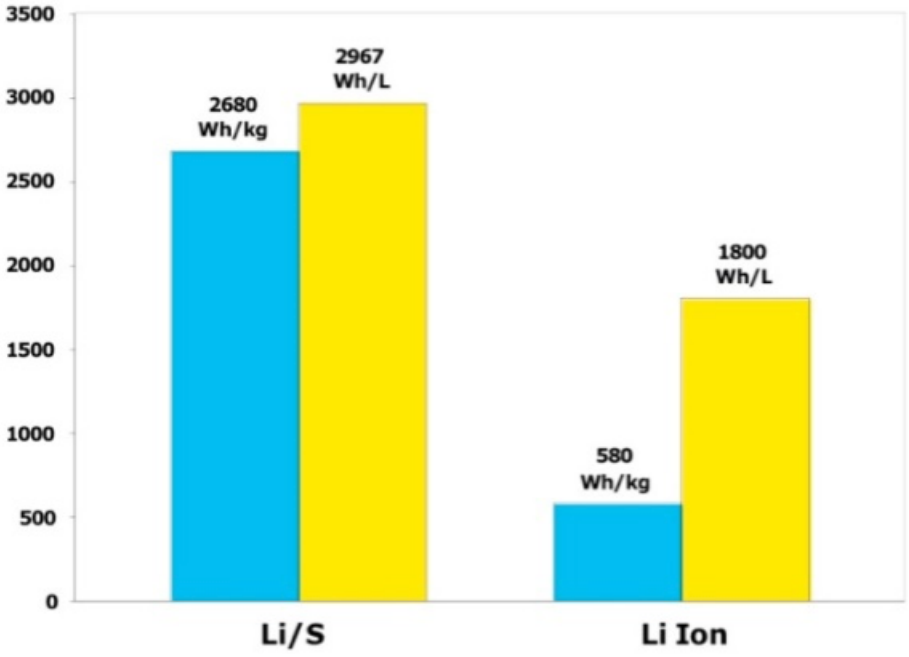


Image source: Berkeley Lab

Facts about Li-S batteries

- Li-S full cell voltage is close to 2V, but the high specific capacity of cathode and anode materials used actually brings the final gravimetric energy density (Wh/Kg) above traditional Lithium-ion batteries.
- 2V cell voltage cell means a higher number of series configuration BMS is required for battery pack assembling.
- Today's developments of Li-S are showing a volumetric energy density (Wh/L) below that of NMC Lithium-ion batteries. But the gravimetric energy density is much above 300Wh/Kg, clearly surpassing all types of Lithium-ion batteries mass manufactured today.

Why have Li-S batteries not taken off yet?

In simple words, Li-S batteries have not yet achieved the acceptable cycle life to be used for commercial purposes. It is due to the following challenges:

- Sulfur material has poor conductivity, which can slow down the kinetics of electrochemistry.
- Sulfur cathode exhibits high irreversible loss, poor cycling stability, low coulombic efficiency and high internal resistance.
- Sulfur cathode's volume expands during charge and discharge cycles, and this exerts pressure on the electrode causing damage to the cell architecture.
- Lithium metal anode is prone to dendrite formation, where the dendrites from anode penetrate through the separator and eventually reach the cathode and short circuit the fires. This is one of the major concerns when dealing with Lithium metal.
- There is a search for a better electrolyte that slows the pace of irreversible capacity fade during cycling.

Developments and future of Li-S batteries

There are a few companies extensively working on Li-S batteries. Like most researchers working on Li-S, one of the companies I know is able to reach between **100 and 200 charge-discharge cycles with 80% retention capacity**. This company hopes to solve the faster capacity degradation issue going forward. However, some companies have given up after years of hard work and huge fundraising. One of the notable companies that worked on Li-S and failed to deliver was a UK-based company, Oxis Energy.

Eventually, the cycle life will be improved in the coming times, and a few companies will set up manufacturing plants at a pilot scale. It is very difficult to say when because no company is close to commercialization as of today. Since Li-S has a higher gravimetric energy density (Wh/Kg) than traditional Lithium-ion batteries, it would be an ideal fit in drone applications and open up the gates to short-range electric planes. When ready, it would also be used to power many other applications where weight is a luxury.

Rahul Bollini *is an R&D expert in Lithium-ion cells with 8 years of experience. He founded Bollini Energy to assist in deep understanding of the characteristics of Lithium-ion cells to EV, BESS, BMS and battery data analytics companies across the globe. Rahul can be reached at +91-7204957389 and bollinienergy@gmail.com.*

E-TRNL ENERGY WORKING ON NEW PRISMATIC CELL MANUFACTURING TECHNOLOGY

Mumbai headquartered battery tech start-up **e-TRNL Energy** recently announced raising a **pre-seed round of INR 7.5 crores**. The start-up is working on a proprietary cell manufacturing technology that claims to deliver safer and denser batteries with fast charging. In this Q&A, **co-founder Apoorv Shaligram** shares more about their work.

Please help us understand which aspects of battery technology are you working on.

We have been working on a chemistry-agnostic battery cell manufacturing technology for the last year and a half.

Today, we have cylindrical cells, prismatic cells or pouch cells in lithium-ion batteries. These are the three available formats. **We are working on a new prismatic cell format**. Essentially we redesign the battery from scratch so that the **flow of current is reoriented inside the cell**, which allows us to make a lot of improvements on the core performance metrics.

Tell us more about your solution and approach.

There are certain fundamental constraints about a battery that cannot be changed for any particular cell. For example, batteries heat up, and one cannot really do much about the heating because of the design of the cell. The batteries heat up, and then you decide to cool it. The energy required to cool also has to come from the battery itself!

So, we started with one fundamental question - **How can we prevent heating in the first place?** There was only one answer - If we want to prevent heating, we must change the design.

The most widely used cell in the Indian market today is the cylindrical cell in 18650 format or 21700 format. If you look at the construction of these cells, the current does not flow in a straight line from the negative to the positive terminal. It flows in a spiral and probably takes a path 10X longer than what it is supposed to flow through.

In our design, the path of the current is reoriented in such a way that it passes through the minimum distance. The current is spread out over a large area, and it passes through the shortest dimension of the cell in a straight line. Now, you have a wide highway to go from your starting point to the destination, and on top of that, it is a very short distance so your energy consumption (wastage) is going to be much lower.

We came up with this new design, but the difficult part is to make it manufacturable. A completely new cell design has typically been difficult to manufacture, and that is one of the primary reasons people have not changed the existing manufacturing type. **We have come up with this manufacturing technology (still in R&D). We have done enough proof of concept to know that what we are thinking of is workable and delivers a better cell.**

Can you share how your cell manufacturing process differ from the existing processes?

The cell manufacturing process we are working on actually cuts down the process flow by almost half compared to the conventional cell manufacturing process. We also anticipate that it would result in around an 80% reduction in CapEx.

We are going with a concept called **3DEA™ (3D Electrode Architecture)**, wherein we do not have conventional coated electrodes. **Coating and drying of electrodes is not required.** It is a completely different process, but I cannot reveal much at this stage.

In terms of technology readiness, where do you stand at the moment?

We're at an early stage R&D right now. We have done internal trials and proof of concept on the manufacturing technology, but as a product, it is quite an early stage right now. **We aim to reach TRL 5 or TRL 6 in a year from now** and be market-ready.

Union Budget 2023-24

India's finance minister Ms Nirmala Sitharaman presented the union budget 2023-24 on 1st Feb 2023. The EV industry welcomed the decisions to **extend the concessional import duty on lithium-ion cells** for batteries for another year and the **customs duty exemption** on the import of specified **capital goods/machinery** for the manufacture of lithium-ion cells for use in EV batteries. The FY24 budget allocation for the FAME-II scheme is **INR 5,172 crores,** up from INR 2,898 crores in FY23.

The budget includes **Green Growth as one of the government's top 7 priorities**. Below are some of the announcements outlined for Green Growth objectives:

- 35,000 crore outlay for energy security, energy transition and net zero objectives.
- Annual production of **5 MMT under the Green Hydrogen Mission** to be targeted by 2030.
- Battery energy storage systems to be promoted.
- 20,700 crore outlay provided for renewable energy grid integration and evacuation from Ladakh.
- **Green Credit Programme** to be notified under the Environment (Protection) Act to incentivize and mobilize additional resources for environmentally sustainable and responsive actions.

The Economic Survey of India 2022-23 estimates:

- The domestic EV market is expected to grow at a **CAGR of 49%** between 2022-2030.
- **One crore units** of annual EV sales by 2030.
- EV industry will create **5 crore direct and indirect jobs** by 2030.

JLNPHENIX ENERGY

Powering Green Energy

Automotive Component Manufacturer for E-Mobility Industry

Lithium-Ion Batteries

Two Wheeler

- Cylindrical and Pouch forms
- Thermally managed battery

Three Wheeler

- Laser welded A-grade cells
- Smart IoT enabled BMS

Traction

- Supports fast charging
- High performance and better life cycle

Advanced Technology Powertrain Sub-Assemblies

Hub Motor

Mid-Drive Motor

Speedometer Display, IoT

Wiring Harness

Controller

- Complete Powertrain Solution
- Lower Cost to Performance Ratio
- ASIL-B Functional Safety Compliance
- Higher Motor RPMs and Wheel Torques
- Widest Range of Drivetrain Options (Hub and Mid Mount, BLDC, IM and PMSM)

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On Jan 30, 2023, **Mahindra announced that pre-orders for the new XUV400 electric SUV have surpassed 10,000 units.** The automaker started taking pre-orders for the electric SUV on January 26, 2023, in 34 cities, with introductory prices starting at **INR 15.99 lakh to INR 18.99 lakh** (ex-showroom). These prices, however, are only valid for the first 5000 bookings of the two variants offered – the EC and EL. Mahindra estimates that the present 10,000+ bookings received translates to about a **seven-month supply** of the SUV and aims to deliver 20,000 units within a year of its launch based on current supply chain visibility.

The XUV400 EL is powered by a **39.4 kWh** lithium-ion battery that offers an MIDC range of up to **456 km** and comes with a **7.2 kW** charger.

The XUV400 EC is powered by a **34.5 kWh** li-ion battery, offers an MIDC range of up to **375 km**, and comes with an optional **3.3 kW and 7.2 kW** charger.

Citroën, the French automaker that started selling cars in India in 2021, has started taking pre-orders for its new C3 electric hatchback. The Citroën eC3 looks identical to its petrol version and will compete with the Tata Tiago EV.

The EC3 gets a **29.2kWh** battery with a built-in **3.3kW AC charger** and is also capable of **100% DC fast charging**, which can charge the vehicle from **10-80% in 57 minutes**. The eC3's front-axle-mounted electric motor produces **57hp and 143Nm of torque and has an ARAI-certified 320km range**. Citroën offers a 7-year/1,40,000 km warranty on the battery, a 5-year/1,000,000 km warranty on the electric motor, and a 3-year/1,25,000 km warranty on the vehicle itself.

Currently, Citroën batteries are sourced from the Chinese company Svolt. Citroën vehicles are manufactured at their factory in Thiruvallur near Chennai, Tamil Nadu. Citroën India also partnered with Jio-bp to build EV infrastructure and services across its network. **Jio-bp will install DC fast chargers across Citroën's key dealership network** and workshops across the country in phases. With ë-C3 scheduled for launch in Q1 2023, Jio-bp's charging infrastructure network will be accessible via the My Citroën Connect app.

Tata Motors Nexon EV Range has now been repositioned to start at Rs. 14.49 lakh, while the Nexon EV MAX range has been repositioned to start at Rs. 16.49 lakh with the new XM variant. Nexon EV MAX certified range enhanced to 453 km, and current users can avail enhancement through software update from February 15, 2023.

Deliveries of the new variant, Nexon EV MAX XM, will commence in April 2023. **Tata Motors has also delivered the first batch of 2000 Tiago.evs to customers across 133 cities.**

TVS Motors has entered into an investment agreement with Singapore-based e-2W company **ION Mobility** to provide the latter with ecosystem support in Singapore and Indonesia. The investment comes as a part of US$18.7 million Series A round raised by ION Mobility, bringing the total capital raised by ION to over US$25.5 million since 2020. ION launched its M1-S electric scooter in Jakarta in November 2022.

Simple Energy announced the inauguration of its first manufacturing unit, named Simple Vision 1.0, at Shoolagiri, Tamil Nadu. The manufacturing unit is spread across 2,00,000 sqft, equipped with General Assembly Line, an in-house motor manufacturing line and a battery manufacturing line, along with other facilities like cell storage, CAL (Customer Acceptance Line), etc. The factory also has a testing facility for its in-house vehicle testing.

Hero Electric will procure 10 lakh units of BMS from Mumbai-based **Maxwell Energy Systems** over 3 years and 5 Lakh units of BMS per annum from **Exicom.**

Revolt Motors is now a 100% wholly owned subsidiary of RattanIndia Enterprises Ltd. The financial details of the deal were not made available.

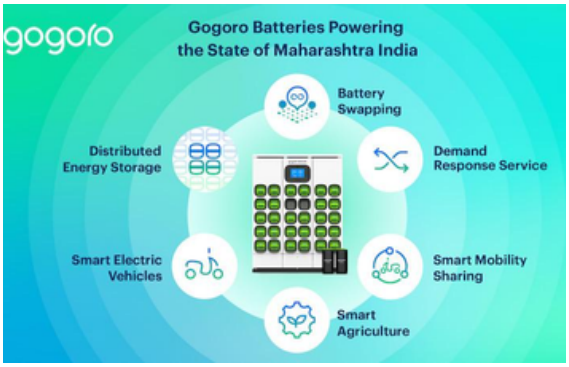
Electric One signs an MoU with cricketer Arjuna Ranatunga **to enter the Sri Lankan 2-Wheeler market** through the newly formed Joint Venture company - Electric One Lanka Pvt. Ltd. The JV will invest about **5mn USD** over the next three years, starting with retail and distribution in the first phase. The partnership will endeavour to set up over 50 retail outlets in five years.

Gogoro tops Taiwan's Electric Scooter Sales in 2022 and led electric scooter sales in the country for the seventh year. Electric scooters accounted for **12%** of all scooters sold in Taiwan in 2022.

Gogoro, with many e-scooter makers, such as A-motors, Yamaha and Suzuki adopting its battery-swapping ecosystem, powers **90%** of all e-scooters in Taiwan.

DHL Supply Chain Thailand has deployed two electric trucks in distribution operations for Big C Supercenter. The trucks, procured from Thai EV, can travel up to **320-350 km** on a single charge, taking three hours to recharge to 100% battery capacity or **90 mins to 80% battery** on a fast charge. The payload capacity is **8.5 tons**.

Mahindra to deploy OTA solutions by Sibros for its Born Electric portfolio of electric SUVs - Sibros will deploy its Deep Logger and Deep Updater in-vehicle and cloud products on Mahindra's INGLO EV platform and IoT cloud.



Swapping solution network provider **Gogoro** and automotive component manufacturer **Belrise (Badve Engineering Limited)** plan a joint **50-50 partnership to invest approximately US$2.5 billion** over eight years with the Maharashtra government to build energy infrastructure including battery swapping, smart electric vehicles, mobility sharing, demand response services and distributed energy storage, smart agriculture, and other applications across the state.

Hyderabad-based **Allox Advance Materials** has signed an MoU with **Govt. of Telangana** for setting up a **C-LFP (Lithium Iron Phosphate)** active battery material production unit. The 3GWh per annum capacity facility with an **investment of ₹210 Cr** will be expanded to 10 GWH/PA with ₹750 Cr by 2030 and will provide employment to 600 highly skilled professionals.

Omega Seiki will invest INR 800 Crore to set up two facilities to manufacture EV powertrains and battery packs for its electric vehicles. The company has four factories for its electric vehicles in Delhi NCR and Pune.

Jae Sung Korea and iM3NY are OSM's technology partners for powertrain and battery, respectively.

Matel Motion, a Pune-based brand for PMSM motors in industrial applications, is set to foray into the EV market and offer **solutions including Motor, Gearbox and Motor Controllers**. A company statement said that MATEL is ready with its manufacturing facility with a capacity of more than **100K units per year**, and series production will start soon. In the first phase, production will start for e2W and e3W OEMs.

Pune-based EV powertrain company **Weber Drivetrain** has entered a technology transfer partnership with China-based **Wuxi Lingbo Electronic Technology for BMS and controller tech**. Weber Drivetrain has launched its manufacturing facility for hub motors and controllers in Chakan MIDC, Pune and **committed a total investment of INR 35 crores in Phase 1**. Wuxi Lingbo works in the fields of brushless DC motors, permanent magnet synchronous motor controllers, battery management systems and vehicle control units. The Chinese company has an annual output of **1.5 million sets of various controllers and 700,000 sets of BMS.**

Israel-based EVR Motors signed a commercial agreement with automotive component supplier **RSB Transmissions** to develop, manufacture and market a line of motors for Light Commercial Vehicles. This is EVR Motots' fourth agreement in 8 months, covering a range of motors from 3kW to 120kW for a wide range of applications.

Lithium-ion recycling company Lohum announced that they have signed a multi-year partnership with Mercedes-Benz Energy. The agreement enables them to offtake 50MWh of second-use battery cell modules from Mercedes-Benz Energy per annum. This development will help Lohum upscale the production of 2nd life battery applications for the Indian stationery and non-auto mobility energy storage markets.

SUN Mobility unveiled a swapping solution for the franchisee model and a new battery pack at AutoExpo 2023. The plug-and-play solution for franchisees requires a **15-amp socket and up to 6 sq ft of space.** Multiple stations can be stacked together to facilitate additional swapping requirements.

Autoexpo 2023 was held from January 13-18, 2023. Many new electric vehicle models were displayed in different vehicle segments. A compilation is available here.

Anand Group has announced their **new cleantech platform, 'ANEVOLVE',** for electric mobility. It will operate a design centre in the NCR and manufacturing facilities in other parts of India. The group already has a manufacturing facility in Bhiwadi, Rajasthan.

ANEVOLVE has also signed an MoU with an Israeli start-up, ZOOZ, to initially supply the latter with critical precision machined parts for mechanical Energy Storage Systems for EV infrastructure in international markets. **ANEVOLVE aims to invest ₹1,000 crores (US$ 120 million) in the short term as part of its commitment to a greener future.**

eBikeGo is entering into the electric bicycle space with their new product Transil e1. The Bicycle will be launched in 3 colours, and it will be priced at around INR 44,999.

Greaves Electric Mobility to get exclusive rights (in Indian 2W and 3W market) to the technology of UK-based electric drive system design company Eta Green Power. The e-powertrain suite, including motors and motor controllers, will be manufactured at Aurangabad.

Log9 has raised a fresh round of capital worth **$40 Mn** as a part of its Series B Funding in a mix of equity and debt raise led by **Amara Raja Batteries and Petronas Ventures**. The round also saw participation from InCred Financial Services, Unity Small Finance Bank, Oxyzo Financial Services and Western Capital Advisors.

Bangalore-based EV charging platform **ElectricPe has raised $5M in the Pre-series A round**. ElectricPe is an EV charger aggregator with **10,000 live charging points** on its app, said the company. The start-up has closed a pre-Series A funding round of **$5 million led by Green Frontier Capital, Blume Ventures, and Micelio mobility**. Other investors include Dubai-based NB Ventures, Anchorage Capital Partners, Supermorpheus, and Climate Angels.

Bangalore-based **Chara Technologies** has raised a pre-series A round of **$4.75M led by Exfinity Venture Partners**. The round also saw participation from Vietnam-based Big Capital, the venture arm of Bitexco, Log9 Materials, Kalaari Capital and CIIE. CO.

So far, Chara has built rare-earth free motors for 2-Wheeler (hub and mid-mount), 3 & 4-Wheeler LCVs and HVAC use cases.

TI Clean Mobility, a wholly owned subsidiary of Tube Investments of India, has **acquired the balance 30.04% stake in Cellestial Emobility for an aggregate consideration of INR 50.90 Cr**. Cellestial is a start-up company engaged in the design and development of **electric tractors**.

Hero Motors Limited, the flagship auto-components company of the **HMC (Hero Motors Company) Group, has raised growth equity capital from GEF Capital Partners and its LPs for a minority stake**. The company will have a significant focus on serving the OEMs in the electric mobility sector going forward.

Delhi-based EV-exclusive lending platform **AMU Leasing has raised an undisclosed amount in its first formal debt funding from the State Bank of India**. So far, AMU Leasing has expanded its presence across 6 Indian states and aims to finish 1 million EVs by 2027.

Sona Comstar signed an agreement to acquire a 54% equity stake in ADAS Sensor company **Novelic** as it looks to foray into Sensors and Software technologies. With additional resources and guidance from Sona Comstar, NOVELIC will further industrialize its products and continue to develop its technology and invest in hiring top talent.

Over the 9 months period of FY2023, **Sona Comstar booked INR 467 crores (a 25% revenue share) from the BEV segment**. With 41 programs across 25 customers, BEV now makes 73% of its net order book, which also includes contracts to supply Electronic Differential Locks and Differential Assemblies for upcoming BEV models by global OEMs.

Indian construction equipment manufacturing company **ACE- Action Construction Equipment unveiled India's first electric crane, 'F150ev'**, at Bauma Conexpo 2023 in India Expo Centre at Greater Noida. The Faridabad-based company claims to be the No. 1 crane manufacturer in India, with a **market share of around 63%**. The crane is powered by a high-voltage **60 KW PMSM motor** designed and manufactured by **Compage Automation**.

Tata Motors commenced deliveries of the **Ace EV for last-mile deliveries**. The company unveiled the new Ace EV in May 2022 for intra-city cargo transport. The first fleet of the Ace EV was delivered on Jan 9, 2023, to leading e-commerce, FMCG and fleet operators. **The EV has a 27kW (36hp) motor with 130Nm of peak torque** with a grade-ability of 22%. Offers a **range of 154 km and a Cargo volume of 208 ft³.**

Altigreen launched the L5 cargo neEV Tez at **INR 3,55,000,** which comes with **15 min rapid charging when plugged into Exponent's charging station (e^pump)**. The **8.2 kWh LFP battery pack** is liquid-cooled and comes with a warranty of **3,000 fast-charge cycles**.

Etrio Automobiles has announced a long-term partnership with Bengaluru-based EV financing and solutions company **Turno** for the financing and deployment of 1,000 e-3w cargo vehicles manufactured by Etrio in the next 12 months.

Mahindra Electric Mobility Limited has merged with Mahindra & Mahindra.

A new **Last Mile Mobility division** has been formulated, which is the new home for some vehicles from Mahindra Electric and some Mahindra & Mahindra products, including Treo, Alfa, eAlfa, Jeeto and Zor.

Tata Passenger Electric Mobility completes the acquisition of Ford India's Sanand Property and the Vehicle Manufacturing Plant and Machinery. All VM Employees are offered employment.

WhatsApp payments for EV charging - EV SaaS start-up **Pulse Energy** has partnered with **WhatsApp and WATI** to allow 'scan and pay' at Log9 Mobility's InstaCharge charging points. WhatsApp payment option will initially be available to drivers of 3W EVs and later expand to 2W and 4W EVs.

Britishvolt Collapses - The **UK battery start-up has collapsed into administration, with most of the staff made redundant,** reported BBC**.** It began constructing a gigafactory in northeast England in 2021, but work was halted in August 2022 amid funding difficulties.

Michigan-based battery startup **Our Next Energy (ONE) closed a $300 million** Series B funding round that takes its valuation to $1.2 billion.

Fast charging battery technology company StoreDot announced an expansion with the official opening of its first US research facility in Irvine, California, USA. The facility will be used to speed up StoreDot's development of semi-solid battery technology and battery material research.

Italvolt, the company developing Italy's largest independent battery cell factory, will license StoreDot's fast charging technology and IP rights to manufacture XFC li-ion batteries in Italy.

Tesla announced $3.6B of new investment in Gigafactory Nevada, adding 3,000 new team members and two new factories: a 100 GWh 4680 cell factory (with a capacity to produce enough batteries for 1.5 million light-duty vehicles annually), as well as their first high-volume Semi factory. Semi is their fully electric combination truck, with 500 miles of range and energy consumption of less than 2 kWh per mile.

24M has been selected to receive $3.2 million in funding from the U.S. Department of Energy. 24M will partner with MIT and Carnegie Mellon University to use its SemiSolid manufacturing platform to develop low-cost, fast-charging **sodium metal batteries** with good low-temperature performance for EVs.

GM investment for battery raw materials - General Motors and Lithium Americas will jointly develop the Thacker Pass mine in Nevada, which is the largest known source of lithium in the US and the third largest in the world.

GM will make a $650 million equity investment in Lithium Americas, the largest-ever by an automaker to produce battery raw materials. Lithium Americas estimates that the lithium extracted and processed from the project can support the production of up to 1 million EVs per year.

Freudenberg e-Power Systems (battery provider for commercial vehicles) and LG Energy Solution have signed a multi-year contract for the supply of lithium-ion cell modules. With a capacity of 19 GWh, Freudenberg is expanding its capacity for truck and bus customers in North America and Europe. The cell modules will be assembled at its XALT gigafactory in Michigan, USA.

Sony Honda Mobility (SHM) - a 50:50 JV for high value-added EVs established in Sep 2022, unveiled the prototype of its new brand **AFEELA at CES 2023**. SHM will develop the production model based on this prototype. SoCs from Qualcomm Technologies' Snapdragon Digital Chassis will be used in key features of the EV.

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