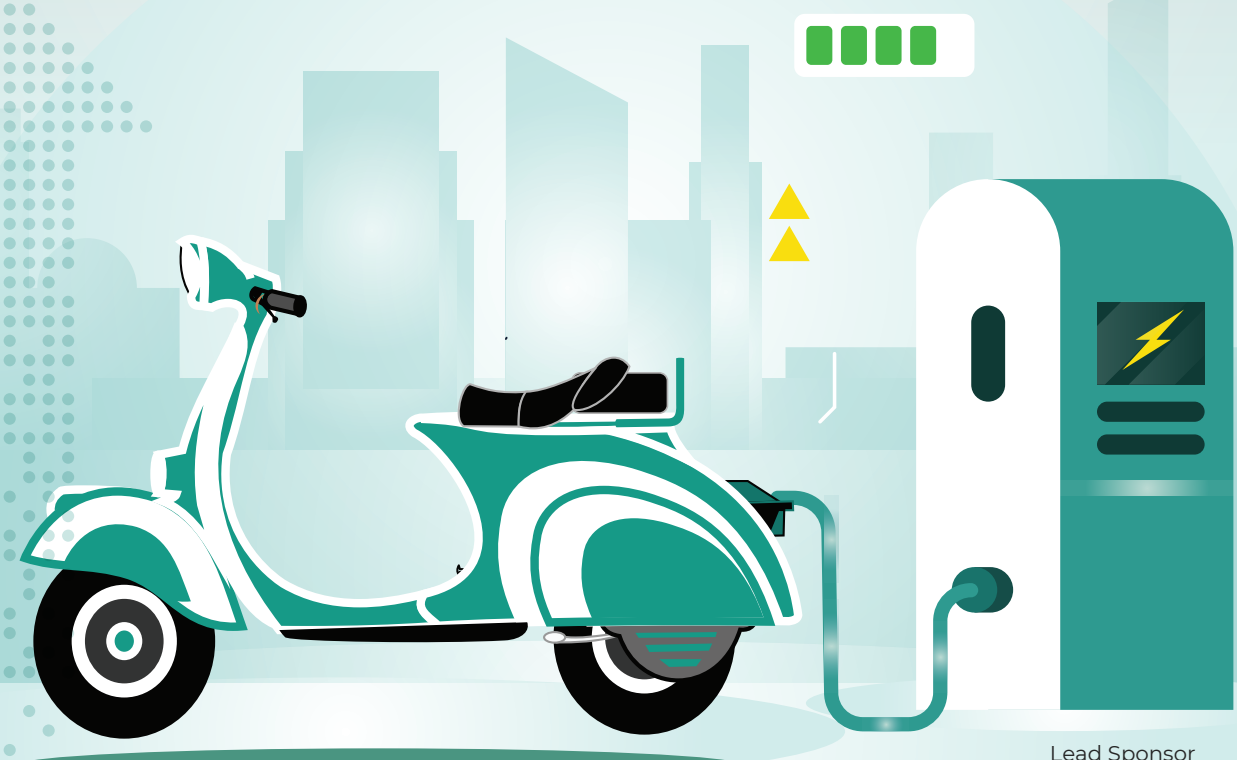
JMK Research & Analytics

E-TWO WHEELER INDIA MARKET OUTLOOK

June 2021



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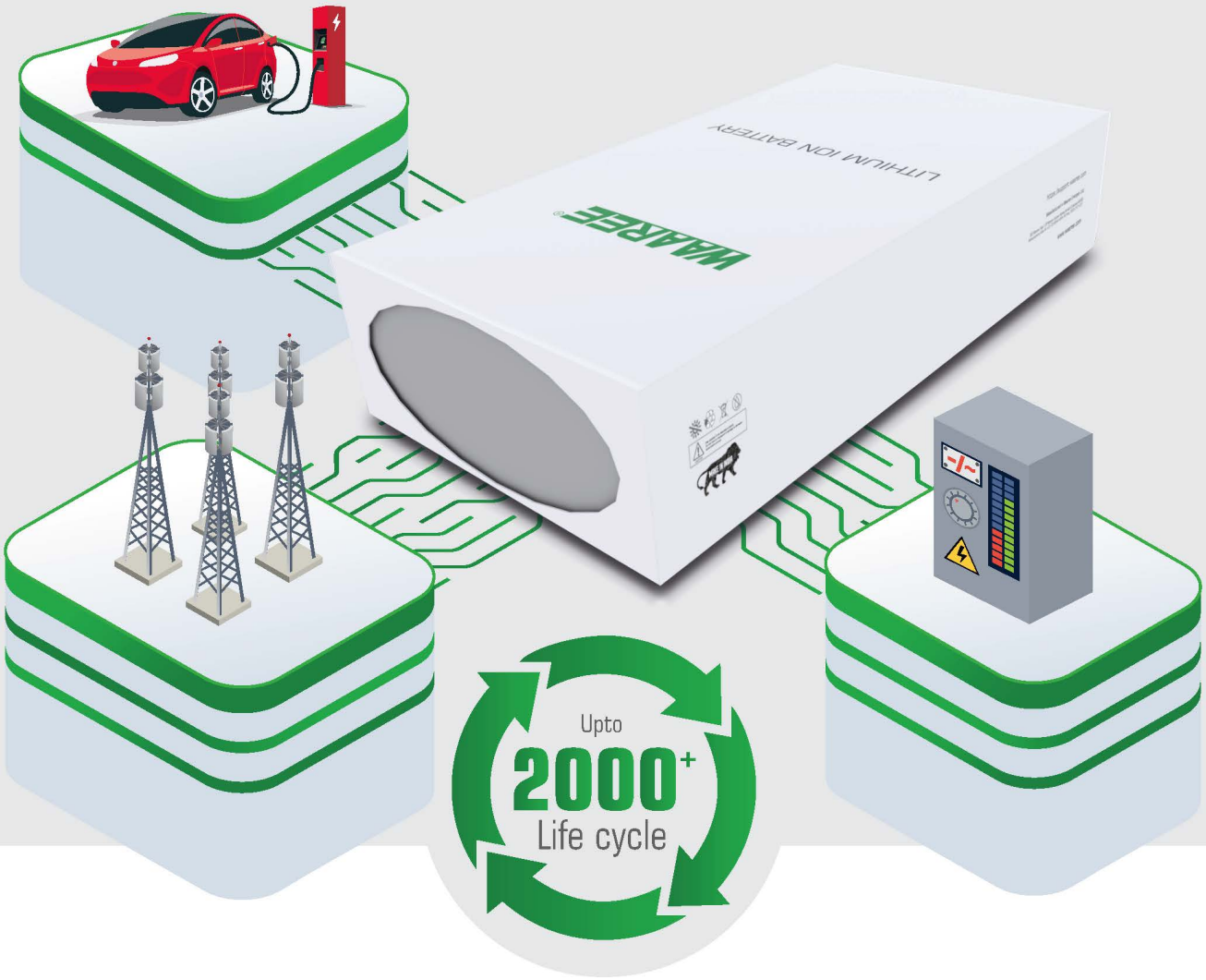

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1. Executive Summary

FY2021 saw the electric two-wheeler sales decline marginally by 5.4% from 152,000 units in FY2020 to 143,837 units in FY2021 due to the disruption caused by the COVID-19 pandemic. However, sales of High speed (HS) E2W (models with speed >25km/hr) witnessed an YoY increase of 47%. Established players such as Hero Electric and Okinawa commanded over 53% of the market share for HS E2Ws in FY2021. Budding players such as Ather, Revolt and Pure EV too increased their respective shares in the market.

High upfront costs were one of the main barriers to EV adoption in India. However, following the recent restructuring of the FAME-II scheme, incentives for E2Ws have been increased from INR 10,000/kWh to INR 15,000/kWh and cap on incentives has gone up from 20% to 40%. This has driven down the prices of E2Ws, bringing it closer to the prices of ICE-2 wheelers. Further, E2W space is anticipated to witness significant disruption after 2023 once the battery prices fall below $100/ kWh. This price is seen as the point around which EVs would achieve price parity with respect to the Internal Combustion Engine (ICE) vehicles. Other drivers for E2Ws are rising fuel prices, falling battery prices and investments in the local battery manufacturing space.

FY2021 witnessed a slowdown in terms of the investments made in the E2W space as compared to the previous years, since the COVID pandemic disrupted and delayed plans of various organizations. In a divergence from previous years' trends, however, the investments in E2W OEM space have been higher than that in shared mobility sector this year. Within the E2W OEM space, premium HS E2W manufacturing companies have received majority of these investments, securing ~80% of the total investments in the E2W space in FY2021.

In FY2021, 34 new models were launched out of which 19 were LS (low speed less than 25 kmph speed) E2Ws. LS E2Ws, apart from being more affordable, are also exempted from RTO registration and riders don't need a driving license and there are no helmet compulsions, making them a popular choice. However, these models also pose a challenge when it comes to E2W adoption, as they cannot match the performance ICE-counterparts offer and many players who offer LS E2Ws cease to exist in a matter of months, due to low sales margins and increasing competition in the market, denting the confidence of customers.

JMK Research estimates that E2W sales would reach 30 lakh units in the next 5 years, witnessing a CAGR of 84% from FY2021 to FY2026. The growth engine of the E2W market will be fuelled by various drivers, of which strong governmental push and affordability would play key roles.

This report analyses the current electric two-wheeler (E2W) market scenario in India including policy initiatives, current market size, investments in the sector, key market drivers, challenges, market share of key players, and detailed profiles of key players in the E2W market space.

2. Introduction

India has a massive two-wheeler (2W) market, offering an opportunity to fulfil the need for personal mobility with minimal spending. In FY2021, 2W registrations alone accounted for a whopping 80% of the total vehicle registrations in India. Out of this, E2Ws accounted for 0.8% of the total 2W registrations in FY21.

India is home to 22 of the 30 most polluted cities[1] in the world. In this context, the shift to electric mobility has become inevitable to reduce greenhouse gas (GHG) emissions as EVs emit 50% less greenhouse gases than petrol or diesel. EV adoption is therefore the best solution to tackle the hazardous air pollution levels in choked cities in India.

To make EV adoption easier for manufacturers and consumers, the Government of India has taken some keys steps in the last few years. Various incentives and subsidies are provided under FAME I and FAME II schemes by the government. Under the FAME II scheme, the subsidy outlay has been increased to nearly ten times to that of FAME I allocations. Out of the total number of EVs sold under the FAME-II Scheme till May 2021, E2Ws accounted for a majority share of ~77%.

Early HS E2W adopters such as Hero Electric and Okinawa continue to lead the market, accounting for over 50% of the total sales. Other players such as Ampere, Ather and Revolt too saw increased sales as compared to the previous fiscal year sales. The HS E2W segment also accounted for ~80% of total investments in the E2W sector in FY2021. With this in the backdrop, HS E2Ws can play a pivotal role in the near future in increasing the share of EVs in the country to meet the country's emission goals and reduce the use of ICE vehicles.

The E2W sales, though remaining subdued during FY2021, were supported by few other drivers including rising fuel prices and falling battery prices. Although challenges such as range anxiety and battery replacement costs still exist, these are expected to be dealt with in the near future as the technology scales up and develops.

JMK Research estimates that next year's registration figures will witness a YoY growth of around 75% as the market is poised to recover from the slight slump caused by the COVID pandemic. Furthermore, the market will grow from 1.43 lakh units in FY2021 to 30 lakh units in FY2026.

1. *IQ Air Report*

3. Policy Updates

To promote the adoption of EVs, the central and state governments have devised several policies to offer incentives and hence catalyse the EV penetration.

Central Policies

NEMMP 2020

In 2013, the Government of India launched NEMMP 2020, intending to reduce dependence on crude oil for transportation by promoting electric vehicles in India. Department of Heavy Industries (DHI) had estimated Government support in the range of INR 135-153 billion for R&D and building EV infrastructure.

By providing fiscal incentives in the nascent stage of development, the Government aimed a humongous target to attain 6-7 million electric vehicle sales year on year from 2020 onwards. It was expected that a cumulative sale of 15-16 million EVs by 2020 would save 9500 million litres of crude oil, which is equivalent to INR 620 billion of savings.

FAME – I

Under the national mission, DHI formulated the Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME) scheme with an approved financial outlay of INR 7.95 billion for a period of two years. The focussed areas of development in this scheme were R&D of pilot projects, charging infrastructure, and demand creation. The demand incentive provided under the scheme could directly be availed by the buyers upfront at the point of purchase. The two years scheme was later extended for another two years up to 31st March 2019. FAME–I had a planned budget allocation of 7.95 billion as demand incentives, but only 5.29 billion was allocated in over four years. The subsidies were applicable for two-wheelers, three-wheelers, passenger cars, light commercial vehicles, and buses.

In December 2017, Minister of Heavy Industries announced subsidy for 390 buses, 370 taxis, and 720 three-wheelers across 11 cities in India under FAME scheme. To attain this, the government proposed total fund support of INR 4.4 billion, which included INR 0.4 billion as incentive for the installation of charging infrastructure.

FAME – II

In March 2019, DHI notified phase II of the FAME scheme with a total budget outlay of INR 100 billion until March 2022, which has been extended till March 2023. FAME – II proposes INR 86 billion as demand incentives to be provided upfront during the purchase of EVs. To encourage public transport, the buses would receive a subsidy of 40% of the cost of vehicles, and a 20% subsidy would be given to other commercial vehicles. The scheme would cover incentives for 1.56 million vehicles until 2022. To provide a further push to clean public mobility, the DHI approved a sanction of 5595 electric buses to 64 cities, state government entities, State Transport Undertakings (STUs) for intra-city and intercity operation under the scheme.

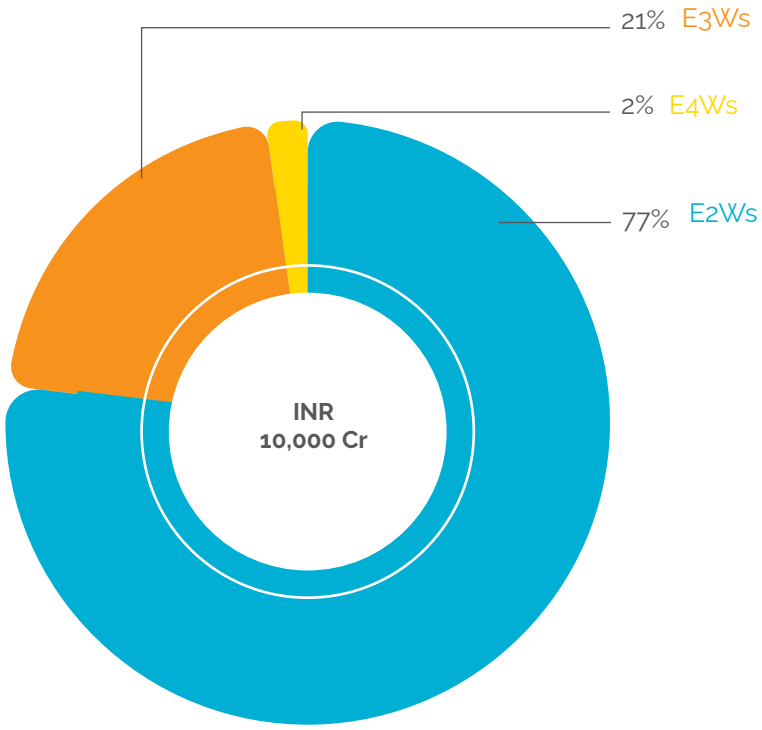
Fund allocation under the FAME-II scheme is focussed more on demand incentives and setting up charging infrastructure. Under FAME 2, stringent eligibility conditions are

imposed to promote local manufacturing.

- Localization of up to 40% for buses, 50% for other vehicle categories of ex-factory price
- Subsidy linked to battery size with no reference to range/ performance: INR 20,000 per kWh for buses; INR 10,000 per kWh for other vehicles
- Maximum subsidy cap across categories

Under the FAME II Scheme 76,071 EVs have been sold[2] as of May 2021, out of which E2W accounted for the sales of 58,673 units. Karnataka accounted for the largest share of EVs sold (17,105), followed by Tamil Nadu (11,718), Maharashtra (8,555), Delhi (5,492), and Rajasthan (5,499).

Figure 3.1 : Share of Electric Vehicles sold under the FAME-II Scheme as of May 2021

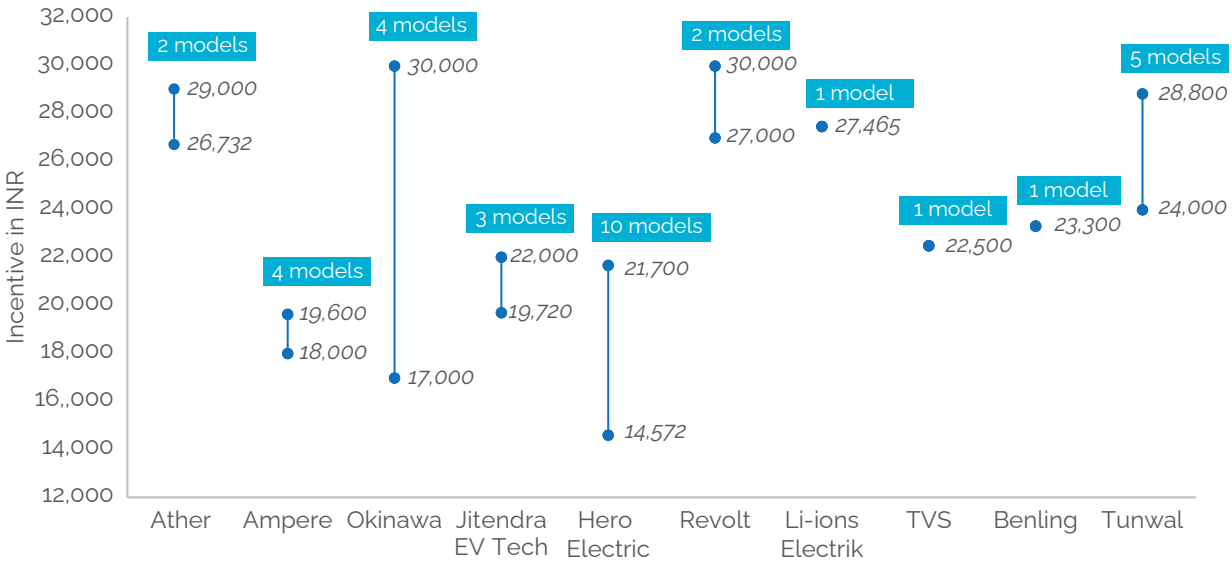


Source: Ministry of Heavy Industries and Public Enterprises

Under the scheme, 33 HS E2W models from different OEMs have been approved as of May, 2021.

2. *Ministry of Heavy Industries and Public Enterprises, Department of Heavy Industries*

Figure 3.2: Approved Models and incentives availed under FAME 2



Source: Ministry of Heavy Industries and Public Enterprises, Department of Heavy Industries

Central Policy Updates

FAME II scheme modified and extended till 2024

On 11 June 2021, the Ministry of Heavy Industries and Public Enterprises released a notification[3], making partial modifications to the FAME-II Scheme. The modifications indicate that the government is focusing on E2Ws to push the adoption of EVs in India. As per the notification:

- Incentives on E2Ws have been increased from INR 10,000/kWh to INR 15,000/kWh
- Cap on incentives for E2Ws increased from 20% of cost of vehicle to 40% of cost of vehicle

Further, on 25 June 2021, the Ministry of Heavy Industries and Public Enterprises released another notification, notifying about the **extension of the FAME II scheme till 31 March 2024.**

Extension of validity of FAME-II certificates

The Ministry of Heavy Industry and Public Enterprises, Department of Heavy Industries (DHI) has released a notification[4] extending the validity of FAME II certificates for all EV Models (E2W,E3W and E4W) approved under FAME II by one year. The notification also states that OEMs/Testing Agencies will have to submit the revalidation certificate within an additional timeline of one month from the last validity date of the certificate. If the vehicle model(s) is not revalidated within the stipulated period, its registration on the FAME India Scheme portal is liable to be cancelled.

Cabinet approves PLI Scheme for Advanced Chemistry Battery Cells

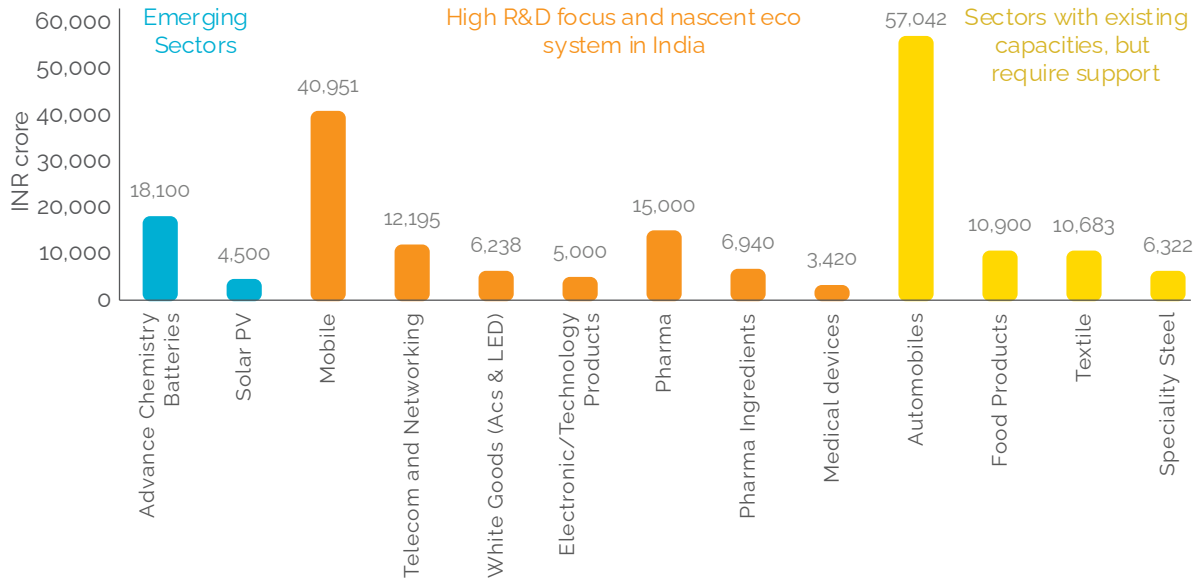
The Union cabinet has given its approval to introduce a PLI (Production-Linked Incentive) Scheme[5] for ten priority sectors. Advance Chemistry Cell (ACC) Battery sector is placed under first priority with an outlay of INR 18,100 Crore over a five-year period. The PLI scheme for ACC battery will incentivize large domestic and international players in establishing a competitive ACC battery set-up in the country.

3. *Ministry of Heavy Industries and Public Enterprises*

4. *Department of Heavy Industry, Notification (Extension for validity of FAME-II certificates), 12 April 2021*

5. *Press Information Bureau, Government of India: Cabinet approves PLI Scheme for 10 sectors, 11 Nov 2020*

Figure 3.3: Fund allocation under PLI (Production-Linked Incentive) scheme



Source: Press Information Bureau, Government of India

State Policy Updates

While the Central Government has introduced various scheme to scale up EV production and adoption, states too have drafted and implemented policies to catalyse this growth. This year saw states such as Meghalaya, Delhi and Telangana implement respective EV policies in the state. Like last year, the trend of waiving RTO fees and road tax have continued. Particulars related to E2Ws for respective states are illustrated below.

State	EV Policy Status	E2W-related Initiatives	Target
Meghalaya	Notified on 5 February 2021; Implemented from April 1, 2021	• Meghalaya government will offer incentives towards the adoption of at least 15% of EVs in 5 years to catalyse the adoption of EVs from the date of implementation. • Registration fees will be waived off for all types of EVs purchased during the policy period. • Government will take steps to reserve parking spots for EVs.	To have 3,500 units of E2Ws in 5 years from notification

State	EV Policy Status	E2W-related Initiatives	Target

		In case the Government decides to implement Odd-Even system for plying of vehicles to curb pollution, the EVs shall be exempted from such arrangement
		• For E2Ws:
		  ◦ Battery capacity: 2kWh
		  ◦ Incentive/kWh: INR 10,000
		  ◦ Incentive/Vehicle: INR 20,000
		  ◦ Total Incentive over 5 yrs.: INR 7 Crores
		  ◦ Max. ex-factory price to avail incentive: INR 1.5 lakhs	

Telangana	Implemented from October 30, 2020	• For E2Ws, 100% exemption of road tax and registration fee for first 2,00,000 E2W purchased and registered in the state • Telangana State Electricity Regulatory Commission (TSERC) to provide special power tariff category for EV charging stations • Charging/swapping stations for every 50km within state boundaries on highways to cities of Bengaluru, Mumbai, and Chennai to be encouraged	

Delhi	Notified on Aug 7, 2020: Valid for 3 yrs from the date of notification	• For E2Ws, purchase incentive of INR 5,000/kWh of battery capacity. (Max incentive of INR 30,000). Eligibility criterions:
		  ◦ Advanced battery chemistry,
		  ◦ Minimum top speed: 40km/hr,
		  ◦ Minimum acceleration: 0.65m/sec2,
		  ◦ Maximum electrical consumption not exceeding 7kWh/100km,
		  ◦ Minimum 3 year manufacturer's warranty including battery (FAME II pre-requisites on local manufacturing and minimum range do not apply)
		  ◦ All 2Ws engaged in last-mile delivery to transition to 50% EVs by March 31, 2023, and to 100% by March 31, 2025
		• Road tax and registration fees to be waived off for all BEVs during the policy period.
		• All financial incentives applicable for both fixed battery and battery swapping models. If battery sold separately, 50% of purchase incentive will be for owners and rest to energy operators for cost of any deposit that may be required for use of swappable battery
			Objective of policy is to catalyse BEV (Battery Electric Vehicle) adoption such that they contribute 25% of all new registrations by 2024.

State	EV Policy Status	E2W-related Initiatives	Target

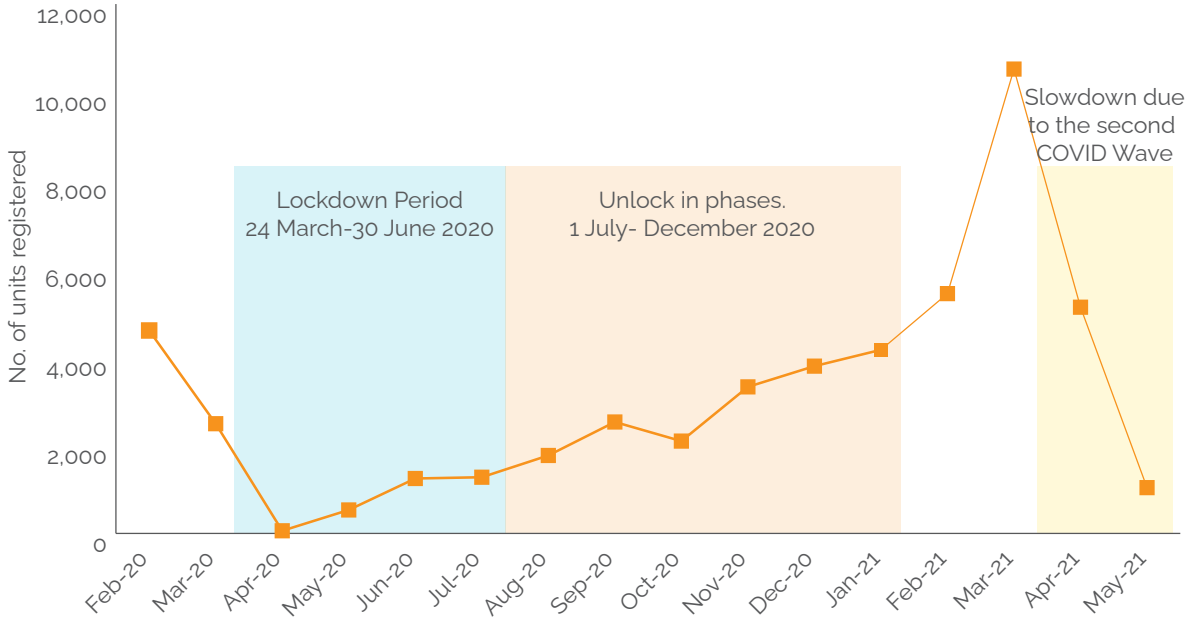
Gujarat	Announced on 22 June 2021. Policy valid for 4 years from date of commencement (1 July 2021)	• All EVs to be exempted from registration charges.
		• Policy is applicable of all vehicles approved under the FAME-II Scheme
		• For E2Ws:
		  ◦ Incentive of INR 10,00/kWh
		  ◦ Maximum ex-factory price to avail incentive: INR 1.5 lakhs
			Policy aims to have achieve 1,10,000 E2Ws on road by the end of the policy period, which makes up for 55% of the total EV target set by the state government under the policy

Source: JMK Research

4. E2W Market Size

FY2021 witnessed a slump of 5.37% in FY 2020-2021 with 143,837 units sold as opposed 152,000 units in the last fiscal year. Although the covid-induced lockdown and its consequential challenges slowed down the growth of E2W market in FY2021, post the lockdown, an upward sales trend was expected and in favor of this, due to high resurgent market demand, considerable growth was, later, realized, as illustrated in the chart below. However, in April 2021, sales again began dropping due to the spike in COVID case with the second COVID wave.

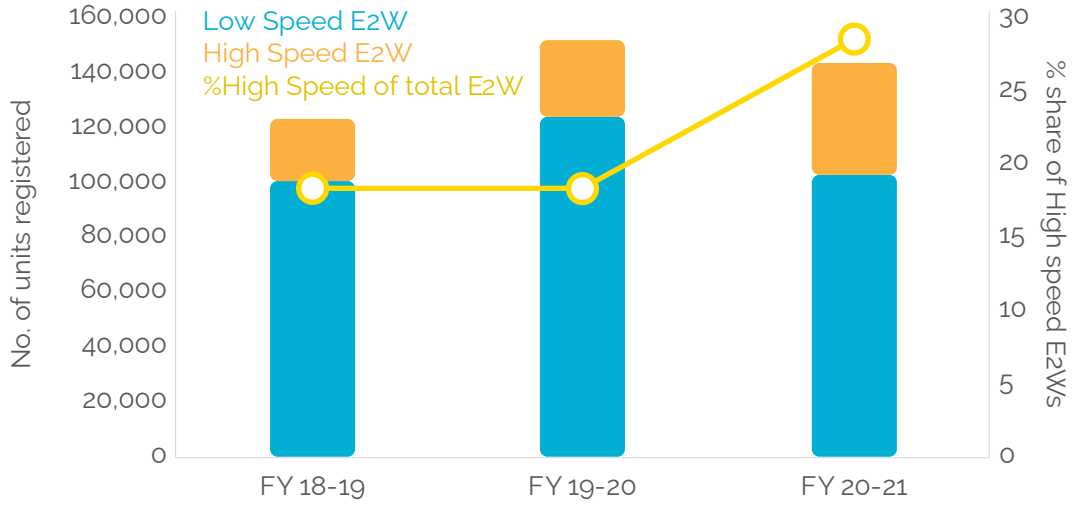
Fig 4.1 : Impact of the lockdown on HS E2W Registrations



Source: Parivahan Dashboard, JMK Research
Note: HS models are those with speed >25km/hr

HS E2Ws have seen a YoY growth of 47%, with 41,048 units being sold in FY2021 as opposed to 27,787 units sold in FY2020. The share of HS E2Ws in the overall E2W sales went up from 20% in FY2020 to 28% in FY2021. LS E2Ws, on the other hand, witnessed a decline of 17.9% vis-à-vis FY2020. However, LS E2Ws, apart from being more affordable, are also exempt from RTO registration and riders don't need a driving license and there are no helmet compulsions. This makes them highly attractive to buyers even today.

Fig 4.2 : Breakup of low speed (LS) and high speed (HS) E2Ws

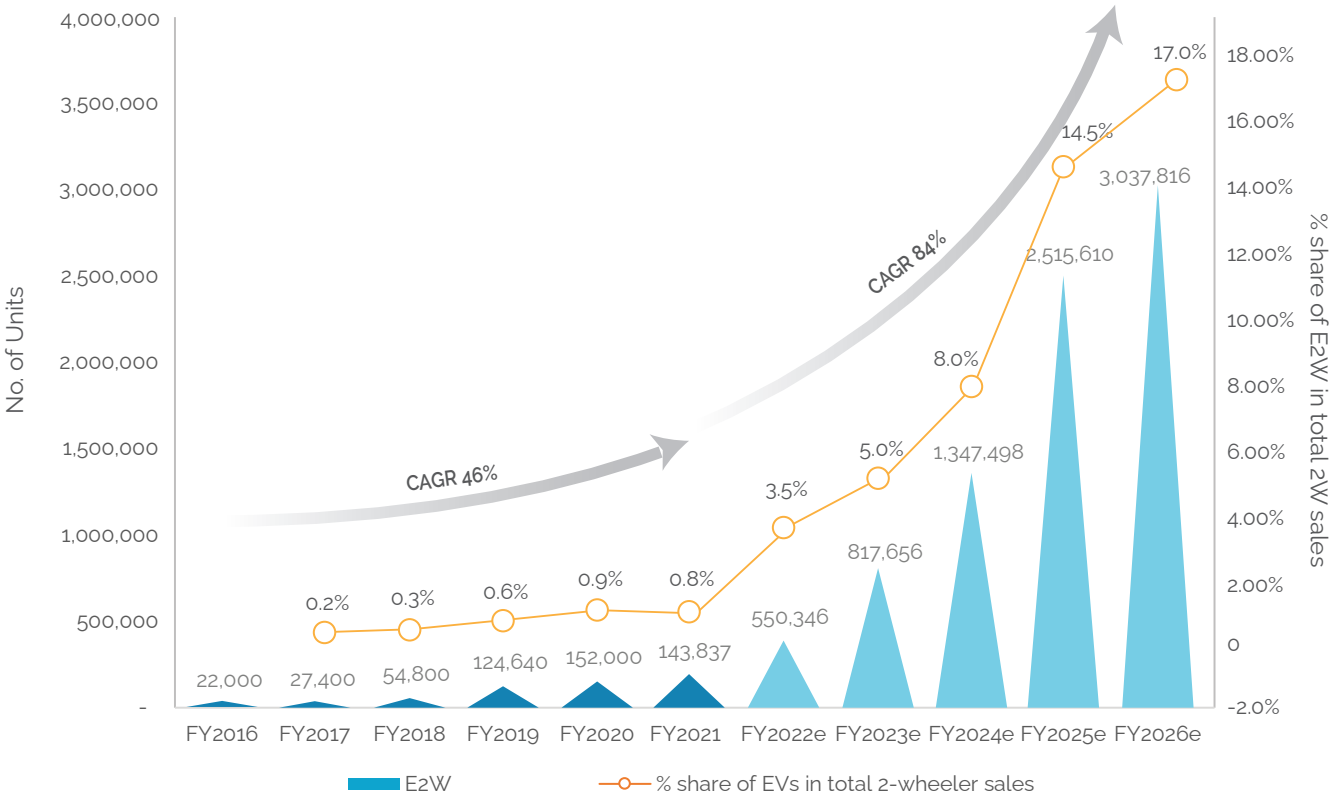


Source: Parivahan Dashboard, JMK Research
Note: HS models are those with speed >25km/hr

As per JMK Estimates, next year's registration figures will see the market recover from the slight slump caused by the COVID pandemic and are expected to witness a YoY growth of around 75%. Assuming there is no change in the current policy scenario, the future adoption of Electric two-wheelers will mainly be driven by battery prices, which constitute over 40% of total E2W cost. After 2024, significant disruption in E2W space is anticipated, with the fall of battery prices below $100/ kWh. This price is seen as the point around which EVs will start to reach price parity with the Internal Combustion Engine (ICE) vehicles.

We further estimate that from FY2022 onwards, with every 7-8% fall in YOY battery prices, the share of E2W's in total two-wheeler sales is projected to double, with a major disruption in FY2024 with battery prices below $100/kWh. The percentage of E2W in overall two-wheeler sales in India is predicted to increase from 0.8% in FY2021 to about 17% in the next five years, thus clocking about 30 lakh units of E2W annual sales in FY2026. As per these estimations, the CAGR of E2W sales from FY2021 to FY2026 is expected to be about 84%.

Fig 4.3 : E2W market size in India



Source: JMK Research

Note: Total 2-wheeler sales are estimated to grow with a CAGR of 3.2% from FY2022 to FY2026. HS models are those with speed >25km/hr

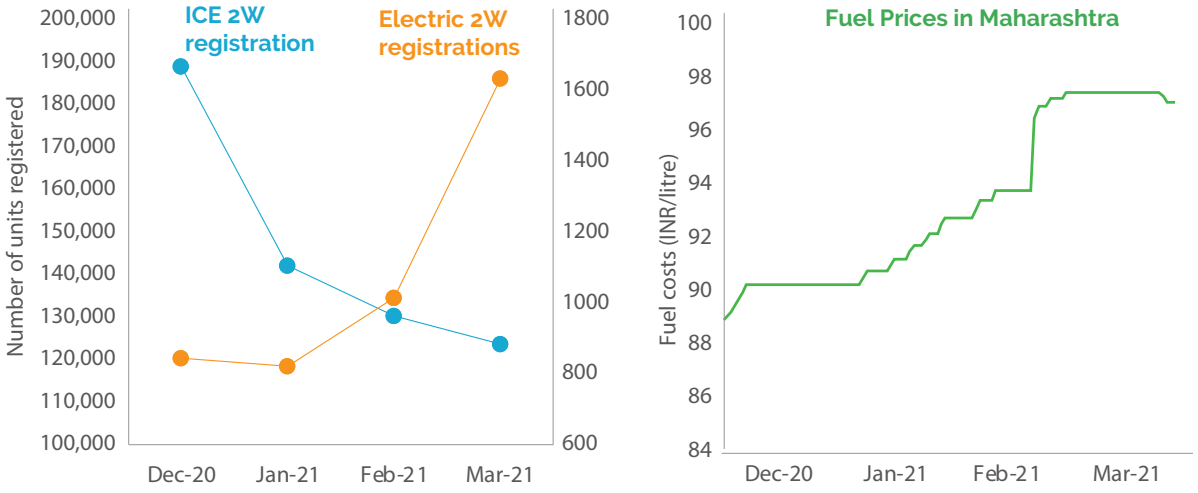
5. Key Market Drivers

The decline in overall E2W sales this fiscal notwithstanding, the industry has witnessed a strong government push over the last two years to increase EV penetration in India. This push can be observed in terms of incentives offered under the FAME-II scheme and waiving off registration fees and road tax by many states. Apart from the central- and state-level government policy measures and increasing consumer awareness, the resurgent growth in sales post lockdown were driven by the following factors:

Rising Fuel Prices

The skyrocketing fuel prices have boosted E2W sales as consumers are looking for alternatives. In Maharashtra, for instance, from December 2020 to March 2021, registrations for HS E2Ws increased by 94.16% and in the same period, registrations for ICE 2-wheelers declined by 18.4%. This period witnessed petrol price increase from INR 89.16/litre to a high of INR 97.57/litre in just 3 months.

Fig 5.1 : HS-E2W, ICE 2W Registration Trend & Fuel Price Trend in Maharashtra (Dec-2020-Mar-2021)

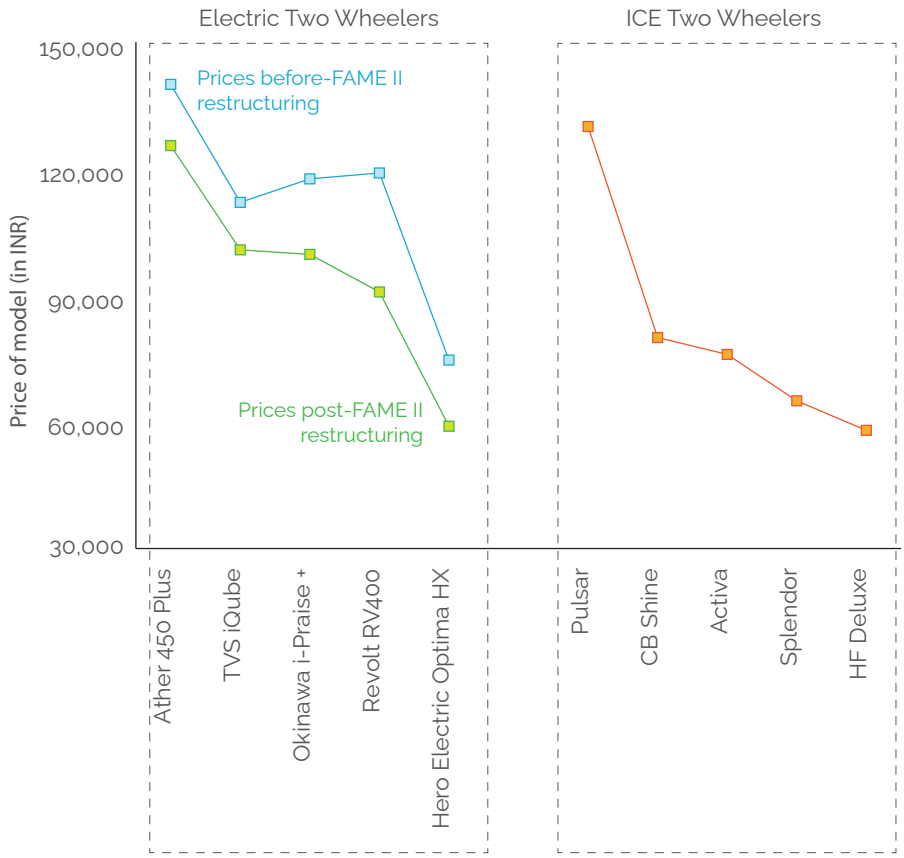


Source: Vahan Dashboard, Industry news articles
Note: HS models are those with speed >25km/hr

Cost of E2Ws

One of the major challenges to E2W adoption were its high upfront costs. However, in recent times, due to the implementation of the BS6 Emission norms, the prices for many ICE 2-wheelers have been bumped up. On the other hand, the prices for E2W approved under the FAME-II scheme have decreased with the introduction of new restructured norms. Due to this, the price-gap between the two classes of 2-wheeler is not as big as it was a year ago, as illustrated by the graph below, and in many cases has reached parity with petrol-equivalent.

Fig 5.2 : Electric 2-wheeler prices Vs ICE 2-wheeler prices (as of June 2021)



Source: Company websites, JMK research
* Prices are Ex-showroom prices
** EV prices are including FAME-II subsidy for high range models

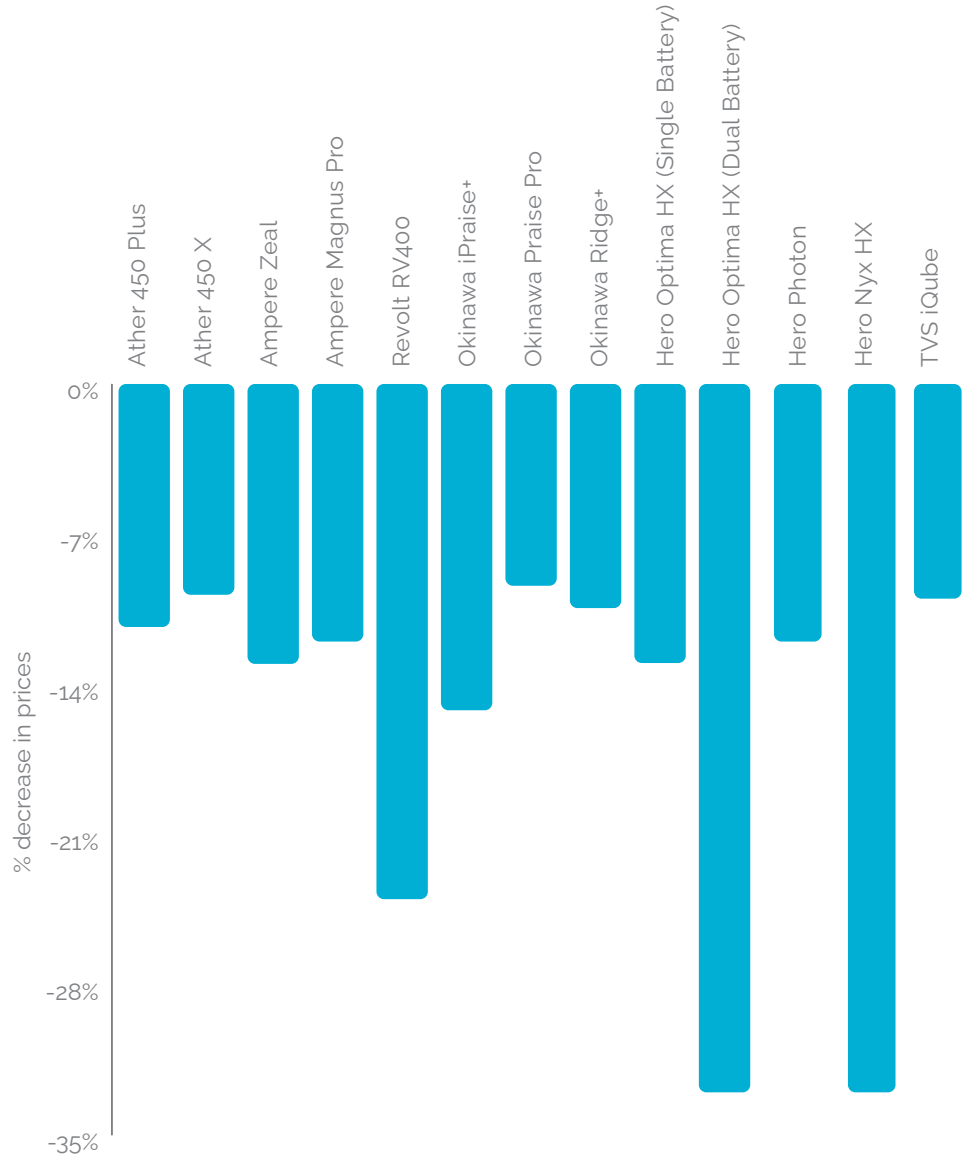
Table 5.1 : Prices of E2Ws after restructured FAME-II Scheme

Brand	Model	Price before FAME-II Restructuring (INR)	Price after FAME-II Restructuring (INR)	% Decrease
Ather	450 Plus	1,27,916	1,13,446	**11.32%**
	450X	1,46,926	1,32,498	**9.82%**
Ampere	Zeal	68,990	59,990	**13.04%**
	Magnus Pro	74,990	65,990	**12%**
Revolt	RV400	1,19,000	90,799	**24%**
Okinawa	iPraise+	1,17,600	99,708	**15.2%**
	Praise Pro	84,795	76,848	**9.4%**
	Ridge+	69,000	61,791	**10.44%**
Hero	Optima HX (Single Battery)	61,640	53,600	**13%**
	Optima HX (Dual Battery)	78,640	58,980	**33%**
	Photon HX	79,940	71,449	**12%**
	Nyx HX	1,13,115	85,136	**33%**
TVS	iQube	1,12,027	1,00,777	**10%**

Source: Company websites, JMK Research
*Prices are ex-showroom prices

As depicted by the chart below, prices of models under the FAME II scheme have dropped by over 10%. This has enabled to E2Ws to become more price-competitive in the 2-wheeler market. Also, it is important to note that the prices depicted above are only inclusive of the FAME-II subsidy, and do not include state level subsidies. Depending on the policies implemented, the prices further go down in respective states. Take the Ather's 450X model for example. In Bangalore the effective price of the model is INR 1.32 lakhs (as there is no state-level subsidy). However, the same model in New Delhi will cost INR 1.17 lakhs due to an additional state-subsidy of INR 14,500.

Fig 5.3 : Percentage decrease in E2W prices after FAME-II restructuring



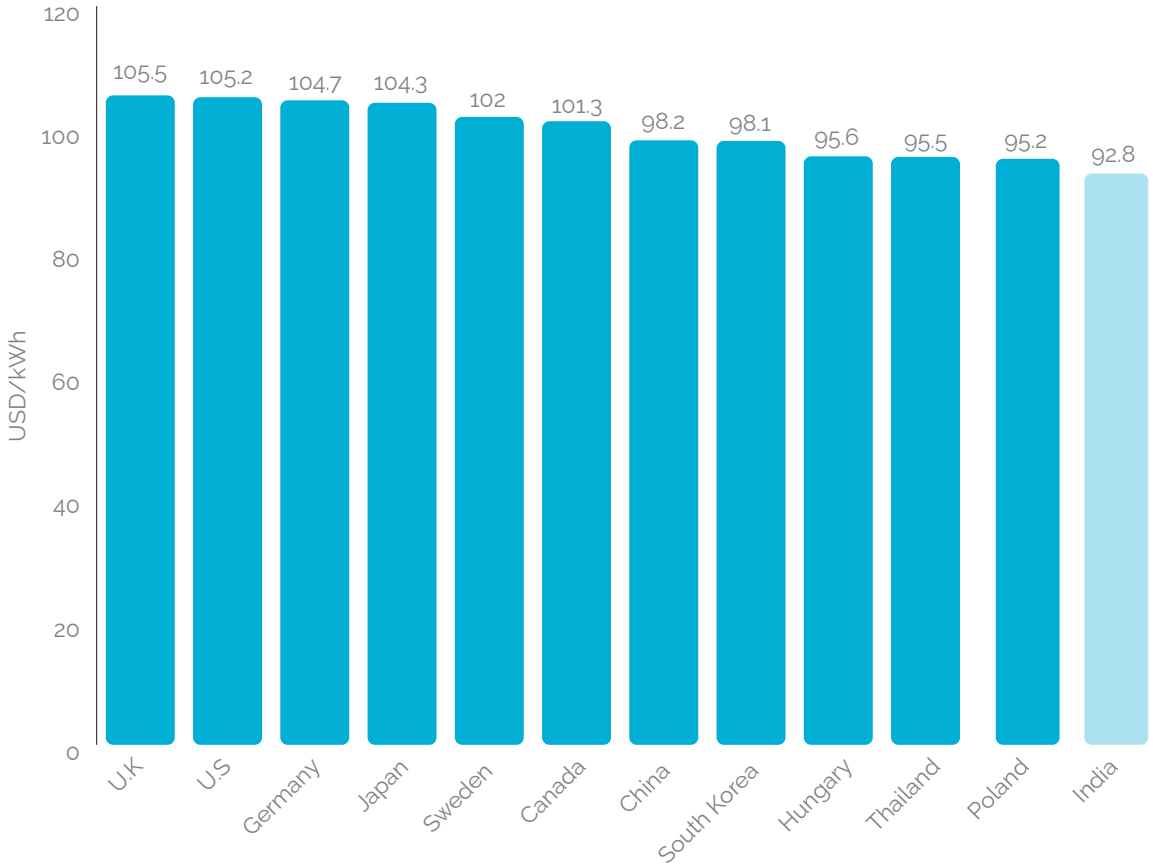
Source: Company websites, JMK Research

Bridging the Local Manufacturing void

Leading global lithium-ion battery manufacturers have already started exploring the opportunities to initially build battery pack assembly units, and eventually transition to large scale lithium-ion cell manufacturing in the country. Now, with the Central government's recently approved PLI Scheme worth INR 18,100 Crores for battery manufacturing, addition in manufacturing capacities and increase in the cell-to-pack value chain is expected. On top of this, this scheme is also expected to fill the local

battery manufacturing void, thereby reducing reliance on imports from China and hence bringing down the overall costs of batteries significantly. According to Bloomberg New Energy Finance (BNEF), India is the lowest cost country for li-ion based cell manufacturing, primarily due to low labour and land costs. The ACC(Advanced-Chemistry Cells) performance-based subsidy is expected to be as high as USD 27 per kWh at the cell level.

Fig 5.4 : Country-wise Manufacturing Cost of Li-based Pouch Cell



Source: BloombergNEF

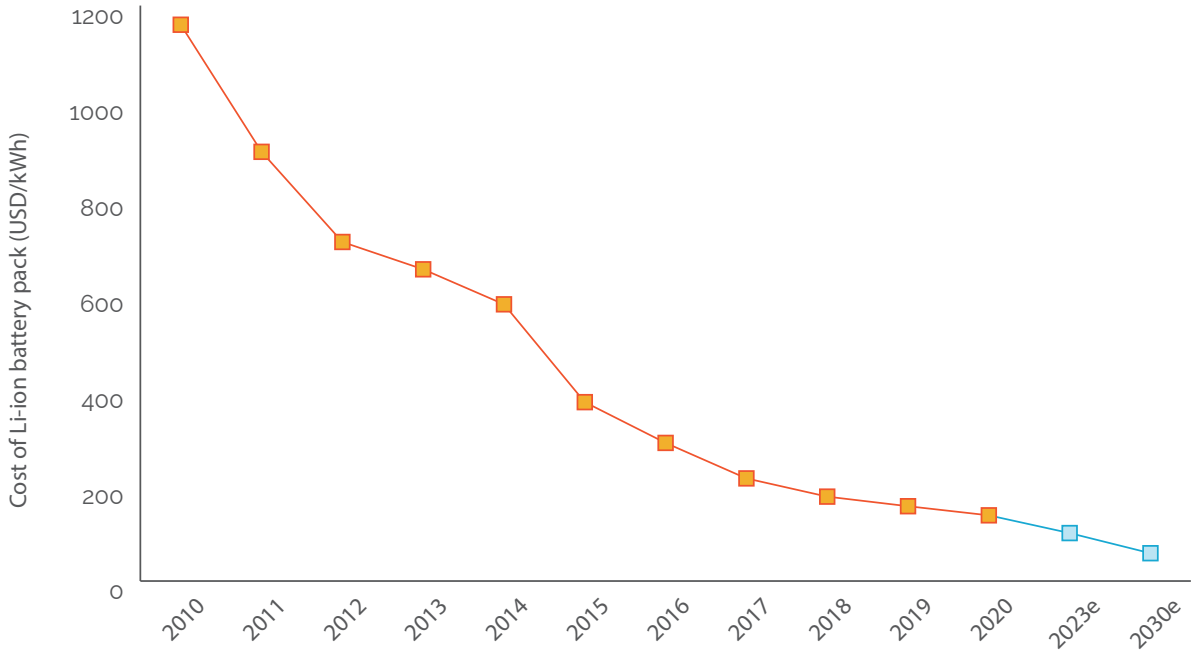
Note: Cell type considered is NMC-622[6]

Falling battery prices

In EVs, batteries constitute about 40% of the total cost. As mentioned above, Indian EV OEMs have been relying on Chinese imports to meet their battery demands. The drop in battery prices from USD 1,160/ kWh in 2010 to USD 137/ kWh in 2020 in the international market is the key driver for adoption of EVs in India. Costs are expected to further fall to reach USD 100 by 2023, and to US$58 by 2030. due to increasing scale economics. This, combined with improvements in battery design, are expected to make E2Ws price competitive in a market that is highly sensitive to prices.

6. NMC – Lithium Nickel Manganese Cobalt Oxide

Fig 5.5 : Average volume-weighted li-ion battery pack price

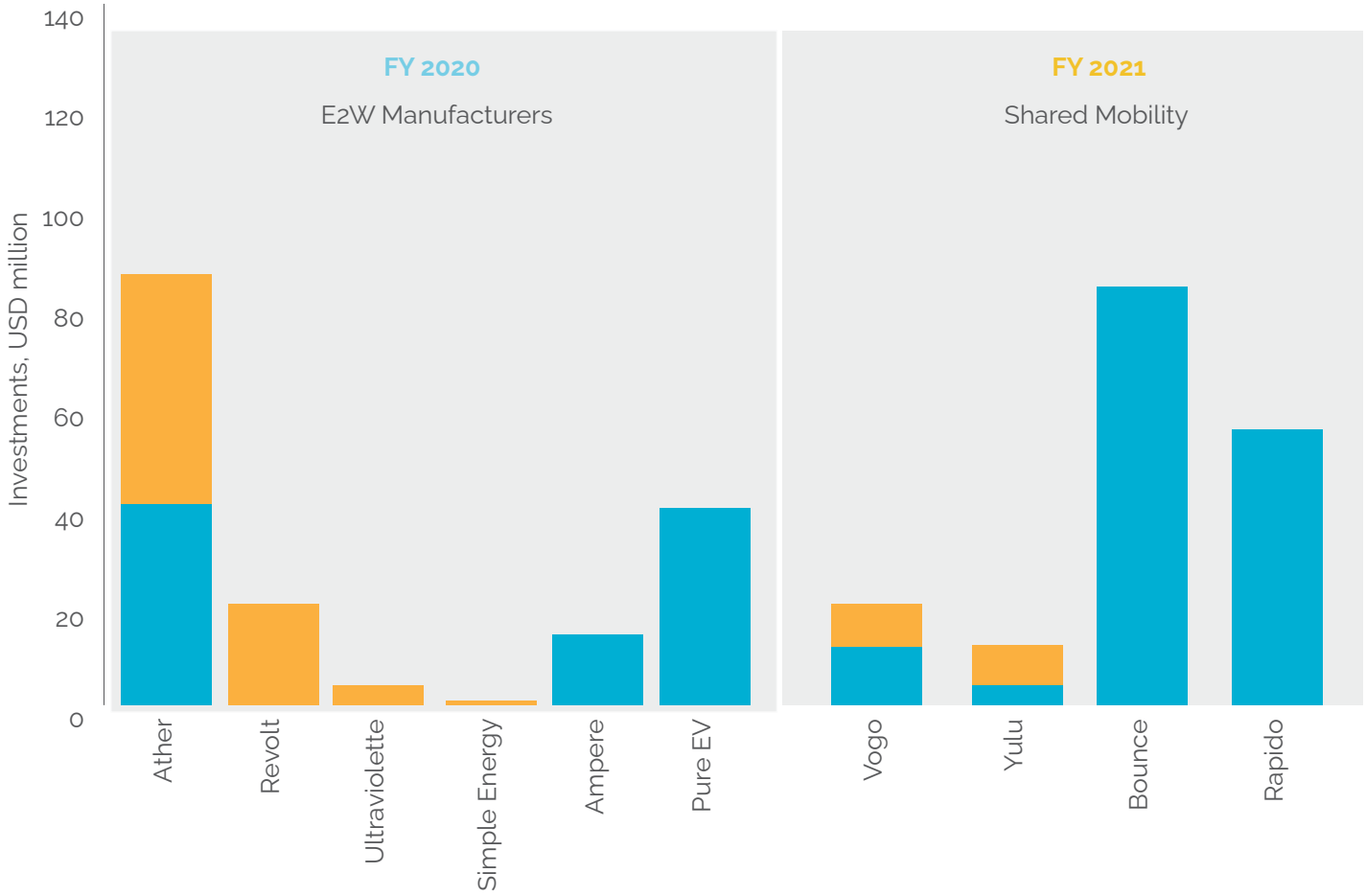


Source: Bloomberg New Energy Finance

6. Key Investments in the Indian E2Ws space

FY2021 witnessed a slowdown in terms of the investments made in the E2W space as compared to the previous years since the COVID pandemic disrupted and delayed plans of various organizations. In a divergence from previous year trends, however, the investments in E2W OEM space have been higher than that in shared mobility sector this year. Within the E2W OEM space, premium HS E2W manufacturing companies have received majority of these investments, ~80% of the total investments in the E2W space in FY2021. Ather Energy yet again accounted for the majority share of investments made. This change in trend could be attributed to growth potential it offers to its investors from a long-term perspective along with the change in consumer behavior as people prefer their own vehicles over shared mobility, an aftermath of the pandemic, increasing popularity of E2Ws due to the performance and futuristic features (such as IoT connectivity) they offer and growing awareness among the younger generation.

Fig 6.1: Key Investments in the E2W Space over the last two years



Source: Industry news articles, JMK Research

Table 6.1 : Key Investments in the E2W segment

Month	Company name	Company type	Deal type	Acquirer/ Investor(s)	Deal value ($ Mn)
Apr-21	**Revolt Intellicorp**	E2W OEM	Equity	RattanIndia	20
Feb-21	**eBikeGo**	EV-based logistics startup	Equity	Bollywood singer Sukhbir Singh, Quess Corp Ltd CEO Vijay Sivaram, Asian Institute of Technology's Brahmanand Mohanty, and Mungo Befestigungstechnik AG chairman Alparslan Kutukcuoglu	2
Feb-21	**Vogo**	Bike rental	Equity	Lightrock, Kalaari, Matrix Partners and Stellaris Venture Partners	12
Jan-21	**Simple Energy**	Electric Scooter OEM	Equity	Vel Kanniappan and four other investors	1
Jan-21	**Tresmoto**	Electric Scooter OEM	Equity	Angel Investor and professional CEO Raaj Kumar	Undisclosed
Nov-20	**Ather Energy**	OEM	Equity	Sachin Bansal, Hero MotoCorp	35
Oct-20	**Ultraviolette Automotive**	OEM	Equity	GoFrugal Technologies	Undisclosed
Sep-20	**Ultraviolette Automotive**	OEM	Equity	TVS Motor	4
Aug-20	**Simple Energy**	OEM	Equity	Vel Kanniappan	Undisclosed
Jul-20	**Earth Energy EV**	OEM	Equity	LR Joshi, MD, Pranada Bio-Pharma and others	Undisclosed
Jul-20	**Ather Energy**	OEM	Equity	Hero MotoCorp Ltd.	11
Jun-20	**Yulu Bikes**	e-bike rental startup	Equity	Rocketship.vc	3.96
May-20	**Etergo**	OEM	M&A	Ola Electric	Undisclosed

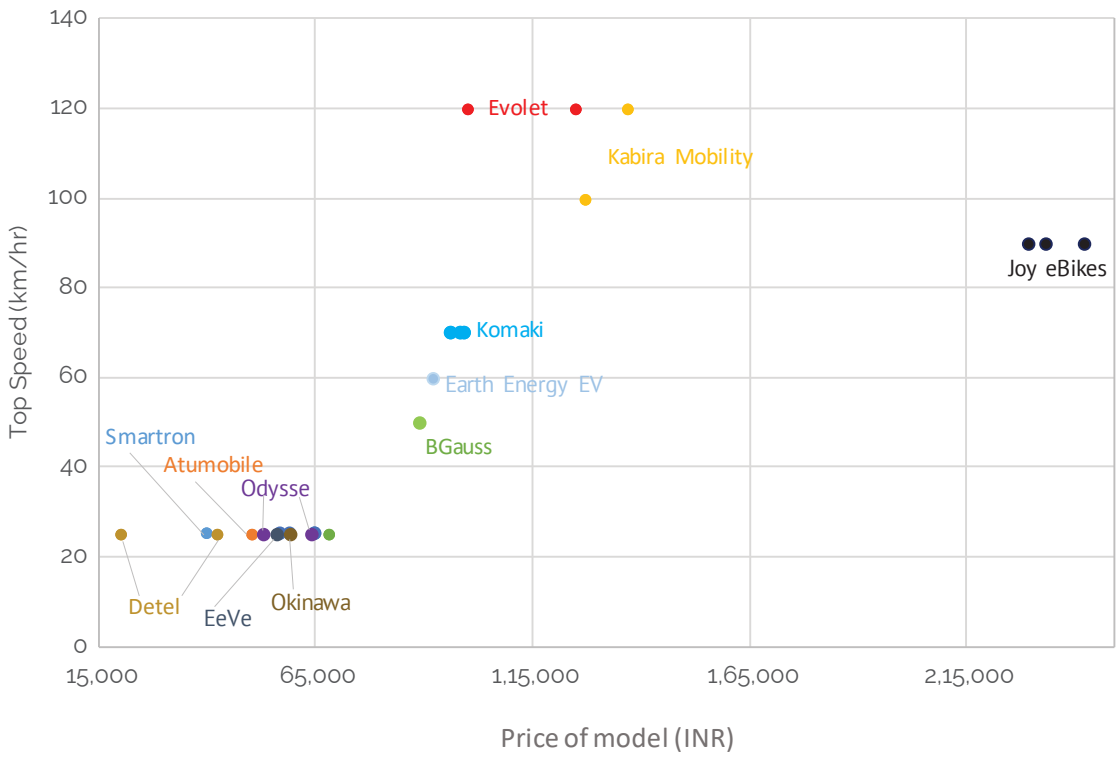
Source: News Articles, JMK Research

7. New Product Launches

In FY21, 34 new models were launched out of which 19 were LS E2Ws . As mentioned before, LS E2Ws, apart from being more affordable, are also exempt from RTO registration and riders don't need a driving license and there are no helmet compulsions, making them a popular choice. However, yet again this year, the market didn't see any new entry for models having speed limits between 25-40 kmph, possibly because they do not come under the FAME-II scheme and need to be registered at the RTO.

This year also saw new players such enter the market such as Atumobile and Smartron in the LS category, Earth EV in the HS category, and BGauss and Kabira Mobility with offerings in HS as well as LS categories. Further, players such as Evolet and Kabira Mobility launched models with top speeds of over 100km/h while Joy e-Bikes launched 4 models priced over INR 2 lakhs. Ather launched an iteration of its already popular 450 model, named 450x, while Okinawa launched two models in the LS segment.

Fig 7.1 : ***New E2W models: Price vs Top Speed***



Source: Industry news articles, JMK Research

Upcoming models and new entrants

Hero Electric, Ultraviolette and Tork Motors were expected to launch their highly anticipated HS E2W offerings , however this was delayed due to the pandemic. Simple Energy is also expected to launch its Ather-rivalling scooter by August 2021.

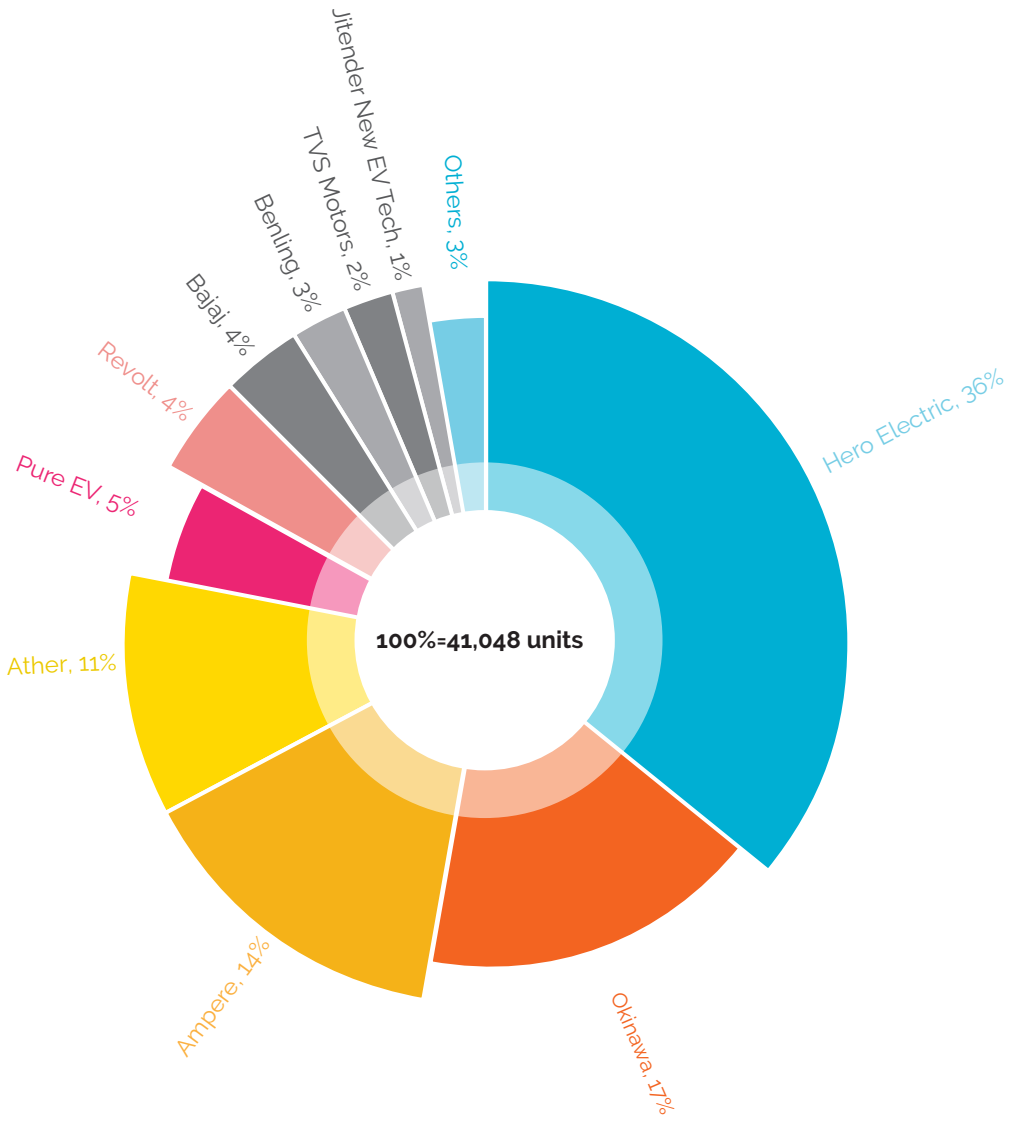
Hero MotoCorp has also announced plans of entering the E2W market, which is expected to be based on Battery Swapping technology platform developed jointly by Gogoro and Hero MotoCorp, following their joint-venture in April 2021.

Other than the new product models by existing players, biggest players that is going to enter E2W market will be Ola Electric, one of the sister companies of the popular ride-hailing service-Ola Mobility. It is expected to launch its E2W offering in July 2021. The brand acquired the Dutch E2W company, Etergo in May 2020. In December 2020, Ola Electric inked an MoU with the Tamil Nadu government for an investment of Rs 2,400 crore to set up its first factory in the state, which commenced construction in March 2021. Ola claims, upon completion in June 2021, that the factory will be the world's largest scooter manufacturing facility, which will initially have an annual capacity of 2 million units.

Ola also revealed plans to invest $2 billion in the next five years to build an electric two-wheeler charging network along with its partners. The charging network will be spread around 400 cities and towns and will be building more than 1,00,000 charging points as part of this network. In the first year, Ola is setting up over 5,000 charging points across 100 cities in India. The network will charge 50 per cent of the Ola Scooter battery in 18 minutes for a 75 kms range. The organisation has so far raised USD 592.2 million from investors such as Ratan Tata, Tiger Global, SoftBank, Maxim Partners, Hyundai Motors and Kia Motors.

8. Market Share of High Speed E2Ws in India

Fig 8.1 : Market Share of E2W players in India in HS segment (>25 kmph) in FY2021



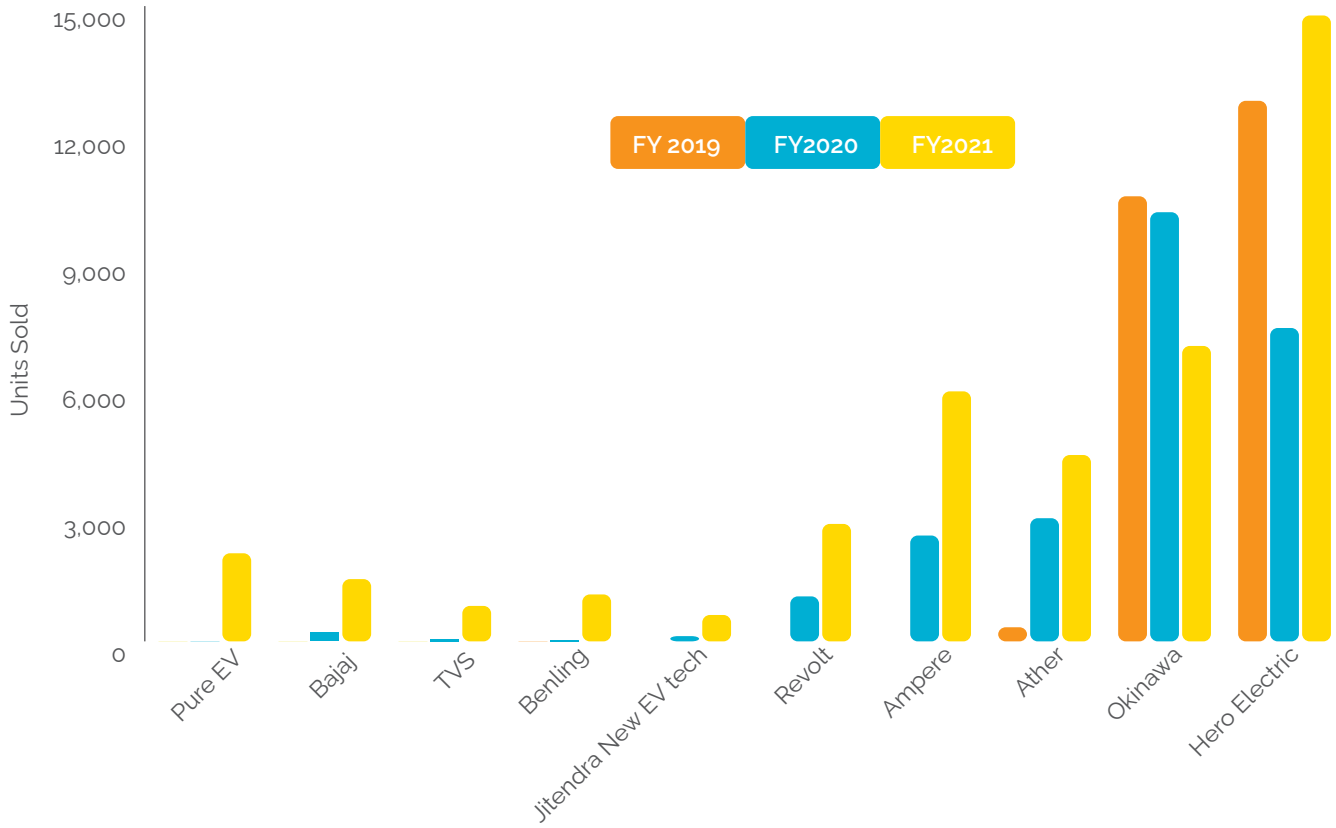
Source: Ministry of Road Transport & Highways (MoRTH), JMK Research

Note: Sales figure are for only high speed E2W models with >25kmph speed. As per SMEV, high speed vehicles market in FY2021 is only 40,836 units as SMEV has considered high speed vehicles of >40 kmph speed instead of 25 kmph speed, which is in accordance with the FAME 2 guidelines.

Hero Electric secured the top position in HS E2W sales' ranking, with a 36% share (>14,000 units), followed by Okinawa (17%), Ampere (14%), Ather (11%), Pure EV (5%), Revolt (4%), Bajaj (4%), Benling (3%) and TVS(2%).

Surprisingly, while Hero Electric (~100%), Ampere (136.2%), and Revolt (161.1%) witnessed more than 100% YoY growth and Ather about 50% Okinawa witnessed a YoY drop in sales of 31.2%. This year has also witnessed rising popularity of newer players such as Pure EV, having sold over 2,000 units in its debut year and accounting for a 5%-market share. The revamped Chetak by Bajaj, the only E2W offered by the company, is currently available only in Pune and Bangalore. This model was only available on a made-to-order basis, which might explain its minor 3% share. Bajaj's share, however, is expected to increase next year as Bajaj plans to open new outlets in Hyderabad and Chennai.

Fig 8.2 : Year-wise trend of High Speed E2W Sales



Source: Parivahan Dashboard

Note: HS models are those with speed >25km/hr

9. Challenges

Being a nascent technology, there are certain barriers when it comes to making a choice of switching to an E2W. There are some prevalent challenges that can cause major hindrances while choosing an E2W over its petrol counterparts. However, as the technology develops and scales, these barriers can be dealt with over time.

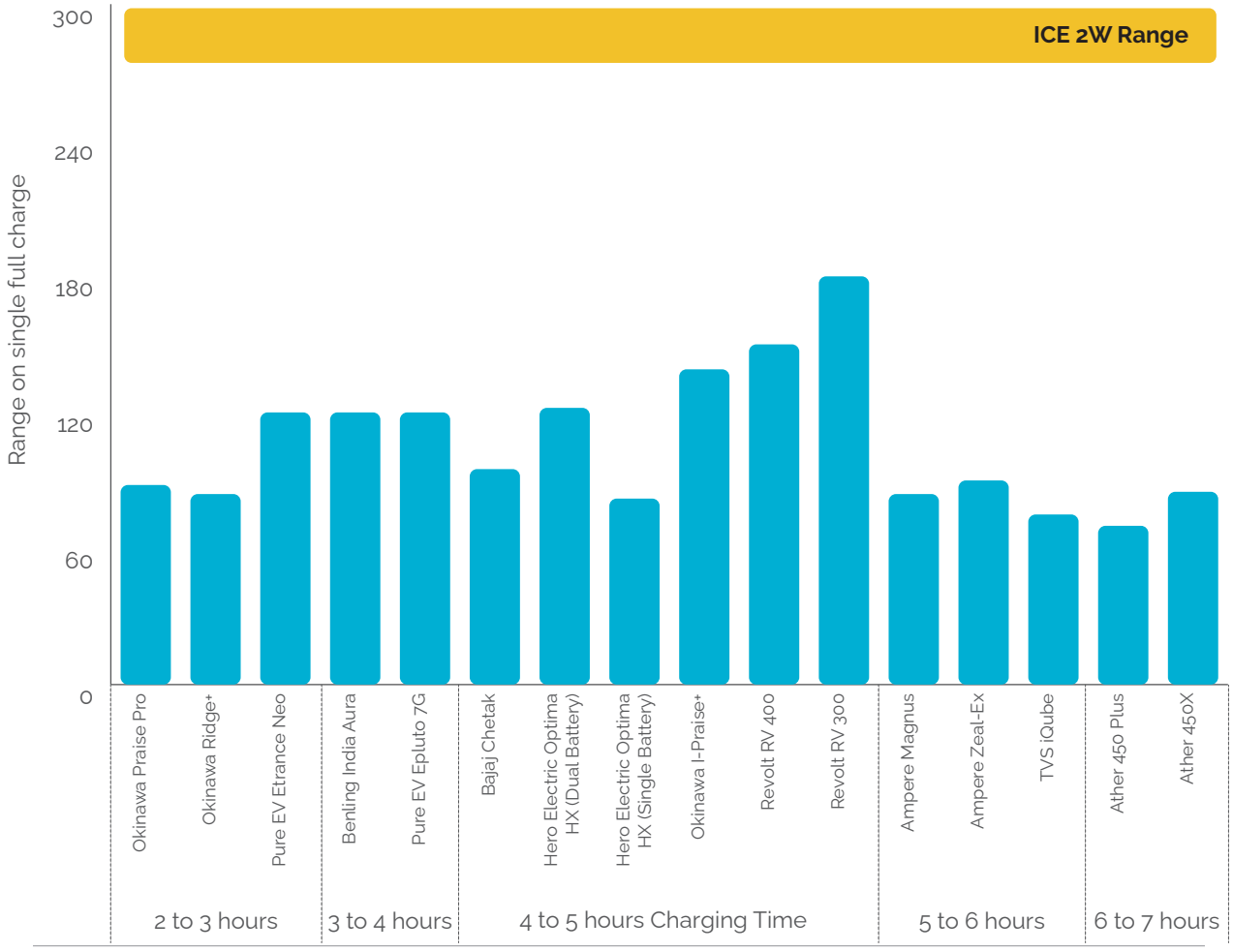
Low confidence due to performance issues

While LS E2Ws are the more popular choice amongst customers, they cannot match the performance ICE-counterparts offers. This, coupled with the fact that many organisations who offer LS E2W offerings, cease to exist in a matter of months due to low sales margins and increasing number of players in the market, have dented the confidence of customers.

Range anxiety

EV's typical daily riding range is about 80-100 kms, whereas that of petrol powered scooters is about 300 kms (Assuming the fuel tank capacity is 5 ltr and the mileage of 60 km/ltr.)

Fig 9.1 : Electric 2-wheeler ride range with respective charging period



Source: Company websites, JMK research

* Prices are Ex showroom prices

Challenges with E2W charging

Inadequate Charging Infrastructure

In the tier -1 cities such as Delhi, Mumbai, Chennai, Bangalore, etc. most of the population reside in Multi-Unit Residential Blocks of high rises. The existing infrastructure lacks space even for parking facilities within the buildings. Arranging charging stations or charging points in such complexes is a huge challenge. New complexes can be designed favourably but altering the existing ones would require a lot of investment and building plan alterations.

To combat this, the two possible methods for E2W charging are battery swapping or using PCS(Public Charging Stations), which have their own drawbacks.

Public Charging Systems

As of 13 April 2021, there were 3,397 PCS(Public Charging Stations) installed across India under the FAME scheme. However, there are more than 60,000 petrol pumps across India for ICE-based two-wheelers. This, coupled with the time charging an E2W takes(4-5 hr for 0% to 100% charging), makes it in inconvenient proposition for consumers.

Issues with battery swapping stations

At present, Battery Swapping Stations are considerably costlier[7] than home charging and PCS in India. The high cost of battery swapping can be attributed to the huge cost associated with maintaining a sizeable number of long-life & reliable batteries (includes battery replacement + cost), and the lack of battery pack design standardization across different OEMs and vehicle types. It is also important to note that, the businesses which desire to provide battery swapping facility to its customers would be levied an 18% GST on battery procurement.

Limited battery life and high replacement costs

A typical Lithium battery used in E2Ws is capable of withstanding 300 to 500[8] charge and discharge cycles, before reaching its diminishing point (capacity drops to 80% of original capacity). Assuming average range of E2Ws to be 100 km, the range a battery can cover in its single life span is 30,000 km to 50,000 km. A survey[9] had found that an average commuter travels 35 km/day on a two-wheeler. This translates to a life span of 2-4 years (manufacturer warranty on average is 3 years).

The battery replacement cost associated with, specifically, HS E2W models after 2-4 years of use is expected to be INR 40,000 – 45,000. Also, batteries when sold as a part of an EV package attract a 5% GST, but if bought separately attract a hefty 18% GST. This is a major barrier for consumers from a long-term perspective.

Lack of financing options

Although there has been a steady growth in E2W sales and adoptions in recent years, there is a dearth of finance mechanisms to support the consumers in financing their purchase. A normal two-wheeler loan from banks comes with interests ranging from 16%-21% per annum. This coupled with the high price tag that an E2W comes with can dissuade prospective buyers to make the purchase. As a workaround, players such as Ather and Revolt have come up with innovative schemes to lure customers and build their confidence in E2Ws. However, these two organisations only account for 15% of the HS E2W market and the gap still remains to be bridged.

7. *The Hindu, 'Should Government Promote EV Battery Swapping?', 27 August 2021*
8. *Inverted, 'Challenges with 2 wheeler batteries in India'*
9. *Times of India, 'Indian Commuters travel 35 km/day, says survey'*

Policy Barriers

As per FAME II, only the E2Ws with a minimum top speed of 40 kmph and a range of 80 km per charge would qualify for subsidy incentives. When this criterion came into effect in April 2019, it rendered 90% of the E2W being produced then, ineligible for subsidy.

The FAME II scheme requires the EV manufacturers to have a minimum of 50% localization in their products in order to be eligible for incentives. Most local suppliers are not willing to sell their products, at competitive prices supported by economies of scale, until the annual volumes in domestic E2W market reach 1 million units. This hinders the localization of the supply chain, which in many cases, is below 50%.

The current incentives in FAME II are based on their battery size, which has actually made low-powered electric two wheelers costlier by a range of INR 10,000 to INR 12,000. As mentioned earlier, Batteries sold as an integral part of EV attract 5% GST whereas those sold separately attract 18%. This is a critical barrier for those customers who wish to buy battery back-up or those who look for battery change in the future. Simultaneously, the businesses which desire to provide battery swapping facility to its customers would be levied an 18% GST on battery procurement.

10. Key Players

Fig 10.1: Key players in the E2W space

Player	Market Share	No of Dealers	Investments	Models		Manufacturing Facilities
	FY21			LS	HS	
Hero Electric	36%	600+	Majority of the funds raised for the company have been done internally. Only external fundraising done by Alpha Capital Advisors in December 2018 of US$ 22 million	6	4	Manufacturing facility near Ludhiana, Punjab, India. The built-up area is 58,000 sq. ft. with 60,000 sq. ft. of open area
Okinawa	17%	550	Self-funded	4	3	Manufacturing facility in Bhiwadi, Rajasthan with production capacity of more than 1.8 lakh units per year. Revealed plans of investing INR 70 crores at its upcoming 5-lakh unit per annum plant at Alwar in Rajasthan
Ampere	14%	300	Wholly-owned subsidy of Greaves Cotton.	6	2	Two manufacturing facilities in Coimbatore that together have a production capacity of 60,000 vehicles
Ather	11%	15	So far, the company has raised capital of about US$ 142 million. Hero MotoCorp and Sunny Bansal are major investors.	0	2	Ather's manufacturing facility is spread over 120,000 sq.ft. in Hosur, Tamil Nadu. It can produce over 110,000 vehicles and 120,000 battery packs in a year. The facility will be expanded to 400,000 sq.ft in the second phase.

Player	Market Share FY21	No of Dealers	Investments	Models		Manufacturing Facilities
				LS	HS	
Revolt	4%	11	50% stake acquired by RattanIndia in April 2021	0	2	Have plant in Manesar, Haryana spread over 1 lakh sq.km.
Bajaj	4%	2	Self-funded	0	1	Currently manufactured in Pune plant, however Bajaj plans to move production outside Maharashtra.
Benling	3%	52	Funded and owned by China based Bling Capital .	3	1	Assembling plant in IMT Manesar, Gurugram. To expand manufacturing plants in Pune and Chennai
TVS	2%	2	Self-funded	0	1	E2W manufactured in TVS' manufacturing plant in Hosur, Tamil Nadu

Source: News Articles, JMK Research

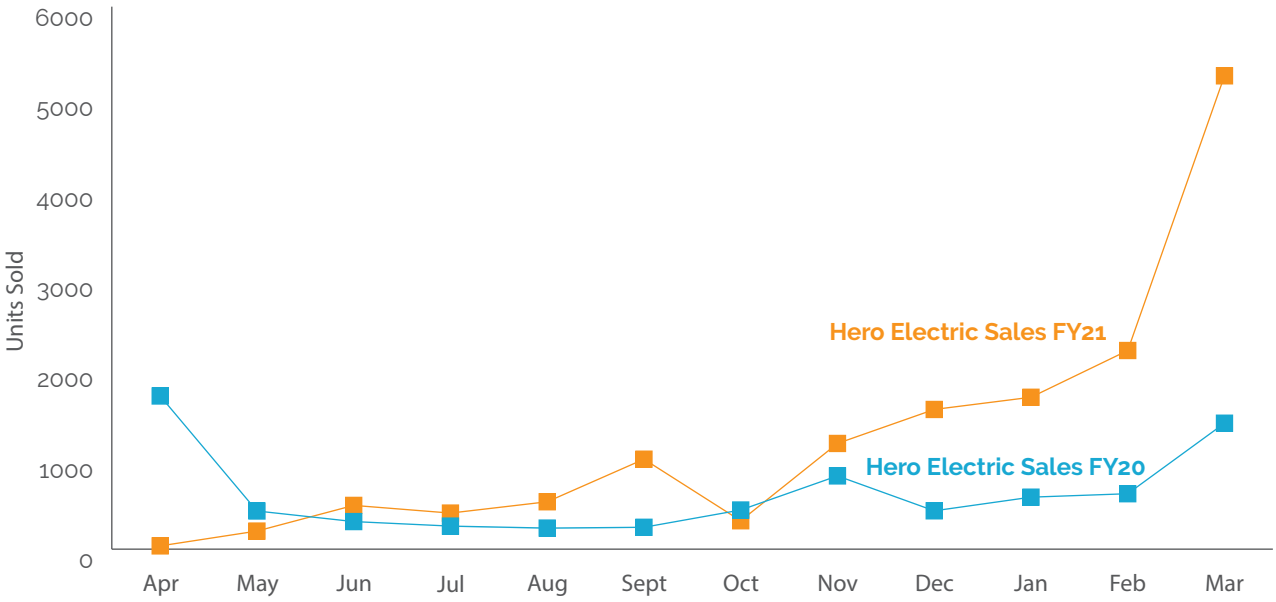
Note: HS models are those with speed >25km/hm

Hero Electric

Hero Electric is the biggest player in the E2W market in India, having accounted for over 40% of the HS E2W sales in FY2021. It launched its first lithium-ion battery-based scooter in 2017. At present, the Company has 600+ dealership network across the country with presence in more than 325 cities.

In FY2021, the company sold about 14,778 units while in FY2020, it sold around 7,399 units of high range E2Ws. The high range models' sales are just a small percent of total E2W sales of the company. Hero Electric had tied up with EV logistics start-up eBikeGO in December 2020 to deliver over 1,000 units for last-mile delivery.

Fig 10.1: Hero Electric two-wheeler sales



Source: Parivahan Sewa website
Note: HS models are those with speed >25km/hr

Product Portfolio

The company offers about 10 different E2W models with price range of INR 46,640 to INR 83,940. Hero Electric has divided its portfolio into two segments based on top speed of the scooters: City Speed (HX), which represents the HS segment, has 4 models and Comfort Speed (LX), which represents the LS segment, has 7 models.

Models	Features	Price (ex-showroom)
Photon HX	Battery capacity – 72V/ 26Ah Vehicle range – 108 km Charging time – 5 hrs Top speed – 45 kmph	INR 79,940
Optima HX (Dual Battery)	Battery capacity – 51.2V/ 30Ah Vehicle range – 122 km Charging time – 4-5 hrs Top speed – 42 kmph	INR 58,980

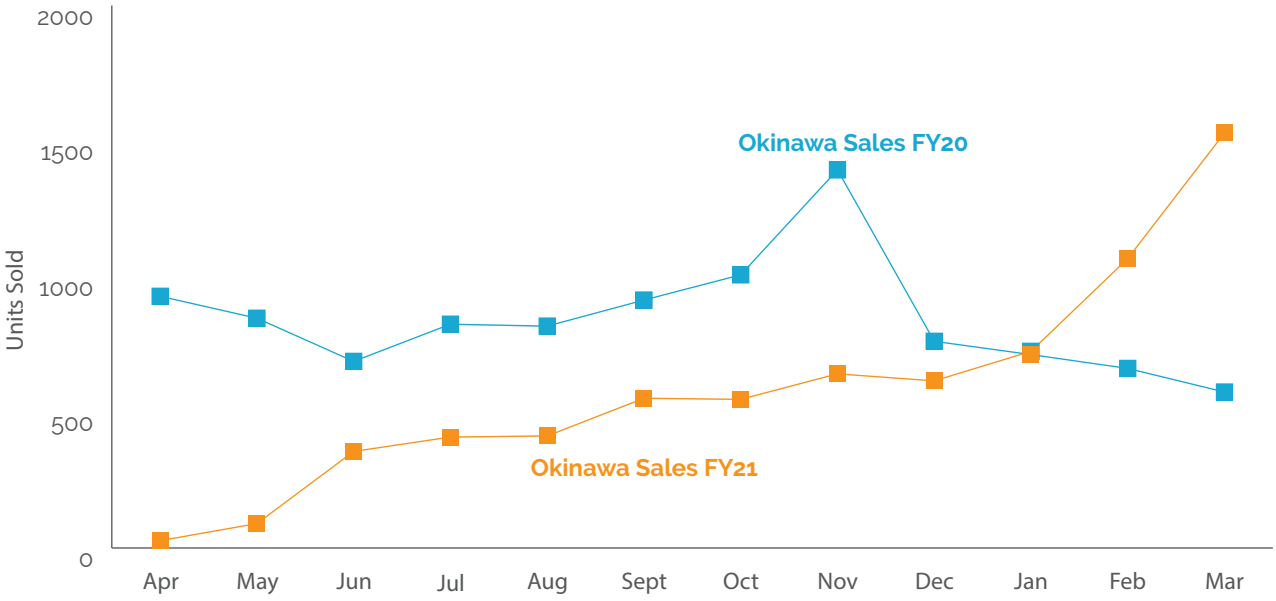
Models	Features	Price (ex-showroom)
Optima HX (Single Battery)	Battery capacity – 51.2V/ 30Ah Vehicle range – 82 km Charging time – 4-5 hrs Top speed – 42 kmph	INR 53,600
Nyx HX	Battery capacity – 51.2V/ 30Ah Vehicle range – 165 km Charging time – 4-5 hrs Top speed – 42 kmph	INR 83,940
Optima LX (Lead Acid Battery)	Battery capacity – 48V / 20Ah Vehicle range – 50 km Charging time – 8-10 hrs Top speed – 25 kmph	INR 51,440
Optima LX	Battery capacity – 51.2V/ 30Ah Vehicle range – 85 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 67,440
Nyx LX	Battery capacity – 51.2V/ 30Ah Vehicle range – 85 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 67,440
Atria LX	Battery capacity – 51.2V/ 30Ah Vehicle range – 85 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 63,640
Flash LX	Battery capacity – 51.2V/ 30Ah Vehicle range – 85 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 56,940
Flash LX (Lead Acid Battery)	Battery capacity – 48V / 20Ah Vehicle range – 50 km Charging time – 8-10 hrs Top speed – 25 kmph	INR 46,640

Source: Company Website

Okinawa

For two years, FY2019 and FY2020, the company was able to achieve sales >10,000 units for high range models, however in FY2021 Okinawa sold only 6,975 E2Ws. Okinawa has also revealed plans of investing INR 70 crores to manufacture motors and controls for its scooters at its upcoming 5-lakh unit per annum plant at Alwar in Rajasthan, which is scheduled for commissioning in early June, 2021.

Fig 10.2: Okinawa Autotech Sales



Source: Parivahan Sewa website
Note: HS models are those with speed >25km/hr

Product Portfolio

Okinawa has 7 models in its portfolio ranging from INR 58,992- INR 1,08,728. Out of the 7 models, three are high speed models (>25kmph) and four are low speed E2Ws.

Models	Features	Price (ex-showroom)
I-Praise +	Battery capacity – 3.3 kW Vehicle range – 139 km Charging time – 4-5 hrs Top speed – 58 kmph	INR 99,708
Praise Pro	Battery capacity – 2 Vehicle range – 82 km Charging time – 2-3 hrs Top speed – 58 kmph	INR 76,848
Ridge+	Battery capacity – 1.74kW Vehicle range – 84 km Charging time – 2-3 hrs Top speed – 45 kmph	INR 61,791
Lite	Battery capacity – 1.25 kWh Vehicle range – 60 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 63,990
R30	Battery capacity – 51.2V/ 30Ah Vehicle range – 85 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 58,992
Dual	Battery capacity – 1.25 kWh Vehicle range – 60 km Charging time – 4-5 hrs Top speed – 25 kmph	INR 58,992

Source: Company Website

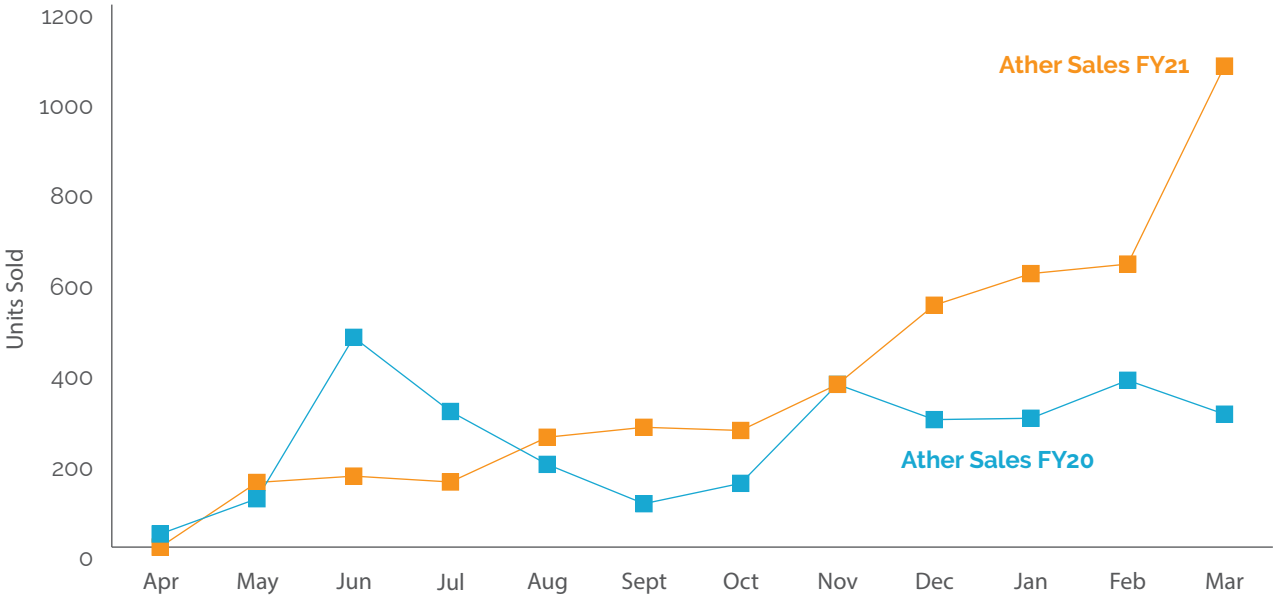
Ather Energy

In FY2021, Ather sold over 4,400 E2Ws, while in the previous fiscal year, 2,900 units were sold. Clearly, the market is picking up for Ather. Ather recorded its highest monthly sales in March 2021, and it was also the first time wherein they recorded 4-digit sales figure. Ather further reported their Q4 FY21 performance to be their best, having booked positive margins for the first time ever. In the same quarter, Ather increased its presence from 4 to 10 cities.

This fiscal year also saw Ather raise US$ 4 miilion from Hero Motocorp in July 2020 and US$ 35 million in November 2020 with Hero MotoCorp and Sachin Bansal increasing their shares in the company. So far, the company has raised capital of about US$ 142 million through equity mode.

Although Ather hiked its prices significantly this year, it has also announced a buyback scheme to attract customers. Under this, Ather is offering its customers who purchase an Ather 450 Plus or 450x an option of returning the vehicle back after a period of three years for a price of INR 70,000 and INR 85,000 respectively. This is being done to increase the confidence of buyers who might be unsure of the long-term perspectives of owning an E2W.

Fig 10.3 Ather Energy - E2W Sales in India



Source: Parivahan Sewa website
Note: HS models are those with speed >25km/hr

Product Portfolio

In its product portfolio, Ather has two models. Both are high end models above INR 1 lakh price range. Home charger is provided to customers in this price along with a 3-year warranty on battery and vehicle.

Models	Features	Price (ex-showroom)
Ather 450 Plus	Battery capacity – 2.4 kWh Charging time – 4-5 hours Vehicle range/ charge – 75 km Top speed – 80 kmph	INR 1,25,490
Ather 450X	Battery capacity – 2.9 kWh Charging time – 4-5 hours Vehicle range/ charge – 85 km Top speed – 85 kmph Fast charging – 15 km in 10 mins	INR 1,44,500

Source: Company Website

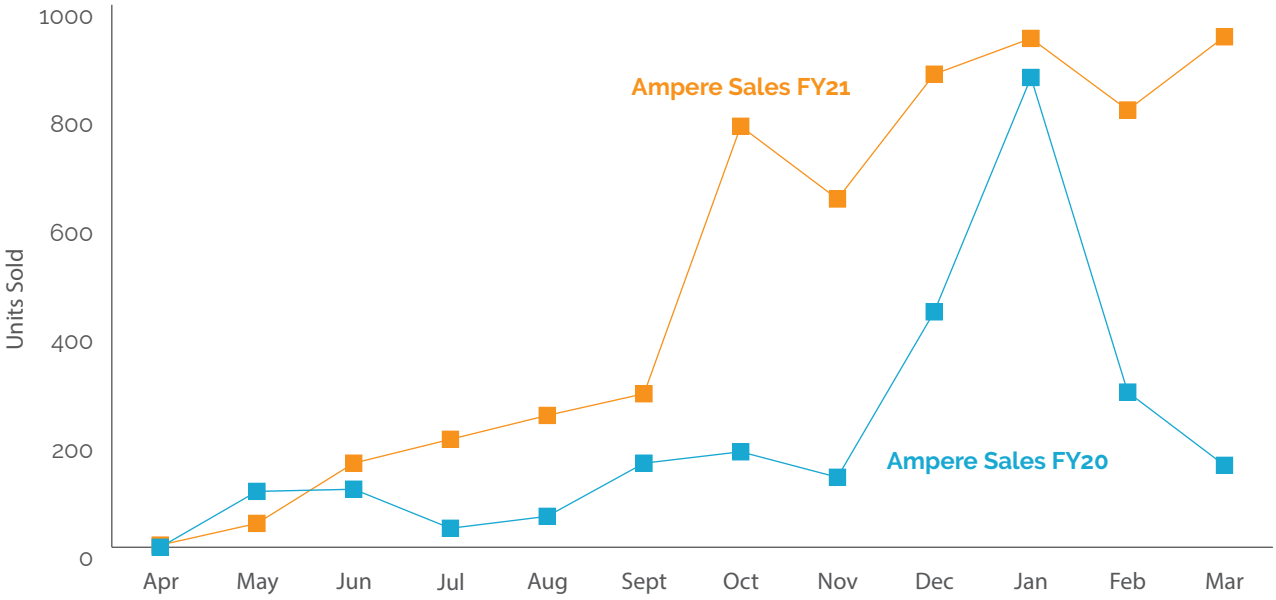
Apart from these E2W models, Ather is also building its network of charging stations under its program "Ather Grid". Charging stations have already been placed in Bengaluru, Chennai, Pune, Ahmedabad, Mumbai and Hyderabad. These charging stations provide fast DC charging upto 80% at 1.5 km/ min.

Ampere Vehicles

In FY2021 the Company has registered sales of 5,903 units for its high range models, which is more than twice of what Ampere sold in FY2020. Most of its sales are contributed by low range vehicles with top speed of less than 25 kmph.

In February 2021, Ampere signed a MoU with the Government of Tamil Nadu

Fig 10.4 Ampere Vehicles Sales



Source: Parivahan Sewa website
*Sales figure for FY19 not available.
Note: HS models are those with speed >25km/hr

Product Portfolio

Amongst its E2W models, the company product portfolio has 7 models of low range vehicles (top speed 25 kmph) and only 1 model of high range category (top speed of 55 kmph).

Models	Features	Price (ex-showroom)
Zeal (Li)	Battery capacity – 60 V, 30 Ah Vehicle range – 85 km Charging time – 5-6 hrs Top speed – 55 kmph	INR 59,990
Magnus Pro (Li)	Battery capacity – 60 V, 30 Ah Vehicle range – 85 km Charging time – 5-6 hrs Top speed – 55 kmph	INR 65,990
Magnus 60 (LA)	Battery capacity – 60 V, 20 Ah Vehicle range – 50 km Charging time – 8-10 hrs Top speed – 25 kmph	INR 44699
V48 LA	Battery capacity – 48 V/ 20 Ah Vehicle range – 50 km Charging time – 8-10 hrs Top speed – 25 kmph	INR 33,749
Reo LA	Battery capacity – 48 V/ 20 Ah Vehicle range – 50 km Charging time – 8-10 hrs Top speed – 25 kmph	INR 40,129
Reo Li	Battery capacity – 48 V/ 24 Ah Vehicle range – 60 km Charging time – 5-6 hrs Top speed – 25 kmph	INR 52,499
Reo Elite LA	Battery capacity – 48 V/ 20 Ah Vehicle range – 60 km Charging time – 8-10 hrs Top speed – 25 kmph	INR 42,999
Reo Elite Li	Battery capacity – 48 V/ 24 Ah Vehicle range – 60 km Charging time – 5-6 hrs Top speed – 25 kmph	INR 59,990

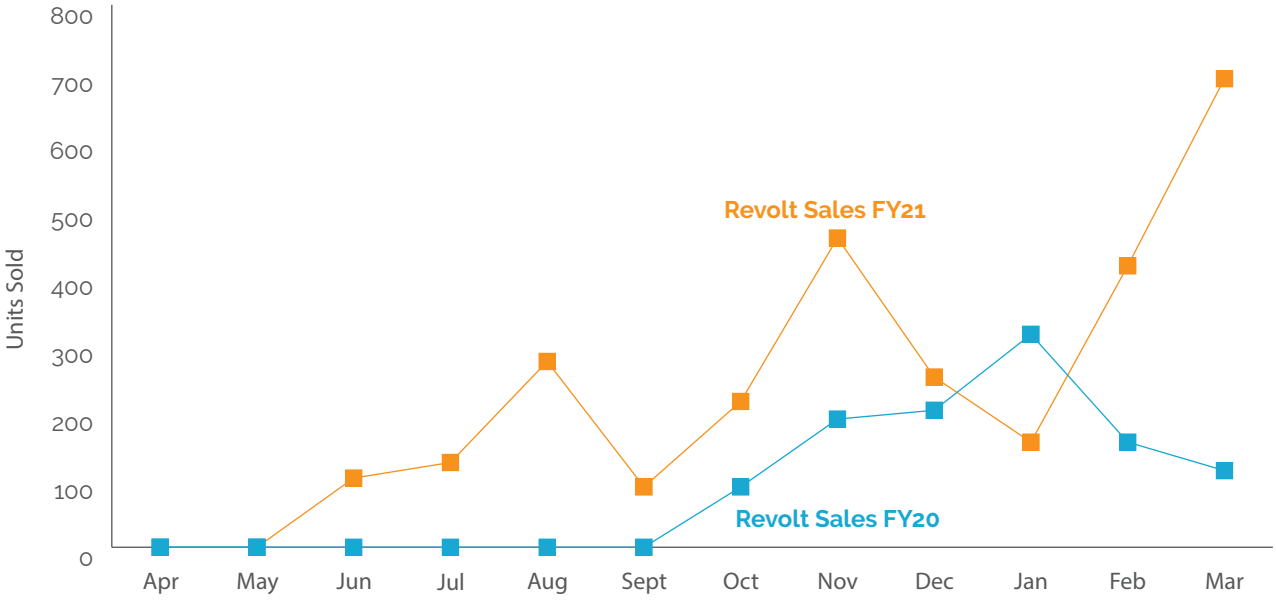
Source: Company Website

Revolt Motors

Revolt follows an innovative business model called MAAS – Motorcycle-As-A-Service, which is a first of its kind in India. Under the MAAS scheme, customers need to pay specific monthly charges, which is INR 2,999 for RV300 and INR 3,499 or INR 3,999 for RV400 (as it offers two monthly plans). There is no extra charge applicable. Customers are only required to pay their monthly rates as per the subscribed plan, also called MRP –My Revolt Plan, for the duration of 3 years. Post this term, the customer will have complete ownership over their vehicle.

Two months after its launch, Revolt started receiving subscriptions for its two models and within the last half of FY2020, the start-up had registered a total of 1,062 new subscriptions. In FY2021, it had registered total sales of over 1,700 units. In April 2021, RattanIndia invested US$ 20.6 million, acquiring 50% stake in Revolt.

Fig 10.5 Revolt Motors Sales



Source: Parivahan Sewa website
Note: HS models are those with speed >25km/hr

Product Portfolio

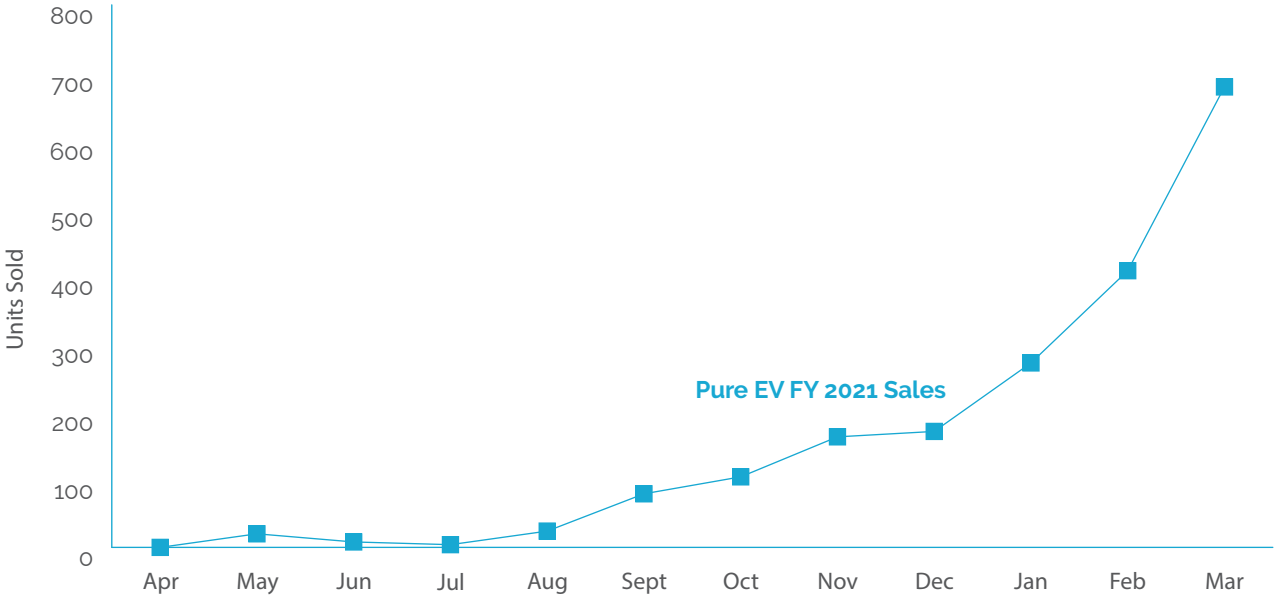
Models	Features	Price (ex-showroom)
RV 300	Battery capacity – 60V, 2.7kWh Vehicle range – 180 km Charging time – 4.2 hrs Top speed – 65 kmph	INR 1,11,000*
RV 400	Battery capacity – 72V, 3.24KWh Vehicle range – 150 km Charging time – 4.5 hrs Top speed – 85 kmph	INR 90,799

Source: Company Website

Pure EV

PureEV made its first commercial launch of EVs in April 2019 with 4 E2W models. These models make up its LS E2W range. It introduced its first HS E2W, EPluto 7G, in February 2020. Currently, Pure EV has two HS scooters in the market, the ETrance Neo and EPluto 7G. Although a new entrant in the market, the startup has managed to capture 5%-share of the HS E2W market in FY2021.

Fig 10.6 Pure EV Sales



Source: Parivahan Website
Note: Sales figures are for models with speed >25kmph

Product Portfolio

Pure EV offers 6 products, of which one is an e-cycle, Etron. The five e-scooters launched by the startup are ETrance, ETrance+, ETranceNeo, EPluto, and EPluto 7G.

Models	Features	Price (ex-showroom)
ETrance	Battery capacity – 1 kWh Vehicle range – 60 km Charging time – Unknown Top speed – 25 kmph	INR 51,999
ETrance +	Battery capacity – 1.8 kWh Vehicle range – 85 km Charging time – 4 hrs Top speed – 25 kmph	INR 62,999
ETrance Neo	Battery capacity – 2.5 kWh Vehicle range – 90-120 km Charging time – 4 hrs Top speed – 60 kmph	INR 75,999
EPluto	Battery capacity – 1.8 kWh Vehicle range – 85 km Charging time – 4 hrs Top speed – 25 kmph	INR 70,499
EPluto 7G	Battery capacity – 2.5 kWh Vehicle range – 90-120 km Charging time – 4 hrs Top speed – 60 kmph	INR 83,999

Source: Company Website

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