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EV Updates

Q2

2021

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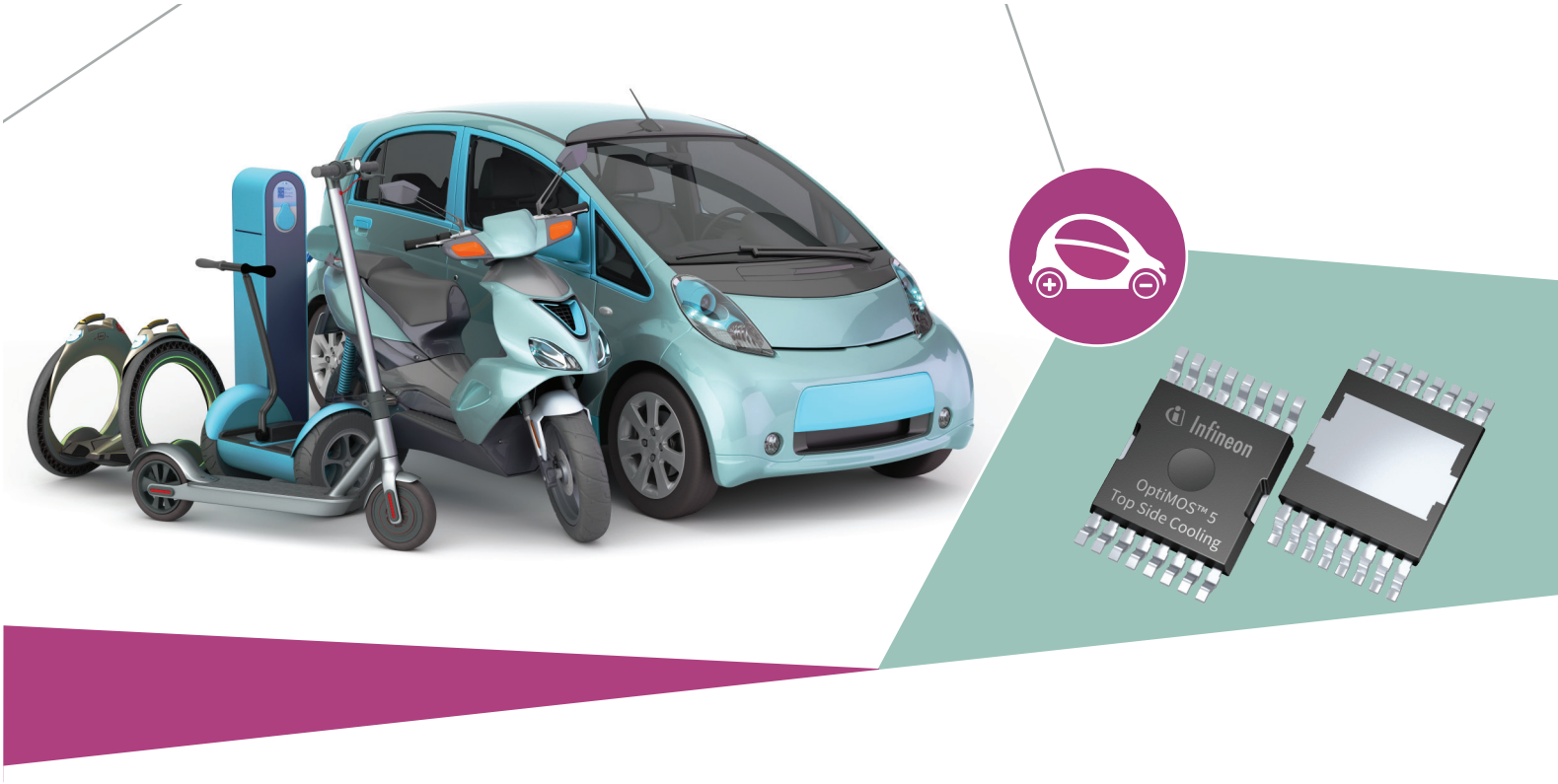


OptiMOS™ power MOSFETs in TOLT

Optimized for superior thermal performance

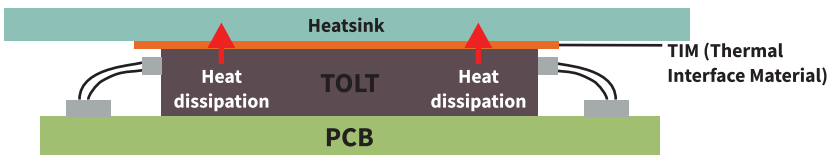
Infineon's OptiMOS™ power MOSFET family expands its high performance package offerings with the introduction of the TO-Leaded top-side cooling (TOLT) package to its portfolio. The TOLT package offers the same high current low profile benefits as the TO-Leadless (TOLL) package with the additional advantage of top-side cooling for optimum thermal performance.

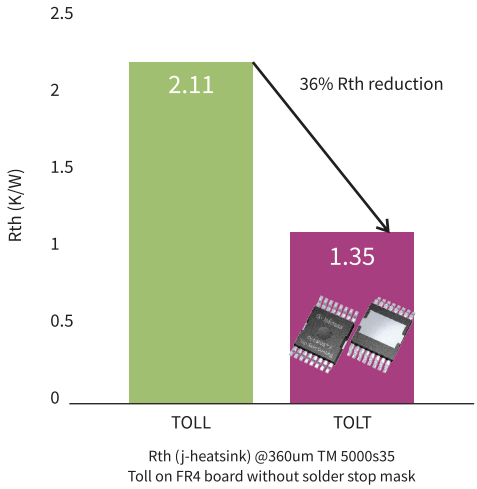
This innovative package combined with the key features of OptiMOS™ 5 power MOSFET technology enables best-in-class products in 80V and 100V as well as high current rating >300A for high power density designs.

With top-side cooling, the drain is exposed at the surface of the package allowing for 95% of the heat to be dissipated directly to the heatsink, achieving 20% better RthJA and 50% improved RthJC compared to the TOLL package.

Benefits

- Increased system efficiency enabling extended battery life time
- Improves overall system cost by minimizing heatsink and thermal gel
- Reduce size with high power density, ease of manufacturing with FR4 PCB
- High power density with Best in Class performance (very low RDS(on) and high current capability)
- Superior thermal performance which improves the overall system reliability with longer end product life time





Rth (j-heatsink) @360um TM 5000s35
Toll on FR4 board without solder stop mask

https://www.infineon.com/optimos-tolt

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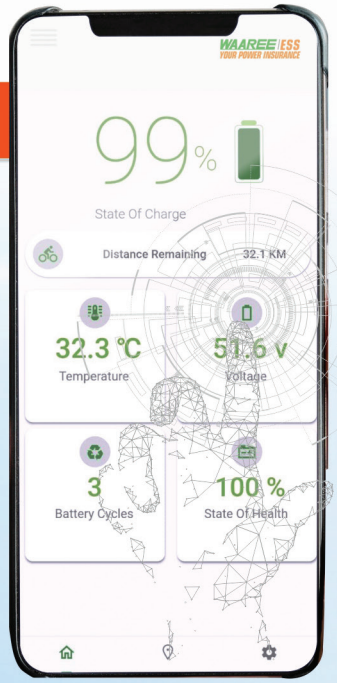
SMART LITHIUM ION BATTERIES FOR ELECTRIC VEHICLES

SMART APP CONTROL



- High Energy Density
- Fast Charging Application
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Contents

1 Executive Summary

EV segment has witnessed decline in sales in India at a considerable rate due to the second wave of covid-19 pandemic. Further, no EV segment (except the Electric Two-Wheeler (E2W) segment) saw launch of a new model in India during the last quarter. In Q2 2021, key updates across EV sector include:

- Launch of 16 electric two-wheeler models. There has been no new product launch in the Electric Three-Wheeler (E3W), Electric Four-Wheeler (E4W) and E-Tractor categories. However, new launches have been planned like Model S, X and 3 by Tesla in the upcoming months under the four-wheeler category.
- Gujarat released its 'Electric Vehicles Policy 2021'. Effective from 1st July 2021, it will be valid for 4 years from the date of implementation.
- Approval for Advanced Chemistry Battery Cells under PLI Scheme by Cabinet with an outlay of Rs. 18,100 crore over a five-year period.
- More than Rs. 305 Crores (USD 40 million) of fundings were raised across various segments. Biggest funding was raised by Revolt Intellicorp of Rs. 150 crores from RattanIndia.
- The Q2 2021 sales of registered EVs has declined by 53% from previous quarter's sales, reaching merely 28,680 units.
- The worldwide sales of battery electric vehicles (BEVs) has witnessed a 23.8% surge in growth from 737,722 units in Q1 2021 to 913,509 in Q2 2021.

2 New Product Launches

2.1 Electric Two Wheeler (E2W)

During the Apr-Jun 2021 period, 16 new E2Ws were launched. All the models are either e-scooter or e-bike, except ZOR 405 by Dao EV Tech, which is a moped.

The speed of these products range from 25 km/h to 90 km/h. Notably, each of the 4 models launched by Joy E-Bike have top speed of 90 km/h.

In terms of application, Dao EV Tech's all 4 models are targeted at B2B segment, whereas Hermes 75 by Kabira Mobility and Hope by Gelios Mobility will be promoted for both B2B and B2C segments.

The Hermes 75 is a made-in-India high-speed commercial delivery scooter. The Gelios Hope has been launched for B2B segment, however bookings for B2C/personal applications too will be open soon.

Table 2.1: Electric Two-Wheeler Product Launches in Q2 2021

Name	Speed	Specification	Price
DAO Model 703	70 km/h	• Range – 100 km • Battery – 72V 30Ah (Li-ion) • Motor – 3500 W BLDC	Not unveiled
DAO Vidyut 106	25 km/h	• Range – 80 km • Battery – 60V 15/23Ah (Li-ion) • Motor – 250W	Not unveiled
DAO Vidyut 108	25 km/h	• Range – 80 km • Battery – 60V 15/23Ah (Li-ion) • Motor – 250W	Not unveiled
DAO ZOR 405	45 km/h	• Range – 70 km • Battery – 60V 23Ah (Li-ion) • Motor – 2100W	Not unveiled
Geliose Mobility Hope	25 km/h	• Range – 50km/75km • Battery – 48V 18Ah/24Ah/30Ah • Motor – 250 W	Rs. 46,999
Gravton Quanta	70 km/h	• Range- 150 km • Battery- 3 kW (Li-ion) • Charging time- 3 hours • Motor- BLDC Motor with 172 Nm torque at wheels	Rs. 99,000
HOP Leo	60 km/h	• Range – 75-125 km • Battery – 1.62 kWh/2.70 kWh (Li-ion) • Boot space- 19.5 L	Rs. 72,500 onwards

Name	Speed	Specification	Price
HOP Lyf	50 km/h	• Range – 75-125 km • Battery – 1.44 kWh/2.52 kWh (Li-ion) • Boot space- 19.5 L	Rs. 65,500 onwards
Jitendra New EV Tech JET 320		• Range- 72 to 80 km • Battery- 48V, 20Ah/ 60V, 26Ah • Motor- 250 W BLDC hub motor • Boot space- 24 L	Rs. 72,000
Joy e-Bike Beast	90 km/h	• Range – 110 km • Battery – 73.6V 72Ah (Li-ion) • Motor – 5000W	Rs. 2,42,000
Joy e-Bike Hurricane	90 km/h	• Range – 750 km • Battery – 73.6V 54Ah (Li-ion) • Motor – 5000W	Rs. 2,33,000
Joy e-Bike Skyline	90 km/h	• Range – 110 km • Battery – 73.6V 72Ah (Li-ion) • Motor – 5000W	Rs. 2,29,000
Joy e-Bike Thunderbolt	90 km/h	• Range – 110 km • Battery – 73.6V 72Ah (Li-ion) • Motor – 5000W	Rs. 2,33,000
Kabira Mobility Hermes 75	80 km/h	• Range – 120 km • Battery – 2.4kWh (Li-ion) • Motor – 2500W	Rs. 89,600
White Carbon GT5	50 km/h	• Range – 100 km • Battery – 1.8kWh/2,4kWh (Li-ion) • Motor – 3000 W BLDC (Supplied by Bosch)	Rs. 1,15,000
White Carbon O3	25 km/h	• Range – 60km/120km • Battery – 48V 20AH/24AH (Li-ion) • Motor – 250 W BLDC	Rs. 55,900

Source: Industry news articles, JMK Research

Figure 2.1: Price v/s Top Speed of Newly Launched Electric Two-Wheeler Products of Q2 2021

Source: Industry news articles, JMK Research

Note:

Prices of DAO E2W models have not been unveiled. Top speed of Jitendra New EV Tech JET 320 is not known

3 Policies and Regulations

Policy/ Regulation/ Guideline Announced	Key takeaways
Ministry of Power releases the draft National Electricity Policy 2021, calls for expert recommendations	• MNRE, CEA and NITI Aayog has been requested to present their suggestions and recommendations on draft NEP 2021 within two months, starting from 27 April 2021. • Section 17 of the draft covers the development of Charging infrastructure, which states that 'Certain tariff related measures may be required to be undertaken for Public Charging Stations. • The draft mentions the use of Time Of Day (TOD) tariff to avoid charging during peak hours. • Aggregators may be allowed to aggregate the demand of multiple public charging stations to purchase renewable energy using open-access.
Cabinet approves PLI Scheme for Advanced Chemistry Battery Cells	• Advance Chemistry Cell (ACC) Battery sector has been proposed with an outlay of Rs. 18,100 Crore over a five-year period. • Under this scheme, the following benefits are expected: o Net savings of Rs. 2,00,000 crore to Rs. 2,50,000 crore on account of oil import bill reduction during the period of this Programme. o Direct investment of around Rs. 45,000 crore in ACC Battery storage manufacturing projects. o Import substitution of around Rs. 20,000 crore every year.
Government announces waiver on Registration Certificates and renewal of RC for EVs	A draft notification has been issued by Ministry of road transport and highways to amend the Central Motor Vehicles Rules, 1989 proposing to exempt battery operated vehicles (BOV) from payment of fees for the purpose of issue or renewal of registration certificate (RC) and assignment of new registration mark.
Implementation period of FAME India Phase II scheme extended	• The Ministry of Heavy Industries and Public Enterprises released another notification on June 25, 2021, notifying about the extension of the FAME II scheme for a period of two years i.e. up to 31st March 2024. • On approval, this policy will be implemented from April 2022.
West-Bengal aims to become EV leader with new policy	• The government plans to have 10 lakh EVs, combined across all segments, during the implementation period. • The government is also planning to develop 100,000 public and semi-public charging stations within the same duration. • It also targets to achieve EV per public charge point ratio of 8:1. • Further, the policy speaks of establishment of an EV accelerator cell to act as the nodal agency for implementing the electric mobility programme within the state. • The policy shall be effective for a period of 5 years from the date of its notification in the official gazette.

Policy/ Regulation/ Guideline Announced	Key takeaways
Maharashtra government announces revised EV policy	• The Maharashtra government had revealed its draft Electric Vehicle policy 2021 in May 2021. (The final policy was eventually unveiled on 13 July 2021. This policy will be valid till 31 March 2025.) • Some of the salient features of this policy are: o To promote EV adoption in the state with a target of 10% of all new registrations by EVs by 2025. o The policy aims to convert 25% of existing public transport infrastructure to fully electric by 2025 in Mumbai, Pune, Aurangabad, Nagpur, Nashik and Amravati. o To make its 4 major highways networks (Mumbai-Nagpur Expressway, Mumbai-Pune Express Highway, Mumbai-Nashik, and Nashik-Pune) EV-compliant by 2025.
Amendments added to the Karnataka EV Policy to attract investments	• 15% capital subsidy to investors in the EV Sector on value of fixed assets over five equal annual payments. Maximum land area covered under this scheme is 50 acres. • Production-linked subsidy of 1% on turnover will be provided for a period of 5 years starting from the first year of commercial operations for large, mega, ultra and super mega EV assembly. • Stipend will be provided for in-house training of 50% of the training cost, with a limit of Rs. 10,000 per month per trainee.
Delhi Govt to begin single window facility for EV-Charging scheme	• The upgraded scheme for installation of charging facilities will involve private and semi-public spaces as well as cooperative group housing societies (CGHS), high rises, Residents Welfare Associations (RWAs) etc. • The institutional buildings like hospitals and commercial spaces like malls and theatres will also be involved in the policy.

Source: Industry news articles , JMK Research

4 Investments

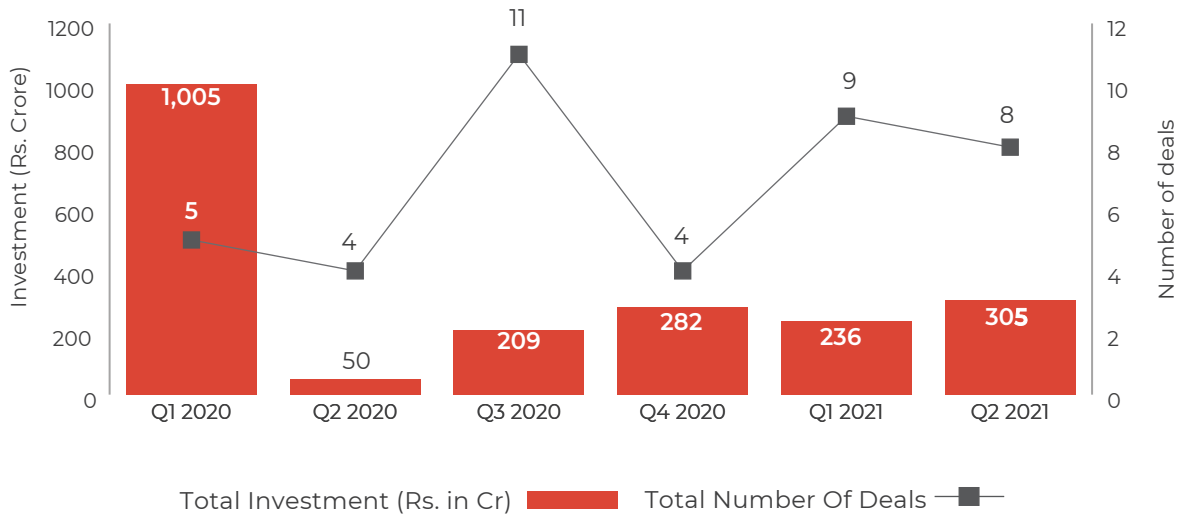
In the recent past, despite the rise in uncertainties owing to the covid 19 pandemic, numerous investors, upon gauging the tremendous potential in the EV sector, have made significant investments in this new-age sector. The continuity in momentum in terms of number of deals and total fund volume in the last quarter is a testament to this fact.

The total flow of funds into the EV sector in Q2 2021 was greater than Rs. 305 crores.

Key investments in Q2 2021:

- Revolt Intellicorp has raised an equity funding of Rs. 150 crores from RattanIndia Enterprises in order to expand its work to 35 cities across India and South Asian countries.
- Dr. Kiran Patel, an Indian-American philanthropist, cardiologist, and entrepreneur, has committed to provide Rs. 120 crores to the Mumbai-based EV charging solutions company, Magenta EV Solutions in Series A funding. This investment will help the company to build more EV charging solutions and therefore expand its mark in the global market.
- Alteria Capital has provided a funding of Rs. 24 crores to Oye Rickshaw to expand its smart lithium-ion batteries swapping stations in different parts of the country. Currently, they have 15 active battery swapping stations and have plans to expand it to 650 stations, across Delhi-NCR and five more cities by December 2021.

Figure 4.1: Quarterly Investment Trend in EV Space



Source: JMK Research

Table 4.1 Investments in Q2 2021 in EV space in India

Date	Company Name	Company Type	Deal Type	Investor	Deal Value (Rs Cr)	Details
21-Apr	Revolt Intellicorp	EV OEM	Equity	RattanIndia	150	Revolt Intellicorp raises Rs.150 crore in equity from RattanIndia
21-Apr	Oye! Rickshaw	EV fleet	Equity	Alteria Capital	24	Oye! Rickshaw raises Rs. 24 Crore from Alteria Capital to expand EV energy infrastructure
21-Apr	Moeving	EV based logistics	Equity	• Manas Fuloria, CEO, Nagarro • Nishant Sharma, Managing Partner & CIO, Kedaara Capital • Mukul Dhyani, Senior IT Executive based out of Europe, • Naresh Agarwal, Head of India R&D, Traceable; • Abhishek Poddar, MD, Macquarie (MIRA); • Mayank Gupta, ex-KKR Director; • Anand Dalmia, Co-Founder, Fisdom; • Bhanu Singhal, ex-Citibank	7	EV startup Moeving raises $1 million, launches operations in multiple cities
21-May	Magenta EV Solutions	EV Charging solutions	Equity	Dr. Kiran Patel	120	Magenta EV announces $15 million investment from Kiran C Patel
21-May	Altigreen EV	EV technology and solutions	Equity	House of Anita Dongre		Altigreen gets investment from House of Anita Dongre for EV solutions development
21-May	Cellestial E-mobility	EV Tractor manufacturer	Equity	Ashik Khan, founder UpCapital Investments	4	EV startup Cellestial raises $0.5 million in pre-series A fundraise
21-Jun	Chargeup	EV Charging solutions	Equity	MapMyIndia		EV battery swapping firm Chargeup raises pre-Series A fund
21-Jun	Switch Mobility Automotive Ltd, India	EV manufacturer	M&A	Switch Mobility – An Ashok Leyland subsidiary		Ashok Leyland arm acquires EV manufacturer Switch Mobility Automotive

Source: Industry news articles, JMK Research

5 Sales Trends- India

The Q2 2021 sales of EVs has decreased by 53% from previous quarter's sales, reaching merely 28,680 units. On a YoY basis, the sales has significantly increased by 242% in the second quarter of 2021. As per the region-wise sales, Uttar Pradesh has the maximum registered EV sales (23%) in India among all the states/ UTs, followed by Tamil Nadu (12%) and Karnataka (9%).

Fig 5.1: Registered EV sales in India: Trend (Q2 2021)

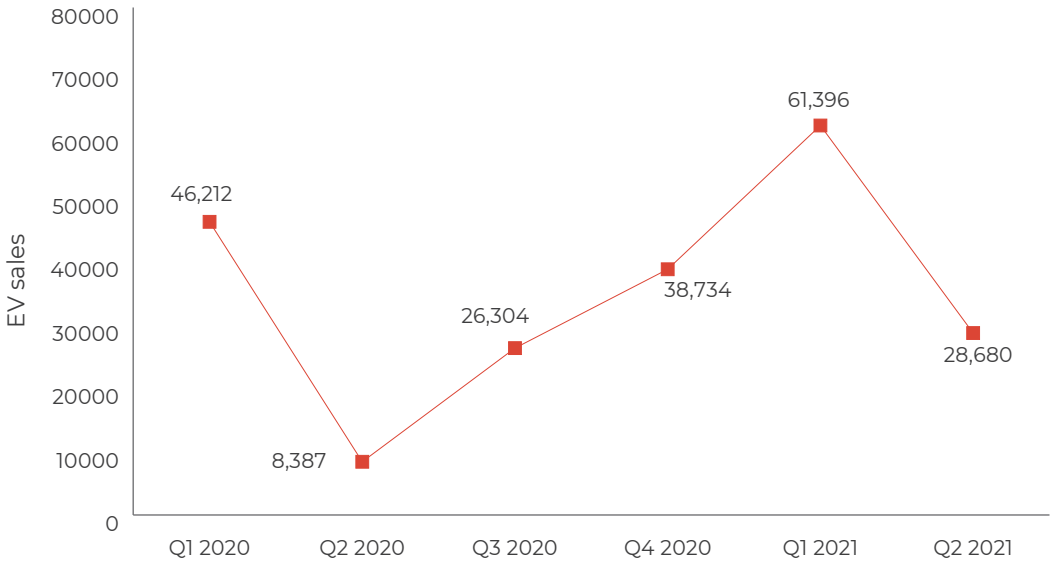
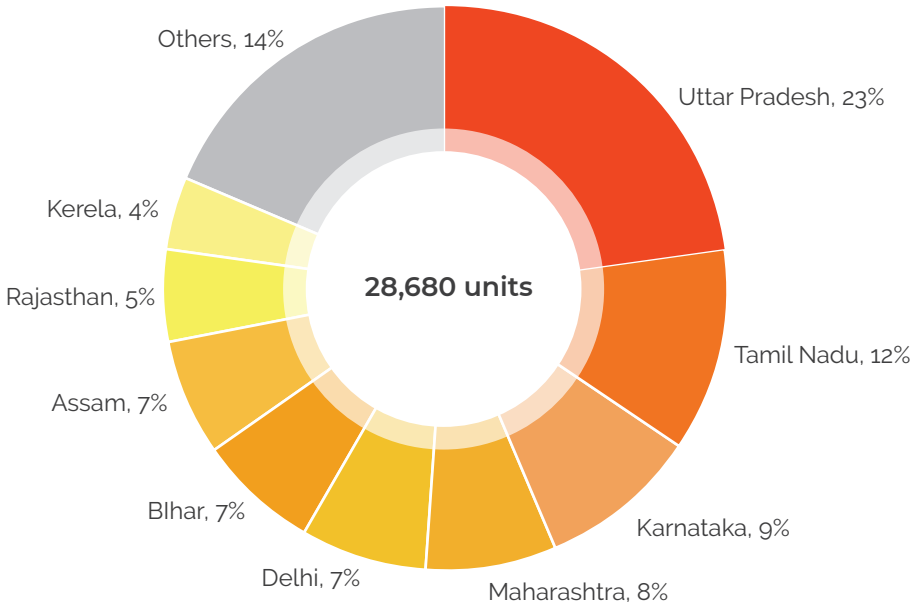


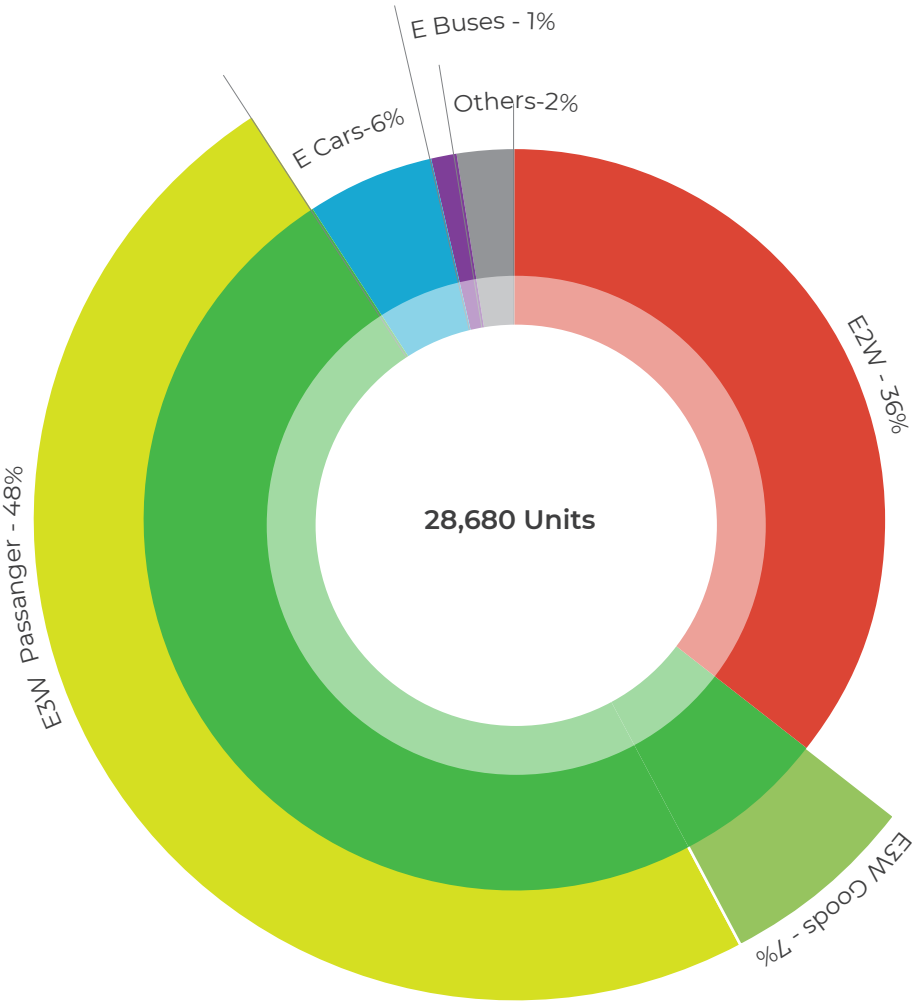
Figure 5.2: Region-wise Registered EV sales in India in Q2 2021



Source: Vahan Dashboard, JMK Research
Note: Sales figures represent EVs registered across 1,305 RTOs in 33 states/ UTs

The figure below shows a category-wise breakup for Electric vehicle registrations in Q2-2021. Majority of the registrations came from passenger three-wheelers (48%) followed by electric two-wheelers (36%), which together account for 84% of the total registrations in this period. Electric cars account for 6% of the registrations followed by Electric buses at 1% and other vehicle classes at 2%.

Figure 5.3: Category-wise Registrations in Q2-2021



Source: Vahan Dashboard, JMK Research

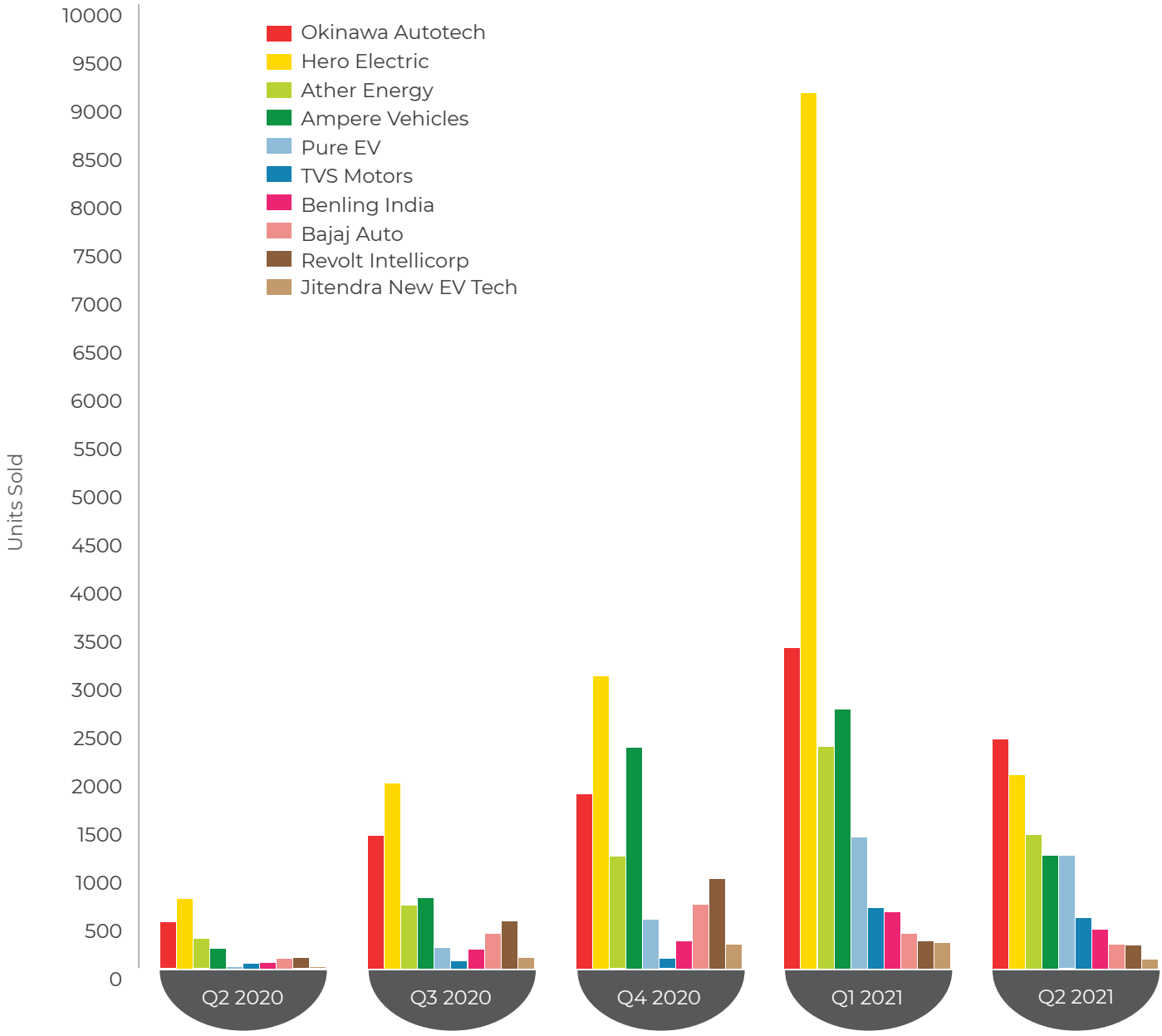
Note: Sales figures represent EVs registered across 1,305 RTOs in 33 states/ UTs

"Others" consist of Adapted Vehicles, Fork Lift, Goods Carrier, Omni Bus, Trailer (Agricultural) etc

5.1 Electric Two Wheeler (E2W) sales trends

In the high-speed (HS) E2W segment, the cumulative sales of top 5 players (Okinawa Autotech, Hero Electric, Ather Energy, Ampere Vehicles, PURE) in Q2 2021 represent 79% of the overall sales (10,238 units). However, on QoQ basis, the total sales has decreased by 52%, whereas witnessed a surge of 406% on a YoY basis. With respect to Q2 2021 sales, Okinawa leads with 23% share, followed by Hero Electric (20%), Ather (13.5%), Ampere (11.4%) and PURE (11.4%) in the HS-E2W segment.

Figure 5.4: Player-wise high-speed E2W sales trend



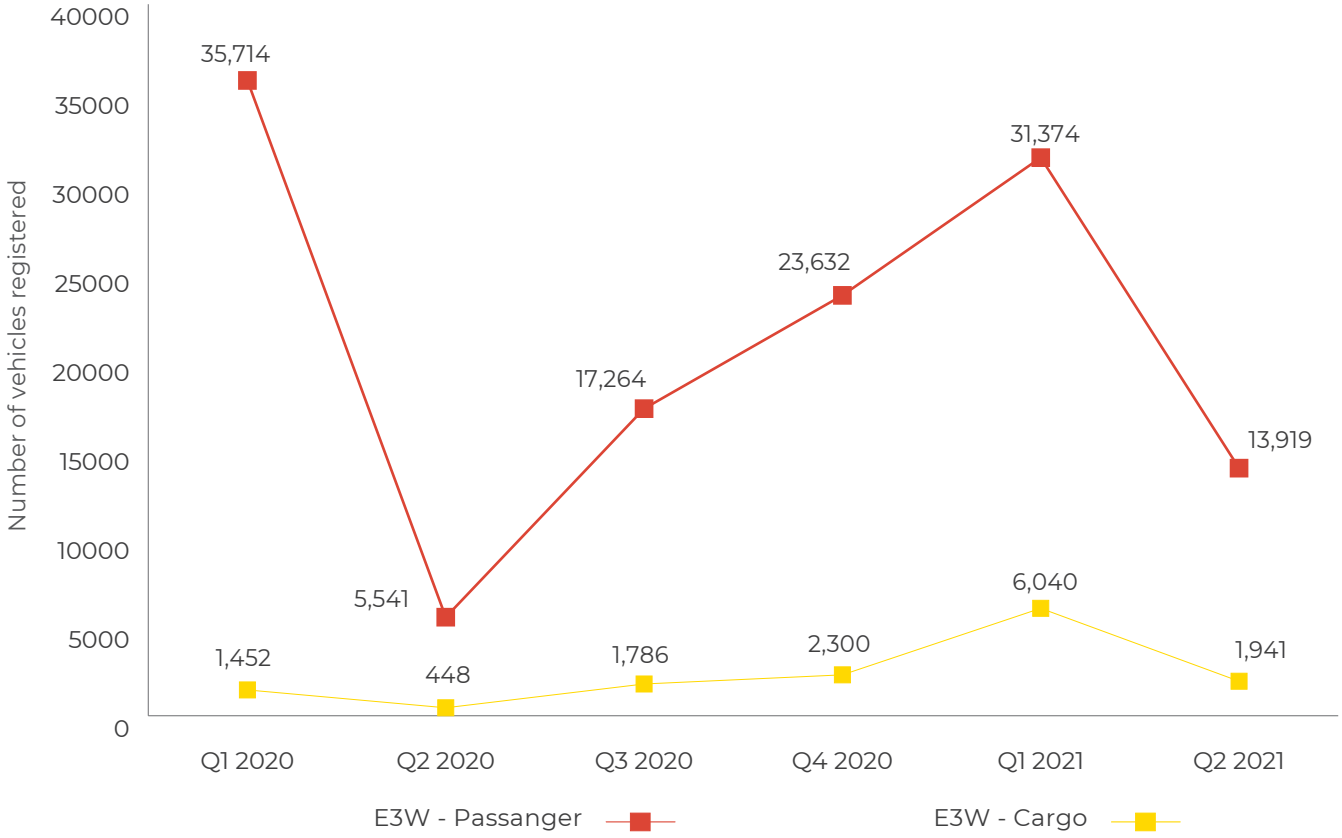
Source: Vahan Dashboard, JMK Research

Note: Sales figures represent only high-range E2W (Top speed > 25 kmph) models registered across 1,305 RTOs in 33 states/ UTs.

5.2 Electric Three Wheeler (E3W) sales trends

The combined sales of both passenger and cargo (registered) E3Ws in Q2 2021 has declined by about 58% as against Q1 2021 sales, attaining merely 15,860 units. The passenger-type E3W accounted for 88% of the total E3W sales for Q2 2021. The sales of passenger and cargo variants have witnessed a surge of 151% and 333% YoY, respectively.

Figure 5.5: Sales trend of cargo E3W and passenger E3W

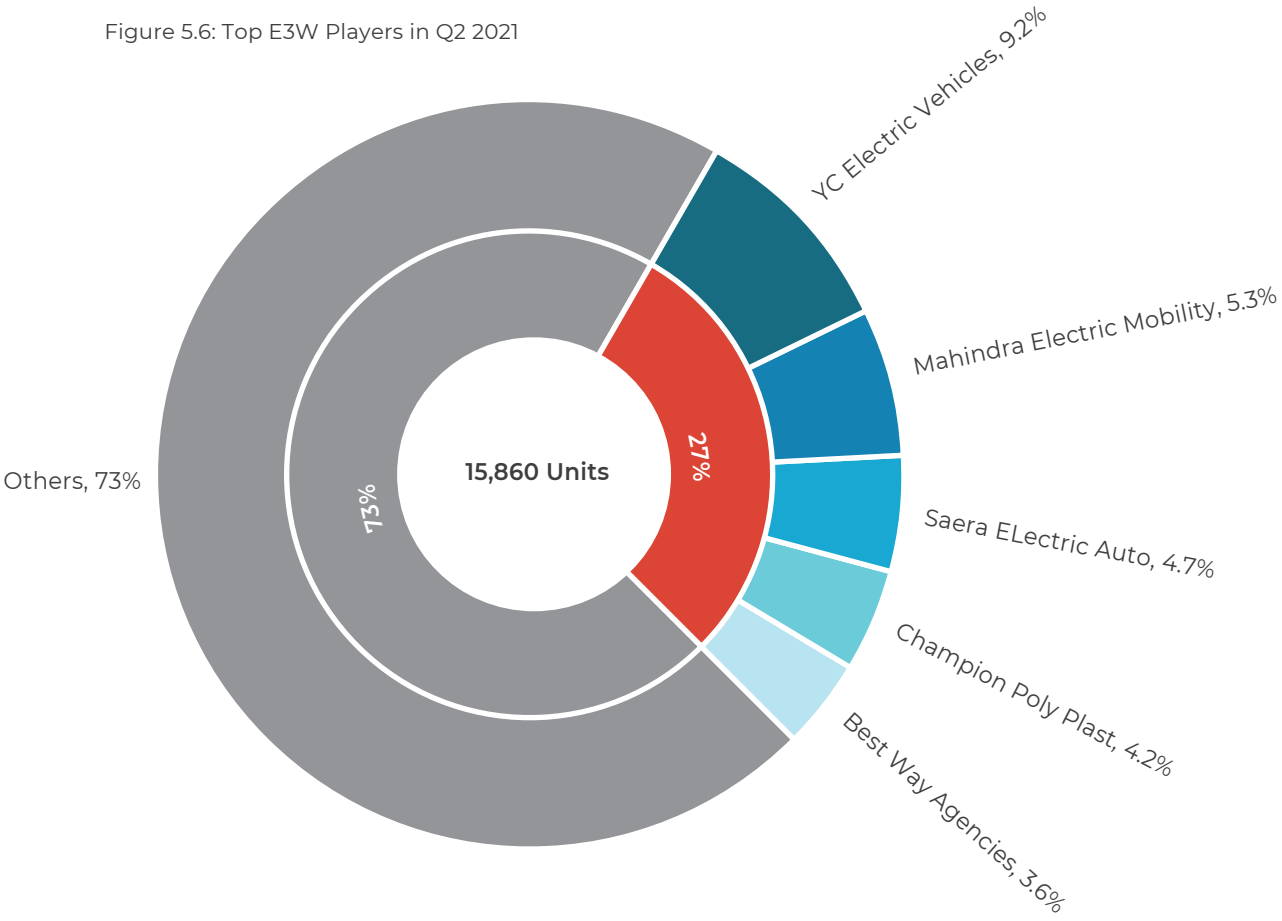


Source: Vahan Dashboard, JMK Research

Note: Sales figures represent E3Ws registered across 1,305 RTOs in 33 states/ UTs. Passanger and Cargo E3W sales shown the figure takes into account both e-rickshaw and three wheeler classes as categorized in the vahan dashboard.

The cumulative sales of top 5 electric 3-wheeler players across passenger and cargo segments in Q2 2021 occupied 27.2.2% share of the entire E3W market. YC Electric Vehicle has the highest share of 9.24%, which is followed by Mahindra Electric Mobility (5.3%), Saera Electric Auto (4.7%), Champion Poly Plast (4.2%) and Best Way Agencies (3.6%).

Figure 5.6: Top E3W Players in Q2 2021



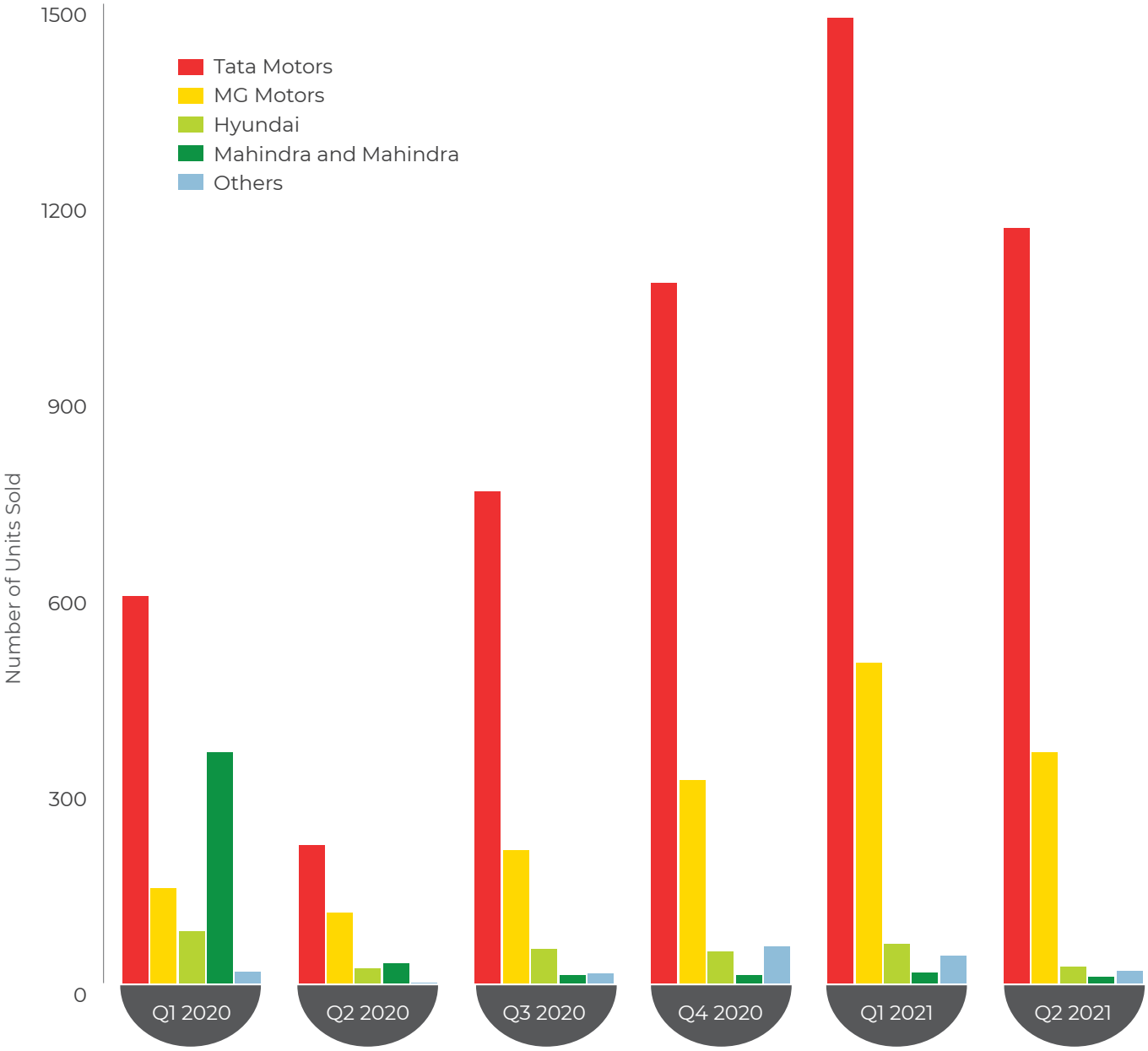
Source: JMK Research

Note: Sales figures represent E3Ws registered across 1,305 RTOs in 33 states/ UTs.

5.3 Electric Cars sales trends

In Q2 2021, on a QoQ basis, the total sales of electric 4-wheelers declined by 25% to settle at 1564 units. However, the Q2 2021 sales registered a significant 319% YoY increase. In the respective quarterly sales, Tata Motors continued to have the maximum share (74%) and it is followed by MG Motor (23%) and Hyundai (2%).

Figure 5.7: Player-wise e-car sales trend



Source: JMK Research

Note: Sales figures represent E-Cars registered across 1,305 RTOs in 33 states/ UTs.

5.4 Electric Buses sales trends

The sales for Q2-2021 saw a marginal decline of 3% at 309 units as compared to Q1-2021. On the other hand, Q1-2021 sales saw a leap of 563% as compared to Q4-2020 sales which can be attributed to the opening up of the market after the COVID lockdown. Over half the sales in Q2-2021 were accounted by JBM Auto followed by Tata Motors (35%), PMI (8%), and Olectra (7%), as depicted in fig 5.9.

Figure 5.8: Sales trend of Electric Buses

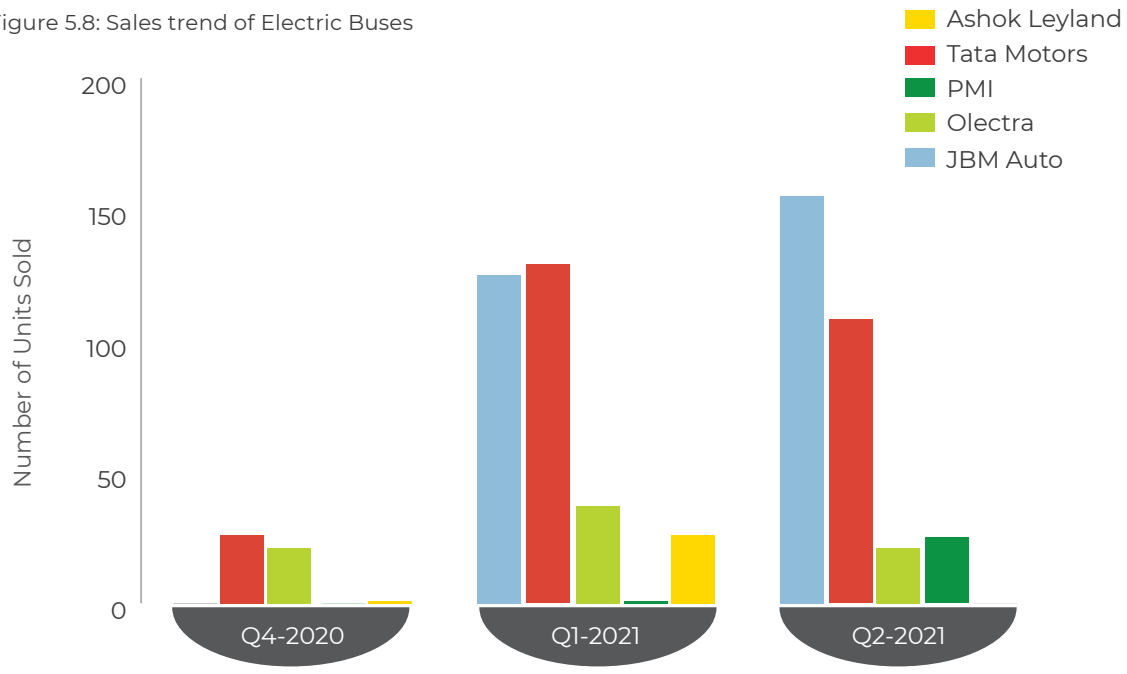
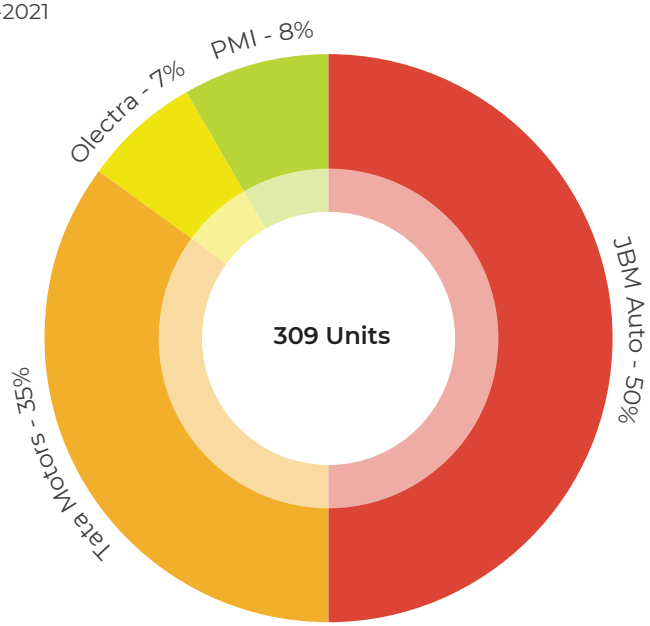


Figure 5.9: Share of e-bus sales in Q2-2021



Source: Vahan Dashboard, JMK Research

Note: Sales figures represent E-Buses registered across 1,305 RTOs in 33 states/ UTs.

6 Global Sales Trends

Globally, the total sales of battery electric vehicles (BEVs) increased by 23.8% from 737,722 units in Q1 2021 to 913,509 in Q2 2021. China has, once again, claimed the lead position in the global BEV sales race with 548,000 units sold in the previous quarter.

At the end of 2020, the average market share of BEVs in the Western European countries including Germany, UK, France, Italy, Spain, Sweden, Norway, Netherlands, Switzerland and Austria was higher than that in China. However, catalysed by government subsidies, the market share of BEVs in China has almost doubled from 5.2% to 9.8% over H1 2021 (first half of 2021), surpassing that of the top 10 Western European countries (8.6%).

China has sold nearly 1 million BEVs in H1 2021, with the market size having increased by approximately four times YoY.

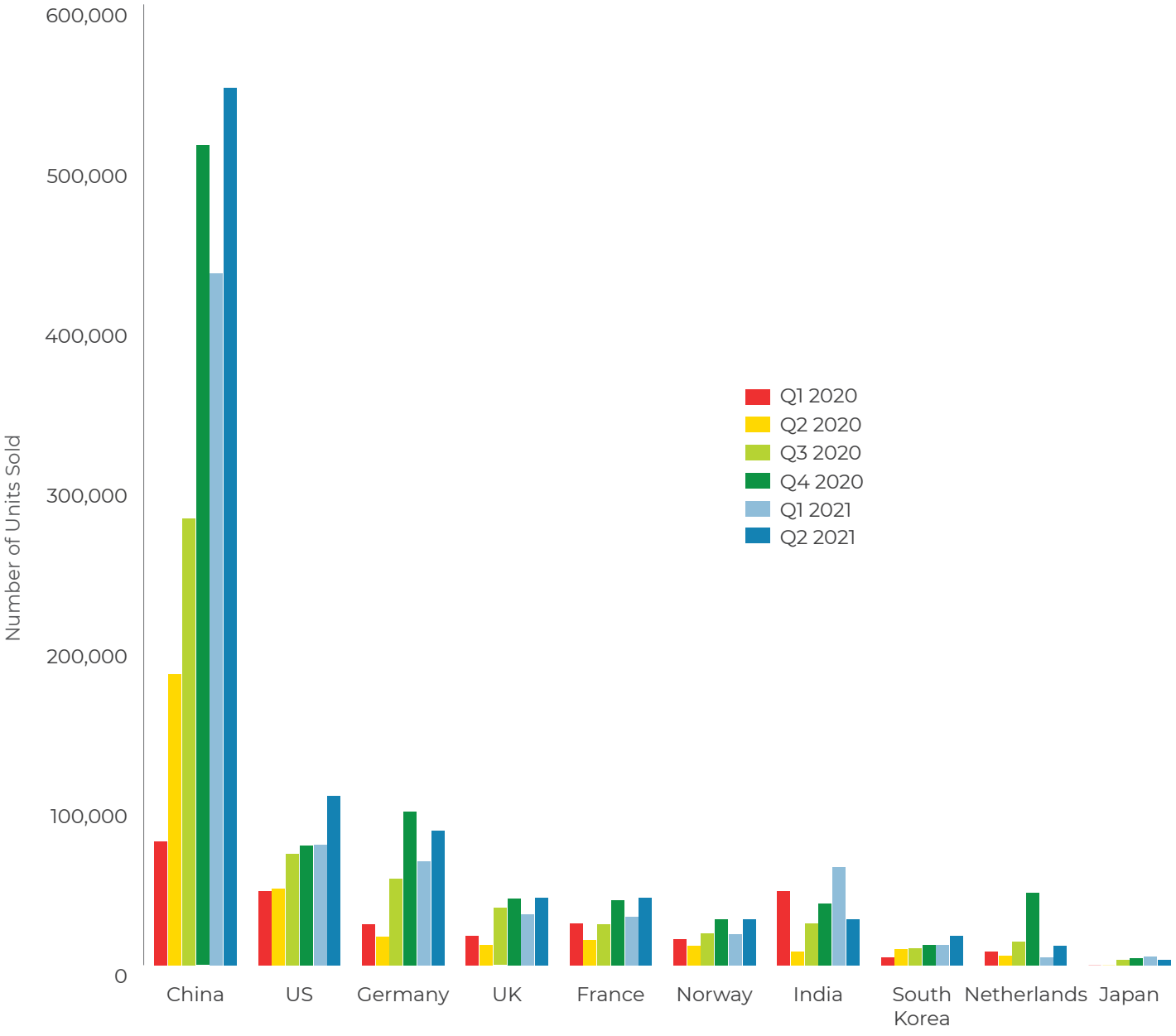
During April-June 2021, the combined BEV sales in the top five European markets including Germany, UK, France, Norway and Netherlands increased by 38.5% QoQ, reaching 209,419 units.

In terms of %age of BEV registrations out of the total vehicle registrations in H1 2021, Norway continues to have the highest BEV share at 57.3%. Other European countries that are leading in the BEV registrations are Germany, Netherlands, UK and France.

The European Union had given a proposal, which was slated to come into effect from 14th July 2021, that targets the complete ban of the sale of non-electric cars by 2035. Additionally, the EU government has a new plan of including mobility sector in the Emission Trading Scheme (ETS), as part of which all new vehicles will be subjected to severe CO2 reduction standards.

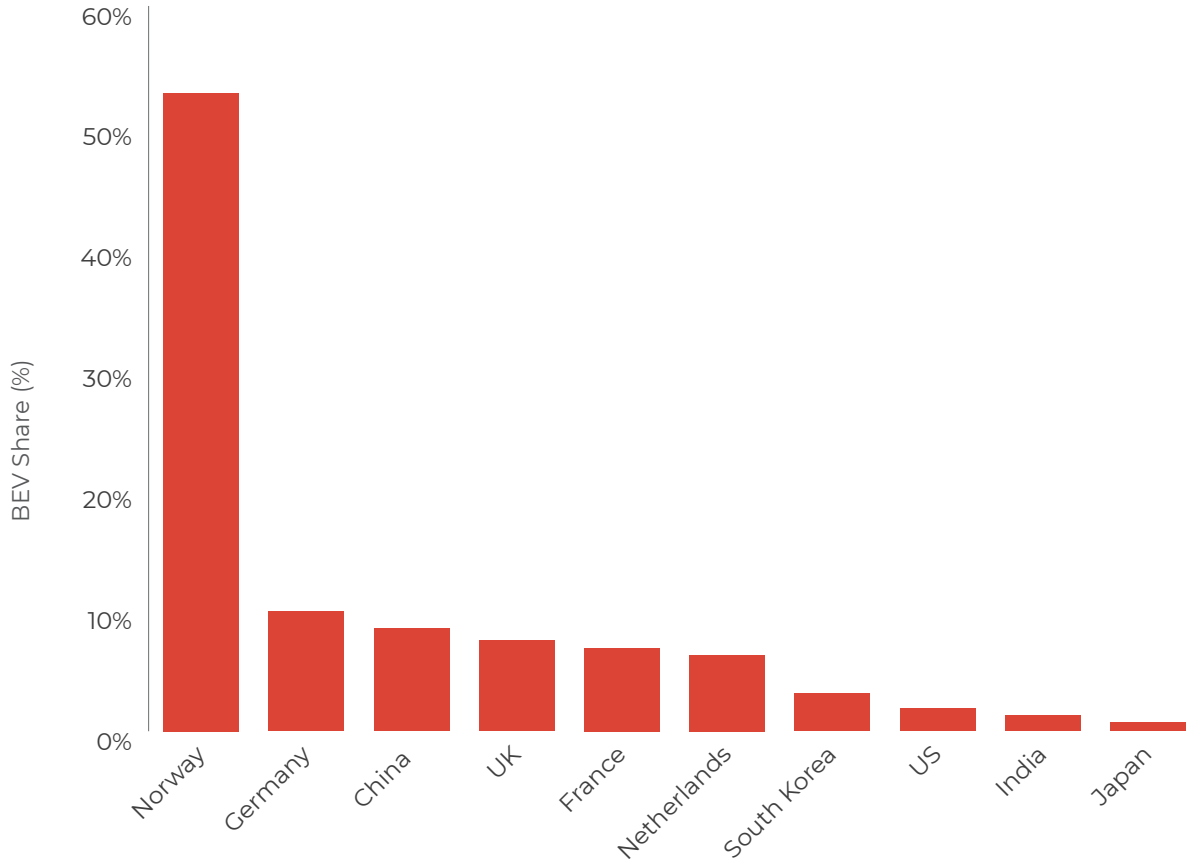
In Q2 2021, the USA recorded a significant increase in BEV sales of 40.5% QoQ, with the BEV market share for H1 2021 at 2.2%.

Figure 6.1: Region-wise Registered Battery Electric Vehicles (BEV) Sales in Q2 2021



Source: The European Automobile Manufacturers' Association (ACEA), Opplysningsrådet for Veitrafikken (OFV), China Association of Automobile Manufacturers (CAAM), Vahan Dashboard, JMK Research

Figure 6.2: BEV Market Share (%age of BEV Registrations out of the Total Vehicle Registrations During H1 2021)



Source: The European Automobile Manufacturers' Association (ACEA), Opplysningsrådet for Veitrafikken (OFV), China Association of Automobile Manufacturers (CAAM), Vahan Dashboard, JMK Research

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