Crisil
Intelligence

Industry assessment for control technologies used in automotive, generator and power tools industry

SEDEMAC Mechatronics Limited | February 2026





by S&P Global

Crisil
Intelligence

Contents

Macroeconomic Overview of the Global & Indian Economy 6

Overview of the Global Economy 6

Review and Outlook of Global GDP 6

Overview of the Indian Economy 7

Review of GDP growth over fiscals 2020-2025 and Outlook for fiscals 2025-2030 7

India to remain a global outperformer ..... **Error! Bookmark not defined.**

Review and outlook for global two-wheeler industry 9

Review of global two-wheeler industry (CY20-CY25) 9

Competitive Landscape 11

Growth drivers for global two-wheeler industry 12

Global two-wheeler Industry Outlook CY25-CY30 14

Review and outlook on the Indian two-wheeler (2W) Industry 18

Review of Indian domestic two-wheeler industry (fiscal 2020 to 2026 YTD) 18

Historic production development - fiscal 2020 to 2026 YTD 18

Split of industry by domestic sales and exports- fiscal 2020-2026 YTD 19

Domestic sales and exports of two-wheeler (fiscal 2020-2026 YTD) 20

Exports 25

Demand drivers and trends in the domestic two-wheeler market 26

R&D support 33

Outlook for the Indian two-wheeler industry (fiscals 2025-2031P) 34

Exports outlook 37

Review and outlook for global three-wheeler industry 40

Review of global three-wheeler industry (CY20-CY25) 40

Growth drivers for global three-wheeler industry 41

Global three-wheeler Industry Outlook CY25-CY30 42

Review and outlook on the Indian three-wheeler (3W) industry 44

Review of the Indian Three-wheeler Industry 44

Electrification in 3Ws 48

Outlook of Indian three-wheeler industry (fiscal 2025 to 2031P) 49

Review of Indian Electric Three-Wheeler Industry 51

Competitive Landscape within the E Auto subsegment 51
Review and outlook for global e-LCV industry 53
Review of global e-LCV industry (CY22-CY25) 53
Competitive Landscape 54
Review and outlook on the Indian Electric Light Commercial Vehicle Industry (e-LCV, 0 to 7.5 tons) 56
Review of Indian domestic e-LCV industry (fiscal 2020-25) 56
EV Penetration in LCV 57
Outlook for Domestic e-LCV 58
Review and outlook on the Indian Heavy Commercial Vehicles industry (>7.5T) 59
Review of Heavy Commercial Vehicles industry 59
Outlook of the Indian Heavy Commercial Vehicle industry 60
Review and outlook for global E Bike industry 62
Review and Outlook of Global Generator (Genset) Industry 69
Review and Outlook of Global Power Tools Industry 79
Review and Outlook of Global Outdoor Power Equipment Industry 87
Review and outlook of the SEDEMAC specific components 91
Introduction 91
Overview of the SEDEMAC specific components 93
Control products for ICE powered 2W & 3W 93
Integrated starter-generator (ISG) Controller/ECU 94
ECU for Electronic Fuel Injection (EFI) 96
Review and outlook of global control products for ICE vehicles (EFI and ISG) 99
Control products for Electric Vehicles (EVs) 101
Motor Control Unit (MCU) 101
Motors 104
Control products for electric vehicles, global, CY2024-2030P 106
Motor controller for e-bikes, global, CY2024-2030P 106
Motor controller for e2W and e3W, global, CY2024-2030P 107
Motors for e2W and e3W, global, CY2024-2030P 108
Motor controller for eLCV, global, CY2024-2030P 109

Motor Control Units (MCUs) for Powertools 111
MCUs for powertools, domestic, fiscal 2025-30P 111
MCUs for powertools, global, CY2024-2030P 112
Control Units for Generators 113
Domestic genset controllers market size, fiscal 2025-30P 114
Domestic genset EFI ECU market size, fiscal 2025-30P 116
Global genset controllers market size, CY2024-2030P 117
Global genset EFI ECU market size, CY2024-2030P 118
Competitive profiles 120
SEDEMAC Mechatronics Limited 120
Bosch India Ltd. 121
Sona BLW Precision Forgings Ltd 122
Schaeffler India Limited 122
ZF Commercial Vehicle Control Systems India Limited 123
Key financial indicators for fiscal 9M FY 2026 125
Key financial indicators for fiscal 2025 126
Key financial indicators for fiscal 2024 127
Key financial indicators for fiscal 2023 128
Threats and Challenges 129
Demand Side Challenges 129
Economic Slowdown and Industrial Output Decline 129
Above or below normal monsoons 129
Impact of changing interest rates scenario 129
Increase in vehicle cost of ownership 129
Price escalations on account of regulatory push 130
Inherent cyclicity of the domestic 2W, 3W and PV industry 130
Supply Side Challenges 130
Raw Material Availability and Cost 130
Skilled Labour Shortage 130
Technological Obsolescence 131
Increasing Competition 131

Policy and Regulatory Challenges 131

Changes in tax and duties regime 131

Ad hoc changes in policies 131

Macroeconomic Overview of the Global & Indian Economy

Overview of the Global Economy

Review and Outlook of Global GDP

Global economic growth remained resilient in calendar year 2025, with advanced economies showing steady, albeit slightly slower growth (1.8% in CY2024, vs 1.7% in CY2025).

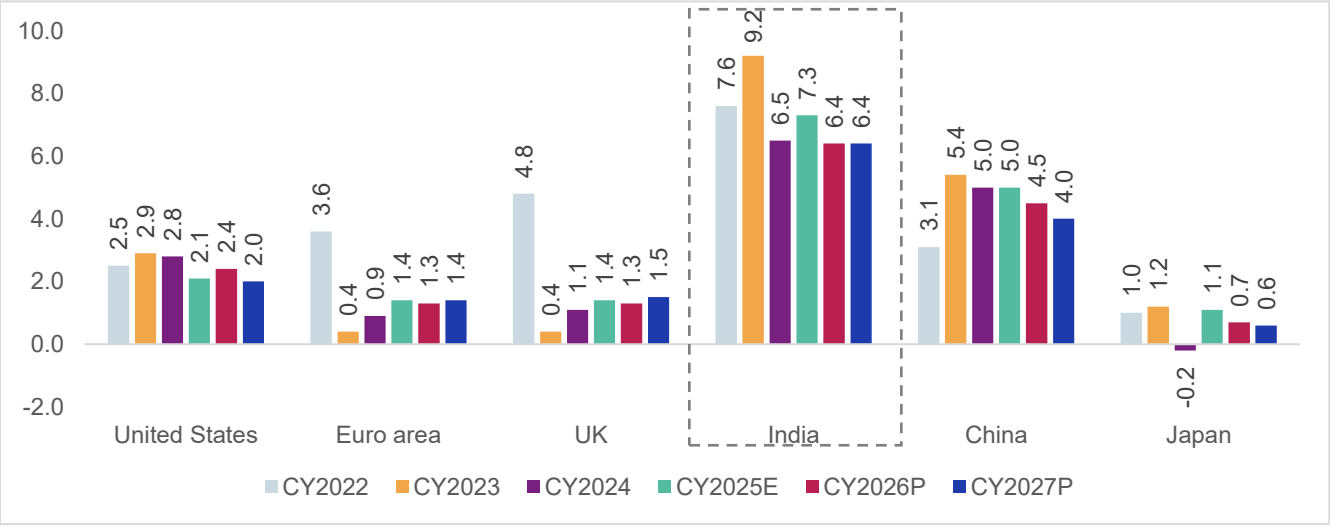
The global growth pace is estimated to be steady at 3.3% in CY2026 and 3.2% in CY2027 according to IMF's world Economic outlook January 2026 estimates. A significant shift in policy is reshaping the global trade system, bringing uncertainty to the resilient global economy. The outlook for global trade has declined sharply due to a surge in tariffs and trade policy uncertainty. The new tariff measures by the United States (US) and countermeasures by its trading partners may have an adverse impact on economic growth and inflation, and the escalating trade tension and heightened policy uncertainty are expected to weigh heavily on global economic activity.

The global growth pace is estimated to be steady at 3.3% in CY2026 and 3,2% in CY2027 according to IMF's WEO January 2026 estimates. Trade policy challenges are being countered by investments in tech (like AI), government support, and adaptable businesses, which are helping to keep things on track. The effects of tariffs and uncertainty are expected to fade going ahead.

Growth in advanced economies (like US, UK, Euro area, Japan) is projected to remain stable (1.7% in CY2025 to 1.8% in CY2026 and 1.7% in CY2027) with the support of fiscal policy as well as lower policy rate. Further, the adverse effects of elevated trade barriers are expected to diminish over the period.

In emerging markets and developing economies (like China, Russia, Brazil, India) growth is expected to slow down (4.4% in CY2025 vs 4.2% in CY2026 and 4.1% in CY2027), with pronounced downgrades for countries affected most by recent trade measures. The growth outlook is relatively more stable for India, despite global environment uncertainty. The steady expansion of the economy is supported by private consumption, particularly in rural areas.

GDP growth (% y-o-y) of key economies



Note: On Calendar Year (CY) basis

** Euro area comprises 19 member countries of the EU*

Source: International Monetary Fund (IMF); World Economic Outlook (WEO) – January 2026 update, Crisil Intelligence

As per World Economic Outlook by International Monetary Fund (IMF):

- Growth in advanced economies is estimated to be 1.7% in CY2025 and it is projected to be 1.8% in CY2026. The US witnessed an upward revision from the previous estimates of IMF owing to stronger than expected GDP growth in the third quarter of CY2025 followed by federal government shutdown.
- The US economy is estimated to be at 2.1% in CY2025 and it is projected to expand by 2.4% in CY2026 driven by reduced helped policy rate and supportive fiscal policy has helped to underpin economic growth. Moreover, as the initial shock of higher trade barriers wears off their negative effects have started to fade, allowing for a more stable economic outlook. Further growth is expected to remain strong at 2.0% in CY2027 driven by fiscal boost from tax incentives for corporate investments under the One Big Beautiful Bill Act of CY2025. Technology driven momentum is expected to be moderate but still provide some offset to lower immigration and moderating consumption.
- In the Euro area growth is estimated to be at 1.4% in CY2025. Further the growth rate is expected to remain steady at 1.3% in CY2026 and at 1.4% in CY2027. The growth projections for 2027 is marginally upward compared to CY 2026 owing to expected increase in public spending, particularly in Germany, and strong ongoing growth in Ireland and Spain.
- The United Kingdom growth estimated to be at 1.4% in CY2025 and growth projected to be at 1.3% in CY2026 due to slowdown in investments expected. Further growth forecast for CY2027 is expected to be at 1.5%.
- In Japan growth is expected to moderate from 1.1% in CY2025 to 0.7% in CY2026 and projected to be 0.6% in CY2027.This indicate slightly upward revision to IMF previous estimates, supported by fiscal stimulus package announced by government.
- Emerging and developing economies are estimated to have grown by 4.4% in CY2025 and growth pace expected to taper to 4.2% in CY2026.The growth projection for China is revised upward from IMF previous estimates to reach 5.0% in CY2025 supported by additional policy bank lending for investment and lower US effective tariff rates on Chinese goods. The economic growth rate is expected to decline to 4.5% in CY2026 and 4.0% in CY2027 as structural challenges begin to have a great impact. In India growth is estimated to be at 7.3% in CY2025 reflecting strong performance in the last two quarter of CY2025. On this elevated base, growth pace of the Indian economy is projected to moderate to 6.4% in CY2026 and CY2027.

Overview of the Indian Economy

Review of GDP growth over fiscals 2020-2025 and Outlook for fiscals 2025-2031

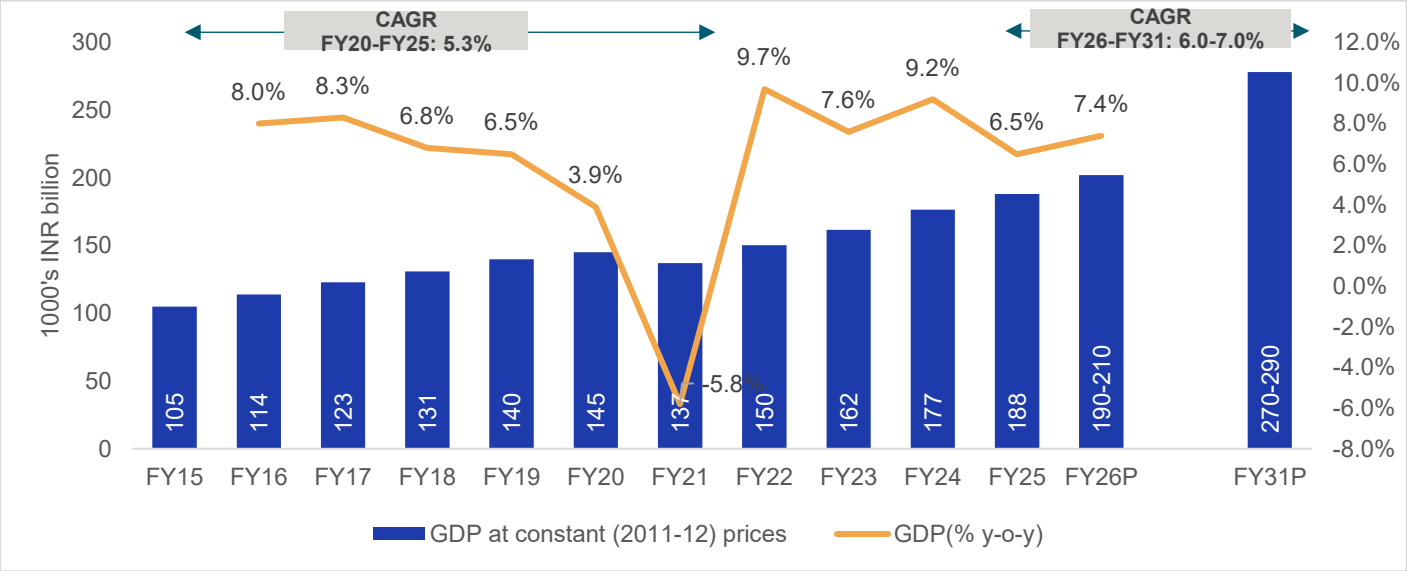
According to the IMF's January 2026 database, India has become the fourth-largest economy in the world surpassing Japan. At present, it is the fastest-growing major economy, outpacing its global peers.

The Indian economy is estimated to have logged a CAGR of 5.3% between fiscals 2020 and 2025, driven by benign crude oil prices, soft interest rates and low current account deficit. However high growth and low inflation redefine the growth momentum in CY2025. Inflation remains below the lower tolerance level; unemployment is on a declining trajectory and export performance continues to improve. Further, the financial environment remains supportive, with readily available credit and low interest rates. Also, the domestic demand remains strong, supported by robust private consumption.

According to the National Statistics Office's (NSO) First advance estimates (FAE), India's GDP is projected to grow at 7.4% in fiscal 2026 compared to 6.5% in fiscal 2025. Fixed investments, majorly accelerated GDP growth in this fiscal. The real GDP growth is projected to be 6.7% for fiscal 2027. Growth is slightly higher than the pre-pandemic decadal trend rate of 6.6% supported by healthy consumption, supportive monetary policy, low crude oil prices and mild pick up in private investment.

Private consumption has witnessed a slight moderation, but it continues to remain robust, driven by several supportive factors. These include tax relief measures, recent rate cut by RBI, substantial direct benefit transfers and positive impact on low inflation. Moreover, healthy monsoon is expected to support the agriculture sector and rural incomes. Robust agricultural production on the back of the favorable monsoon will help keep food inflation in check, which will free up household budgets for discretionary spending

India's GDP growth trend and outlook



Note: P – projected
Source: National Statistical Office (NSO), IMF, Crisil Intelligence estimates

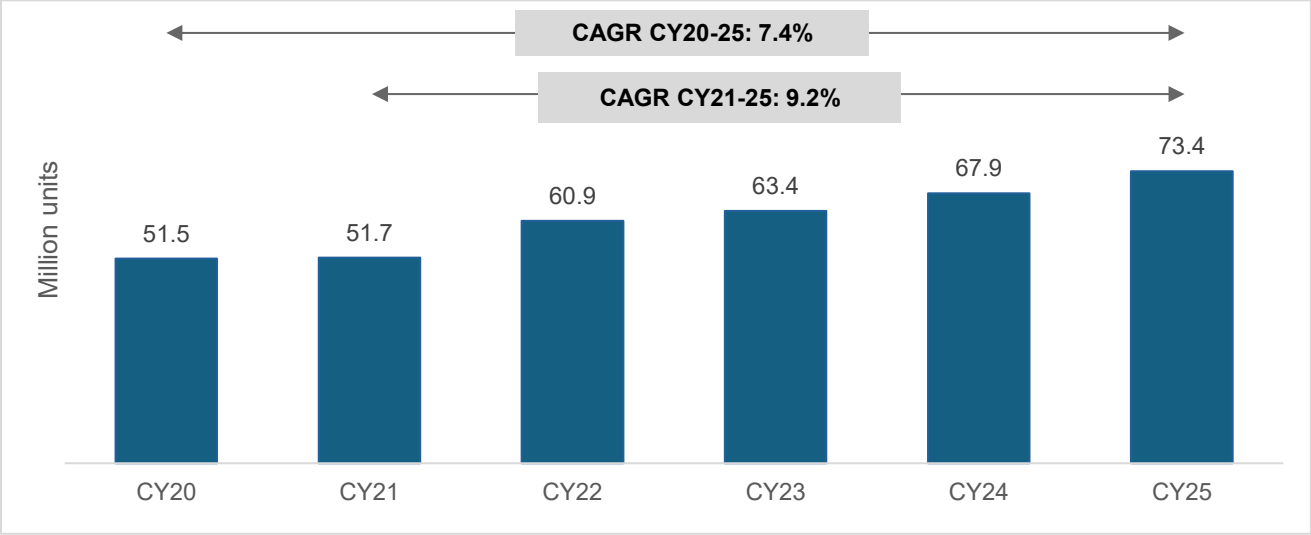
CRISIL Intelligence expect the GDP growth momentum to continue over the long-term horizon and the economy to clock a CAGR of 6-7% between fiscals 2026 and 2031.

Review and outlook for global two-wheeler industry

Review of global two-wheeler industry (CY20-CY25)

The global two-wheeler industry grew at 7.4% CAGR during CY2020 to CY2025 period. The industry witnessed a sharp contraction during the pandemic period amidst the lockdowns, factory closures, supply chain disruptions, and reduced travel. With gradual improvement in the pandemic scenario, normalization in economic activity, resumption in travel, ironing out of supply chain disruptions and supported by the pent-up demand, the industry bounced back and witnessed a healthy 9.2% CAGR growth between CY 2021 to CY2025.

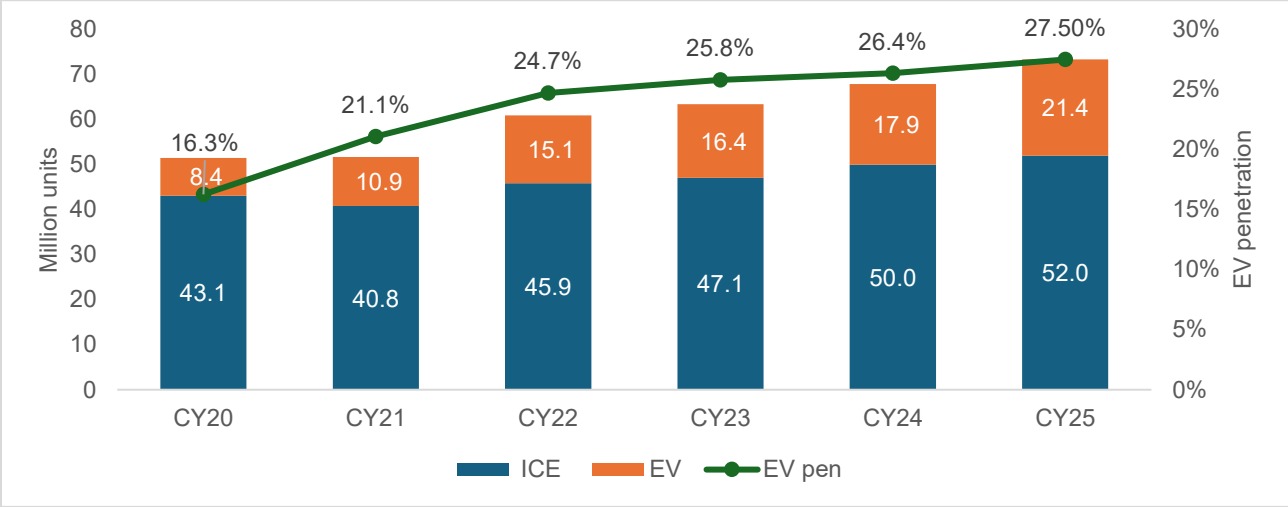
Global two-wheeler industry sales trend



Note: Data includes High speed as well as low speed electric vehicles
Source: Nexdigm data

Moreover, the rising electrification provided an additional push to the global two-wheeler demand during the CY2021 to CY2025 period. E 2Ws clocked a sizeable 18.3% CAGR during the same period and reached 21.4 million units by CY2025. With the faster rise in EV sales the EV penetration increased from 16.3% in CY2020 to 27.5% by CY2025.

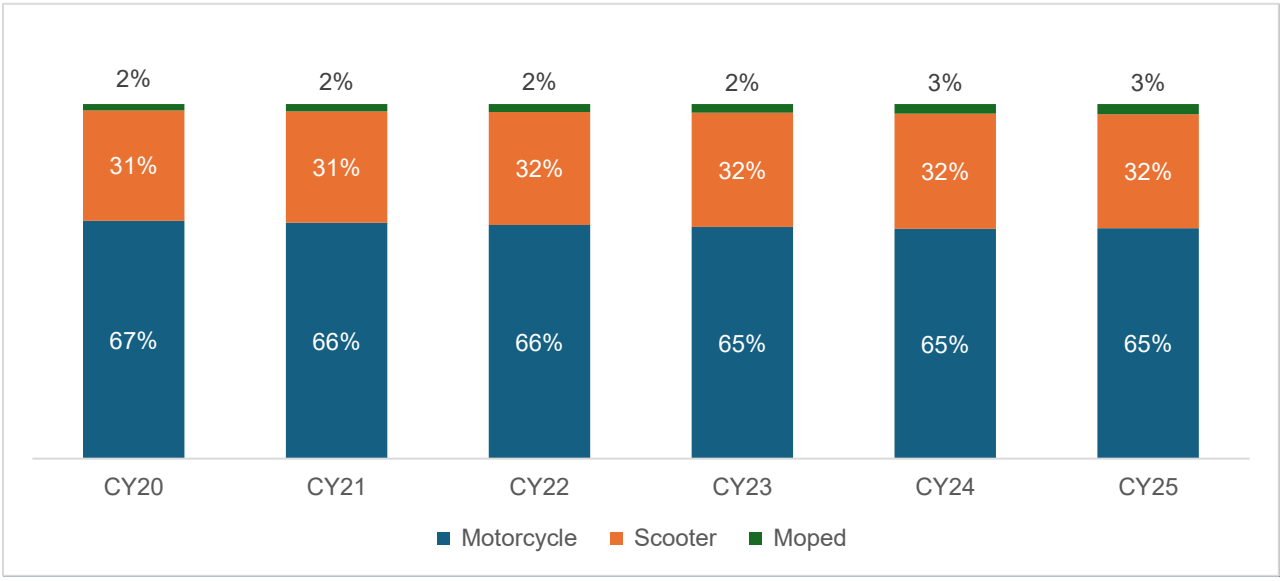
Global two-wheeler sales powertrain split



Note: Data includes high speed as well as low speed electric vehicles
Source: Nexdigm data

Increasing electrification, which is more prominent in scooters, has aided the growth of scooters segment which clocked a faster growth at 8.0% CAGR compared to motorcycles segment which witnessed 6.7% CAGR growth. Globally, motorcycles continued to dominate the industry with 60%+ share, although, their share dropped from 67.0% in CY2020 to 65.0% in CY2025.

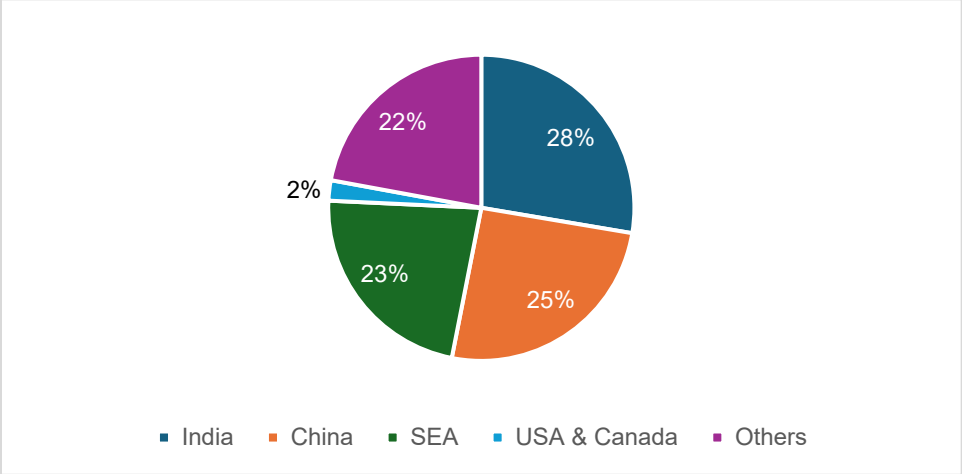
Global two-wheeler industry segmental split



Source: Nexdigm data

Asia Pacific (APAC) Region dominates the world two-wheeler market with 70%+ share. The top two contributors to the global sales, India and China are part of the APAC region coupled with other large two-wheeler markets like ASEAN countries of Indonesia, Thailand, Vietnam, Philippines, Malaysia, Singapore, Myanmar, and Cambodia.

Global two-wheeler sales regional split CY2025

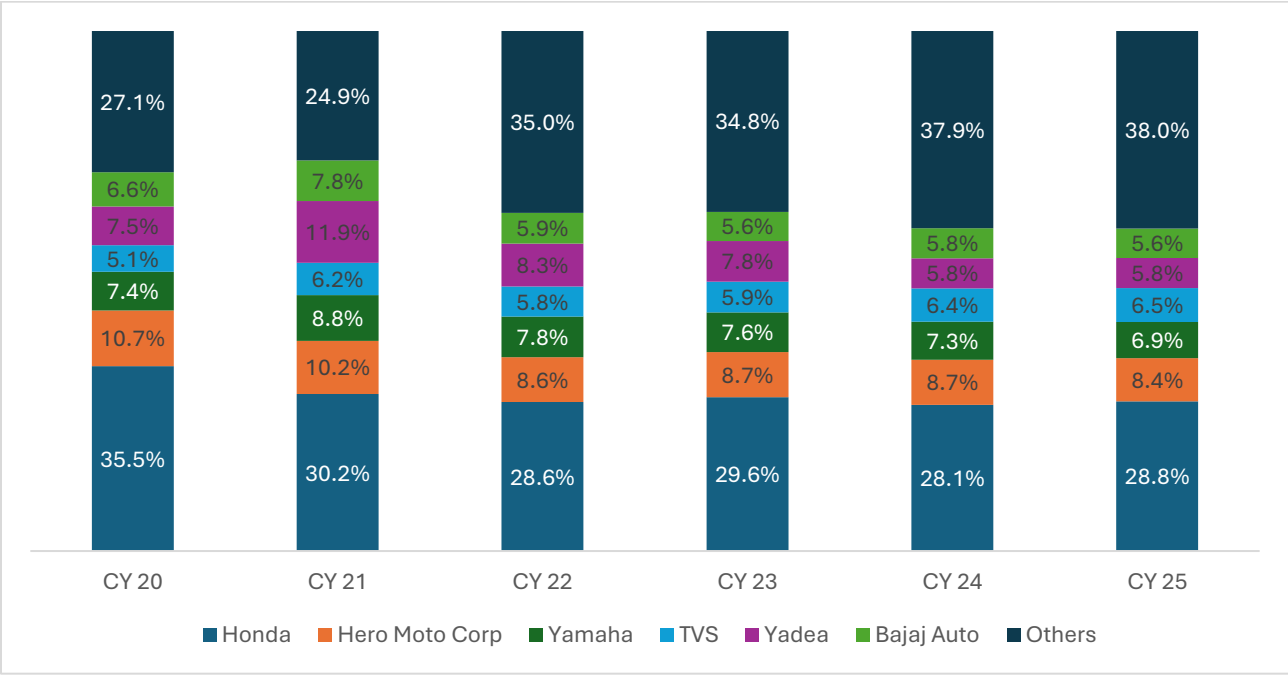


Note: SEA: Southeast Asia
Source: Nexdigm data

Competitive Landscape

Honda leads the global two-wheelers market, followed by Hero MotoCorp, Yamaha, TVS, Yadea and Bajaj Auto. Together, these five manufacturers account for over 50% of the global market. Amidst the intensifying competition, especially from the emerging EV players, the share of these 5 players has dropped from 62% in CY20 to 56.4% in CY25.

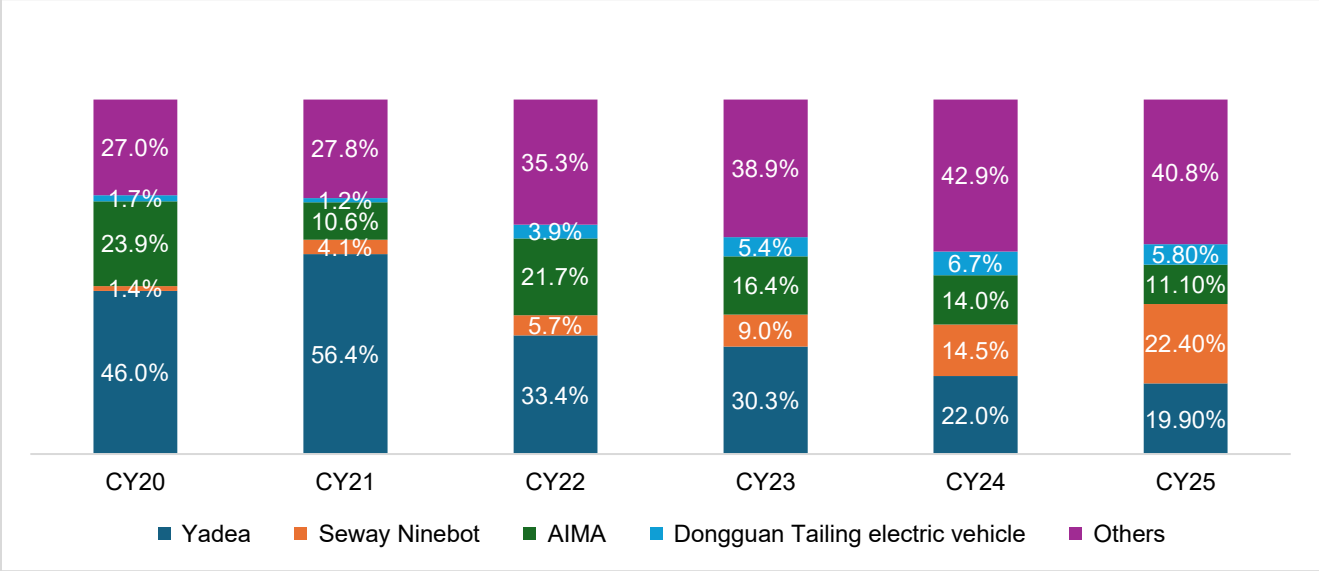
OEM wise contribution in global 2W sales



Note: Data includes High speed as well as low speed electric vehicles
Source: Nexdigm data

Within the EVs, Yadea leads the segment followed by Seway Ninebot who has expanded its presence in the EV space significantly during CY20 to CY25 period. Portfolio expansion by traditionally ICE players like TVS, Bajaj coupled with entry of new age players like Ola, Ather intensified competition within the EV segment as well.

OEM wise contribution in global E 2W sales



Note: Data includes high speed as well as low speed electric vehicles
Source: Nexdigm data

Growth drivers for global two-wheeler industry

Two-wheelers see a healthy demand in many emerging economies including India and are preferred over four wheelers by a sizeable population especially for their regular commute. This is primarily due to the lower acquisition cost, higher mileage, lower maintenance costs, ease of navigation, especially during the traffic hours, hassle free parking and suitability of two-wheelers on rugged roads.

On a long-term horizon, the two-wheeler industry demand is expected to continue to remain buoyant amidst:

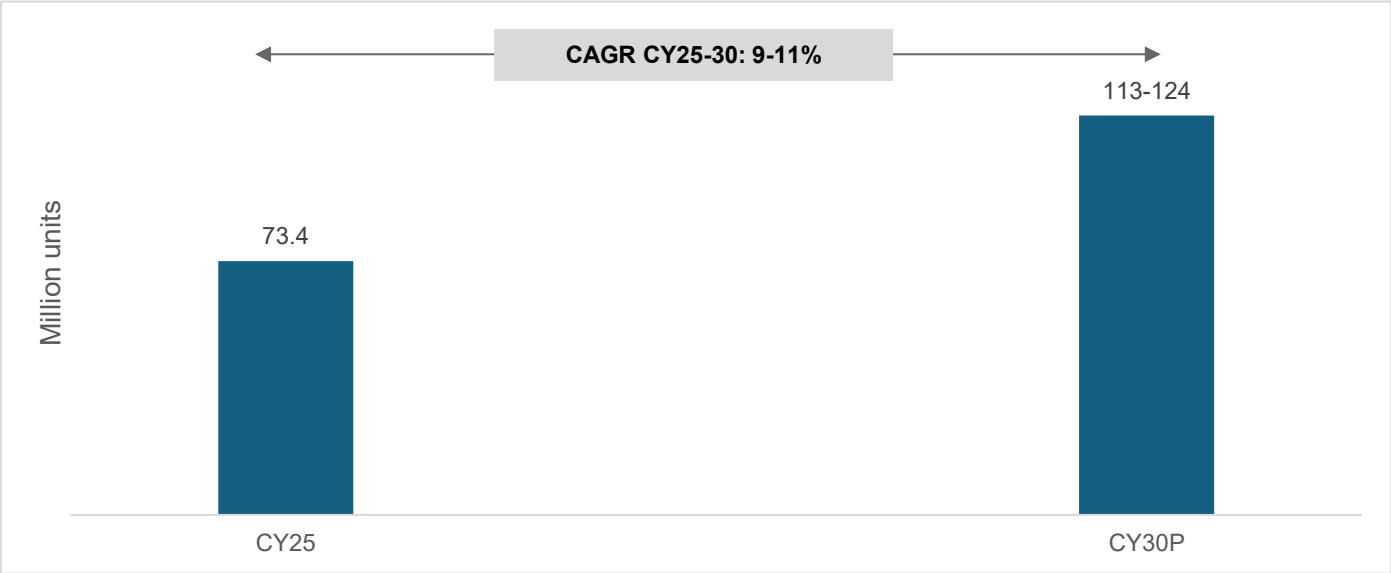
- Macroeconomic development: Continued growth in GDP to support the growth in disposable incomes especially in the emerging nations like India which is the top contributor to the global two-wheeler market. India is expected to outpace the global GDP growth over the longer horizon supporting the improvement in disposable income. Increasing disposable incomes is expected to support the growth of middle class, especially in emerging markets and aid the two-wheeler demand.
- Increasing urbanization & congestion: Continued population growth in major cities amidst the shift from nearby rural areas towards the cities is leading to increased urbanization and increased congestion in these cities. Two-wheelers can navigate through congested roads more easily than cars, making them a popular choice for daily commutes.

- Affordability and fuel efficiency: Two-wheelers are often more affordable than cars, with lower purchase prices and maintenance costs, making them accessible to a wider range of consumers. Two-wheelers are generally more fuel-efficient than cars, making them an attractive option for commuters looking to save on fuel costs.
- Rising Demand for Last-Mile Connectivity: Two-wheelers are often used for last-mile connectivity, and the growth of e-commerce and food delivery services is leading to an increase in demand for two-wheelers for commercial use.
- Technological Advancements: Continued technological advancements and launch of more efficient, feature rich attractively designed vehicles are making two wheelers more appealing to the consumers. Technologically advanced features including ride journal, real time statistics, intercity trip planner, savings tracker, universal connectivity (smart phone, smart watch, helmet), anti-theft alert etc. are an added incentive for the customers to prefer e2Ws. Many two-wheelers now come equipped with connected features such as GPS, Bluetooth, and Wi-Fi, enabling features like navigation, vehicle tracking, and ride analytics. Two-wheelers are now equipped with advanced safety features like ABS (Anti-lock Braking System), CBS (Combined Braking System), and traction control, which improve safety and stability. Further, many OEMs are working on autonomous features like adaptive cruise control, lane departure warning, and blind spot detection, enhancing safety and convenience.
- Rising electrification: EV penetration is rising at a rapid pace globally aided by.
- Government support: Amidst the rising environmental concern, many governments have set up tall electrification targets. Governments in various countries are aiding the EV adoption through regulations and incentives.
- Over and above the incentives for the customers, the governments are also offering incentives in the form of tax breaks for EV manufacturers to set up their plants and are also promoting battery manufacturing capabilities, EV component manufacturing as well as expansion of charging infrastructure. Certain countries in Europe are offering direct purchase subsidies, tax exemptions and non-fiscal benefits for purchase of EVs. China is promoting EV adoption with tax breaks, research funding, subsidies and New Energy Vehicle (NEV) mandates for OEMs. South Korean government is implementing regulations and incentives to encourage EV adoption as well as to increase the availability of charging infrastructure.
  Such government initiatives are expected to back EV adoption over the longer run.
- Expansion in charging infrastructure: Governments worldwide are playing a pivotal role in accelerating the electrification of the automotive industry by providing substantial support for the expansion of charging infrastructure. This strategic move is expected to give a significant boost to the adoption of electric vehicles (EVs), driving the industry towards a more sustainable and environmentally friendly future.
- The expansion of charging infrastructure is a crucial factor in addressing the concerns of potential EV buyers, particularly range anxiety and charging convenience. By investing in the development of a comprehensive and accessible charging network, governments are helping to alleviate these concerns and create a more favorable environment for EV adoption.
- Increasing awareness: Growing concerns about climate change, air pollution, and environmental degradation are leading to increased awareness about the benefits of EVs, including reduced greenhouse gas emissions and lower operating costs.
- Lowering acquisition costs: The prices of lithium-ion cells and battery packs have been declining steadily in recent years. This is due to several factors, including increased demand, technological advancements, and economies of scale. Battery prices are expected to slide further going ahead, keeping the acquisition costs in check.
- Economies of scale: The fast-rising electrification within the two-wheeler industry, and in turn, the increased production levels, are expected to bring in economies of scale going ahead, helping the industry keep the vehicle prices competitive over the long-term horizon.

Global two-wheeler Industry Outlook CY25-CY30

The global two-wheeler industry is projected to grow at 9-11% CAGR to reach 113-124 million units by CY30. This growth will be led by the increasing two-wheeler sales in India, China and the Southeast Asia. Improvement in economic conditions, rising demand from underlying segments like e commerce, ride hailing coupled with increased traction for EVs to support this demand growth.

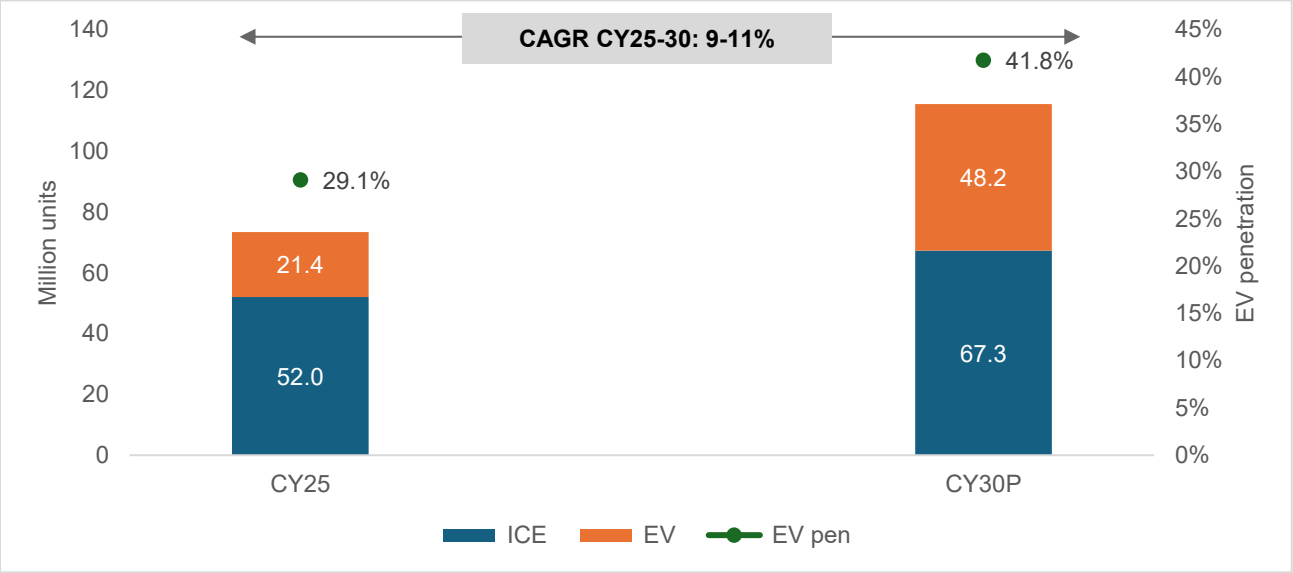
Global two-wheeler industry sales outlook



Note: Data includes High speed as well as low speed electric vehicles
Source: Nexdigm data

Governments' focus on ecofriendly transportation, EV incentives, increasing customer awareness, shifting customer preferences, expansion in EV portfolio, improving EV infrastructure, reducing global battery prices & in turn reducing EV acquisition costs are expected to provide thrust to electrification going ahead. Stricter emission norms and long-term electrification goals of the governments are other key factors providing the push to electrification levels. EVs are projected to clock a much faster growth at 17-19% CAGR while off the larger base, the ICE vehicle sales are expected to grow at a relatively slower pace of 4-6% CAGR. In turn, globally, the EV penetration is expected to reach 41-43% levels by CY2030 from the 29.1% penetration levels witnessed in CY2025.

Global two-wheeler sales powertrain split outlook



Note: Data includes High speed as well as low speed electric vehicles
Source: Nexdigm data

One of the largest contributors to the global two-wheeler sales, scooter segment, is expected to grow at an accelerated pace going forward led by the expanding vehicle portfolio, rising electrification as well as continued demand for scooters. And the scooters share is expected to remain constant around 31-33% in CY2030 from 32.1% share in CY2025. The share of motorcycles is expected to slightly increase from 64.9% in CY25 to 65-67% in CY30

By 2030, India is expected to remain the global leader in the two-wheeler market, followed by China and other Southeast Asian countries such as Thailand, Indonesia, and the Philippines. These markets will continue to dominate due to their large populations, growing middle class, and heavy reliance on two-wheelers for daily mobility.

Europe will see rising demand for two-wheelers, especially in countries like Germany, the Netherlands, and Malta, where over 70% of the population lives in urban areas. The European Green Deal's goal to reduce carbon emissions by 55% by 2030 is to drive growth in electric two-wheelers, supported by government subsidies and tax benefits. Urban congestion and the expansion of food delivery services are also boosting demand for scooters and motorcycles in cities.

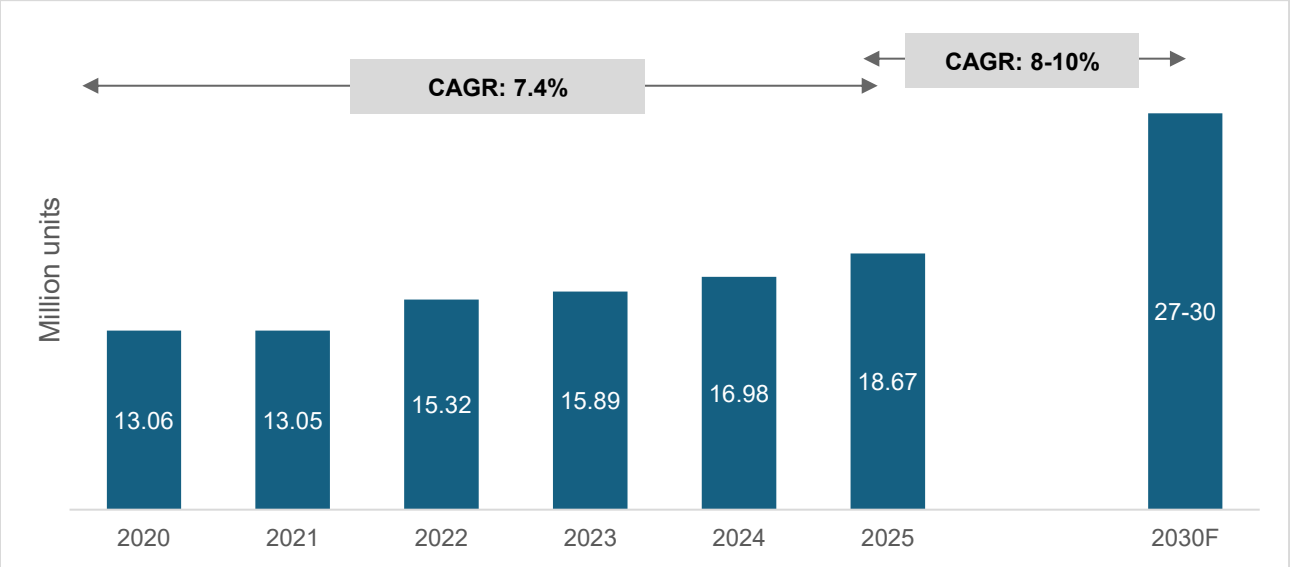
In the US and Canada, two-wheeler demand is expected to grow amidst the increasing investments in bike lanes, charging infrastructure, and urban mobility planning. Both governments offer incentives to promote electric mobility, such as the US Clean Vehicle Credit and Canada's Zero-Emission Vehicle Program, which provides rebates up to CAD 5,000. Rising urban congestion is encouraging consumers to choose motorcycles, scooters, and e-bikes for short trips and last-mile travel.

Review and outlook of two-wheeler industry by volume – region wise

China

In China, the two-wheeler market has shown strong growth, rising from 13.06 million units in 2020 to an estimated 18.66 million units by 2025, reflecting a CAGR of 7.4%. The market is expected to accelerate further to reach between 27-30 million units by 2030, growing at a projected CAGR of 8-10% in the second half of the decade. This growth is primarily driven by China's aggressive push toward electrification, backed by government policies,

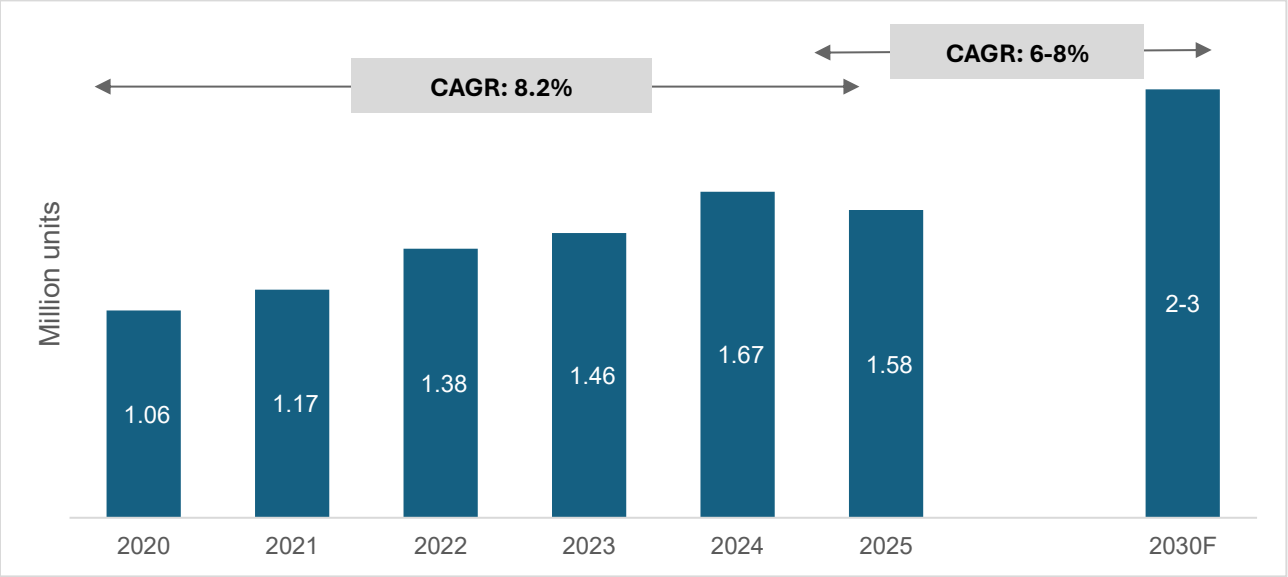
subsidies, and local manufacturing capabilities in electric two-wheelers. Additionally, rapid urbanization and the growing adoption of smart and connected mobility solutions are fueling demand, especially among younger and urban consumers.



Source: Nexdigm data

USA & Canada

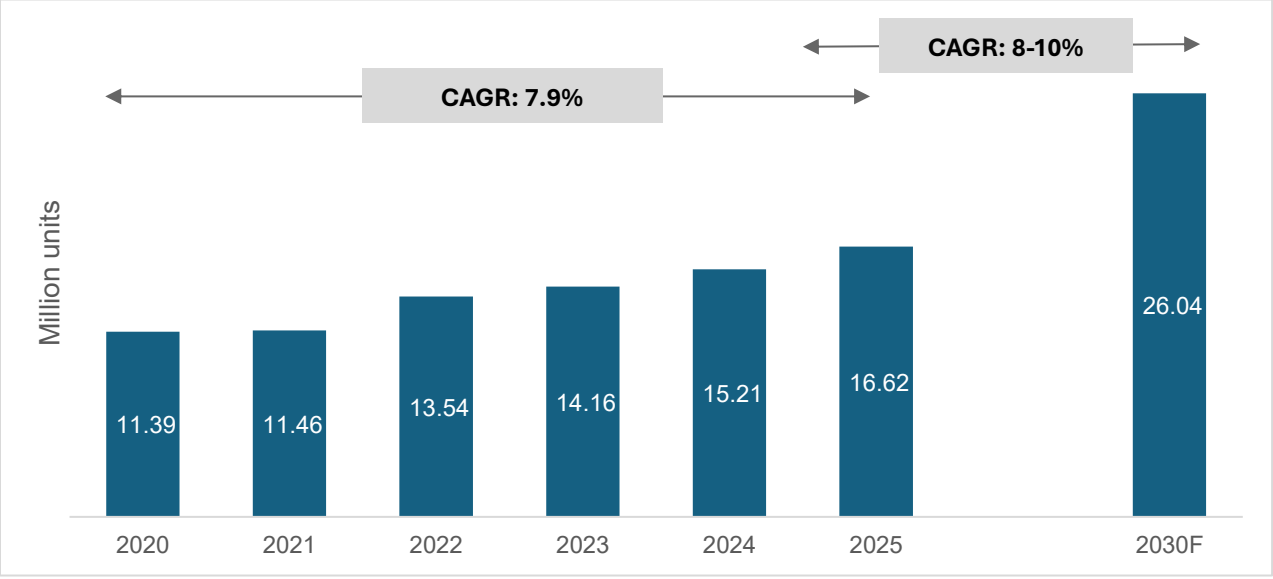
In USA and Canada, the two-wheeler market has expanded steadily from 1.06 million units in 2020 to an estimated 1.58 million units in 2025, maintaining a CAGR of 8.2%. The market is expected to grow further, reaching 2-3 million units by 2030 with a projected CAGR of 6-8% during the second half of the decade. Growth in North America is largely attributed to a strong leisure and recreational riding culture, with high demand for premium, cruisers, and adventure motorcycles. Moreover, a gradual shift toward electric two-wheelers is emerging, supported by increasing awareness around sustainability, environmental regulations, and rising fuel prices.



Source: Nexdigm data

SEA – South-east Asia

In Southeast Asia (SEA), the two-wheeler market grew from 11.39 million units in 2020 to 16.62 million units in 2025, showing a CAGR of 7.9%. It is expected to reach 24-27 million units by 2030, supported by a CAGR of 8-10% in the latter half of the decade. SEA's growth is driven by the region's heavy reliance on two-wheelers for everyday commuting due to congested urban centers and limited public transport infrastructure. Additionally, the booming e-commerce and food delivery sectors are significantly increasing demand for two-wheelers, especially for last-mile logistics and fleet-based applications.



Source: Nexdigm data

Review and outlook on the Indian two-wheeler (2W) Industry

Review of Indian domestic two-wheeler industry (fiscal 2020 to 2026 YTD)

India is the largest motorised (engine-powered) two-wheeler market in the world by volume, with domestic sales of 20 million units in fiscal 2025. The two-wheeler sales volume constituted 76.3% of the total automobile market, which includes two-wheelers, three-wheelers, passenger vehicles (PVs), commercial vehicles (CVs) and tractors by volume in fiscal 2025. The passenger vehicle segment contributed about 16.4% to the Indian automobile industry, while CVs contributed about 3.7% with three-wheelers and tractors contributing 2.6% and 3.6% respectively.

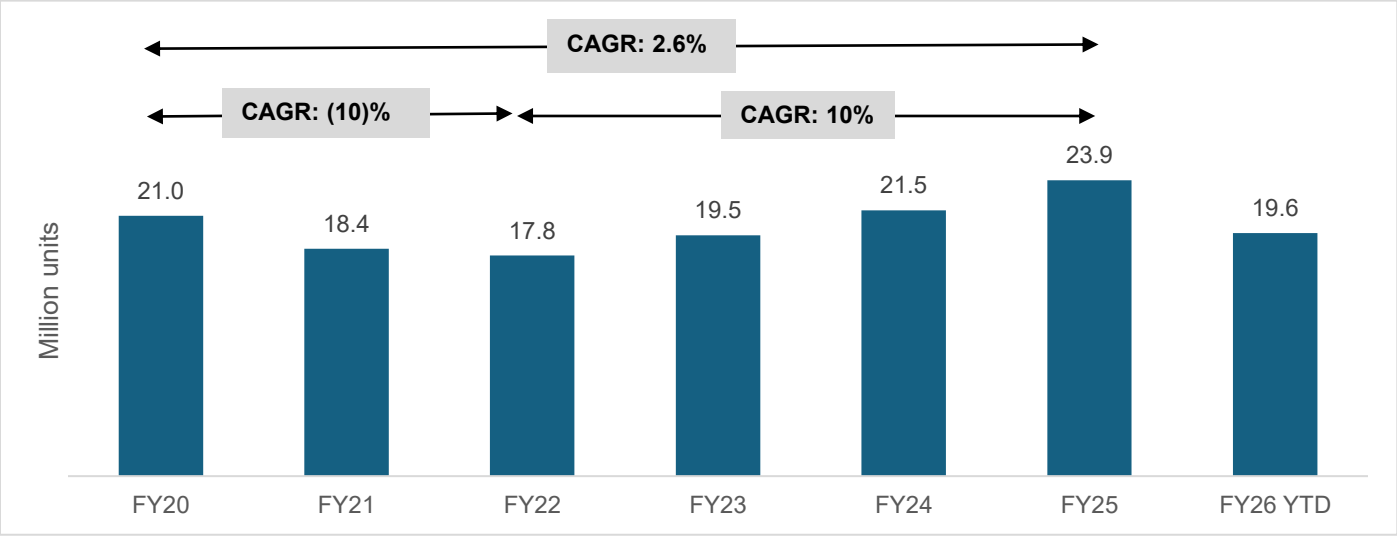
The two-wheeler segment witnesses a healthy demand in India and is preferred over four-wheelers by most of the Indian population, especially for their regular commute. This is primarily due to the lower acquisition cost, higher mileage, lower maintenance cost, ease of navigation especially during rush hours, hassle-free parking and suitability of two-wheelers on rough roads.

Two-wheeler industry contributes the highest share amongst all other vehicle category majorly driven by revival of rural sentiments and new launches. Fiscal 2025 witnessed the strong performance in the domestic segment and the sharp growth in rural demand accelerated growth momentum in two-wheeler sales.

Historic production development - fiscal 2020 to 2026 YTD

The domestic production clocked a CAGR of 2.6% over the period of 5 years to reach a volume of 23.9 million in fiscal 2025. In fact, between fiscal 2009 to fiscal 2019, the industry production accelerated at a much faster pace of 11% CAGR and reached a historic high of volumes of 24.5 million in fiscal 2019.

Review of domestic production of two wheeler (fiscal 2020-2026 YTD)



Note: SIAM production numbers do not include numbers for a few OEMs such as Ola.
YTD: April-December 2025
Source: SIAM, CRISIL Intelligence

During fiscal 2009 to fiscal 2019, India's GDP as well as private final consumption expenditure grew at a healthy pace of 7% CAGR. Moreover, inflation levels were on a tapering trend reaching ~3% levels in fiscal 2019. This favorable macro-economic environment led to an increase in disposable incomes and gave a thrust to the industry growth over the decade. In addition, the expansion in vehicle portfolio by OEMs, the accelerated growth in the scooter segment and the healthy growth of the premium motorcycle (=>125 cc) sub-segment provided an additional support to the industry growth over the decade. These favorable factors helped the two-wheeler industry reach a historic high of 24.5 million volumes in fiscal 2019. These record high production numbers were despite the higher-than-normal price rise (due to BSIV implementation in fiscal 2018) as well as the GST implementation (fiscal 2018) and demonetization (fiscal 2016) that limited growth of the industry.

During this period, significant technological development was also witnessed pertaining to fuel injection systems. While some two-wheeler manufacturers began experimenting with Electronic Fuel Injection (EFI) before 2019 to improve performance and emissions, it was only with the implementation of BSVI norms in April 2020 that EFI became the preferred fueling system across the industry. Although EFI was not legally mandated, the need to meet BSVI's stringent emission norms effectively made it the dominant fueling choice, replacing traditional carburetors. In 2019, the Indian government also mandated installation of Anti-Lock Braking System (ABS) on two-wheeler, driving the adoption of sensor technology in this sector. Another significant development post-2018 was the replacement of traditional starter motors with Integrated Starter Generator (ISG) technology. This system gained traction in the two-wheeler industry due to its ability to deliver silent and reliable engine starts - a key benefit for urban traffic conditions. While it also contributed marginally to fuel efficiency improvements, the primary driver of adoption was the improved customer experience through smoother and quieter starts.

However, over the next three years, from fiscal 2019 to fiscal 2022, the industry witnessed a contraction at a CAGR of 10% as the pandemic, nationwide lockdowns, reduced mobility, unfavorable macroeconomic scenario, closure of schools, colleges and offices, and work from home impacted the demand for two-wheelers.

With improvement in mobility, reopening of schools/colleges/offices, revival in macroeconomic environment, industry production revived and clocked a 10% CAGR between fiscal 2022 to fiscal 2025. During Apr-Dec of fiscal 2026, the two-wheeler industry sustained this growth momentum with production reaching 19.6 million units clocking the growth of 9% compared to the corresponding period fiscal 2025. The gradual uptick in production volume was witnessed during this period owing to recovery from pandemic, rising demand due to improved rural sentiments and increased export growth. This period also saw a surge in electric two-wheeler segment and first-time industry reaches to more than million units' sale in EV segment.

The fiscal year 2026 witnessed a modest beginning for electric vehicle (EV) penetration, commencing from a relatively low base in April, amidst a reduced subsidy. However, EV penetration gradually increased until September, driven by rising EV sales, although growth was somewhat constrained by the limited availability of rare earth magnets. The introduction of GST 2.0 led to a reduction in GST on internal combustion engines (ICE) vehicles, providing an additional boost to ICE vehicle sales during the festive months of October and November. Conversely, the GST on EVs remained at 5%, widening the price gap between ICE and EVs, which negatively impacted EV penetration during this period. Nevertheless, December saw a gradual uptick in EV penetration.

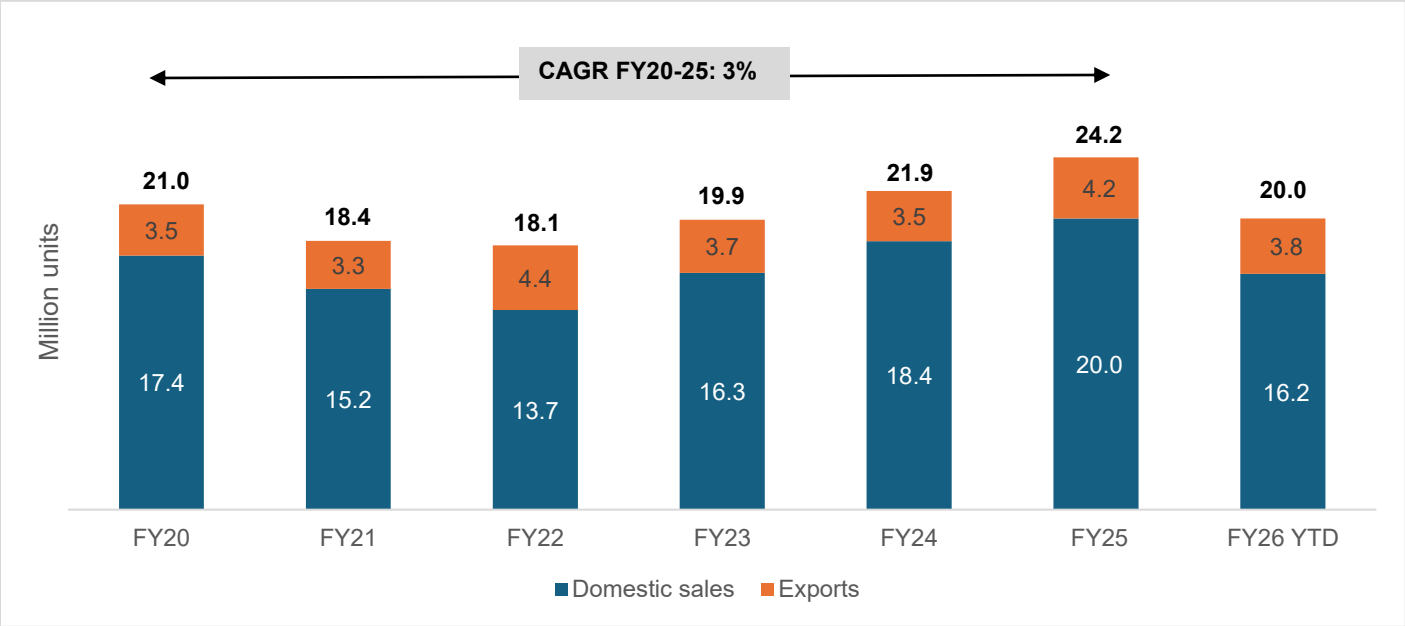
Split of industry by domestic sales and exports- fiscal 2020-2026 YTD

The total sales of the two-wheeler industry grew at a CAGR of 3% between fiscal 2020 to fiscal 2025 and reached a volume of 24.2 million in fiscal 2025. Domestic sales, which contribute more than 80% of the total sales of the

industry, witnessed growth at 2.8% CAGR while the smaller exports segment clocked a faster 3.6% growth off the low base.

The domestic industry witnessed a sharp drop at 11.4 CAGR% between fiscal 2020 – fiscal 2022 amidst the pandemic and reached a low of 13.7 million in fiscal 2022. From the reduced base of fiscal 2022, domestic sales rebounded in fiscal 2023 and recorded a healthy growth of 19%, driven by improving demand sentiments and the normalization of economic activities and increased mobility. The pent-up demand due to the postponement during the pandemic period and a sharp rise in scooters demand with restarting of colleges and offices provided a boost to the industry demand. Despite the normalization of public transport, improved frequency of intracity bus and railway services, the demand for the last mile mobility, and in turn the demand for two-wheelers remained buoyant during the year.

Domestic sales and exports of two-wheelers (fiscal 2020-2026 YTD)



Note: Data for ICE and EV domestic sales are the retail data based on Vahan; Exports are based on the SIAM reported numbers.

YTD: April-December 2025

Source: SIAM, VAHAN, CRISIL Intelligence

However, the higher interest outgo with increased repo rates and further increase in vehicle prices restricted the growth of the domestic sales in fiscal 2023.

In fiscal 2024, the domestic sales grew by a further 13%, supported by further improvement in the macroeconomic scenario, rural support, continued traction for premium motorcycles as well as scooters. In addition, continued demand for electric two-wheelers despite the subsidy cut supported the growth in fiscal 2024. The new launches, especially in the premium segments provided an added support to the demand. The commuter motorcycle segment also witnessed some improvement during the year after consecutive contractions aided by limited rise in operating costs as well as increased customer incentives.

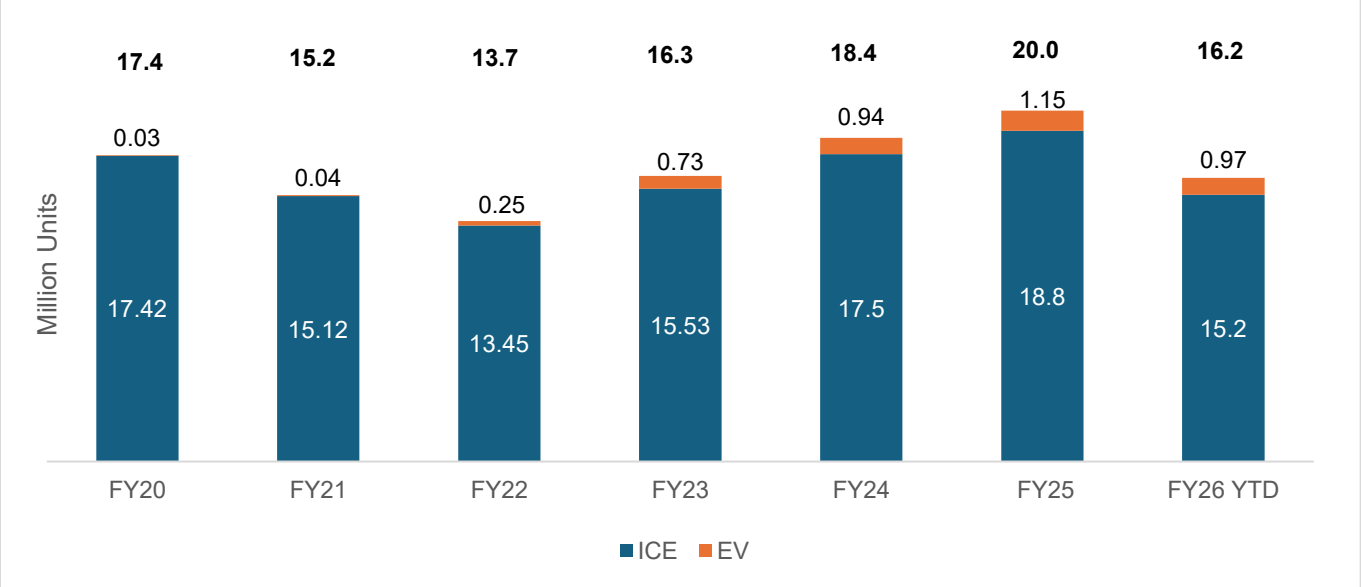
In the fiscal 2025, Industry sales clocked 20 million units, an increase of 8% over the previous year. Strong performance in rural area witnessed during the fiscal year. As per Federation of Automobile Dealer Association (FADA) two-wheeler market grew by 8.39% in rural area compared to 6.77% in urban areas in the fiscal 2025.The growth has

been driven by recovery in the rural market aided with healthy crop prices boost the rural incomes and pent-up replacement demand.

Fiscal 2026 has already recorded sales of 16 million units and exports of 4 million units in its first nine months, supported by GST cuts in September 2025 along with continued rural market momentum. During the Apr-Dec fiscal 2026 period, domestic sales witnessed 5% growth y-o-y and exports witnessed 24% growth y-o-y. The sustained growth of the two-wheeler (2W) industry has also supported the expansion of the ISG segment.

Scooter sales are also supported by urban income and rising demand for scooters in the rural market. Additionally, premiumisation to also aids volume across both Motorcycles and scooters. Continued demand for premium vehicles as well as electrification provided an added support to the domestic market during the year.

Domestic two-wheeler sales volume trend (ICE vs EV)



Source: VAHAN, CRISIL Intelligence

y-o-y growth	FY20	FY21	FY22	FY23	FY24	FY25	FY20-25 CAGR
ICE	-17.8%	-13.2%	-11.1%	15.5%	12.7%	7.6%	1.6%
EV	-4.1%	67.0%	464.1%	187.9%	28.5%	22.9%	112%

Source: SIAM, VAHAN, CRISIL Intelligence

Between fiscal 2020 and fiscal 2025, the domestic sales of two-wheeler grew at 2.8% CAGR to reach ~20 million levels. Over the last 5 years, the electrification within the industry has significantly contributed to growth in overall industry sales. In fiscal 2022, Electric 2-wheelers achieved highest growth. The sharp rise in EV was driven by government push for EV adoption and increasing consumer interest in electric vehicles.

In fiscal 2022, despite a continued decline in ICE two-wheeler sales, the strong growth momentum in EV retails - which grew by over 460% year-on-year - partially offset the decline in overall two-wheeler sales volume, even though

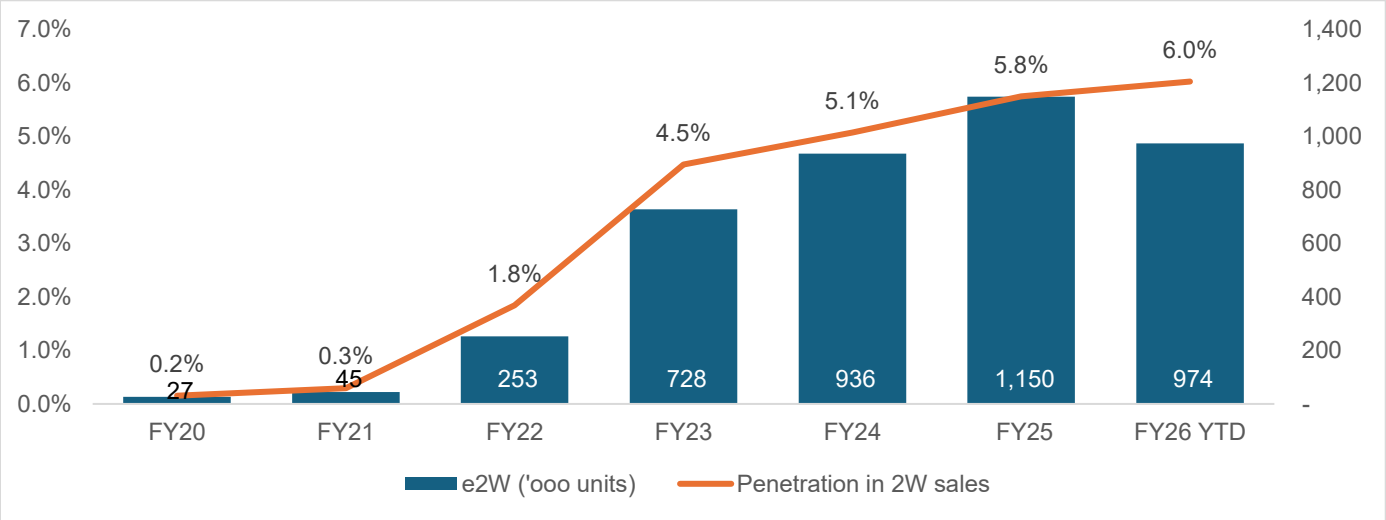
the share of EVs was minimal compared to ICE. During fiscal 2020 to 2025, ICE segment grew marginally by 1.6 %. However, EV retails grew with 112% CAGR for the same period. For fiscal 2025, EV penetration reached around 5.8% and EV volumes recorded 1.15 million units. In Apr-Dec of fiscal 2026, EV penetration witnessed a marginal increase to 6.0%, restricted due to vehicle supply issues amidst the rare earth crisis. The increased push to ICE vehicles during the third quarter of fiscal 2026, with price cut in ICE vehicles in GST 2.0 also limited the EV penetration during the year.

Electrification in the 2W industry

EVs are gaining global interest amidst the need to curb pollution. In India EVs are gaining popularity, as the government is extending support via Faster Adoption and Manufacturing of Hybrid and Electric vehicles (FAME II), EMPS subsidy and latest PM E-drive subsidy, state subsidy and tax rate cuts to encourage EV adoption. Further, growing awareness and concerns about environmental issues are likely to drive electrification in India.

EV sales have grown, especially the post pandemic aided by the rising awareness, government support and expanding EV portfolio of the industry. The entry of the new age non-traditional OEMs like Ola, Ather, Okinawa and Ampere provided an additional boost to the EV segment in India.

E-2W Retails and Penetration trend – fiscals 2020 to 2026 YTD



Note: Only high-speed electric two-wheelers have been considered for the analysis
VAHAN data does not include Telangana & Lakshadweep retails
YTD: April-December 2025
Source: VAHAN, CRISIL Intelligence

The high-speed electric two-wheeler have propelled momentum in electric two-wheeler having increased at a rapid pace from 27 thousand units' retails in fiscal 2020 to 1.15 million units' retails in fiscal 2025 marking significant growth of 112% CAGR during the period. The healthy growth in electrification was encouraged by rising awareness, continued government support, lower total cost of ownership of EVs compared to their ICE counterparts, narrowing gap between acquisition cost of EV and ICE parallels, lower maintenance, new age advanced features and expanding EV portfolio of the industry. The penetration level for EV grew from 0.2% in fiscal 2020 to 5.8% in fiscal

2025 and remaining steady at 6.0% in the Apr-Dec of fiscal 2026.Going ahead, the rise in electrification is estimated to contribute significantly to the industry growth over the long term.

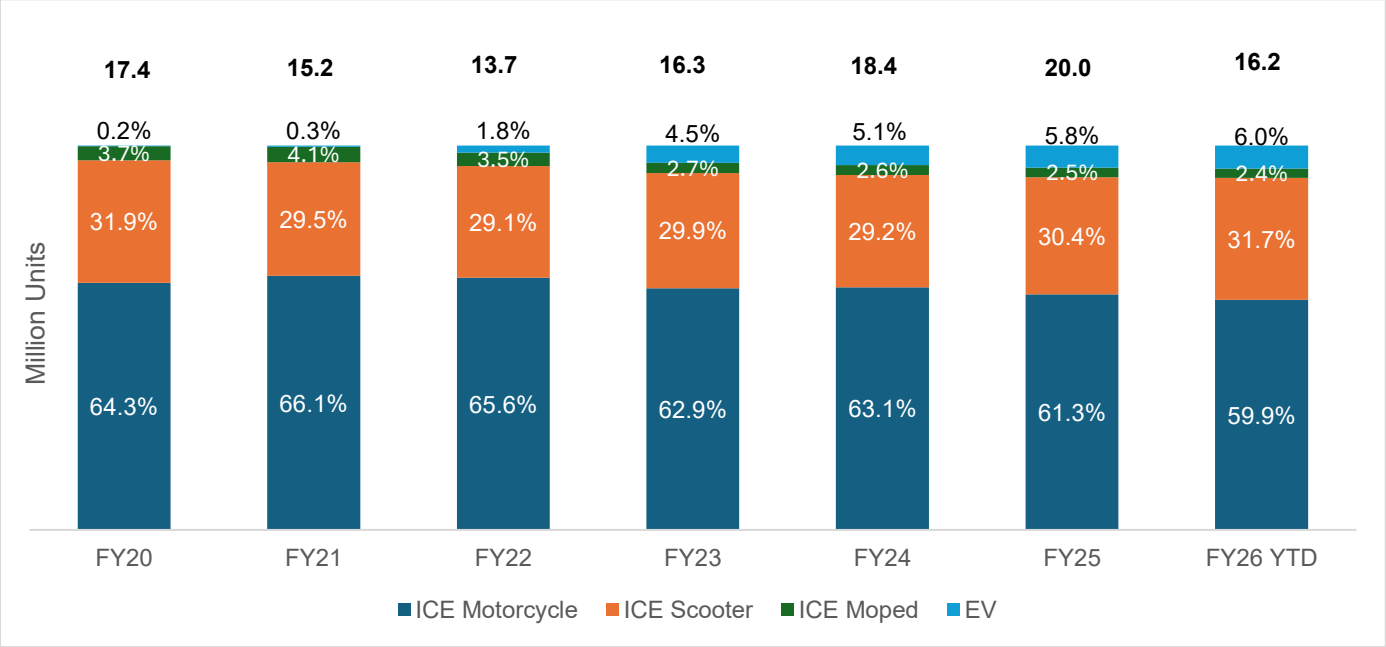
Segment wise domestic sales trend

Motorcycles dominate the domestic two-wheeler industry sales with more than 60% contribution to the annual domestic sales volumes. However, their contribution has gradually contracted over the years, from 64% in fiscal 2020 to 61% by fiscal 2025 and approximately 60% in Apr-Dec of fiscal 2026.The continued requirement of motorcycles, especially for daily commuting in the absence of public transport, supported the demand for motorcycles and limited their decline.

On the other hand, the scooters segment expanded its presence over the long-term horizon; from 32% in fiscal 2020 to 36% in fiscal 2025 and 38% in Apr-Dec of fiscal 2026. The mopeds segment also lost some ground to scooters and EVs over the years, from 3.7% share in fiscal 2020 to 2.5% in fiscal 2025 and 2.4% in Apr-Dec of fiscal 2026.

The share of the scooter segment increased on the back of strong demand from Domestic two -wheeler sales segmental trend. New model launches increasing use of scooters by working women in urban areas (due to high convenience) and a growing preference as a second vehicle in households. There has been an increase in multiple vehicle ownership, including a passenger vehicle, and multiple two-wheelers in a single family, driving demand.

Domestic two-wheeler sales trend – fiscals 2020 to 2026 YTD



Note: It is essential to note that the segmental split provided pertains to ICE two-wheelers, as the corresponding breakdown for EVs is not readily available. Notably, e-scooters account for over 95% of total EV sales, making them a dominant force within the EV segment. For this analysis, only high-speed EV data from VAHAN has been considered.
YTD: April-December 2025
Source: SIAM, VAHAN, CRISIL Intelligence

The scooter also gained acceptance in rural areas as road penetration increased, and it became a utility vehicle. Earlier, the scooter was positioned primarily as an urban vehicle. Now, it has gradually evolved to become a preferred means of commuting for women in rural areas as well.

CAGR for Domestic Two -wheeler sales segmental trend (fiscal 2020-2025)

y-o-y growth	FY20	FY21	FY22	FY23	FY24	FY25	FY20-25 CAGR
Motorcycle	-17.5%	-10.6%	-10.3%	13.9%	13.7%	5.3%	1.8%
Scooter	-16.9%	-19.1%	-6.4%	31.7%	13.0%	14.5%	5.2%
Moped	-27.7%	-3.1%	-23.3%	-6.7%	9.1%	4.2%	-4.7%

Between fiscal 2020 to fiscal 2025, scooters clocked the fastest growth at 5.2% CAGR while the dominant segment motorcycles posted a moderate growth at 1.8% CAGR. The smallest segment mopeds contracted at 4.7% CAGR during the same period.

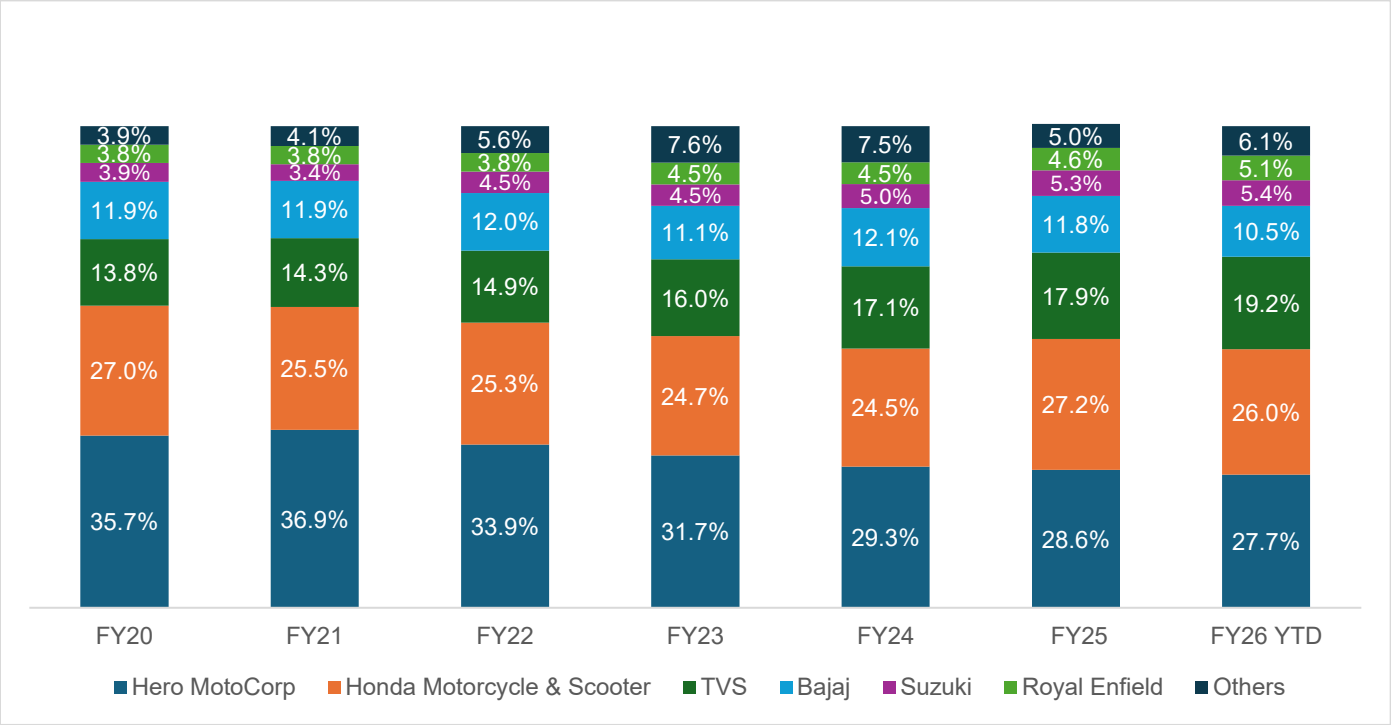
There was significant growth in fiscal 2023 in Scooter as well as Motorcycle segment due to the pent-up demand from the past two years provided a boost to the sale. In addition, the increased retails of e-scooters also gave an additional boost to the scooter sales. The scooter segment grew at a faster pace of 32% year-on-year, compared with 14% growth witnessed in motorcycles, thus backing the share expansion of scooters in fiscal 2023. In fiscal 2024, both motorcycles and scooters increased at a healthy pace of around 14% keeping the share near steady. However, in fiscal 2025 motorcycle segment drop sharply by 5.3% while scooter segment held steady growth at 15% owing to remarkable contribution of electric two wheelers.

Key players in the domestic two- wheeler industry

India’s two-wheeler industry is an oligopolistic market with the top four players contributing more than 80% of the annual sales. However, over the years, the competition has intensified within the industry, especially, with the entry of new age startups such as Ola, Ather, and Ampere (Greaves Electric Mobility), catering to the fast-expanding segment of EVs along with significant influence by the rising market share of other conventional players like Suzuki and Royal Enfield. In fact, the contribution of the top four OEMs has decreased from 88% in fiscal 2020 to 84% in fiscal 2025.

Hero MotoCorp (HMCL) continues to lead the market, although HMCL’s contribution has declined from ~36% in fiscal 2020 to 28.6% in fiscal 2025 and remained near steady in Apr-Dec fiscal 2026. The increased traction for scooters, including e-scooters as well as premium motorcycles, coupled with pressure on commuter motorcycles sales – where HMCL dominates – have impacted its share. The second largest contributor, Honda Motorcycle & Scooter (HMSI), has also lost some ground to other players, especially the e-scooter manufacturers.

OEM wise contribution to the overall two-wheeler domestic sales – fiscals 2020 to 2026 YTD



Note: Data includes ICE and EVs; EV retail data from VAHAN have been considered.

YTD: April-December 2025

Source: SIAM, VAHAN, CRISIL MI&A

With the continued traction of its premium motorcycles and scooters, like Raider and Jupiter, coupled with the growing adoption of its e-scooter model iQube, TVS has gained further ground in the market during the fiscal 2020-fiscal 2025 and Apr-Dec of fiscal 2026. Bajaj has successfully maintained its ~12% share over the past five years. Multiple launches in the premium motorcycle segment and increase in production and sales of its Chetak e-scooters have aided its sales. Rising sales of premium scooters backed Suzuki's share expansion, while multiple launches in the growing premium motorcycle segment led to share expansion for Royal Enfield.

Recent entrants such as Ola and Ather have also grabbed notable share from the legacy OEMs led by the rising electrification within the domestic two-wheeler market. As of fiscal 2025, Ola and Ather contributed 2% and 1%, respectively to two-wheeler annual domestic sales.

Exports

Exports typically account for 15-20% of the overall two- wheeler sales in India. Between fiscals 2020 and 2025, two-wheeler exports logged 3.6% CAGR reaching 4.2 million in volume in fiscal 2025 from 3.5 million in fiscal 2020.

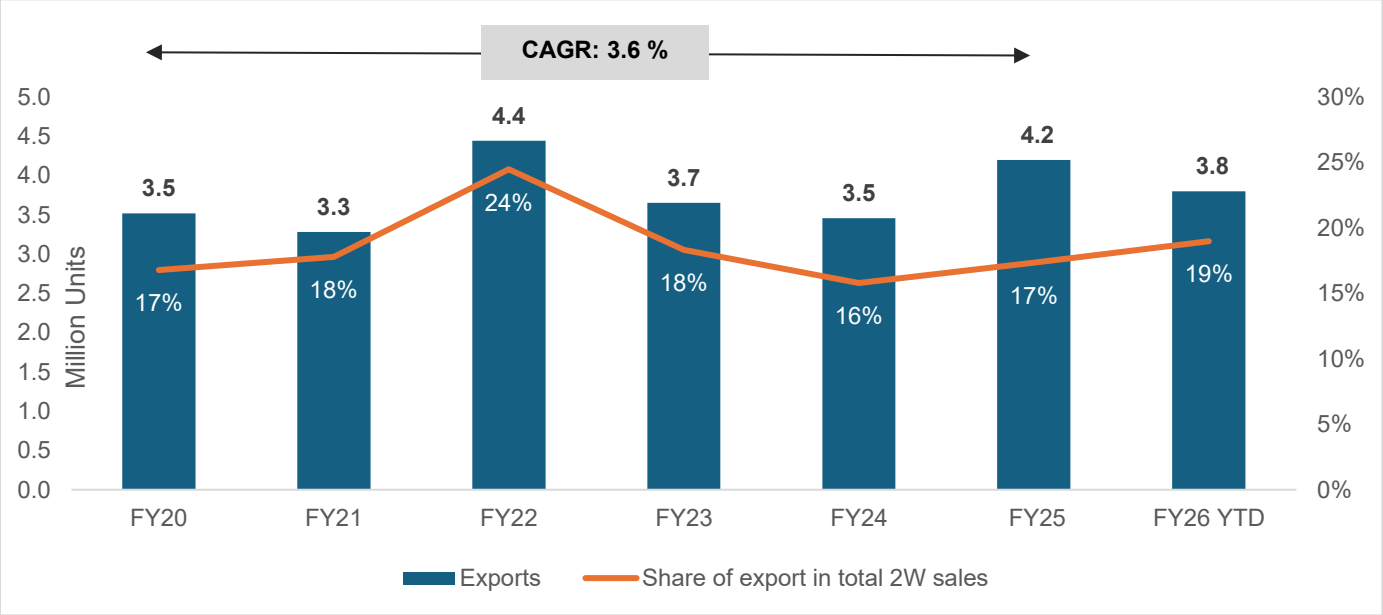
The growth was led by an increase in global demand and entry into new markets such as the US, Europe and Middle East by players such as Bajaj and TVS. Also, joint ventures with global brands - such as KTM, Husqvarna and BMW - and catering to the global demand of these brands from India has given an additional thrust to two-wheeler exports.

However, the tightening global monetary condition after the inflation spiral and forex unavailability limited the exports. Geopolitical conflicts have also been impacting overseas demand.

During the five-year period fiscal 2020 to fiscal 2025, share of exports within the total sales remained near steady between 16-18% with fiscal 2022 being an exception, when the shipment rose to a healthy 24% as OEMs focused on exports amid a slowdown in the domestic market.

With domestic market witnessing a revival post pandemic, OEM focus primarily remained on the domestic market the share of exports normalized to 18% in fiscal 2023. In fiscal 2025, two-wheeler exports grew by 21.4% and reached 4.2 million units. Even during the Apr-Dec of fiscal 2026, industry exports rose to 24% y-o-y and reached to 3.8 million units. The growth was primarily driven by portfolio expansion and a rise in demand from key regions like Africa and Latin America.

Two-wheeler exports trend



Note: YTD: April-December 2025

Source: SIAM, CRISIL Intelligence

Policies supporting EV adoption in India

PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme:

The PM E-DRIVE scheme with an outlay of ₹10,900 crore, will be implemented from 1st October 2024 to 31st March 2026, for faster adoption of electric vehicles (EVs), setting up of charging infrastructure and development of EV manufacturing eco-system in the country. The primary goal of the scheme is to accelerate the adoption of electric vehicles (EVs), develop essential charging infrastructure, and establish a robust EV manufacturing ecosystem across the country. Under this scheme, electric vehicle sales have already seen a record surge, reflecting the growing momentum of EV adoption.

The PM E-DRIVE scheme is implemented through the following key components:

- Subsidies: Demand incentives for electric vehicles such as e-2 wheelers (e-2W), e-3 wheelers (e-3W), e-ambulances, e-trucks, e-buses and other emerging categories of EVs.

- Grants for creating capital assets: Funding will be provided for the acquisition of electric buses (e-buses), the establishment of a comprehensive network of charging stations, and the upgrading of the Ministry of Heavy Industries (MHI) testing facilities.
- Administration of the Scheme including IEC (Information, Education & Communication) activities and fee for project management agency (PMA).

Under the PM E-DRIVE scheme in FY 2024-25, the number of e-2W and e-3W(L5) registered were 10,10,101 and 1,22,982 respectively. Sales of more than 1 million EVs have been successfully achieved in FY 2024-25, is a testament to the MHI's flagship schemes including FAME, EMPS, PM E-DRIVE. The subsidy for e3W has now been reduced to Rs 2,500 per kWh capped at Rs 25,000 from November 2024 as the upper sales reached the limit of 80,546 for the year FY25.

The scheme aims to incentivize approximately 24.79 lakh electric two-wheelers (e-2Ws). Only e-2Ws equipped with advanced batteries are eligible for this incentive. Both commercially registered and privately owned e-2Ws can benefit from the scheme.

The initiative is also designed to incentivize around 3.2 lakh electric three-wheelers (e-3Ws), covering registered e-rickshaws/e-carts or L5 category vehicles. Only those e-3Ws with advanced battery technology are qualified for the demand incentive. The scheme is solely applicable to e-3Ws used for commercial purposes. A budget of Rs. 500 crores have been allocated for deploying e-ambulances under this scheme.

This is a new government initiative to encourage the use of e-ambulances for comfortable patient transport. Performance and safety standards to be established in collaboration with the Ministry of Health and Family Welfare (MoHFW), Ministry of Road Transport and Highways (MoRTH), and other relevant stakeholders. Eligibility criteria for e-ambulances are currently under discussion with MoHFW and will be announced soon.

The scheme aims to promote the adoption of electric trucks to reduce CO2 emissions and establish e-trucks as a key logistics solution in the future. A fund of Rs. 500 crores have been set aside to incentivize the use of e-trucks. Only those holding a scrapping certificate from MoRTH-approved vehicle scrapping centres (RVSF) are eligible for the incentives. Monitoring systems will verify scrapping certificates. The relevant details for e-trucks, including the number of vehicles to be supported, maximum subsidy, performance criteria, etc. will be notified separately based on consultation with relevant stakeholders.

A total of Rs. 4,391 crore is allocated for the procurement of 14,028 electric buses by State Transport Undertakings (STUs)/public transport agencies. The demand aggregation for these buses will be managed by CESL in nine major cities, with more than 40 lakh population namely Delhi, Mumbai, Kolkata, Chennai, Ahmedabad, Surat, Bangalore, Pune and Hyderabad. For procurement and operation of e-buses in unique geographies – hilly and north-eastern states, island territories, coastal regions, etc. different set of guidelines including non-OPEX model as suitable to support e-bus penetration may be adopted by MHI.

Incentives under PM E-DRIVE Scheme for e2W and e3W segments:

Vehicle Segment	No. of vehicles to be supported		Incentives for vehicles		Maximum ex-factory price
	FY25	FY26	FY25	FY26	
e2W	1,064,000	1,415,120	Rs. 5,000/- kWh capped at Rs. 10,000 max.	Rs. 2,500/- kWh capped at Rs. 5,000 max.	Rs. 1.5 Lakhs
e3W (L3)	43,371	67,225	Rs. 5,000/- kWh capped at Rs. 25,000 max.	Rs. 2,500/- kWh capped at Rs. 12,500 max.	Rs. 2.5 Lakhs

e3W (L5)	80,546	124,846	Rs. 5,000/- kWh capped at Rs. 50,000 max.	Rs. 2,500/- kWh capped at Rs. 25,000 max.	Rs. 5 Lakhs

Source: Ministry of Heavy Industries (MHI)

Also, 14,028 number of e-buses to be supported under this scheme. The scheme aims to establish a robust network of public charging stations, including 22,100 fast chargers for e-4Ws, 1,800 for e-buses, and 48,400 for e2Ws and e3Ws, boosting user confidence. These charging points are to be installed in key cities with high electric vehicle penetration and along select highways. The total outlay for charging infrastructure under the scheme is Rs. 2,000 crores.

Phased Manufacturing Program

Under FAME II policy, PMP has been introduced with the aim of boosting domestic manufacturing of EVs, its assemblies/ sub-assemblies and parts/sub-parts thereby increasing the domestic value addition. It was launched to localize production across the entire EV value chain. PMP valid for 5 years till 2024 was to support setting up of a few large-scale, export-competitive integrated batteries and cell-manufacturing Giga plants in India. A phased roadmap to implement battery manufacturing at Giga-scale was considered with initial focus on large-scale module and pack assembly plants by 2019-20, followed by integrated cell manufacturing by 2021-22. This was to help improve air quality in cities along with reducing India's oil import dependence and enhance the uptake of renewable energy and storage solutions. The PMP offers a scaled duty structure for imported EV parts. To provide further impetus to electric mobility and promote indigenous development of electric vehicles, the central government has reduced and rationalized basic custom duty on electric vehicles.

Production Linked Incentive (PLI)

The PLI scheme for Automotive and Auto components was launched with budgetary outlay of Rs 25,938 crore for a period of 5 years (FY2022-23 to FY2026-27). The objective is to promote the domestic manufacturing of advanced automotive technology products, including electric vehicles and their components. Under this scheme, 18 Original Equipment Manufacturers have applied, playing a crucial role in accelerating the electric mobility revolution.

The PLI scheme for Advanced Chemistry Cell (ACC) battery storage was launched with budgetary outlay of Rs 18,100 crore. The objective was to establish a domestic manufacturing ecosystem for battery cells. The focus was to encourage giga factories to manufacture Li-ion and other advanced batteries used in EVs. The firms selected were supposed to set up at least 5 GWh of battery manufacturing. The plan is to set up 50-gigawatt hour (GWh) manufacturing capacity for ACC batteries by attracting investments totaling Rs. 45,000 crores. The incentives will be disbursed over a period of five years. It was paid out based on sales, energy efficiency, battery life cycle, and localization levels. This lowered the battery pack costs by encouraging local production and boosted long-term cost competitiveness of EV 2Ws. For e-3Ws, this has encouraged commercial fleet adoption, logistics applications and helps rural mobility with high indigenization. For e-Passenger vehicles, it boosted localized supply chains for cars like Tata Nexon EV, Mahindra XUV400 and Hyundai Kona and also focused on indigenous e-motors, vehicle control units and inverters.

The PLI scheme for electronics and IT hardware was launched with budgetary outlay of Rs 38,601 crore to boost manufacturing of electronic components used in EV control units, battery management systems and charging equipment. This was to support indigenization of electronic sub-assemblies essential in EVs.

Rare Earth Permanent Magnet Policy

A pivotal shift in India's electric mobility strategy is the "Scheme to Promote Manufacturing of Sintered Rare Earth Permanent Magnets (REPM)," approved by the Union Cabinet in November 2025. While previous policies like FAME and PM E-DRIVE focused on vehicle assembly and charging infrastructure, the REPM scheme targets the foundational component of the EV powertrain, the traction motor. By earmarking ₹7,280 crore over a seven-year period, the government aims to establish a domestic production capacity of 6,000 metric tonnes per annum (MTPA). This initiative is strategically designed to insulate the Indian EV industry from global supply chain volatilities and export

restrictions on critical minerals, particularly Neodymium (NdFeB) magnets, which are essential for high-efficiency motors.

The policy framework employs a dual-incentive structure to catalyze a mine-to-magnet ecosystem. It provides ₹6,450 crore in sales-linked incentives alongside a ₹750 crore capital subsidy to support the creation of integrated manufacturing facilities that convert rare earth oxides into finished magnets. For EV manufacturers, this domestic availability is expected to reduce production lead times and lower vehicle costs, which have historically been sensitive to the fluctuating prices of imported rare earth elements. By integrating this policy with existing PLI schemes for Advanced Chemistry Cells (ACC) and Auto Components, India is positioning itself not just as a consumer market, but as a self-reliant hub for the high-technology materials that define the future of green mobility.

EV demand incentives offered at state level

Many state governments have come forward and are providing incentives on purchase of electric vehicles, wherein the benefit provided is in addition to central policy benefits.

State	Amount / Rate	Vehicle Type	Cap per Vehicle	Policy Duration / Others
Maharashtra	INR 5,000/kWh	All EVs	INR 1.5 lakh for first 10,000 cars	100% road tax exemption till 2025; No 6% sales tax for EVs > $35,000 (~30 lakh)
Gujarat	INR 10,000/kWh	All EVs (min 2 kWh battery)	INR 1.5 lakh	Valid till 2025
Bihar	INR 5,000/kWh (INR 7,500–10,000 total) for first 10,000 e2Ws	Electric 2-wheelers	Not specified	While policy remains in force 75% rebate on tax (first 10,000 e2Ws, 50% henceforth.
Odisha	INR 5,000/kWh	Electric 2-wheelers	INR 20,000	Policy revised in April 2023
Meghalaya	INR 10,000/kWh (first 3500 e2Ws)	Electric 2-wheelers	INR 1.5 lakh	The policy also provides 100% exemption on road tax during policy period
Telangana	–	Electric 2-wheelers	–	100% exemption of road tax and registration fee (first 2 lakh e2Ws)
Tamil Nadu	INR 10,000/kWh	Commercial electric 2-wheelers	INR 30,000	Max 6,000 vehicles incentivized per year
Uttar Pradesh	INR 5,000/vehicle (e2W); 15% of ex-factory cost	e2W, Electric PVs	INR 1 lakh (PVs)-(up to 25k units); e2Ws up to 2,00,000 vehicles	Policy extended to 2027

Note: Not an exhaustive list

Source: BEE, State EV policy document

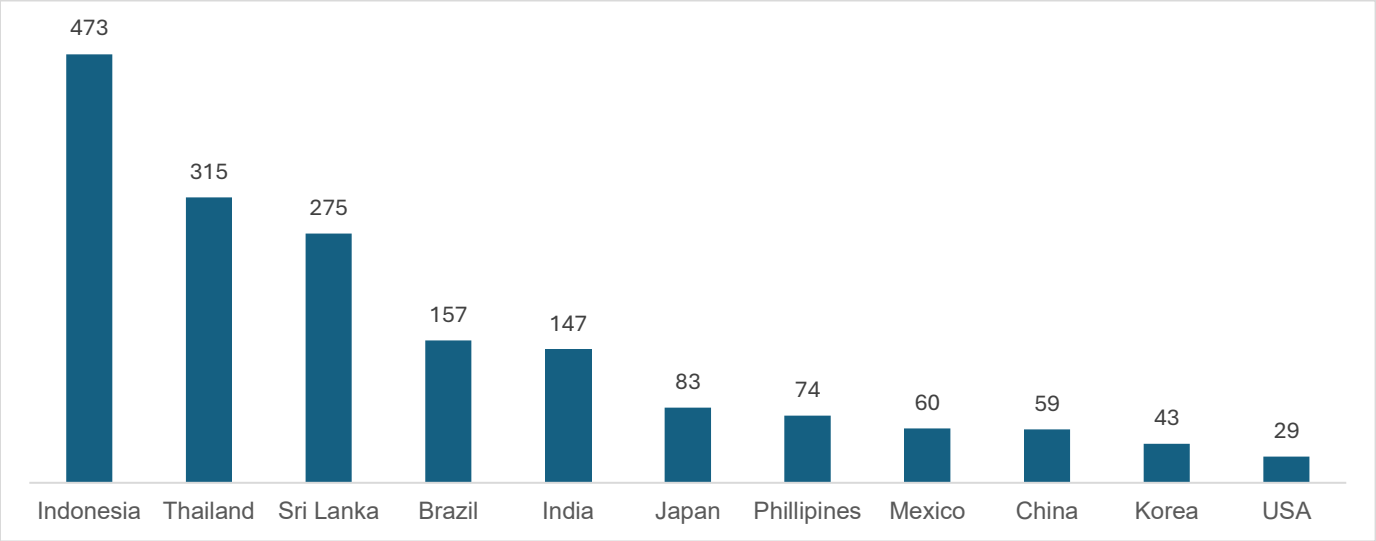
Demand drivers and trends in the domestic two-wheeler market

The performance of the Indian two-wheeler industry is dependent on numerous social and economic factors, including demographic trends and preferences, income levels, affordability of two-wheelers for customers, changes in government policies, overall economic conditions and the availability of finance and interest rates. Certain factors, such as general macroeconomic, certain policy and regulatory changes like GST 2.0, ABS implementation, BSVI transition and consumer trends, have a direct impact on the demand of two-wheelers.

Two-wheeler Penetration by population

CRISIL Intelligence estimates 2W penetration in India is 147 two-wheelers for every 1000 people. This two-wheeler penetration of India is much lower than many of the countries like Indonesia (473 per thousand people), Thailand (315), Sri Lanka (275), and Brazil (157).

Two-wheeler penetration (per 1000 people)



Note: Penetration numbers are for CY2023, India numbers is for fiscal2024
Source: International Road Federation- World Road Statistics 2025

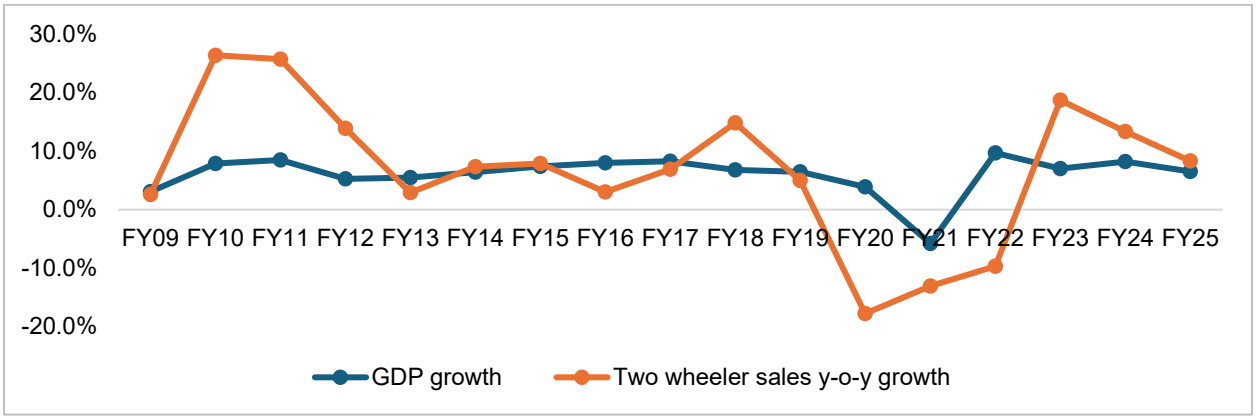
This provides a sizeable headroom for the two-wheeler industry to grow going forward. Some of the key drivers aiding India's domestic two-wheeler industry demand are rising rural income, premiumization and electrification. EV penetration has reached 5.8% in fiscal 2025 from 0.2% in fiscal 2020 and remaining steady at 6.0% in the Apr-Dec of fiscal 2026 marking significant growth in electrification of two-wheeler.

Macroeconomic support

India's consistent GDP growth and expanding private consumption have supported long-term two-wheeler demand. Post-pandemic recovery, coupled with rising income levels, has further aided the industry's rebound. Policy shifts like GST and BS-VI had a temporary impact but were absorbed over time. The introduction of GST 2.0 in September 2025 led to a reduction in GST on internal combustion engine (ICE) vehicles, providing an additional boost to ICE vehicle sales. Going forward, macro stability is expected to continue fuelling industry growth.

Going ahead, CRISIL Intelligence expects India's GDP to clock a healthy growth at 6.5-7.5% CAGR (till fiscal 2031) aiding the growth of domestic two-wheeler industry sales over the long-term horizon.

GDP vs two-wheeler industry growth trend



Source: MoSPI, SIAM, VAHAN, CRISIL Intelligence

Improvement in Rural Income and Infrastructure

Rural regions contribute 55–60% of India's two-wheeler sales, supported by better road connectivity, rural infrastructure, and agricultural income. Government push for rural development and good monsoon forecasts is expected to sustain income growth. Improved rural affordability is driving penetration even in Tier 3–4 markets.

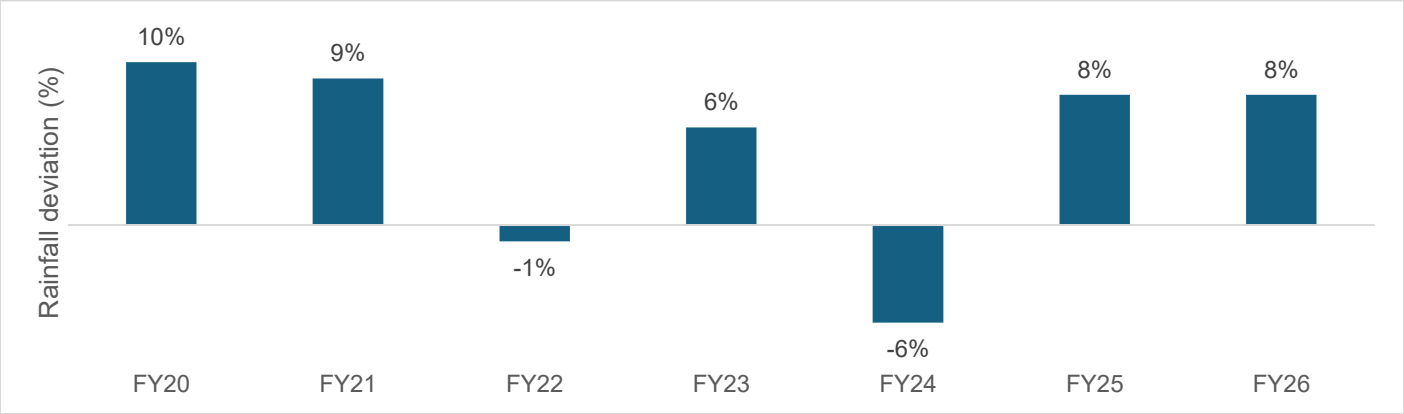
Improvement in rural infrastructure and road connectivity have helped the scooters segment to make inroads into the rural areas despite rural customers' preference for motorcycles. Under the Pradhan Mantri Gram Sadak Yojana (PMGSY), launched in 2000, the government aims to build all-weather roads in the rural regions to improve connectivity and support the rural economy. Over the years, the government has successfully executed a major portion of the PMGSY annual target set for the year. Even during fiscal 2024, it achieved 89% of the target constructing 26,000 km of 38,000 km target. Expansion of the rural road network not only improves connectivity but also aids the rural economy. So, the rural incomes have a direct bearing on the two-wheeler industry sales.

The rural areas are still primarily agrarian. With 86% of land holdings, small and marginal farmers dominate the country's agricultural sector. They primarily rely on monsoons for water. Hence, its timely arrival and adequacy are crucial for a good crop.

In fiscal 2024 as per IMD monsoon deviation was -6%. During the fiscal 2025, India received favorable rains with 8% higher rainfall than its long period average (108% of the LPA) in the June to September 2024 period. The expected improvement in rural incomes, subdued inflation levels aided the two-wheeler industry growth.

As of the end of September 2025, the current fiscal year (2026) has witnessed a normal monsoon season, with a positive 8% departure from the long-term average. This bodes well for the rural economy and, in turn, is expected to have a positive impact on two-wheeler sales.

Rainfall trend



Note: If the rainfall average is within ±10% from its long period average (LPA) or 90% to 110% of LPA, the rainfall is said to be "normal". The LPA for the June to September period is 868.6mm.

Source: IMD, CRISIL Intelligence

Premiumization in the industry

Consumers are increasingly opting for premium motorcycles and scooters with advanced tech, stylish design, and better features. This trend is backed by rising disposable income, easy finance availability, and lifestyle upgrades. Premium models witnessed robust growth in fiscal 2025, reflecting a shift in buyer preferences. The share of premium Motorcycle has increased to ~54% in fiscal 2025 compared to 52% in fiscal 2024. Premium scooter share remained at 47% for both the fiscals. Premium segment particularly above 125cc segment witnessed substantial growth. Premium two wheelers offer a range of features such as larger engines, connectivity, keyless features, improved riding comfort, and enhanced performance. High performance EVs also contribute towards premiumization. Further growing urban demand for 2Ws to counter traffic congestion, and growing EV portfolio is attracting new age customers to the premium segment.

Shrinking replacement cycles

Replacement cycles have reduced from 10–12 years a decade ago to around 6–7 years currently. Factors include evolving customer preferences, availability of finance, and faster tech obsolescence. This trend is driving a higher frequency of repeat purchases.

The rising share of scooters with a relatively lower ownership holding period is another factor contributing to the shortening of the replacement cycle. Rising premiumization and electrification is also supporting the trend. The shortened replacement cycle for the average customer is an added boost for the two-wheeler sales.

R&D support

The two-wheeler customer base in India has traditionally been rooted in rural and semi-rural regions, particularly for entry-level commuter motorcycles. However, in recent years, urban areas have seen growing traction from young, tech-savvy, Gen Z customers - especially in scooters and EVs - who prefer modern designs, connected features, and premium styling. Key trends driving these demands include the need for hybrid systems that improve efficiency, efficient start-stop systems and technologies that help in noise reduction and performance improvement.

Integrated Starter Generator system

The Integrated Starter Generator (ISG) system has revolutionized the two-wheeler industry by offering features that improve the overall user drive experience. It eliminates the starter motor and related assembly by utilizing the alternator as a motor for starting the engine enabling silent, fast and reliable start, which improves the idle start stop experience and leads to lower mass emissions and improved fuel economy. Idle start-stop function allows the engine automatically switched off when the vehicle is stationary such as at a traffic light and restart instantly when rider applies the throttle saving fuel and reducing emission. ISG system is often lighter than traditional starter motor and generator setups, potentially contributing to better fuel economy and performance. OEMs are focusing on implementing ISG technology to their high-volume models due to its varied features and benefits.

Smart Ignition systems

Smart ignition systems have radically transformed two-wheelers by integrating advanced safety, security and convenience technologies, moving far beyond traditional mechanical key-based systems. Few examples of smart ignition are as follows:

- Keyless and biometric systems: Modern vehicles feature true keyless ignition, using smart cards or mobile apps for secure access – eliminating physical keys and enabling multi-modal authentication. These systems increase anti-theft protection and allow for personal user settings and remote management, significantly raising convenience and security.
- IoT and connected features: Integration of IoT connectivity enables remote diagnostics, location tracking, ride analytics and even predictive maintenance via dedicated apps. Fleet operators use these features for efficient monitoring and management, including remote locking/unlocking, route planning and preventive maintenance scheduling.
- Environment and efficiency impact: Hybrid ignition systems coordinate battery and engine use, optimizing efficiency and emissions control based on speed and conditions.

Electric Fuel Injection

Similarly, the revolutionization of Electric Fuel Injection (EFI) in vehicles marks a significant transformation in automotive technology, advancing from mechanical carburetor systems to sophisticated, computer-controlled fuel management. This change made engines more efficient, responsive and environmentally friendly by using real-time data from sensors to optimize the air-fuel mixture dynamically. Modern EFI also integrates advanced diagnostics, over-the-air software updates and compatibility with hybrid powertrains.

Silent start technology in 2W

In this technology due to the use of ISG (ACG- Alternating Current Generator in Honda), instead of the traditional started motors, engines start without noticeable jolt or noise. The ISG system eliminates the noise and clunks that are associated with traditional starter motors resulting in a much quieter start. This feature, typically found in scooters like Honda Activa 125, eliminates gear meshing noise and provides a smoother, quieter startup experience.

ISG system often requires less maintenance compared to older starter systems. It also provides a smoother and more gradual start compared to traditional starters.

Idle stop system

The ISG starter also ensures comfortable frequent operation of Idling stop system. The Idling stop system automatically switches the engine off at the traffic light and other brief stops, reduces fuel consumption and blocks out toxic exhaust gas and unwanted noise. It enables the engine to stop automatically for few seconds after the vehicle stops moving and when the throttle is opened, the vehicle engine restarts and takes off smoothly.

Over the years, two-wheelers have seen addition of features such as digital instrument cluster, navigation, USB charging port, Bluetooth connectivity and cruise control. As technology continues to advance, the two-wheeler industry will witness more innovations in the coming years, making ride safer and more enjoyable for the customer, in turn, supporting the growth of the industry over the long term. The EV segment has revolutionized the industry in terms of the latest technological designs and offerings, and ICE vehicles are following with notable advancements. The new-age vehicles offer a wide range of features and innovations to ensure safer, more efficient and environmentally friendly transportation and that cater to varied consumer needs. Thus, all the OEMs spend a notable amount on research and development (R&D) to integrate the latest tech, design and features for the upcoming models. R&D has also become a necessity to analyze the safety of the two-wheeler riders. In the last six years, the two-wheeler OEMs have spent ~2% of their annual operating income on R&D.

Outlook for the Indian two-wheeler industry (fiscals 2025-2031P)

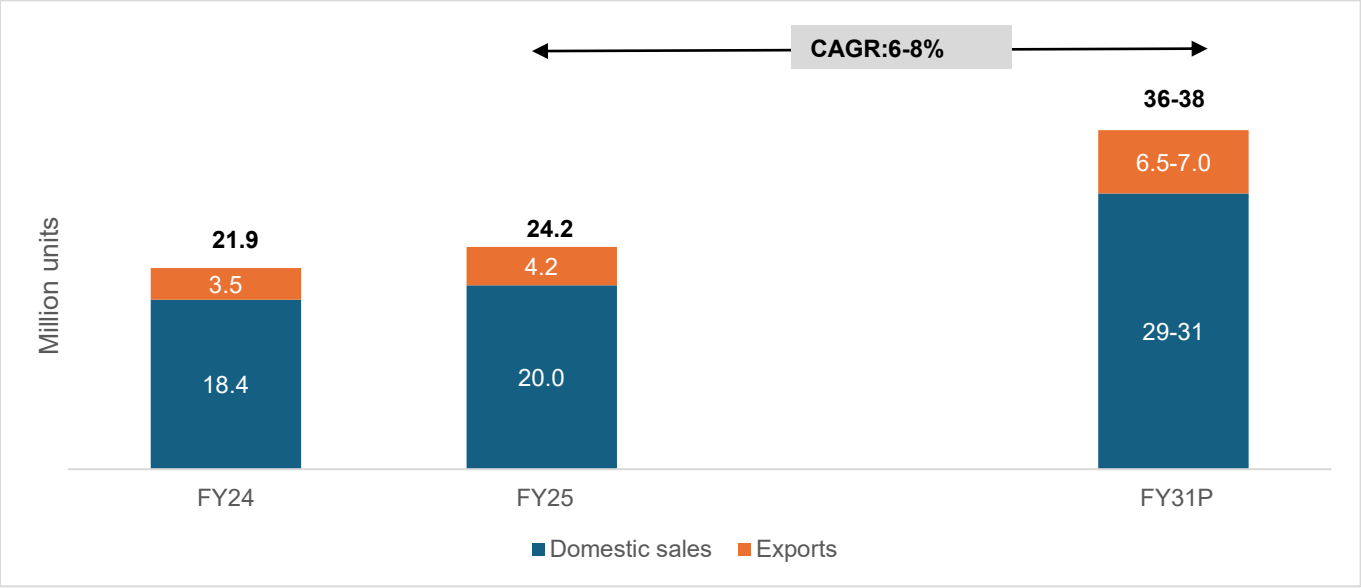
Crisil Intelligence projects domestic two-wheeler sales to record a CAGR of 6-8% from fiscal 2025 to fiscal 2031P. Crisil Intelligence expects electric -two-wheeler penetration to reach 25-30% by fiscal 2031P. During this 6-year forecast, below normal monsoons are expected.

In the medium to long term, CRISIL expects manufacturers to focus on expansion in distribution networks in semi-urban and rural areas, new model launches in the 125cc segment for scooters and premium segment for motorcycles. Improving rural productivity, diversification towards horticulture crops and government income supports schemes and structural measures taken by the government such as PM-KISAN, eNAM, Pradhan Mantri Fasal Bima Yojna (PMFBY) to name a few, will aid rural income in the long run. This is expected to drive sales of motorcycle segment, which will be a primary beneficiary of rural growth.

On the rural front, rising penetration due to deeper distribution network and improving incomes on the back of three of five normal monsoon, is expected to support two-wheeler demand in the long run. Rural road connectivity plays an important role in driving two-wheeler sales. It acts as an income multiplier in the rural economy - aiding incomes while roads are constructed and enabling mobility and connectivity once the construction is over. In the urban areas, demand is expected to be aided from multiple ownership and increase in demand from Tier 2 cities.

The domestic market is expected to continue its growth momentum over the long-term horizon led by the positive microeconomic and macroeconomic environment, favorable rural demand, premiumization, intermittent launches, shrinking replacement cycle and continued support from financers. Moreover, continued R&D investments by the OEMs and the technological advancements in the industry provide added support to the growth of the industry over the long-term horizon.

Domestic two-wheeler industry sales outlook until fiscal 2031P



Source: SIAM, Vahan, CRISIL Intelligence

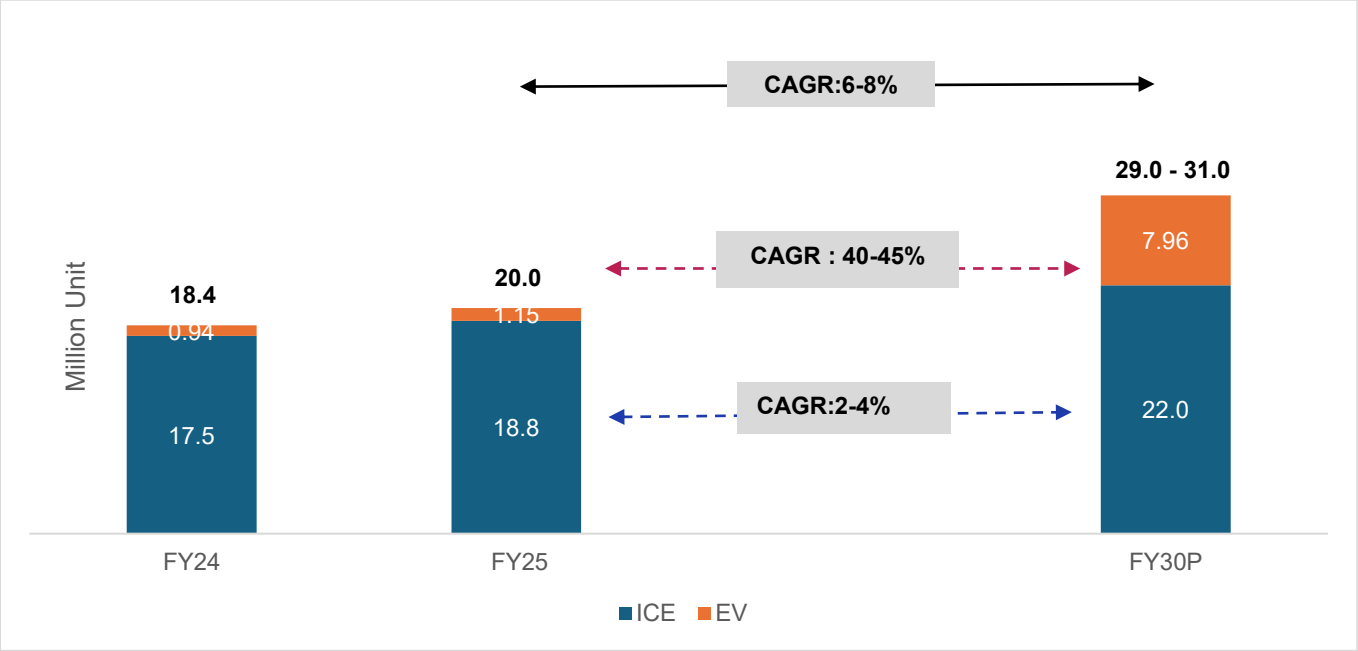
Additionally, the fast-rising EV segment, with EV portfolio expansion by legacy players, capacity expansion by new age players will accelerate industry growth. Entry of Legacy players like HMSI, Suzuki, Bajaj, Hero MotoCorp, Yamaha and Royal Enfield in the EV space will provide further thrust to the segment growth.

The introduction of CNG-powered motorcycles by Bajaj and the announcement of a CNG scooter by TVS are expected to give a significant boost to the two-wheeler industry. These new offerings, which run on CNG, promise to provide lower operating costs compared to their petrol-powered counterparts, making them an attractive option for consumers. This development is likely to propel the growth of the two-wheeler sector even further, as environmentally friendly and cost-effective alternatives gain traction in the market.

Led by these positive industry drivers, the two-wheeler industry sales are projected to grow at 6-8% CAGR and reach domestic sale volumes of 29-31 million by fiscal 2031P. Of this, the e2W segment is projected to clock a healthy CAGR of 40-45% during the period and the ICE 2W vehicle segment is expected to grow at a pace of 2-4% CAGR.

The two-wheeler export market has demonstrated a steady growth rate of 3.6% CAGR between fiscal 2020 and fiscal 2025. We anticipate this trend to continue, with exports projected to reach 6.5-7.0 million units by fiscal 2031P, representing an 8-10% CAGR between fiscals 2025-2031P. As a result, the share of exports in two-wheeler sales is expected to increase to 18-20% by fiscal 2031P, up from 17% in fiscal 2025.

Domestic two-wheeler sales volume trend outlook (ICE vs EV)



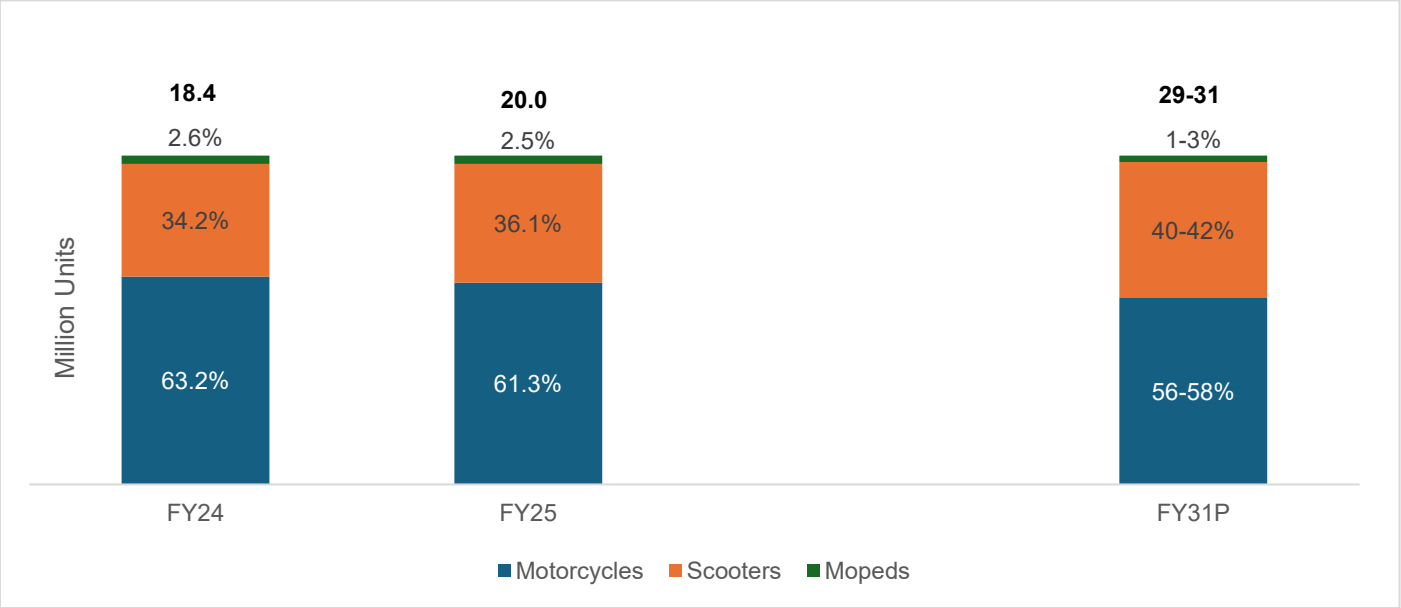
Source: SIAM, Vahan, CRISIL Intelligence

Within the domestic market, CRISIL Intelligence expects the scooter segment to grow at a much faster pace off the relatively lower base, backed by expected sharp rise in E scooter demand, ubiquitous usage of scooters, rising share of women in workforce, projected growth of e commerce segment coupled with continued focus of OEMs on the scooters segment. The strong launch pipeline, especially for e scooters and faster replacement cycles of the scooters segment will also back the faster growth of the scooters segment. Further, the improvement in supporting charging infrastructure is expected to provide added impetus to the segment's growth.

Crisil Intelligence projects the scooters segment to grow at a faster pace of 8-10% CAGR over the long-term horizon. However, the ICE scooters segment is expected to remain rangebound amidst the shift towards the EV segment. A sizeable portion of the ICE scooter replacement demand will shift towards the electric variants. EV penetration within scooters is expected to grow significantly from 16% in fiscal 2025 to 30-53% by fiscal 2031P.

Motorcycles, on the other hand, are projected to grow at a slower pace of 4-6% CAGR over the long-term horizon-till fiscal 2031P. The primary contributor to motorcycle sales, the ICE motorcycles are expected to grow at 4-6% CAGR. The >=125cc subsegments are expected to continue to provide thrust to the motorcycles segment going ahead while the <=110cc subsegment is projected to grow at only a moderate pace. Premiumization and upgradation will limit the growth of <=110cc motorcycles subsegment.

Segmental split outlook for the domestic two-wheeler sales trend



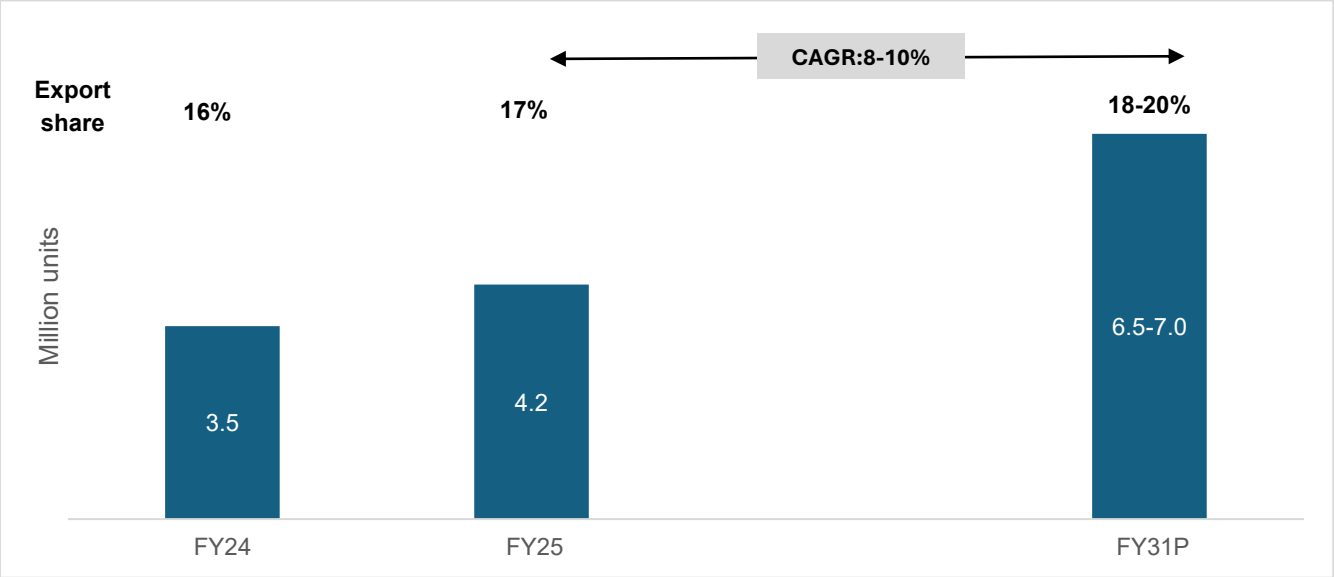
Source: SIAM, Vahan, CRISIL Intelligence

Mopeds are expected to grow at 1-3% CAGR led by the electrification in the price sensitive segment. Electrification within the mopeds segment will lead to the growth of this segment. Crisil Intelligence expects the relatively financially weak, bottom of the pyramid customer base of mopeds segment to opt for EV mopeds which have relatively lower acquisition costs. There is only one model, the recently launched E luna, currently present in the mopeds segment, however, launch of more models is expected in the short term which will revive the growth of this contracting segment.

Exports outlook

Two-wheeler exports from India grew at a moderate pace of 3.6% CAGR during fiscal 2020 to fiscal 2025. Going ahead, CRISIL Intelligence expects two-wheeler exports to clock a faster growth at 8-10% CAGR between fiscals 2025 -2031P to reach volume of 6.5-7.0 million by fiscal 2031P. The share of exports in the overall two-wheeler industry sales is expected to rise to 18-20% in fiscal 2031 from the export share of 17% in fiscal 2025.

Exports outlook for fiscal 2025-2031P



Source: SIAM, CRISIL Intelligence

The growth will be propelled by macro-economic improvement in exports markets, expansion in geographical coverage by the OEMs and more vehicle models getting shipped. Moreover, the fast-growing EV segment is expected to contribute meaningfully to exports amid the capacity expansion by players, sharpening focus on exports and sharp rise in the number of EV models.

Being one of the largest two-wheeler markets, India has a unique opportunity to leverage its scale and manufacturing competitiveness to produce electric two-wheelers not just for the domestic market but also for the exports markets. Further, policies, including the PLI scheme, are offering momentum to domestic OEMs to manufacture and export EVs. The government offers incentives through PLI for the entire EV ecosystem, including automobiles, auto components and ACC batteries.

Additionally, the growing demand for eco-friendly and sustainable transportation options globally is expected to provide a fillip to the demand for electric two-wheelers going forward.

Moreover, India's trade agreements with major global economies would help the domestic OEMs enhance the exports of automobiles and related components. For instance, India's recent trade engagements with the EU and the USA are expected to further support export growth by improving market access and strengthening cross-border trade opportunities.

Nonetheless, geopolitical flare-ups can have a negative impact on oil prices, thereby increasing the inflationary pressure in major importing countries. This can, in turn, impact demand for vehicles in the near term.

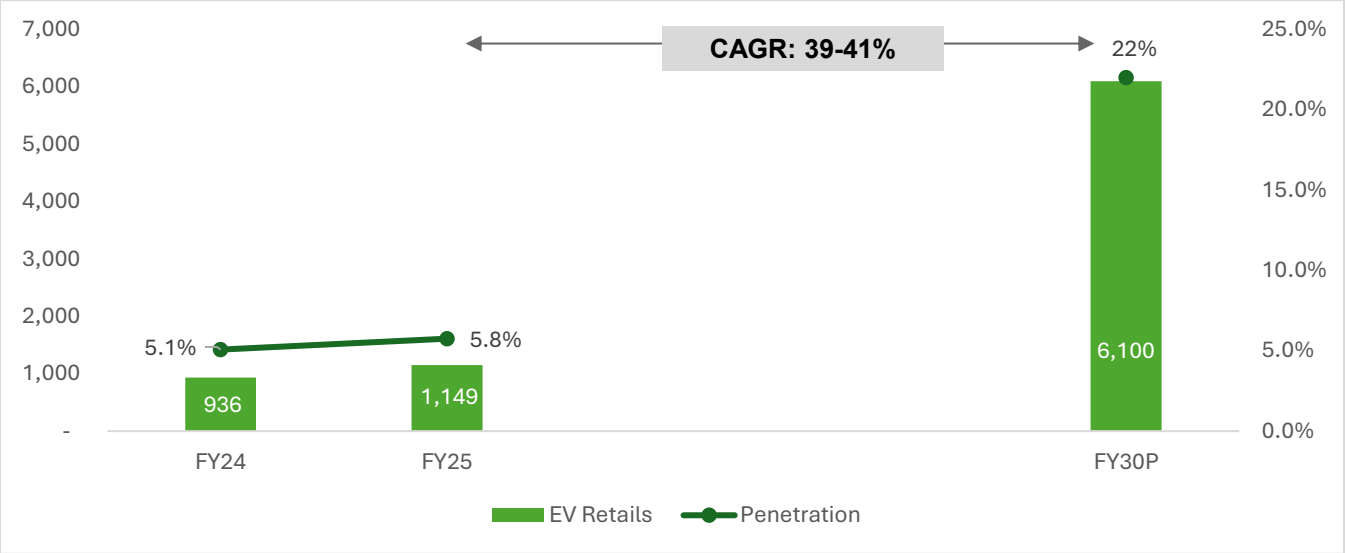
Outlook of e-2W segment

High Speed E-2W Outlook

The electric two-wheeler retails rose at a sharp growth pace of 112% CAGR in the last 5 years, albeit off the small base of fiscal 2020. Going ahead the growth momentum in the industry is expected to continue over the long-term horizon led by rising awareness, improving TCO for electric vehicles, bridging acquisition cost gap between EV and ICE counterparts, larger vehicle portfolio, expanding charging infrastructure, furthering financing support, increasing EV manufacturing capacity, and continued government support.

As the government continues with the demand incentive at least for the next 1 year (till fiscal 2026), Crisil Intelligence expects the EV retails to rise at a healthy pace of ~39-41% CAGR and reach volumes of 6-8 million in fiscal 2030. And the EV penetration to reach 20-25% by fiscal 2030. Such expansion will make e2Ws one of the fastest growing segments in the automotive industry in India.

e2W Outlook



Note: Only high-speed electric two-wheelers have been considered for analysis,

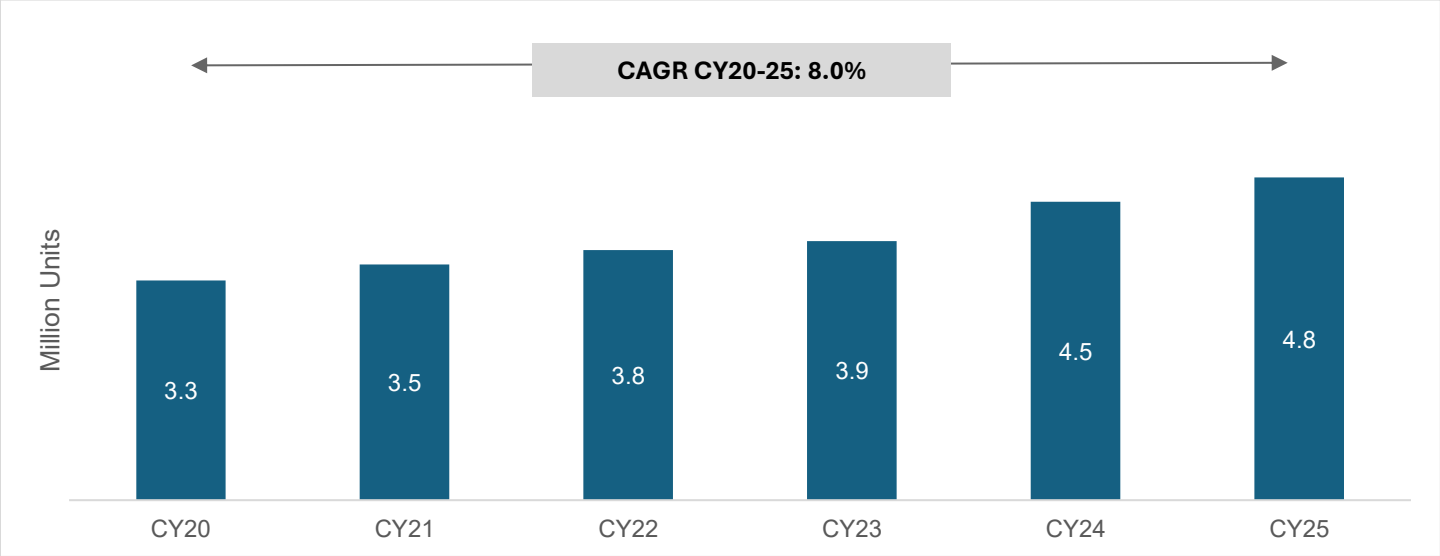
Source: SIAM, SMEV, VAHAN, Crisil Intelligence

Review and outlook for global three-wheeler industry

Review of global three-wheeler industry (CY20-CY25)

The market witnessed healthy growth at 8.0% CAGR during CY2020 to CY2025, increasing from 3.3 million units in CY2020 to 4.8 million units in CY2025. The pandemic impacted the global three-wheeler markets during CY2020 contracting sales by 14% during the year, with China, the largest market, being one of the hardest hit countries. The market gradually recovered and by CY2023 had nearly returned to CY2019 levels.

Global three-wheeler industry sales trend



Note: A three-wheeler, also known as a tricycle in China, is a motorized vehicle with three wheels used for transporting passengers or goods. It can be powered by an internal combustion engine (ICE) or an electric battery (EV). This category includes electric tricycles, low-speed electric tricycles, and motorized tricycles, classified based on their intended use, speed, and power source. It covers both passenger and cargo models, including auto rickshaws, electric auto-rickshaws, and e-rickshaws.

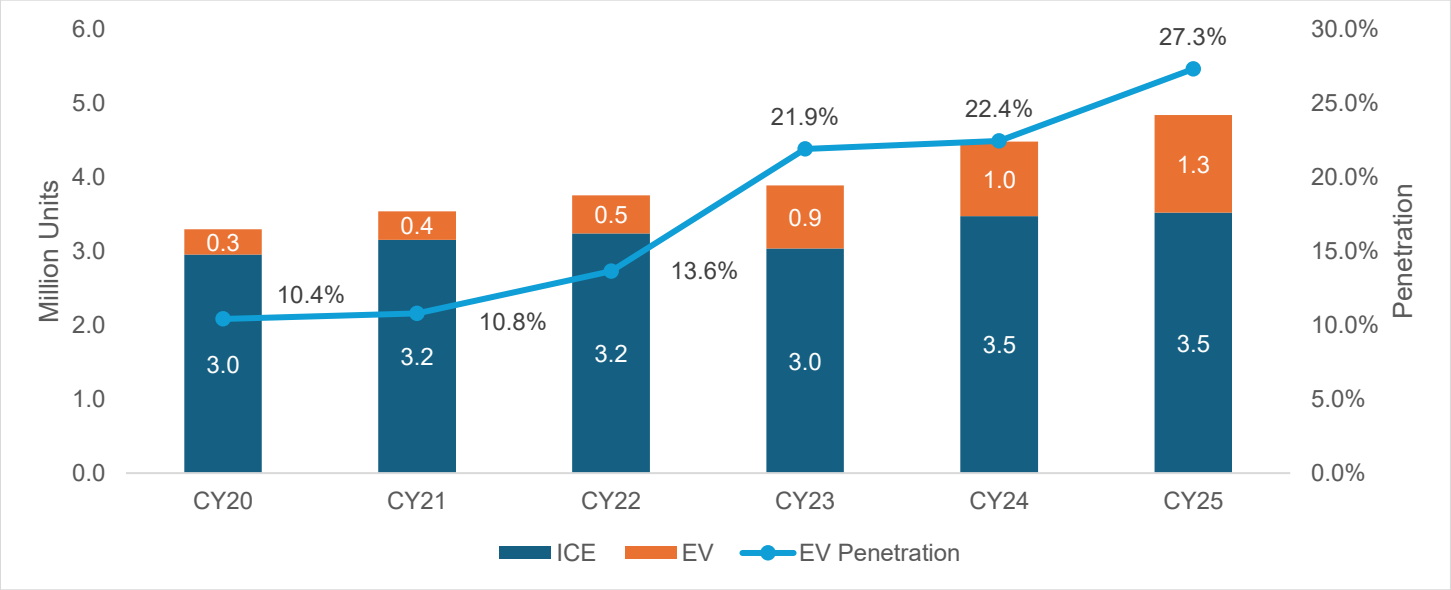
Source: Nexdigm data

Amidst the normalization in economic activity and continued demand from the last mile delivery segment, the global three-wheeler sales picked up pace post pandemic and grew at a healthy pace of approximately 8% in the next five years reaching 4.8 million units by CY2025.

The resurgence in demand from the Asia Pacific market- which dominates the three-wheeler industry, aided the growth of this segment. The global three-wheeler market is dominated by China with 50%+ share, followed by India at 25%+.

Additionally, the healthy growth witnessed by the EV subsegment provided thrust to the global three-wheeler sales. The smaller segment of EVs witnessed a healthy 31% growth during CY2020-CY2025 period while the larger ICE segment grew at a relatively slower pace of 3.6% CAGR during the same period. In turn, the share of EVs grew from 10.4% in CY2020 to 27.3% by CY2025.

Global three-wheeler sales powertrain split



Source: Nexdigm data

The healthy growth in EV segment was aided by the government's support, expansion in charging infrastructure, player focus as well as growth of e-commerce. Additionally, various players made partnerships with e-commerce players to boost the use of EVs in their last-mile delivery supporting the faster growth of EVs.

Moreover, the increase in internet penetration and hence the ride-hailing services have further increased the demand for three-wheelers, E-3W. Various manufacturers have also extended their product portfolios to cater to the growing demand, supporting the growth of EVs.

Growth drivers for global three-wheeler industry

- Macroeconomic development: Continued growth in global GDP is expected to support the growth in disposable incomes going forward. The increasing disposable incomes, especially in emerging markets, are projected aid the industry demand.
- Increasing shared mobility: The rapid urbanization trend, driven by the mass migration of people from rural areas to major cities, is resulting in unprecedented population growth, congestion, and strain on urban infrastructure. This, in turn, is fueling the demand for innovative and sustainable transportation solutions, with shared mobility emerging as a viable alternative to traditional ownership-based models.
- As cities continue to swell, the challenges of traffic congestion, parking scarcity, and environmental degradation are becoming increasingly pressing concerns. In response, shared mobility services are gaining traction, offering citizens convenient, affordable, and environmentally friendly ways to navigate urban landscapes
- E-commerce and Logistics: Growing demand for last-mile delivery and transportation of goods, driven by the e-commerce industry, is expected to provide additional support to the three-wheeler demand
- Rising electrification: EV penetration is rising at a rapid pace globally aided by Rising Fuel Costs and Operational Savings: The growing cost of conventional fuels has made traditional fuel-powered three-wheelers increasingly expensive to operate for both passenger transport and cargo delivery. As fuel prices continue to

rise, so do the per-km travel expenses, prompting a shift toward more economic alternatives. Electric three-wheelers have emerged as a viable solution, offering substantial operational savings and cost-efficiency for users.

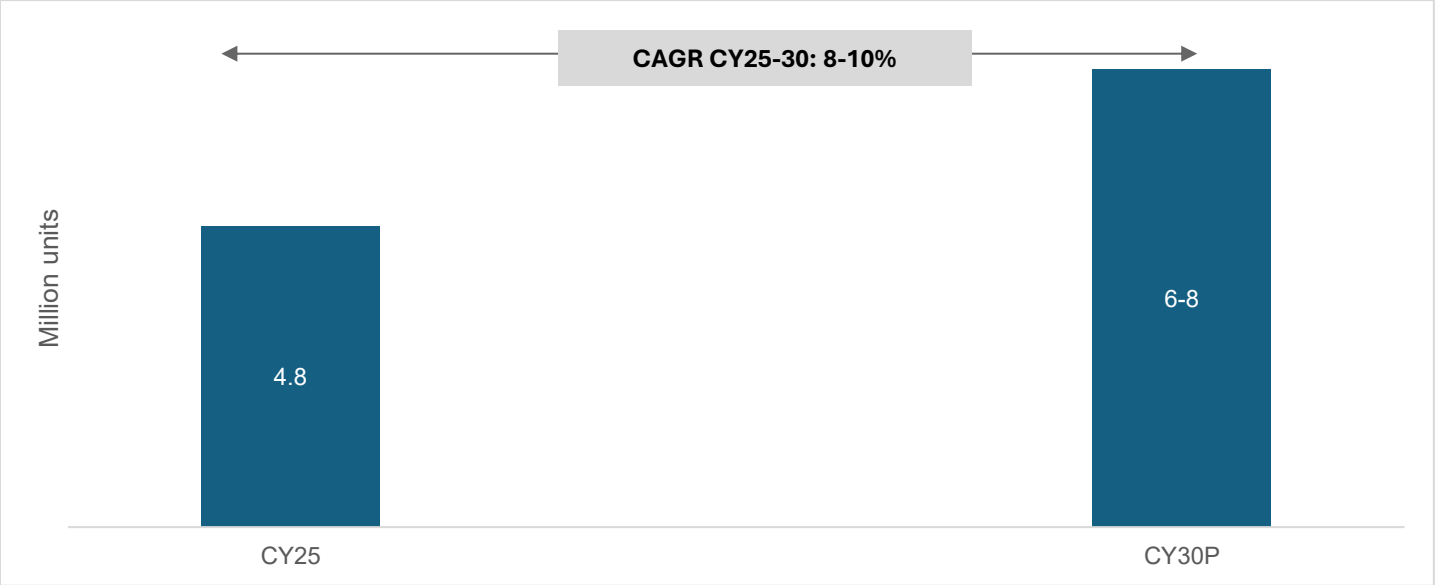
- Government support: Amidst the rising environmental concern, many governments have set up tall electrification targets. Governments in various countries are aiding EV adoption through regulations and incentives. Over and above the incentives for the customers, the governments are also offering incentives in the form of tax breaks for EV manufacturers to set up their plants and are also promoting battery manufacturing capabilities, EV component manufacturing as well as expansion of charging infrastructure. India is offering incentives in the form of Electric Mobility Promotion Scheme, PLI – Auto components, chemistry cells, phased manufacturing policy, Battery recycling and Charging infrastructure policy. China is promoting EV adoption with tax breaks, research funding, subsidies and New Energy Vehicle (NEV) mandates for OEMs. Such government initiatives are expected to back EV adoption over the longer run.
- Expansion in charging infrastructure: Governments worldwide are playing a pivotal role in accelerating the electrification of the automotive industry by providing substantial support for the expansion of charging infrastructure. This strategic move is expected to give a significant boost to the adoption of electric vehicles (EVs), driving the industry towards a more sustainable and environmentally friendly future.
- The expansion of charging infrastructure is a crucial factor in addressing the concerns of potential EV buyers, particularly range anxiety and charging convenience. By investing in the development of a comprehensive and accessible charging network, governments are helping to alleviate these concerns and create a more favorable environment for EV adoption.
- Lowering acquisition costs: The prices of lithium-ion cells and battery packs have been declining steadily in recent years. This is due to several factors, including increased demand, technological advancements, and economies of scale. Battery prices are expected to slide further, going ahead keeping the acquisition costs in check.
- Economies of scale: The rapid electrification of the three-wheeler industry is gaining momentum, driven by growing demand for eco-friendly and cost-effective transportation solutions. As a result, production levels are expected to surge, leading to significant economies of scale that will enable manufacturers to maintain competitive pricing over the long term.
- Expansion in product offerings: Amidst the rising electrification within the three-wheeler industry, traditional ICE vehicle manufacturers are also expanding their EV portfolio. This expansion in the EV portfolio is expected to provide an added impetus to the electrification of the three-wheeler industry.
- Integration of GPS Technology in Electric 3W Rickshaws: The integration of GPS technology in electric rickshaws is transforming fleet management and operational efficiency across the sector. Real-time tracking enables operators to monitor vehicle movement, optimize routes, and ensure timely deliveries or passenger pick-ups. It enhances safety by enabling geofencing, alert notifications, and instant location tracking in case of theft or emergencies. This technology is particularly valuable for businesses running large fleets, as it helps improve asset utilization, driver accountability, and customer satisfaction.

Global three-wheeler Industry Outlook CY25-CY30

The global three-wheeler industry sales are expected to grow at 8-10% CAGR till CY2030 and reach 6–8 million-unit levels.

According to Nexdigm estimates, the EV segment is projected to provide the major push and grow at a faster pace of 21-23% CAGR led by supportive policies, technological advancements, expansion in charging infrastructure, expansion in portfolio as well as changing consumer preferences.

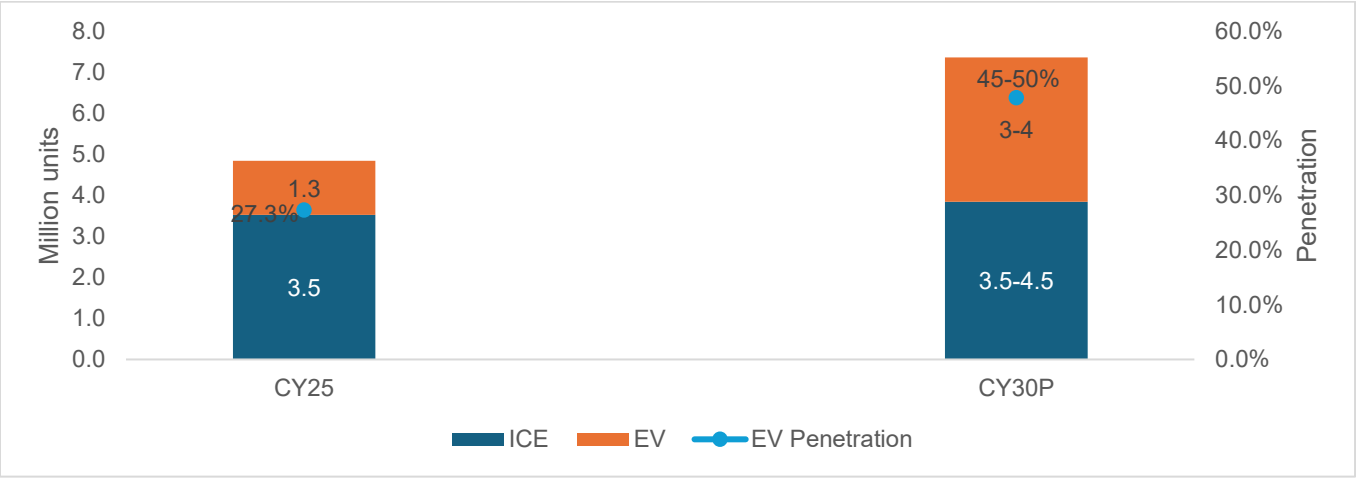
Global three-wheeler industry sales outlook



Note: A three-wheeler, also known as a tricycle in China, is a motorized vehicle with three wheels used for transporting passengers or goods. It can be powered by an internal combustion engine (ICE) or an electric battery (EV). This category includes electric tricycles, low-speed electric tricycles, and motorized tricycles, classified based on their intended use, speed, and power source. It covers both passenger and cargo models, including auto rickshaws, electric auto-rickshaws, and e-rickshaws.
Source: Nexdigm data

Off the elevated base, the larger ICE segment has remained relatively rangebound over the years, is projected to remain near steady going ahead. In turn, the share of EVs is expected to reach 45-50% by 2030 from the current penetration of 27.3% in 2025.

Global three-wheeler sales powertrain split outlook



Source: Nexdigm data

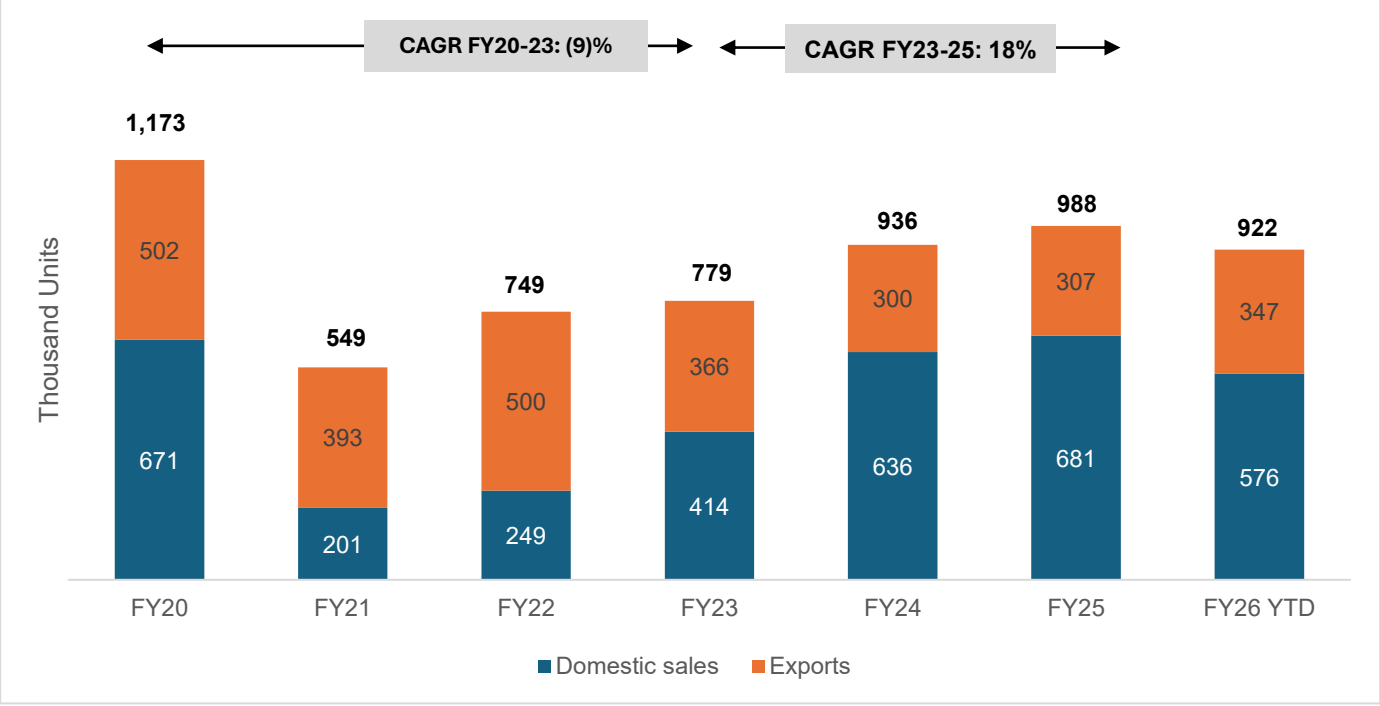
Review and outlook on the Indian three-wheeler (3W) industry

Review of the Indian Three-wheeler Industry

India is the largest three-wheeler (3W) market in the world, with overall sales reached 0.98 million units in fiscal 2025, comprising domestic sales of 0.68 million units and exports of 0.30 million units. The industry contributed to ~2% of the total market – comprising two-wheelers (2Ws), 3Ws, passenger vehicles (PVs) and commercial vehicles (CVs) by volume. In fiscal 2025, 3Ws domestic sales recorded on-year growth of 7% in fiscal 2025 compared to fiscal 2024, led by Passenger vehicles. In fiscal 2025, the passenger segment leads the 3W sales with volumes reaching 0.55 million units.

During Apr- Dec of fiscal 2026, overall three-wheeler (3W) industry recorded sales of 0.92 million units, of which domestic sales accounted for 0.57 million units and exports of 0.35 million units. The sustained growth of the overall three-wheeler (3W) industry has also supported the expansion of the ISG segment.

Three-wheelers overall sales, by volume



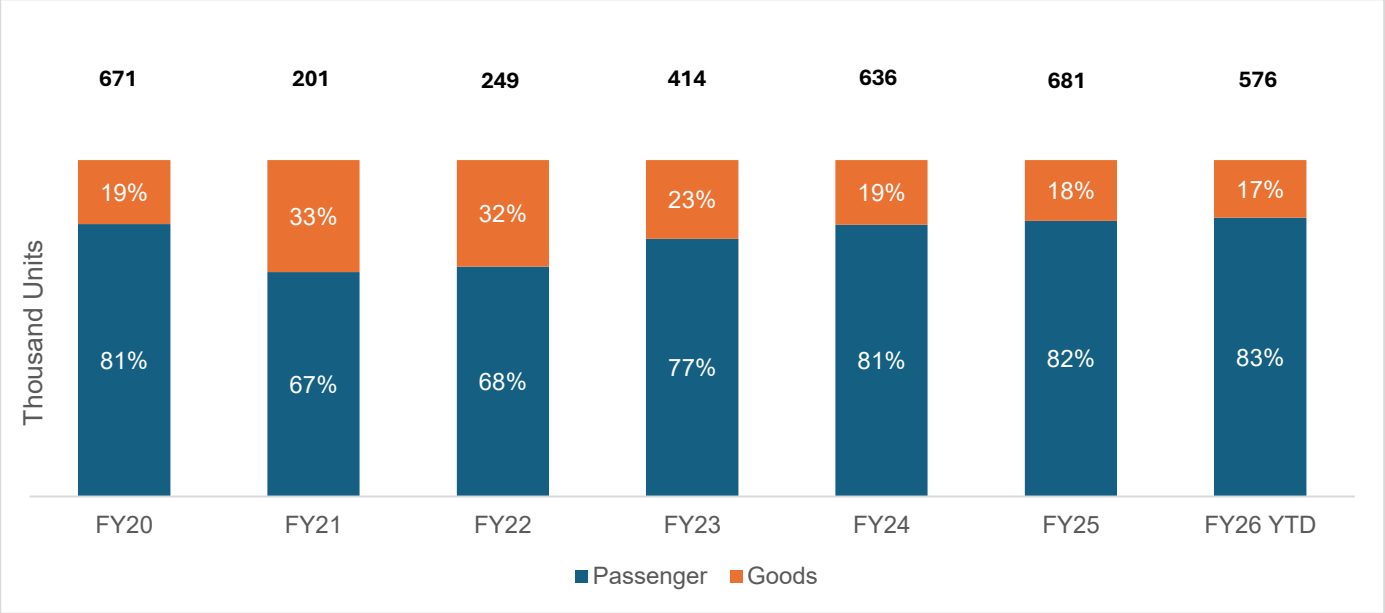
Note: For domestic sales - SIAM and Vahan considered, export data -SIAM is considered
YTD: April-December 2025
Source: SIAM, Vahan, CRISIL Intelligence

3W segment is categorized into two sub segments, i.e., Passenger vehicle (PV) and Cargo/Goods vehicle (GV). The passenger vehicle segment contributed the majority share to overall domestic sales of 3Ws, accounting for 81% in fiscal 2024. A significant decline was witnessed in fiscal 2021 in PVs due to the Covid pandemic and the BS-VI transition. The pandemic shored up preference for personal mobility and leading to a sharp decline in

shared mobility. However, there has been a slight recovery from fiscal 2022 as demand for shared mobility gradually increased. From a very low base of fiscal 2021, the passenger segment clocked a sharp growth at 43% CAGR till fiscal 2025. During Apr-Dec fiscal 2026, passenger segment clocked a healthy growth of 14% and the share of passenger segment was 83% compared to Apr-Dec of fiscal 2025.

The Goods segment accounted for 19% share in fiscal 2024 on a high base of fiscal 2023. The Goods segment contributed the highest 33% in 2021 with robust demand for last-mile delivery, particularly in urban areas. Electric mobility has been making strong presence on the back of a steady pick-up in last-mile connectivity demand and cargo requirement. Electric GV constitutes 28% of total GV sales in 2024, compared with 16% in 2023. The continuous growth shows immense potential, particularly in the electrification of 3Ws. The goods segment witnessed growth at 17% CAGR between fiscal 2021 to fiscal 2025 period. During Apr-Dec fiscal 2026, goods segment clocked a healthy growth of 12% and the share of the goods segment was 17% compared to Apr-Dec of fiscal 2025.

Segment-wise sales share, total volume for fiscal 2020-2026 YTD

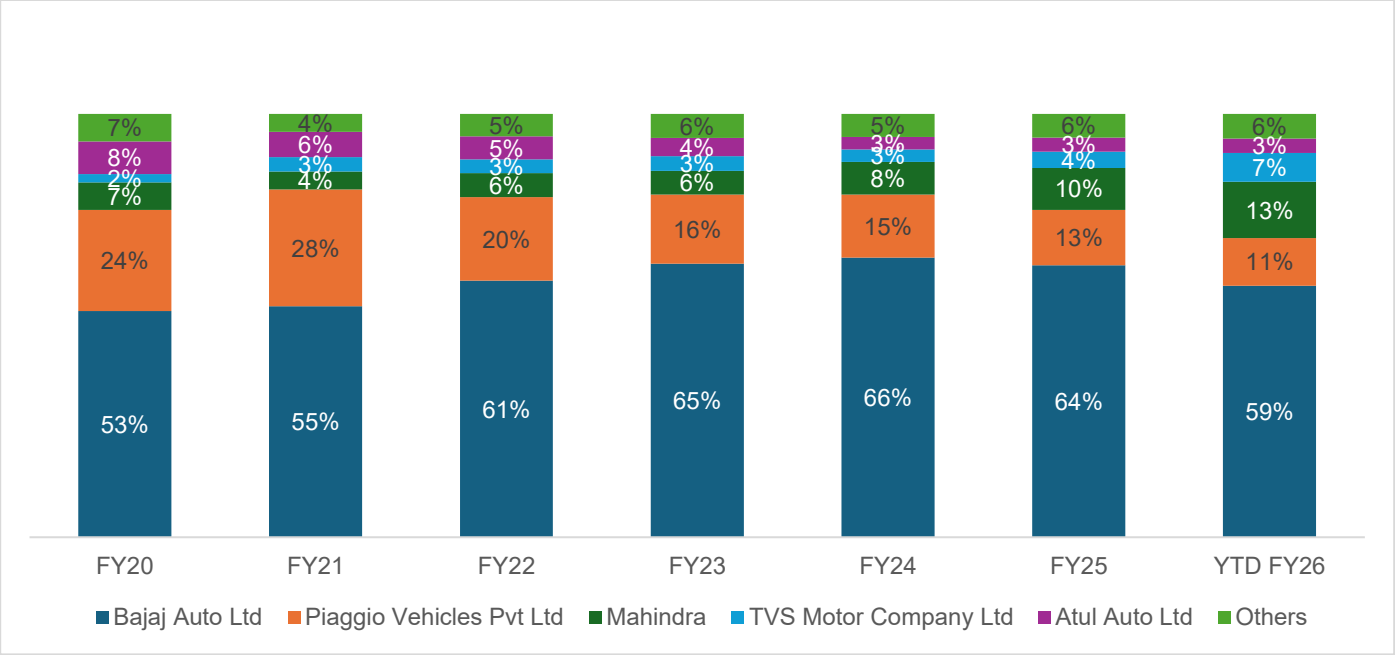


Note: YTD: April-December 2025
Source: Vahan, CRISIL Intelligence

Key players of three-wheeler Industry

The three-wheeler industry is dominated by few large players who contribute to more than 90% of the industry demand. The top players Bajaj, Piaggio, Mahindra, TVS and Atul Auto lead the industry primarily contributing to the industry demand. These players contributed nearly 94% of the industry sales during fiscal 2025 and nearly 94% of the industry sales during Apr-Dec fiscal 2026. Relatively smaller players and the recent entrants GEM have been increasing their share gradually in the industry.

Player wise sales contribution within the L5 three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retails of MLR Auto is considered for calculating share of Greaves Electric Mobility. Retail sales data from VAHAN has been considered for analysis.
YTD: April-December 2025
Source: VAHAN

Bajaj leads the three-wheeler industry with more than 60% share. In the last 5 years, Bajaj has, in fact, expanded its presence further in the industry and commanded approximately 64% share during fiscal 2025 from 54% share in fiscal 2020, although there is a drop in its market share at 59% in Apr-Dec fiscal 2026 period. Presence of Bajaj is dominant in the larger Passenger segment where its contribution has been above 60% throughout the last 5 years. Supported by increased presence in the E Auto segment, Bajaj extended its share further in the passenger segment to approximately 72% by fiscal 2025. This increased presence in the passenger segment boosted Bajaj's share in the overall three-wheeler industry to approximately 64% in fiscal 2025. Over and above the dominance in the passenger segment, the increased presence in the goods segment also aided Bajaj's share in the overall industry.

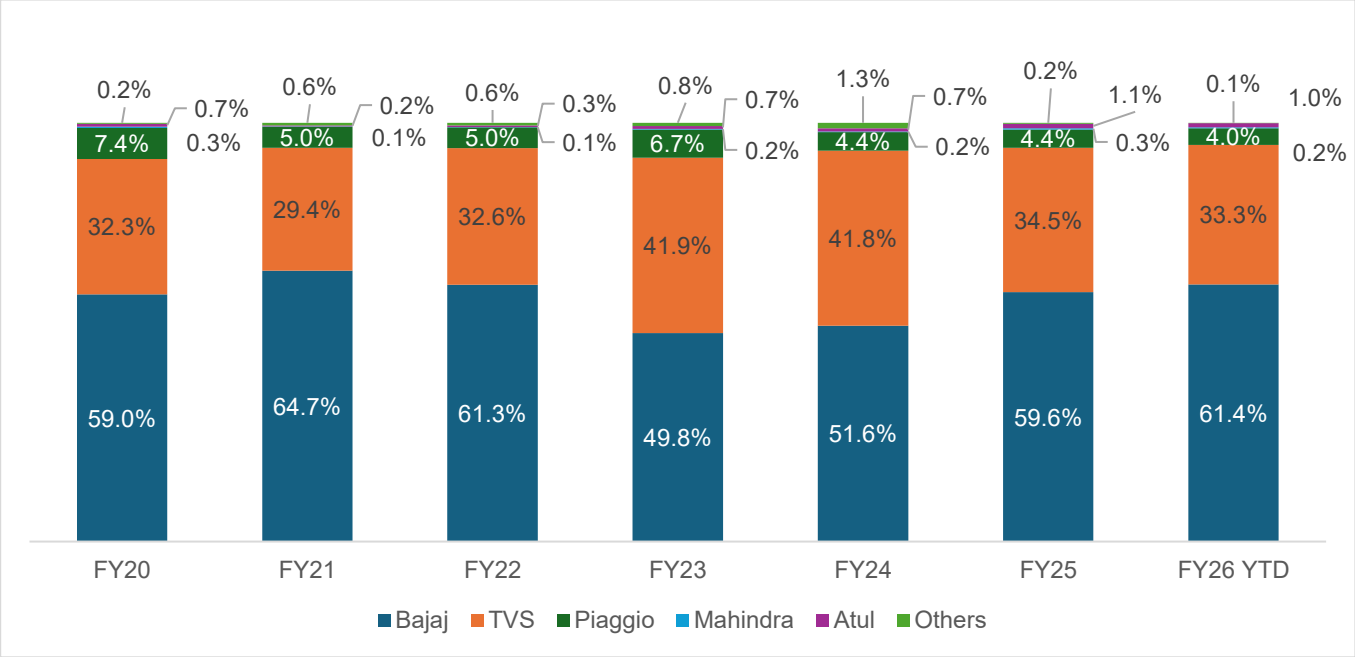
The second largest player Piaggio dominated the goods segment with more than13% share within the subsegment. However, it has been losing ground to Bajaj. The company has relatively lower share in the passenger segment. Amidst the intense competition, its share has dropped from 24% in fiscal 2020 to 13% by fiscal 2025 in the larger passenger segment, which further witnessed a slight drop to 11% during Apr-Dec fiscal 2026 period. While in goods segment, from a high base of approximately 40% in fiscal 2020 its share dropped to 22% in Fiscal 2025.

Another large player, Mahindra has been gaining ground in the industry led by its increasing presence in the passenger segment. The rising share of EVs within the industry coupled with company's higher presence in the E Auto segment is supporting this growth. Additionally, Mahindra managed to retain its presence in the goods segment backing the expansion in the overall three-wheeler industry.

Relatively smaller player, TVS, which is predominantly present in the passenger subsegment, has also maintained its presence in the 2-4% range and as of YTD fiscal 2026 it has increased to almost 7%. Company

has been gradually increasing its presence in the goods subsegment. On the other hand, Atul Auto has been losing ground to other larger players in the last 5 years.

Player wise export contribution within the L5 three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data
YTD: April-December 2025
Source: SIAM

Bajaj continues to dominate the export segment of the L5 three-wheeler industry with a consistently strong presence over the last five years. Its export share peaked at 64.7% in fiscal 2021 before tapering to around 59.6% in fiscal 2025. During Apr-Dec fiscal 2026 its export share has increased to 61.4%. Despite minor fluctuations, Bajaj has firmly held its leadership position, backed by an extensive global distribution network and a well-established product portfolio. While its share dipped to a low of 49.8% in Fiscal 2023 amidst intensifying competition, the subsequent recovery underscores Bajaj's resilience and continued relevance in international markets.

TVS is the second largest player in the export landscape, gradually expanding its share from 32.3% in fiscal 2020 to a high of 41.9% in fiscal 2023, before settling at around 34.5% in fiscal 2025. During Apr-Dec fiscal 2026 its export share has dropped marginally to 33.3%. Consistent growth in exports highlights the company's strategic push to tap into global markets, particularly with products tailored to regional needs. Meanwhile, other players like Mahindra, Piaggio, Atul Auto, and a few smaller manufacturers collective share remain marginal.

Key demand drivers for 3W are:

- Easier availability of finance: Sales growth in the domestic 3Ws industry was accelerated by financial incentives, such as subsidies, interest on subvention on loans, and hire-purchase schemes, tax benefit as an incentive to scrapping an old vehicle (unfit vehicle) along with the offering of the permit-exchange system at no additional cost, easier availability of finance, low interest rates, and higher funding provided by various banks and NBFC.

- Stable agricultural output: Agri GVA grew at a healthy pace of 4.6 % in fiscal 2025 supported by the healthy, timely and well-distributed thereby lifting agriculture income by bolstering crop output. The expected improvement in rural incomes, subdued inflation levels as well as the possibility of a rate cut will aid the three-wheeler industry growth.
- Growth in e-commerce The market has managed to attract not only customers but also global investors and has grown three times between fiscal 2018 and 2023 due to the deepening internet penetration, rising awareness about online shopping, and lucrative deals offered by well-established players and start-ups. In fiscal 2024-25, the e-commerce sector attracted investments worth INR 26,527 crore across 79 deals, accounting for approximately 31% of total start-up funding. This represents a 128% increase compared to 2023, when investments stood at INR 11,980 crore across 59 deals. India's e-commerce industry is entering a high-growth phase, supported by rising disposable incomes, rapid digital adoption, and increasing demand from Tier II and Tier III cities. This rapid growth has also led to an increased demand for efficient logistics and transportation solutions, particularly in the small load logistics segment, where the need for fast and reliable delivery of smaller packages has become a key differentiator for e-commerce companies. The last mile delivery segment, which accounts for a significant portion of the overall logistics cost, is expected to see significant investments in technology and infrastructure, including the adoption of electric vehicles (EVs) and alternative modes of transportation. There is a vast mobility-solution opportunity using EVs in the middle- and last-mile connectivity, with the 3Ws as delivery vectors. Furthermore, the rise of small load logistics has also led to the emergence of new business models, such as hyperlocal delivery and same-day delivery, which require specialized logistics solutions and partnerships with local players to ensure timely and efficient delivery of packages.
- Steady growth in industrial and services GVA: During Fiscal 2019-2024 period, Industry GVA clocked a heathy growth at 4.3% CAGR and in fiscal 2025 Industry GVA recorded 5.6% in fiscal 2025.Services GVA (approximately 55% share in total GVA), the services GVA witnessed a growth of 7.3% in fiscal 2025.

Electrification in 3Ws

With the emphasis on reducing the carbon footprint, electric vehicles (EVs) are gaining importance globally. India is also a signatory to the Paris Agreement under the United Nations Framework Convention on Climate Change. The country is also part of the EV30@30 campaign, targeting a 30% sales share for EVs by 2030.

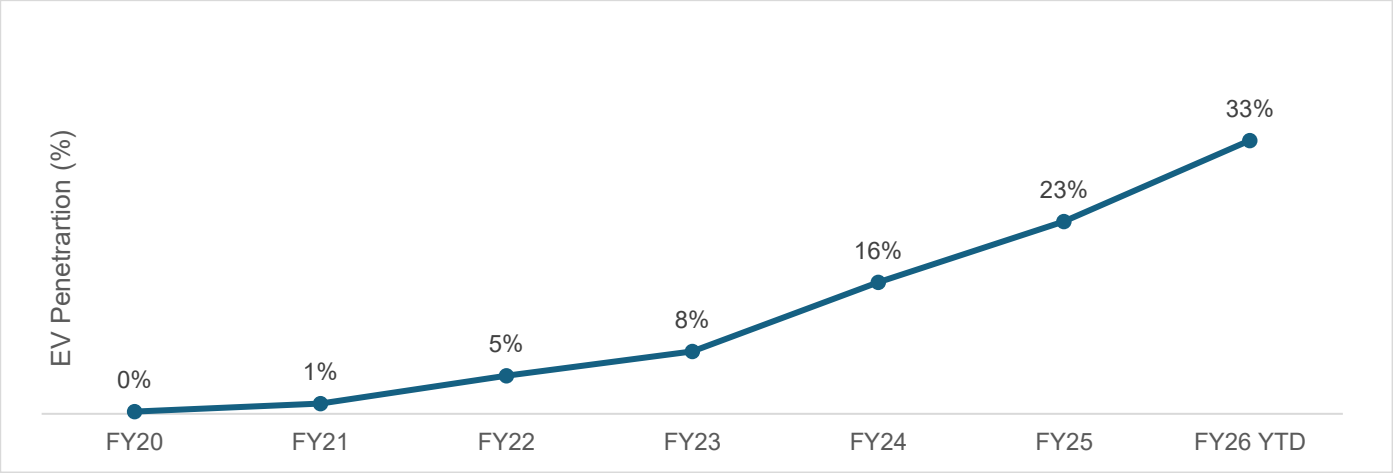
As of 26th December 2025, direct central subsidies for electric three-wheelers (L5 category) under the PM E-DRIVE scheme have concluded, as sales targets of approximately 2.88 lakh units were achieved. Furthermore, growing awareness, concern for environmental issues, and keener focus from automotive companies are driving electrification in India. The EV segment received a real thrust in the past two years with model launches, increasing awareness, elevated fuel prices, and improvement in infrastructure support.

The E Auto retails sales has grown at a stupendous pace of 139% CAGR between fiscal 2019 and fiscal 2025. The e-3Ws with high assured utilisation rates are more profitable for businesses, as they become economical to operate at higher utilisation. E-commerce giants are preferring e-autos for clean and economical last-mile connectivity.

Conversely, the sales of ICE vehicles have contracted at approximately 4% during the same period, supporting the sharp growth in the E Auto penetration from an insignificant 0.3% in Fiscal 2020 to reached 23% by Fiscal 2025.

In fact, it increased to approximately 33% during Apr-Dec fiscal 2026. This indicates remarkable shift towards electrification in three-wheeler segment.

EV penetration in 3Ws (L5 category)



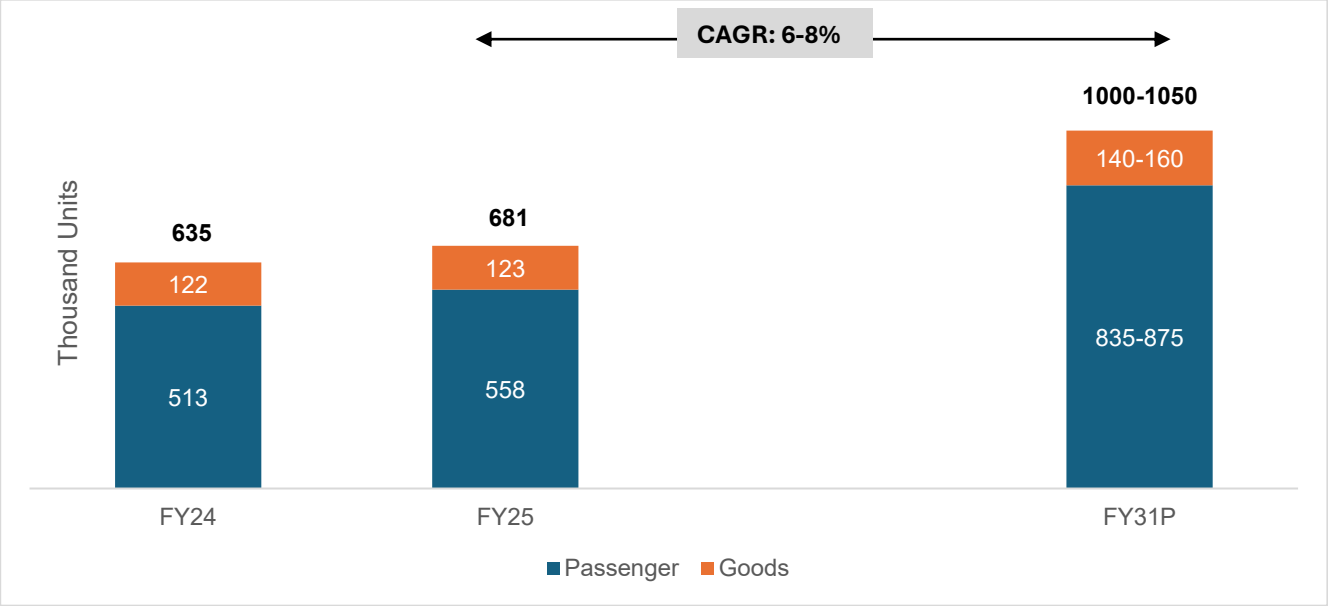
Note: YTD: April-December 2025
Source: Vahan, CRISIL Intelligence

Outlook of Indian three-wheeler industry (fiscal 2025 to 2031P)

Domestic sales

The domestic three-wheeler market grew at 7% on-year in fiscal 2025 from the high base of fiscal 2024. However electric vehicle penetration has reached to 23% in fiscal 2025. The availability of finance, alternative fuels and state subsidies contributed majorly to the growth. Between fiscals 2025 and 2031, domestic 3Ws are projected to record the growth of 6-8% CAGR, led by an 6-8% CAGR in the passenger segment and 3-5% in the goods segment.

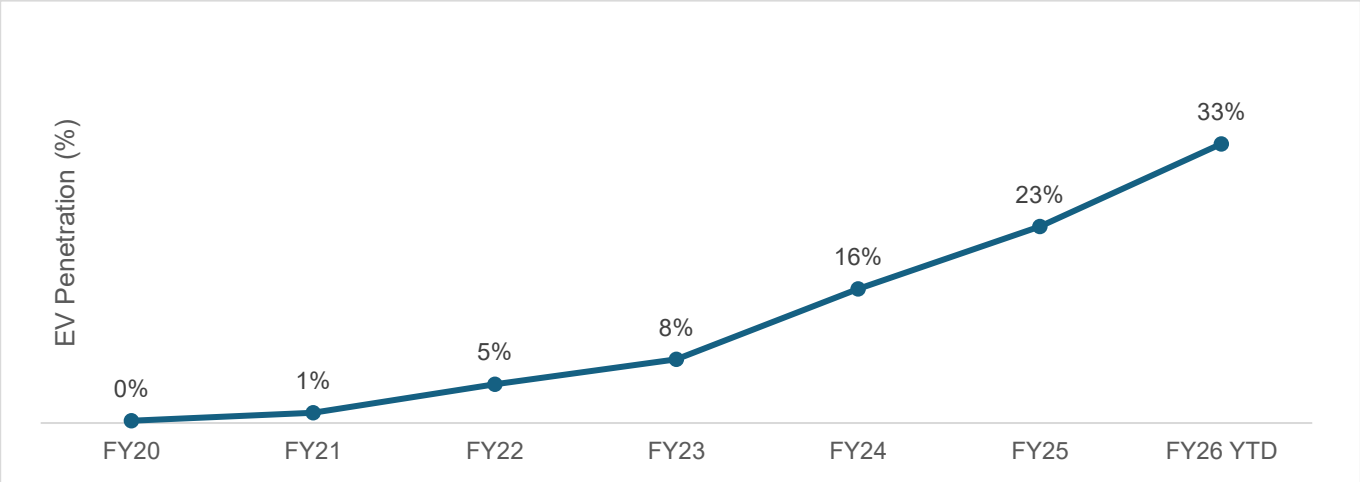
Domestic sales outlook for FY25-31P (in volume terms)



Note: E-Estimated P- Projected, Electric 3Ws do not include e-rickshaws
Source: SIAM, Vahan, CRISIL Intelligence

Review of Indian Electric Three-Wheeler Industry

EV penetration within the L5 three-wheeler industry



Note: Includes E Auto (L5) subsegment sales data, does not include E rickshaw (L3) subsegment data, Retail sales data from VAHAN has been considered for the analysis.

YTD: April-December 2025

Source: VAHAN

Support from government in the form of incentives, entry of legacy players in the EV subsegment, improvement in the EV supply led the growth of EVs within the three-wheeler industry. The shift of customer base from ICE segment to EVs for the low operating costs and no permit requirements provided an additional kicker to the EV demand post pandemic.

In turn the EV penetration within the three-wheeler industry increased from an insignificant 0.3% in fiscal 2020 to a sizeable 23% by fiscal 2025. Continuing the same trend, it increased to approximately 33% during Apr-Dec fiscal 2026.

Competitive Landscape within the E Auto subsegment

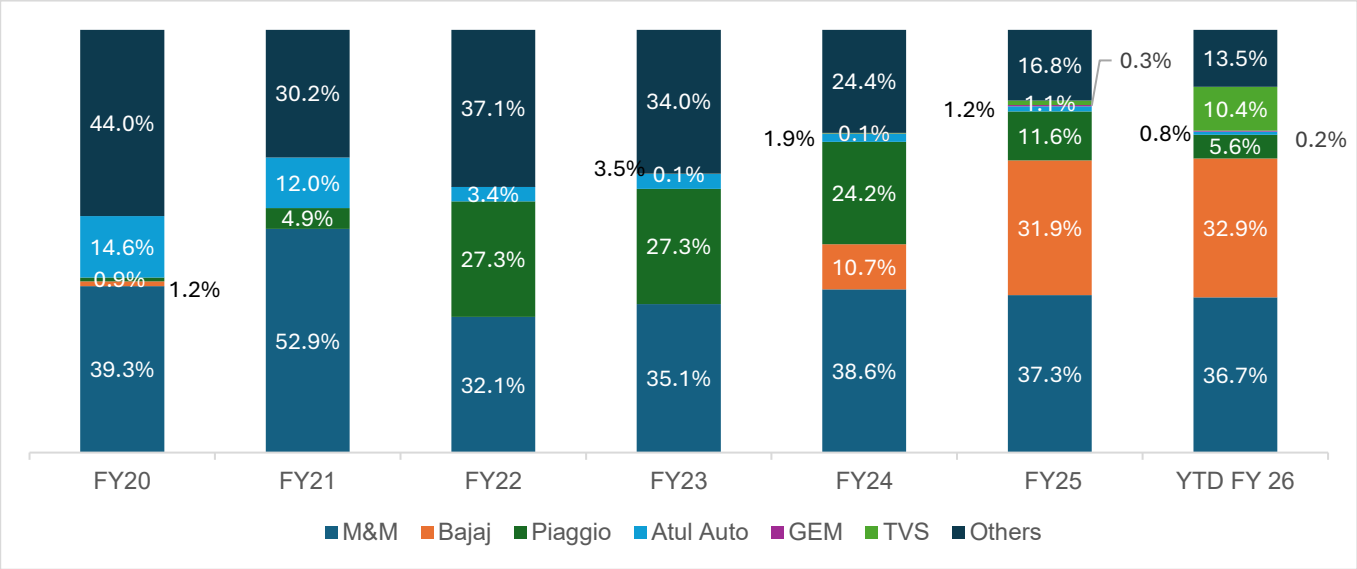
The E Auto segment was relatively fragmented, especially during the pre-covid period. Amongst the larger players in the three-wheeler industry, Bajaj, Mahindra, Piaggio & Atul Auto had a sizeable share.

Share of large players increased in the last 5 years with increased product launches, improvement in vehicle supply as well as expansion in the reach.

M&M continued to dominate the E Auto space in the last 5 years, having more dominance in the larger passenger segment, aiding its share in the overall E Auto subsegment.

TVS Motor has strengthened its market position in the e-auto segment driven by the expansion of its product portfolio, including the launch of the TVS King EV Max in January 2025 and the TVS King Cargo HD in August 2025, along with a sustained expansion of its dealership network across the country.

Player wise contribution within the E Auto segment



Note: Includes E Auto (L5) subsegment sales data, does not include E Rickshaw (L3) subsegment data, Retail sales data from VAHAN has been considered for E Auto segment. Retails of MLR Auto are considered for calculating share of Greaves Electric Mobility GEM.

YTD: April-December 2025

Source: VAHAN

Review and outlook for global e-LCV industry

Review of global e-LCV industry (CY22-CY25)

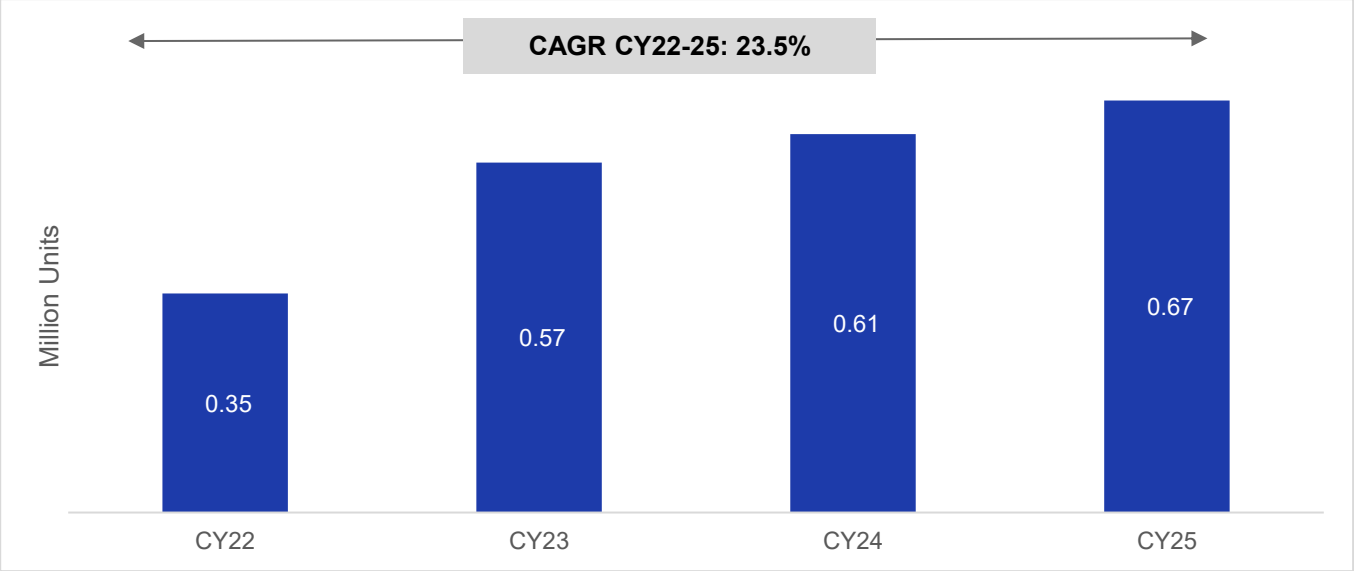
The global electric light commercial vehicle (e-LCV) industry experienced a remarkable growth trajectory, expanding at a compound annual growth rate (CAGR) of 23.5% between CY2022 and CY2025. Although the industry started from a relatively low base, the entry of established and emerging players such as Chery (KARY) Automobile, JAC Motors, Mitsubishi Motors, and Tata Motors accelerated the growth of the eLCV industry.

The post-COVID boom in e-commerce and last-mile delivery services, driven by platforms like Amazon, DHL, FedEx, Blinkit, Noon, Zomato, and Swiggy, created a surge in demand for efficient urban transport solutions. This, in turn, fueled the growth of the eLCV industry, as companies sought to capitalize on the increasing need for sustainable and reliable transportation options.

Policy and regulatory shifts also played a pivotal role in driving the adoption of electric LCVs. Stricter emission regulations and net-zero commitments accelerated the transition to electric LCVs, as governments and companies alike recognized the importance of reducing their environmental footprint.

From 0.35 million units in CY2022, the industry witnessed a sharp growth at 23.5% CAGR to reach 0.67 million units by CY2025.

Global eLCV industry sales trend

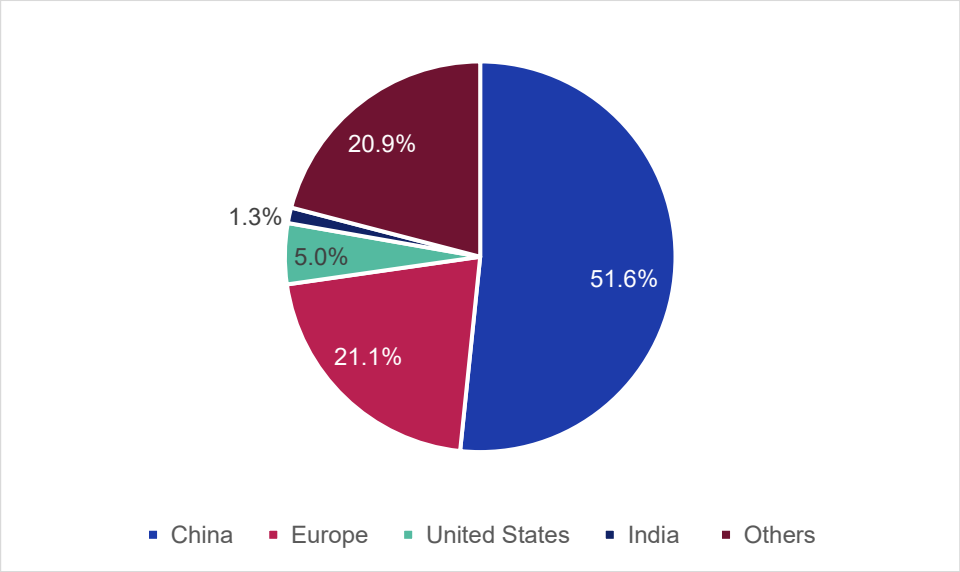


Note: E-LCVs include 4 wheel vehicles under gross vehicle weight ≤ 3.5 tonnes), designed for commercial purposes like urban deliveries, powered entirely by electric batteries.
Source: Nexdigm data

The global electric light commercial vehicle (eLCV) market is dominated by China, which accounted for a significant 51.6% share during CY2025. This was largely driven by the country's robust domestic demand, coupled with its well-established manufacturing capabilities. Europe followed with a notable 21.1% share, driven by stringent emission regulations and the growing need for sustainable urban delivery solutions. The United States held a smaller but still notable 5.0% share, benefiting from government incentives that encourage the

adoption of eco-friendly vehicles. India's share remained relatively modest at 1.3%, presenting opportunities for growth and development in this emerging market.

Global eLCV regional sales split CY2025



Source: Nexdigm data
Note: Others include Kenya, Sweden, South Korea, Africa, Vietnam, Mexico, Brazil, South Africa, as well as other Latin American and Middle Eastern markets

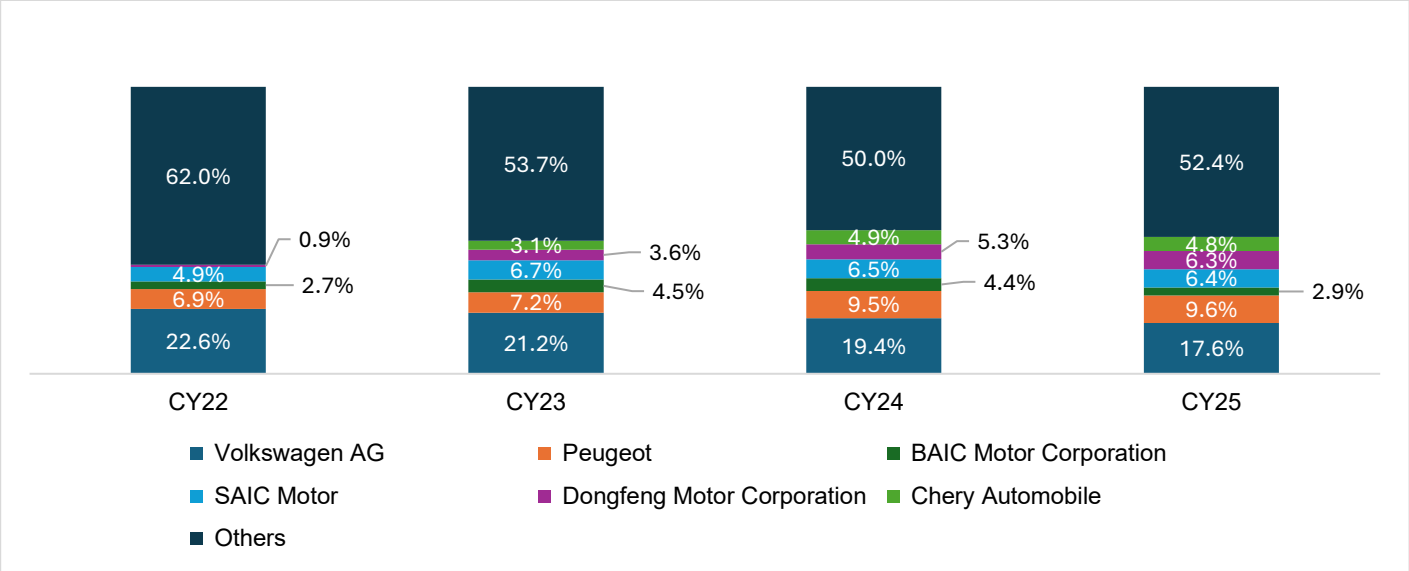
Competitive Landscape

The global electric light commercial vehicle (eLCV) market is led by Volkswagen AG, which held a dominant position with a 17.6% market share in CY2025. The company's strong performance across Europe and the US, coupled with its local manufacturing capabilities in Europe, enabled it to maintain its leadership position. The top five players in the market, including Peugeot, BAIC Motor, SAIC Motor (Maxus), and Dongfeng Motor, collectively accounted for 42.8% of the total market share during the year. Peugeot has made significant strides in the eLCV market, particularly in Europe and the UK, driven by its strategic partnerships and strong market presence.

BAIC Motor Corporation ranked third in the eLCV market, largely due to the strong performance of its subsidiary, BAIC Foton. The company's domestic manufacturing capabilities and growing export demand contributed to its sales growth. Furthermore, BAIC has also been expanding its global footprint through partnerships with companies like Piaggio in Europe and Chia Tai in Thailand.

SAIC Motor (Maxus) and Dongfeng Motor Corporation are also prominent players in the global eLCV market, driven by their strong domestic presence in China and early entry into the electric commercial vehicle space.

OEM wise contribution in global eLCV sales



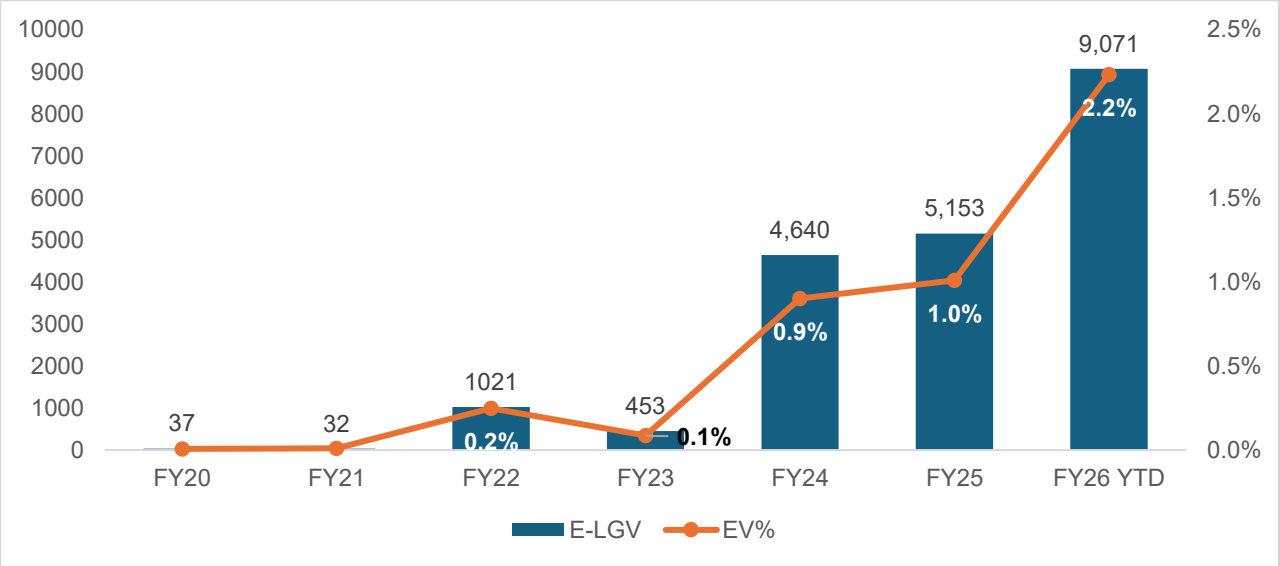
Source: Nexdigm data

.

Review and outlook on the Indian Electric Light Commercial Vehicle Industry (e-LCV, 0 to 7.5 tons)

Review of Indian domestic e-LCV industry (fiscal 2020-25)

Electrification in the commercial vehicle (CV) segment in India remains at a nascent stage, with limited penetration compared to passenger vehicles. However, the shift toward electric mobility is gradually gaining traction, particularly within the Light Commercial Vehicle (LCV) category—specifically in the sub-1 ton and pickup segments. This trend is largely driven by the suitability of LCVs for electrification, as these vehicles typically operate over shorter distances, minimizing concerns around battery range and charging infrastructure. Furthermore, electric LCVs (e-LCVs) offer a compelling value proposition for sectors like e-commerce and last-mile delivery, where they help reduce operating costs and align with broader sustainability goals.



Source: CRISIL Intelligence, Vahan
Note: The above data is taken from Vahan & may vary due to reporting discrepancies and may be subject to revision upon future updates

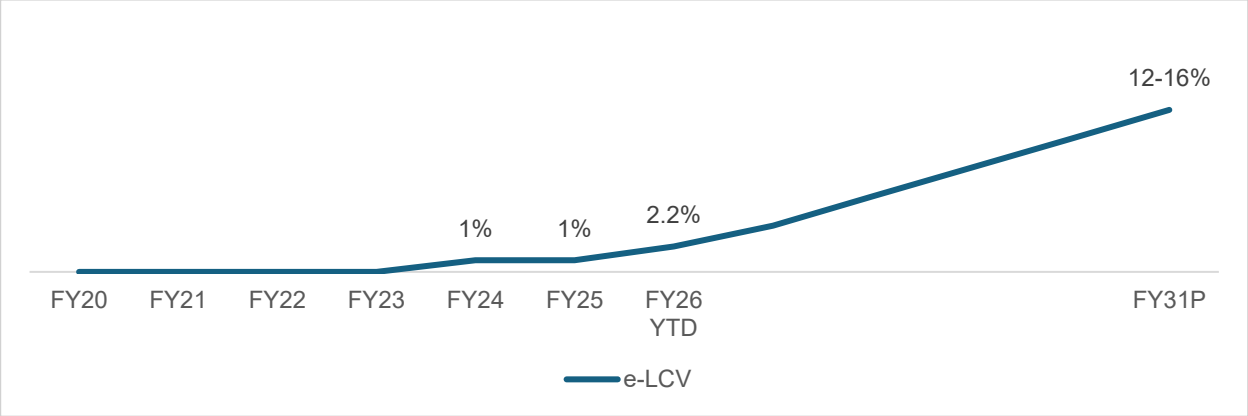
Currently, electric trucks are being piloted mostly for intra-city logistics and last-mile delivery by e-commerce companies and a few logistics players. These are generally in the 3.5-ton to 7.5-ton category, suited for short, fixed routes with overnight depot charging. OEMs such as Tata Motors, Ashok Leyland, Mahindra & Mahindra and Eicher are conducting trials and have unveiled electric truck prototypes, but widespread commercial deployment is limited.

Over the last two years, the segment has witnessed a substantial increase in volumes, underscoring the rapid transition toward electric mobility in the commercial vehicle space. Tata's aggressive expansion and technology-driven approach have played a pivotal role in reshaping the competitive dynamics and accelerating market growth.

Additionally, initiatives under the National Electric Mobility Mission Plan (NEMMP) and the PLI scheme for Advanced Chemistry Cell (ACC) batteries aim to lower battery costs and promote domestic manufacturing, which could help reduce the cost barrier for electric trucks in the future. A few state EV policies (e.g., Delhi, Maharashtra,

and Gujarat) include incentives or road tax waivers for electric commercial vehicles, although uptake remains minimal due to limited model availability

EV Penetration in LCV

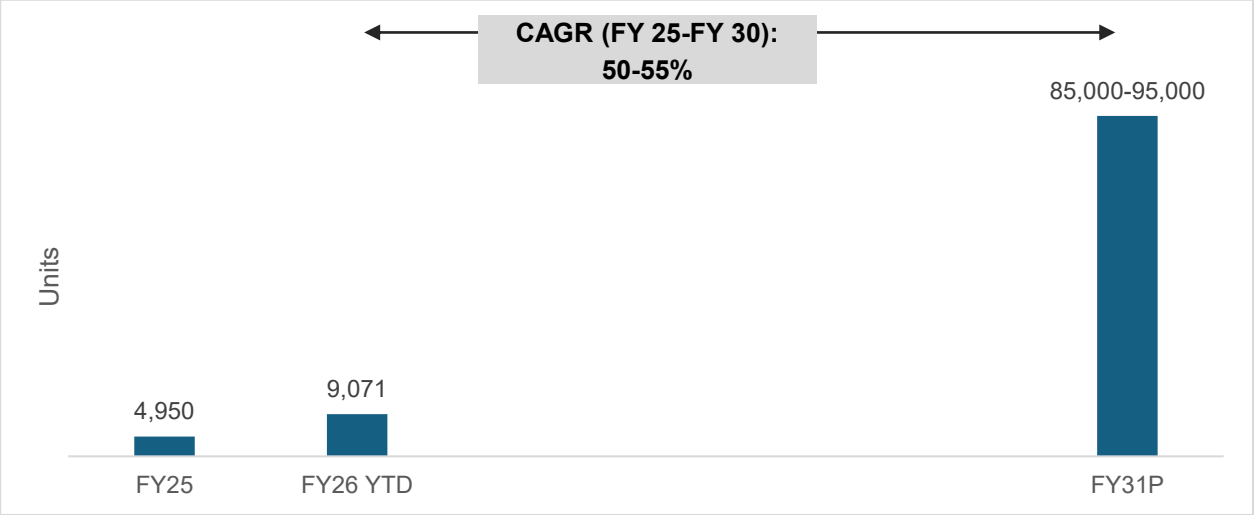


Source: CRISIL Intelligence, VAHAN

The current EV penetration in LCV is around 2.2% as of December 2025. Currently, most of the EVs used in the commercial segment as goods carriers are three-wheelers. However, as the cost differential between electric and diesel vehicles starts reducing, we expect new models to be launched. This will drive sales in the segment as the third-mile logistics and local distribution of goods are well-suited applications for EVs. Tata Ace/ Ace Pro EV, Euler Turbo EV 1000, Eicher Pro X Series, Omega M1KA, JEM Tez, Mahindra Zeo, Switch Mobility IEV series, are some of the e-LCV currently in the market.

Consequently, as depicted in the chart above, EV sales in the LCV goods segment can rise to 85,000-95,000 vehicles by fiscal 2031, as CNG offers better TCO in near future and will be preferred over electric variants. Further EV penetration is expected to grow and reach 12-16% by fiscal 2031

Outlook for Domestic e-LCV



Source: CRISIL Intelligence, VAHAN

The government's continued push towards clean mobility through a combination of policy initiatives, financial incentives, and regulatory support is set to play a pivotal role in accelerating the adoption of electric light commercial vehicles (e-LCVs) in India. Various measures such as subsidies under the FAME II scheme, lower GST rates, state-level incentives, and tax benefits for EV buyers are collectively making electric LCVs a more economically viable and attractive option for transporters and fleet operators.

As last-mile delivery and intra-city logistics continue to expand with the growth of e-commerce, there is a growing need for cost-efficient, sustainable transport solutions. e-LCVs, with their lower operating and maintenance costs compared to their internal combustion engine (ICE) counterparts, are well positioned to meet this demand. Additionally, the increasing availability of charging infrastructure and OEMs' growing focus on introducing competitive and reliable electric models are further contributing to market readiness.

These supportive dynamics are expected to drive strong growth in the e-LCV segment, with industry estimates projecting a robust compound annual growth rate (CAGR) over the next several years. By 2031, the annual volumes of e-LCVs are anticipated to reach approximately 85,000 to 95,000 units. This marks a significant leap from the current base, underscoring the transformative potential of electrification in the commercial vehicle space.

Review and outlook on the Indian Heavy Commercial Vehicles industry (>7.5T)

Review of Heavy Commercial Vehicles industry

The domestic heavy commercial vehicle (HCV) industry experienced notable volatility in sales volumes over the past few fiscal years, shaped by economic downturns, pandemic-induced disruptions, and a gradual recovery backed by infrastructure spending and replacement demand.

In fiscal 2020, the HCV market contracted sharply to 224 thousand units due to a downturn in economic activity and weakened fleet demand. The situation worsened in fiscal 2021, with volumes falling further to 161 thousand units as industrial activity slowed and fleet operators deferred capital expenditure amidst pandemic uncertainties.

However, the segment regained traction in fiscal 2022, recording a notable recovery to 241 thousand units, driven by improved freight availability and a gradual uptick in infrastructure projects. This positive momentum accelerated in fiscal 2023 as sales rose significantly to 359 thousand units, supported by strong replacement demand, rising freight rates, and enhanced fleet utilization. Fiscal 2024 further built on this revival, with sales reaching 374 thousand units. This growth was underpinned by robust infrastructure spending, better transporter margins, and fleet modernization initiatives. Interestingly, the trend has plateaued in fiscal 2025, with volumes remaining flat at 374 thousand units. This stability may indicate a maturing demand cycle, influenced by cautious expansion strategies and a possible saturation in fleet replacement activity.

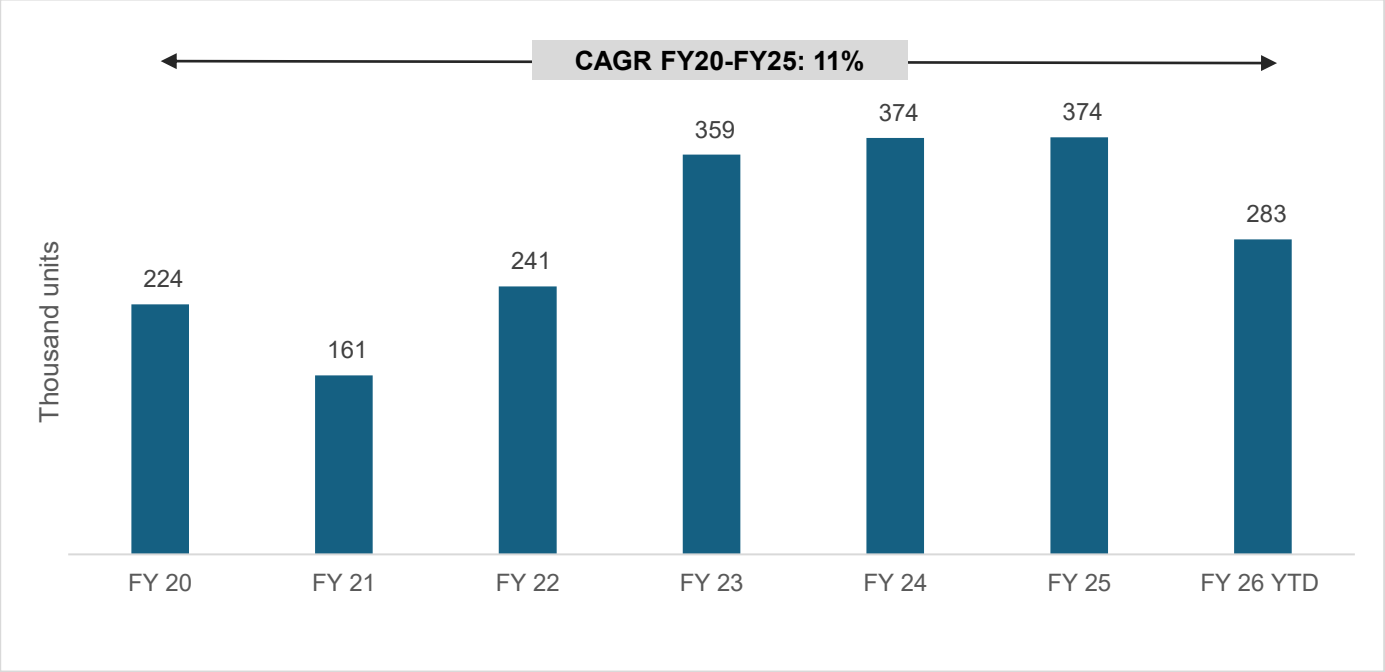
The HCV industry comprises two primary segments: Intermediate, Medium & Heavy Commercial Vehicles (IMHCV) and Buses. The IMHCV segment, which includes core freight carriers and heavy-duty applications, has historically dominated industry volumes, accounting for over 90% of total sales during the fiscals FY20–FY22. Even during the pandemic-induced slump, IMHCV volumes remained resilient due to their critical role in supporting freight movement and infrastructure development.

While the Bus segment, catering to public and institutional transportation, saw a steep decline during the pandemic, with volumes plunging from 40 thousand units in FY20 to a mere 7 thousand in FY21. This drop was largely attributed to school closures, reduced inter-city travel, and lower demand in the public mobility space. However, a gradual rebound began in FY22, and gained momentum in FY23–FY25, with sales improving to 66 thousand units in FY25, supported by public transport services, growing demand for low emission buses (CNG and electric) demand in metro and tier-2 cities, and fleet modernization initiatives.

Together, these segments reflect the broader recovery and shifting dynamics within the HCV market. While IMHCVs continue to anchor industry with consistent demand from logistics and construction sectors, the improving performance of the bus segment signals renewed traction in public mobility and institutional transport.

The market has grown by 9% in fiscal 2026 YTD as compared to the same period in FY 25, indicating an overall market growth in fiscal 2026 in this segment.

Review of Heavy Commercial Vehicles industry (Includes buses), Fiscal 2020-2026 YTD (in volume terms of sales)



Note: IMHCV segment includes >=7.5 tonnage and buses,
FY 26 YTD includes April 2025- December 2025 data
Source: SIAM, CRISIL Intelligence

Outlook of the Indian Heavy Commercial Vehicle industry

Commercial Vehicle industry, encompassing Intermediate, Medium and Heavy Commercial Vehicles (MHCV), and Tippers, has witnessed fluctuating yet resilient performance in recent years. Fiscal 2023 marked a strong recovery, driven by robust replacement demand, infrastructure development, and increased government spending. However, fiscal 2025 growth has moderated, reflecting the impact of economic headwinds and supply-side challenges.

The segmental dynamics of the commercial trucks industry highlight a transition toward a more balanced fleet mix, MHCVs recovering, and tippers maintaining steady demand. The sustained push for infrastructure development, increased logistics digitization, and policy-driven fleet modernization is expected to shape the segment-wise trends in the coming years.

Looking ahead, the commercial vehicle industry is expected to record a steady growth trajectory with a projected CAGR of 2-4% from FY25 to FY31.

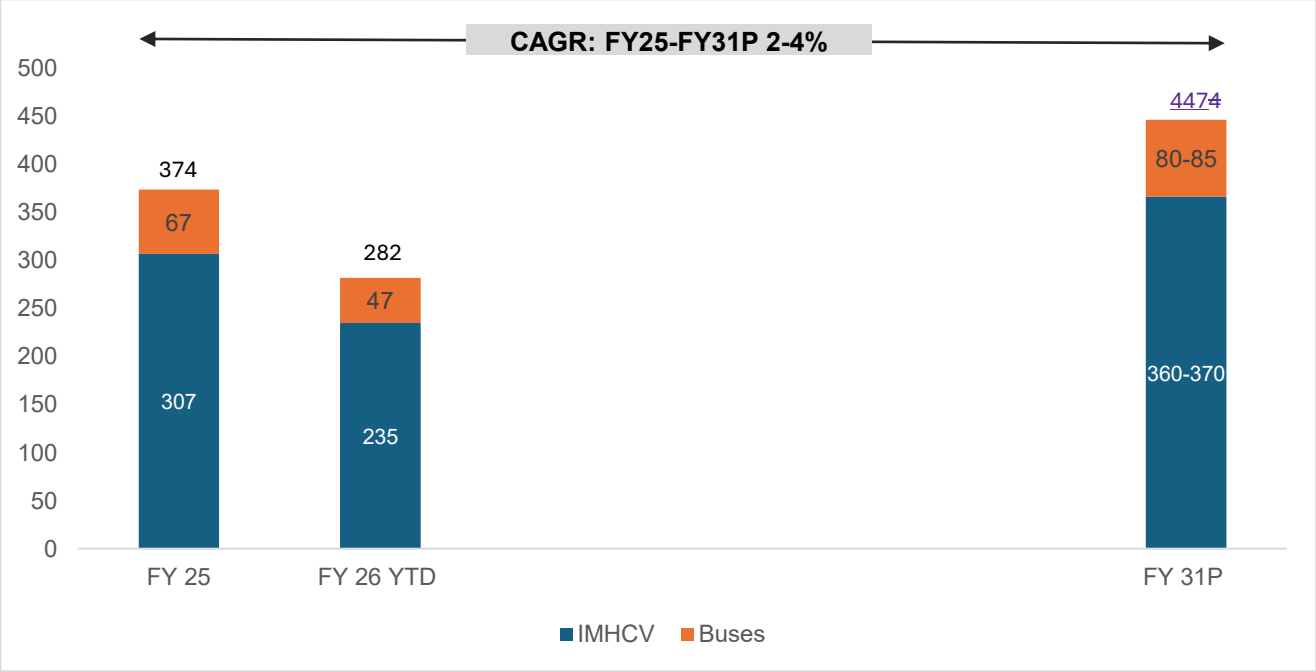
The MHCV industry is expected to grow significantly, with a compound annual growth rate (CAGR) of approximately 2-4% projected from fiscal year 2025 to fiscal year 2031.

Long-term MHCV sales are likely to be driven by several factors, including the country's improving industrial activity, consistent agricultural output, and the government's continued emphasis on infrastructure development. However, volume growth may be limited due to efficiencies gained from the implementation of the Goods and Services Tax (GST), the development of improved road infrastructure, and the commissioning of the dedicated goods corridor (DFC). Nonetheless, the industry remains on a promising growth trajectory in the coming years.

Over the next six years (fiscal 2025-2031), industry GVA is expected to be robust, driven by the government's emphasis on "Make in India." Moreover, improvement in infrastructure and higher expected corporate expenditure is likely to support the capex cycle going forward post-fiscal 2024. India's ambitious infrastructure development plans, including the Bharatmala Pariyojana and Sagarmala programs, are expected to drive commercial vehicle demand during fiscal 2025 to fiscal 2031, as the resulting increase in construction and logistics activities boosts demand for heavy and medium commercial vehicles.

Further, with the recent budget announcements, the National Manufacturing mission has been announced covering small, medium, large industries. It will also support clean tech, build ecosystem for solar cells, EV batteries, high voltage transmission equipment, which will boost the demand in the sector.

The government will create a ₹1 lakh crore Urban Challenge Fund aimed at transforming cities into growth hubs. The fund will finance 25% of the cost of bankable projects, with an allocation of ₹10,000 crore for 2025-26, which is also expected to boost the demand for heavy commercial vehicles.

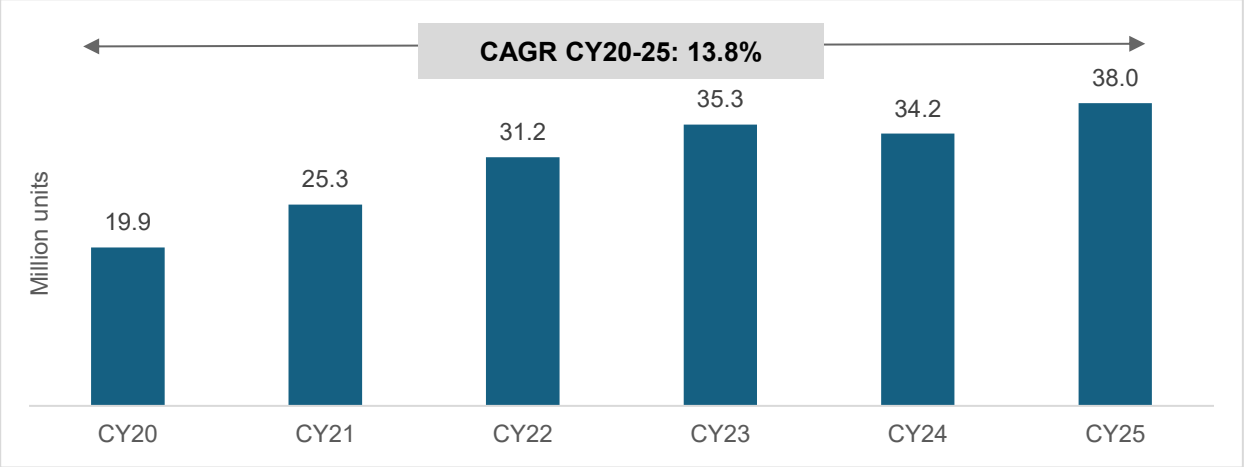


Note: HCV segment includes >=7,5 tonnage
Buses segment only includes IMCV buses
P: Projected
Source: SIAM, Crisil Intelligence
FY 26YTD: April 2025- December 2025

Review and outlook for global E Bike industry

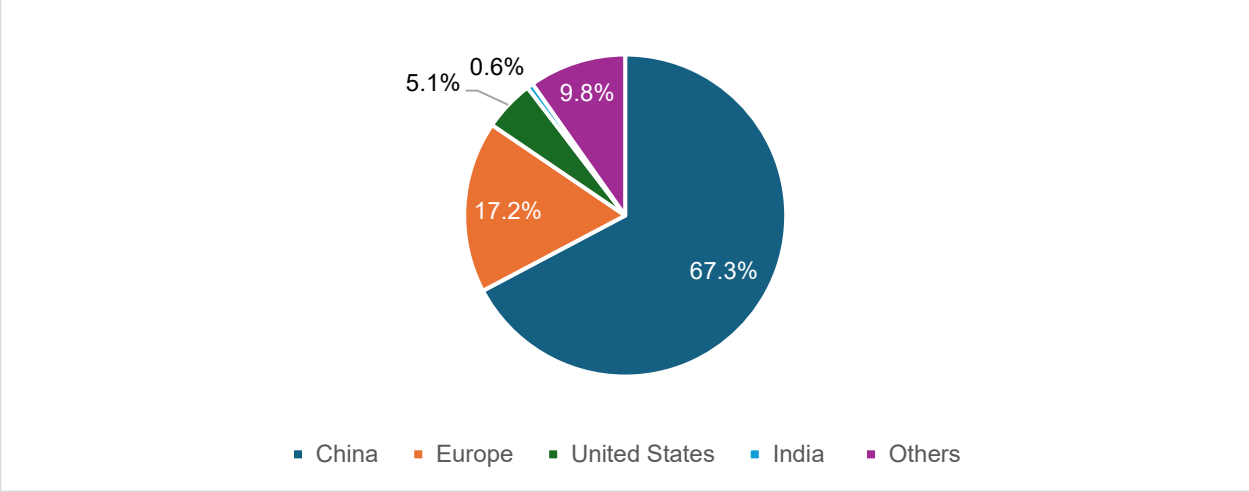
The global E bike industry grew at a healthy 13.8% CAGR during CY2020 to CY2025 period. The industry witnessed healthy growth in the last few years led by the rising awareness, government push towards sustainable mobility, technological advancement, emergence of new models of transport including subscription as well as increased focus on health and wellness especially post the pandemic. Additionally, portfolio expansion and push from manufacturers including major players like Yadea & AIMA provided an added boost to the E bikes industry sales.

Global E bike industry sales trend



Note: E bike denotes electric bicycles or motorised bicycles which does not include tricycle, E kick scooter or Self balancing vehicles
Source: Nexdigm data

Global E bike regional sales split CY2025



Source: Nexdigm data

China dominates the global e-bike market and contributed 67.3% to the global sales in CY2025. Supportive government policies, development of cycling infrastructure as well as strong manufacturing base aided China's numero uno position.

China is followed by Europe at 17.2% share and United States at 5.1% during the year.

For European countries, particularly Germany and the Netherlands, followed by the United States, the demand is driven by a combination of supportive government policies, well-developed cycling infrastructure, and growing environmental awareness among consumers.

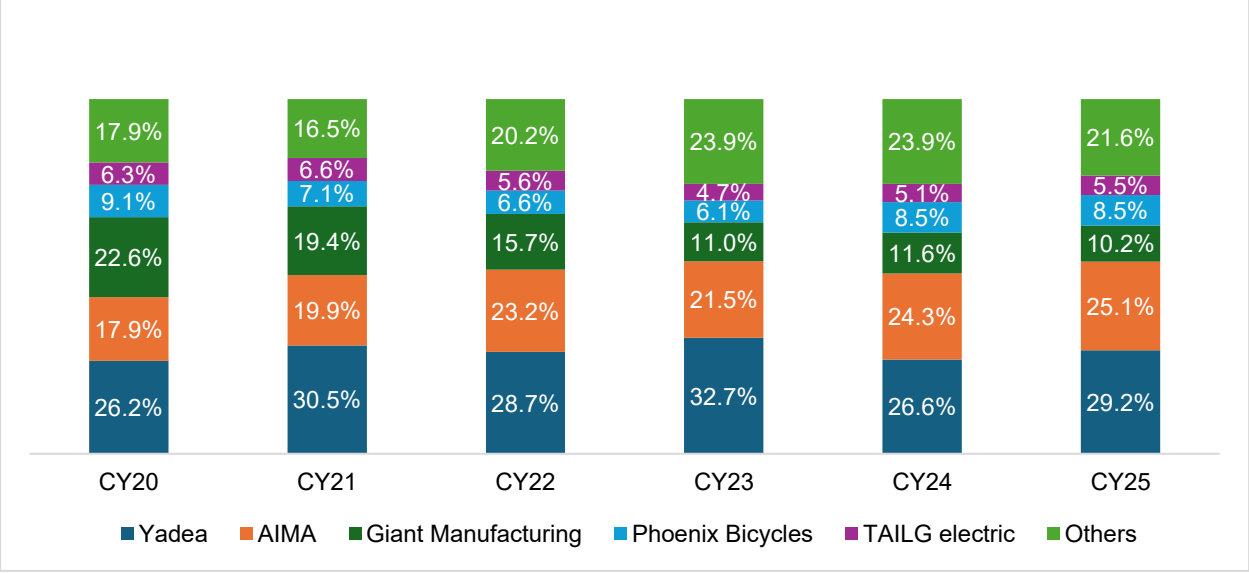
On the other hand, India's E bike market is currently at a nascent stage.

Competitive Landscape

In line with the dominance in global sales, Chinese Manufacturers lead the E bike segment where Yadea is the leading player in the global e-bike market, holding a 29.2% share (CY2025). This strong position is largely the result of China's leading position in global sales coupled with company's substantial investment in research and development over the years

Another Chinese player AIMA followed closely with 25.1 % share during CY2025. AIMA has expanded its share over the years amidst continued expansion in newer regions. Taiwan based Giant Manufacturing is also one of the notable contributors to the E bikes industry.

OEM wise contribution in global E Bike sales



Note: Data includes High speed as well as low speed electric vehicles
Source: Nexdigm data

Growth drivers for global E Bikes segment

The e-bike industry has experienced significant growth in recent years and expected to continue its momentum going ahead. There are several factors that are driving this trend including:

- Environmental Concerns: Increasing awareness about climate change, air pollution, and the need for sustainable transportation has led to a surge in demand for eco-friendly modes of transportation, including e-bikes. Governments, environmental organizations, and consumers are increasingly prioritizing solutions that reduce greenhouse gas emissions, combat climate change, and promote cleaner urban mobility. In this context, the global electric bicycles market is gaining momentum as an integral part of the transition toward greener transportation systems.
- Government Incentives and Policy Support: Governments around the world are actively promoting the adoption of electric bicycles (e-bikes) through supportive policies, financial incentives, and structured subsidy programs. As nations strive to reduce carbon emissions, ease urban congestion, and promote sustainable mobility, e-bikes are recognized as a viable alternative to traditional vehicles. In response, national and local authorities are implementing trade-in schemes, purchase subsidies, tax benefits, and regulatory support to encourage both consumers and businesses to shift toward electric mobility. These initiatives are significantly influencing consumer behavior and boosting e-bike sales globally.
- In China, the Ministry of Commerce, along with four other departments, unveiled updated trade-in policies for electric bicycles, effective from 2025. Under this scheme, individuals who trade in old electric bicycles for eligible new models can qualify for government subsidies. Additionally, the Chinese government has invested significantly in cycling infrastructure, including dedicated bike lanes, which has further encouraged the use of e-bikes and promoted a wider shift toward E Bikes.
- Europe, with its robust cycling infrastructure, also supports e-bike adoption through a variety of incentive programs. Countries across the region offer government-backed rebates and subsidies to reduce upfront costs.
- Technological Advancements: The rising global demand for eco-friendly commuting options has pushed electric bicycle manufacturers to enhance their product portfolios with technologically advanced models. Collaborations between e-bike manufacturers, technology companies, and other industry players are driving innovation and growth in the industry. Innovations in core components such as batteries, motors, digital interfaces, and structural designs are significantly improving the performance, safety, and user experience of e-bikes.
- Such rapid technological advancements in electric bikes are not only enhancing product capabilities but are also expanding their appeal across different consumer segments and global markets, thereby driving the growth of the global electric bicycles market.
- Increasing urbanization & congestion: Urbanization, rising fuel costs, and increasing environmental concerns are driving the shift toward micro-mobility solutions, particularly electric bicycles (e-bikes). As cities worldwide struggle with traffic congestion, long commutes, and air pollution, e-bikes are emerging as an efficient and cleaner alternative for short-distance travel. Many European cities have included cycling as a core part of their transportation culture. According to the European Commission, cities such as Amsterdam, Seville, Vaduz, Copenhagen, Ghent, Berlin, and Malmö are well known for incorporating bicycles into their urban lifestyle.
- Increasing focus on health and wellness: The COVID-19 pandemic brought a major shift in lifestyle priorities, leading people across the globe to become more focused on health and wellness. In response, many individuals began seeking healthier and safer modes of transportation, and electric bicycles quickly gained popularity for offering both fitness benefits and convenience.

- As health consciousness increased worldwide, electric bicycles stood out as an attractive option. These bicycles come with a built-in battery and motor that provide additional power, allowing users to travel longer distances with less physical strain. This feature appealed to a wide range of users, including those returning to exercise or managing health conditions.
- Growing Demand for Last-Mile Mobility: E-bikes are well-suited for short trips, making them an ideal solution for last-mile mobility, particularly in urban areas
- Expansion of E-Bike Subscription Services: Electric bicycle (e-bike) subscription services like Chinese Hello, New York City's Citi Bike program is transforming urban mobility by offering users access to electric bikes through flexible rental or membership models. These services are especially popular in urban centers where commuters seek cost-effective, eco-friendly, and convenient alternatives to traditional transportation.

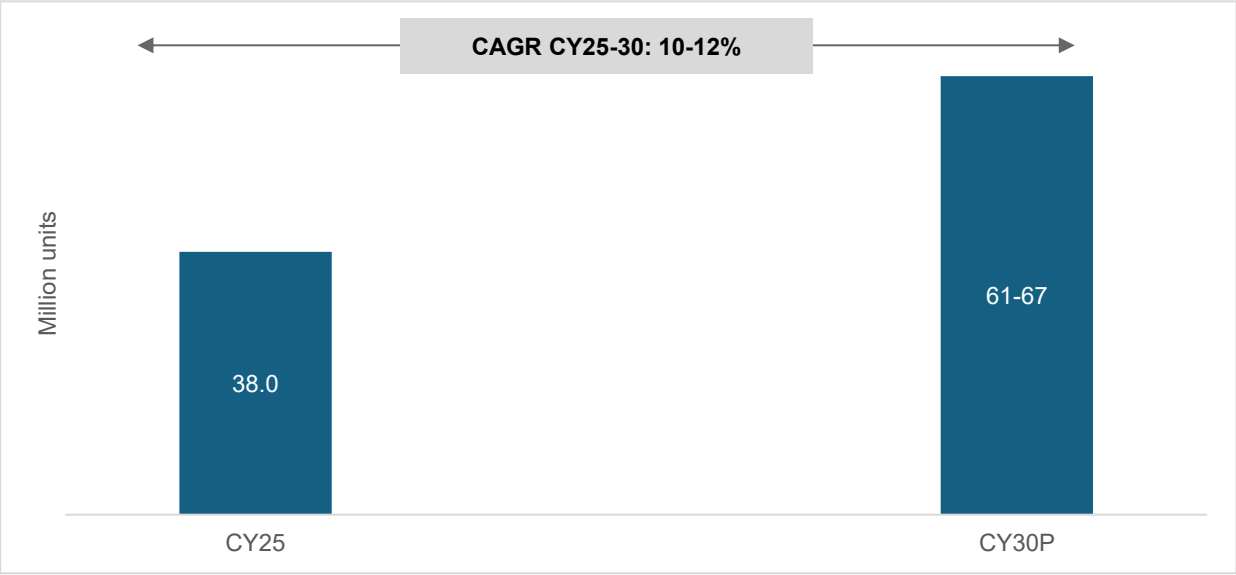
Global E Bikes Industry Outlook CY25-CY30

Global E bikes industry is expected to continue its rising momentum over the long-term horizon. This growth will be backed by increasing awareness, rising environmental concerns, government support, expansion in cycling infrastructure, increasing focus on health and wellness coupled with expanding vehicle portfolio as well as technological advancements.

According to Nexdigm projections, the global E Bikes industry is projected to grow at a faster pace of 10-12% CAGR to reach 61-67 million units by CY30.

Going forward, China is projected to maintain its leadership in the E bikes industry with Europe and United States projected to witness growth at an accelerated pace.

Global E bikes industry sales outlook

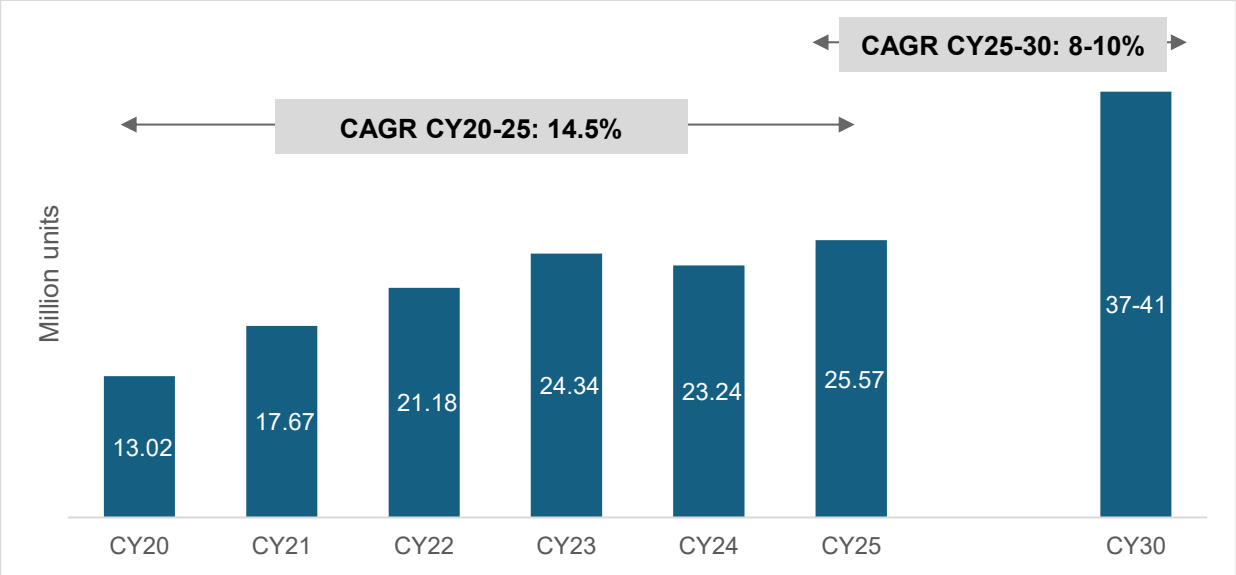


Source: Nexdigm data

Review of E Bike industry by volume – region wise

China

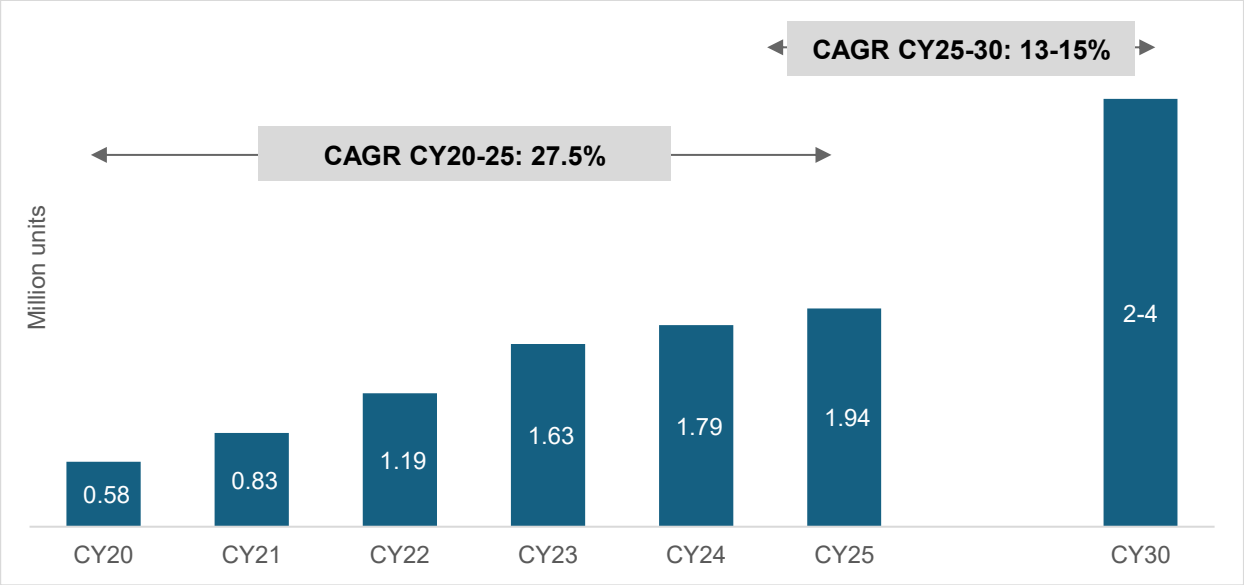
China is dominant global leader in e-bike sales volume, accounting for 13.02 million units in 2020 rising to 24.34 million units in 2023, driven by supportive regulatory frameworks, rising urbanization, and consumer preference for affordable, efficient personal mobility. Despite marginal growth in 2024-25, sales volume is expected to reach 37-41 million units by 2030, supported by growing demand in Tier II and III cities, ongoing replacement of internal combustion engine (ICE) scooters, and export-oriented manufacturing. China's strong local supply chain for batteries and motors further enhances cost efficiency and scalability.



Source: Nexdigm data

USA

Although currently a small segment, the U.S. e-bike market is expanding steadily as urban commuters seek alternative, sustainable, and affordable transport options. Sales volume increased from 0.58 million units in 2020 to 1.94 million units in 2025, with further growth to 2-4 million units expected by 2030. Growth is being driven by micromobility integration with public transit, and city-level initiatives promoting green mobility. Additionally, the rise of shared mobility platforms and increasing local assembly of e-bikes are enhancing the domestic production landscape.

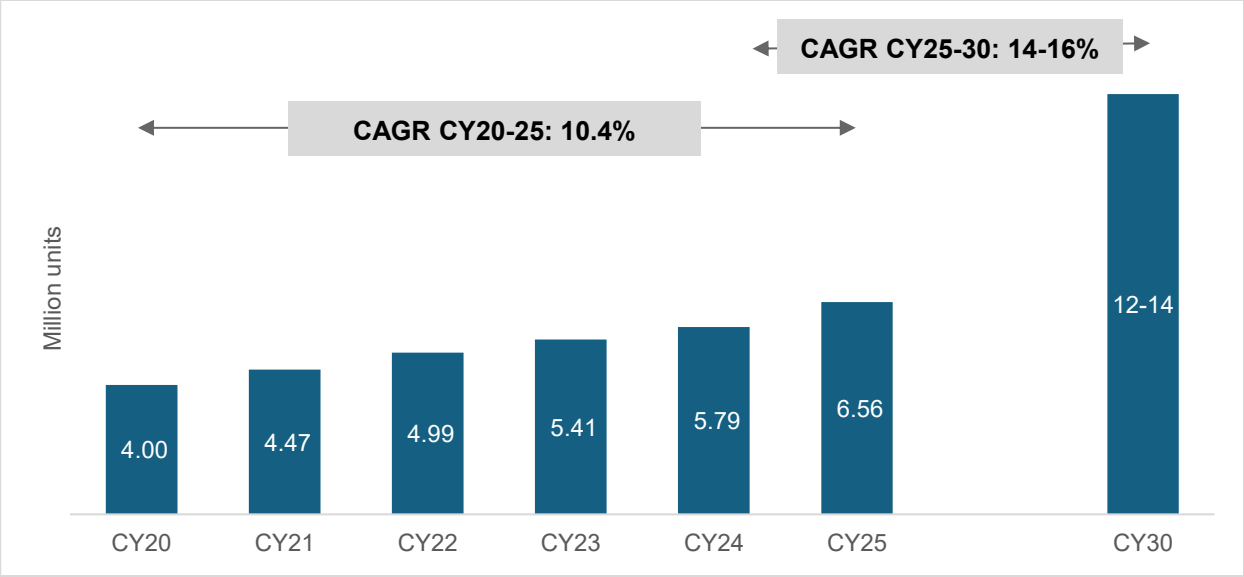


Source: Nexdigm data

Europe

E-bike sales volume in Europe grew from 4.0 million units in 2020 to 6.56 million units in 2025, at 10.4%. Europe is one of the fastest-growing regions in the global e-bike market, driven by robust environmental regulations, increasing fuel prices, and strong government incentives for electric mobility. Sales grew steadily from 4.0 million units in 2020 to 6.56 million units in 2025, reflecting increasing consumer adoption across urban and semi-urban areas.

The market is expected to nearly double by 2030, reaching 12-14 million units with a CAGR of 14-16%, aided by the EU's Green Deal policies, rising health and fitness consciousness, and the widespread rollout of cycling infrastructure. Leading European countries such as Germany, the Netherlands, and France are promoting local manufacturing and reducing import dependencies, which is also expected to fuel production growth.



Source: Nexdigm data

Review and Outlook of Global Generator (Genset) Industry

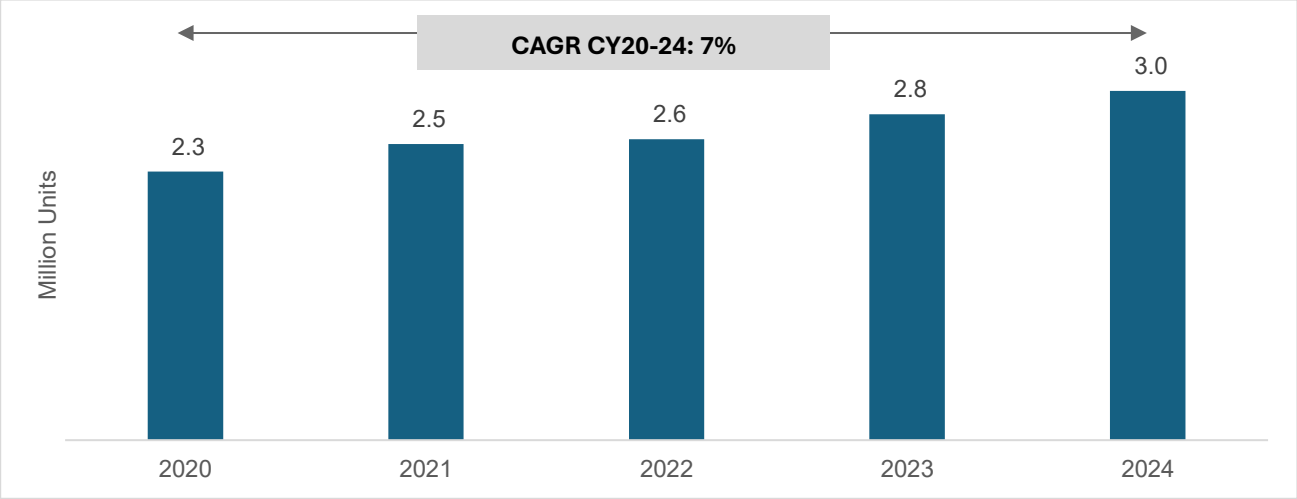
Review of the global genset market (CY2020-24)

The global genset market encompasses all categories of generator sets powered by diesel, petrol, gas, and hybrid systems, serving a wide range of applications across residential, commercial, industrial, and Defense sectors.

As of CY2024, the global fixed gensets market reached 3.0 million units, from 2.3 million units in CY2020 growing at a CAGR of 6.8%, driven by increased demand for backup power in residential, commercial, and data center applications amid rising power outages and remote work trends. Regulatory shifts, such as the implementation of EU Stage V and India's CPCB IV+ norms, also played a key role, initially slowing down smaller players but ultimately consolidating the market around Tier-1 manufacturers. Technological advancements like hydrogen-ready gensets, HVO-certified engines, and telematics integration further fueled demand, especially in developed and emerging economies.

The increasing demand for uninterrupted and reliable power supply is a key demand driver for genset in the US and Europe. Aging grid infrastructure, increasing electricity demand, frequent natural events and extreme weather lead to more frequent and prolonged power outages. This significantly drives the demand for backup genset in residential, commercial and industrial applications. Industries like healthcare, hospitality, data centers and telecom require constant and reliable power supply to avoid disruptions that could have severe impact on the operations. This makes genset essential for their operations. In the developing economies like Asia, India and Africa, the market for gensets is majorly driven by power infrastructure deficits, growing population and increasing demand for reliable power supply.

Review of the global genset sales by volume (CY2020-24)



Note: Inclusive of all categories of generator sets, including those powered by petrol, diesel, solar, gas, hybrid systems, and other alternative fuels, used across residential, commercial, industrial, and Defense applications. This includes only fixed gensets 5 kVA to over 7,150 kVA. The definition covers generators used for primary, backup, or emergency power supply purposes. Since there is no global / domestic body consolidating the numbers of gensets sold, there could be some variation in the actual numbers in the report.

Source: Nexdigm data

Classification of genset based on power rating and key end user industry

The power provided by the generator sets is measured in kVA ratings. The larger the electricity requirement of the application, the larger the kVA rating of the generator needed to provide the backup.

Based on power rating capacity, genset are classified into major three segment –

- Low kVA segment: less than 125Kva
- Medium kVA segment:125kVA -650kVA
- High kVA segment: 750kVA and above

Segment wise key end user industries

Power rating kVA	Key End User
Low kVA segment	Home standby
	Telecom
	Retail (petrol pump, mall, stores)
	Hospitality
	Small industries
	Small restaurants
	Commercial complex (schools, offices)
Medium kVA segment	Manufacturing
	Hospitals
	Farms (Poultry, aquaculture)
	Medium and large industries (Marine, mining and ports, construction)
	Hospitality
High kVA segment	Large industries (Automobile, Iron/ steel, textile, cement etc.)
	IT/ITES/BFSI/E-commerce

Source: Genset manufacturers, industry interaction, CRISIL Intelligence

The telecom sector, standby/back-up (residential and commercial) and rural electrification are the key demand drivers for low KVA genset market due to the need for continuous power at cell towers in areas with unreliable grid access and need for uninterrupted power supply. Historically in India and other developing countries, telecom sector has seen the dominant use of low KVA gensets due to unreliable power supply at cell towers. In more advanced markets, low KVA gensets are primarily used as backup solutions due to unreliable grids and harsh weather conditions.
Real estate and large industries constitute majority of market for medium KVA segment. Demand for genset from healthcare has increased during Covid-19 due to increase in demand for gensets from hospitals, Covid centers and vaccination centers. Infrastructure sector also shown growth post pandemic as construction, activities resumed in second quarter of fiscal 2021 due to ongoing road construction and metro rail projects. The banking sector and data centers also continue to drive demand for gensets.

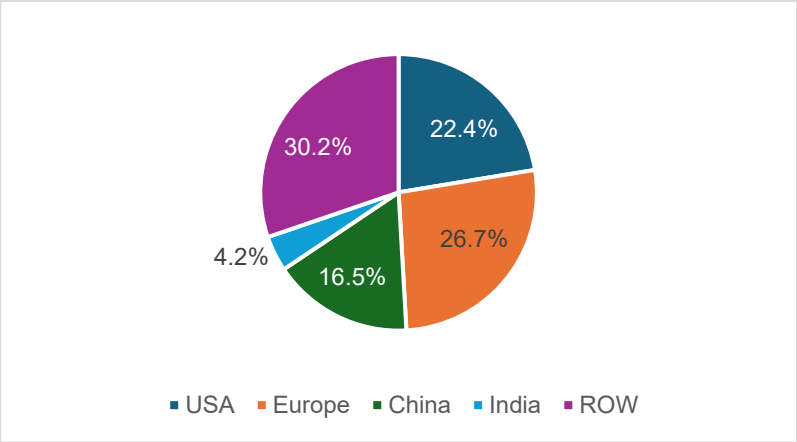
Demand for high power kVA gensets are driven by data centers, large industries like railways, metro rail, industrial /manufacturing companies, IT /ITES (including Banks and financial institutes, ecommerce, data centers) and real estate. Large industry and ITES combined drive the major demand for high kVA segment. Diesel gensets continue to dominate the market, accounting for 71.8% of total unit sales, followed by gas-powered gensets at 24.2%, while alternative and hybrid systems contribute a modest 4.0%, indicating emerging but still nascent adoption of cleaner technologies.

Global genset unit sales regional split (CY2024)

In the global genset market, Europe leads with 26.7%, followed by the USA at 22.4%, driven by strong industrial demand, harsh weather conditions and aging grid. China holds 16.5% due to rapid urbanization and manufacturing growth. India has a smaller share of 4.2% because of market fragmentation and regulatory

changes. The remaining 30.2% comes from emerging regions with growing infrastructure needs and unreliable grid access.

Review of the global genset sales by region (CY2024)

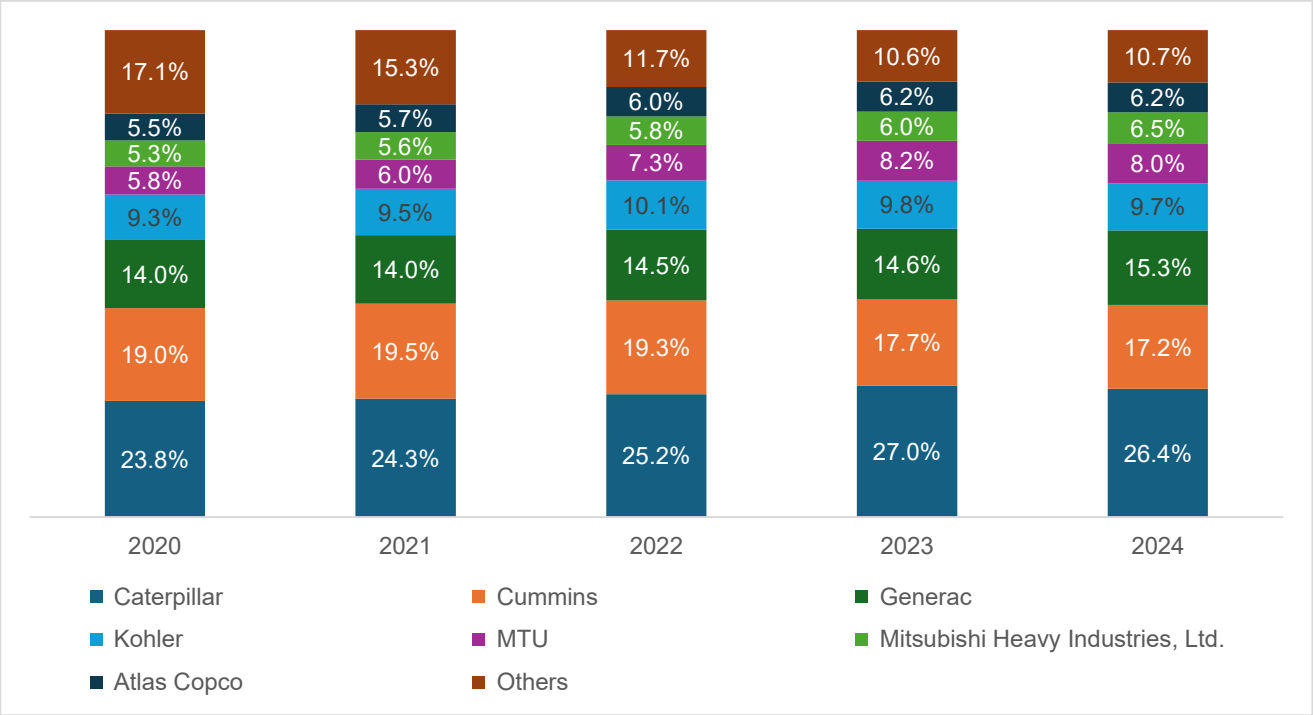


Note: RoW includes Asia (excluding India and China), Africa, Africa and Middle East
Source: Nexdigm data

Competitive Landscape

Caterpillar has consistently held the top spot in the global genset market, attributed to its extensive product portfolio, ranging from small 6kVA units to massive 4000+ kVA gensets, catering to a wide array of customer needs across industries. Generac's genset sales have surged by over the year, with market share reaching 15.3% in CY2024. The company's sales are driven by increasing demand for backup power solutions amid frequent blackouts in Europe and America owing to unstable grid and harsh climate. Its Pramac manufacturing facilities in Italy, Spain, Mexico, and Brazil have played a crucial role in meeting this demand, positioning Generac as a key player in the residential and commercial backup power segment. Cummins, Kohler, MTU, Atlas Copco and Mitsubishi are among the major players in the global market. Cummins is the second largest player in the genset industry with a market share of 17.2% in CY2024. It is a major player in the medium and heavy kVA segment. The launch of hydrogen-ready Centum container gensets for data centers in EMEA and the introduction of CPCB IV+ compliant diesel gensets tailored for the Indian market have support growth of Cummins in these regions.

Global genset unit sales by key players (CY2020-24)



Note: Others Weichai, Yuchai, Wartsila Corporation, Yanmar Co., Ltd., AKSA Power Generation, Kirloskar, Kubota, Mahindra, etc
Source: Nexdigm data

Growth Drivers for global genset industry

Rise in Data Centers and IT Sector Expansion: The global shift toward cloud computing, AI, and digital transformation is driving unprecedented growth in data center infrastructure, particularly in the U.S., Europe, and China. These facilities rely heavily on medium and high capacity gensets to ensure seamless power backup during outages or maintenance, making them a major contributor to genset market growth.

Infrastructure Growth in Emerging Economies: Rapid urbanization and industrialization in emerging markets like India, Indonesia, Vietnam, and across Africa are driving strong demand for gensets. In Africa, nations such as Nigeria, Kenya, and Ethiopia are heavily investing in roads, housing, and utilities to meet population growth and urban expansion. However, grid reliability remains a major challenge, with over 600 million Africans lacking access to electricity, according to the IEA. Gensets are filling this gap by providing essential power for infrastructure projects, remote communities, and industrial operations, supporting economic growth in power-deficient regions.

Growth in Mini and Micro Gensets for Rural Electrification: Compact gensets are seeing rising demand in underserved regions across Africa, Southeast Asia, and Latin America, where grid access remains limited. According to the IEA, over 700 million people globally still lack electricity, with Sub-Saharan Africa accounting for nearly 80% of that number. Mini and micro gensets, particularly solar photovoltaic (PV) mini grids, are playing a crucial role in expanding rural electrification in Africa, especially in regions with limited access to centralized grids.

Increasing demand for uninterrupted power supply: Every sector including residential, commercial and industrial needs reliable and uninterrupted power supply. However, challenges arising from aging grid, extreme weather

conditions, underdeveloped transmission and distribution network poses threat for the same. This is arguably the primary driver, forcing the individuals and businesses to reply to generators for power backup.

Trends impacting global genset industry

The global genset market is expected to shift toward cleaner, smarter, and more flexible technologies between 2025 and 2030. This transformation will be driven by tightening environmental regulations, rising fuel costs, and increasing urban noise restrictions. Hybrid gensets that combine fuel engines with battery storage or solar power will gain popularity due to their improved efficiency, lower emissions, and quieter operation. These solutions will be especially relevant for sectors such as healthcare, telecommunications, and off-grid commercial applications. Manufacturers like Generac, Honda, and Kohler are focusing on developing silent, fuel-efficient, and low-emission models to meet evolving customer needs. At the same time, smart gensets equipped with IoT and AI capabilities will revolutionize the market by enabling predictive maintenance, fuel optimization, remote management, and real-time monitoring. These features will enhance reliability and performance, particularly for critical infrastructure and data centers.

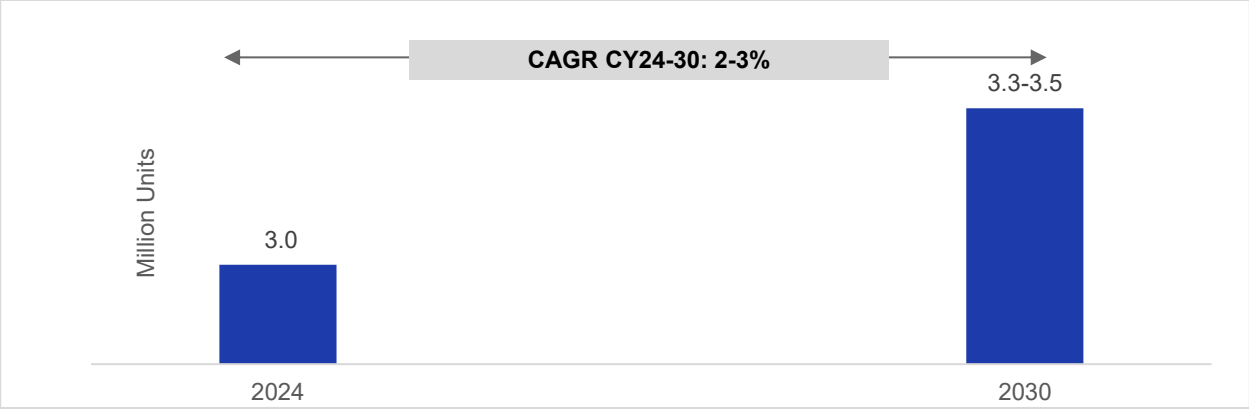
In developing regions, where grids are aging and replacement remains slow, demand for compact and low kVA gensets will rise, primarily drive by residential segment. These units will provide flexible and efficient power solutions for remote communities, construction sites, and emergency operations. Overall, the market will increasingly favor sustainable, intelligent, and adaptable genset technologies that align with global energy transition goals.

Global Genset Industry Outlook CY24-CY30

As of 2024, the global gensets market reached 3.0 million units and is expected to reach 3.3-3.5 million units by 2030, growing at a CAGR of 2-3%, signaling a steady but maturing trajectory. Growth will be primarily driven by the expansion of data centers, urban infrastructure upgrades, and climate-resilient energy planning, especially across Asia Pacific, the Middle East, and parts of Africa. In parallel, the adoption of alternative fuels such as hydrogen and biofuels, integration with smart grids, and the deployment of remote monitoring technologies will become increasingly standard as the market evolves toward sustainability and digitalization.

However, several structural shifts are expected to temper the overall pace of growth. Global electrification is improving, with almost 92% of the world’s population having access to electricity as of 2023 as per World Bank data. This was an increase of around 310 million people gaining access since 2015. The greatest growth in access between 2020 and 2023 occurred in Central and Southern Asia, with both regions making significant strides towards universal electricity access, reducing their basic access gap from 414 million in 2010 to just 27 million in 2023. The increased access to electricity is expected to impact the need for prime power gensets in many regions. Additionally, the rapid expansion of renewable energy, projected to grow through 2030, alongside increasing adoption of battery storage and stricter emission norms, is likely to curb demand for conventional diesel gensets. As a result, the market will face growing pressure to transition toward cleaner and more efficient power solutions.

Global genset outlook (CY2024-30P)

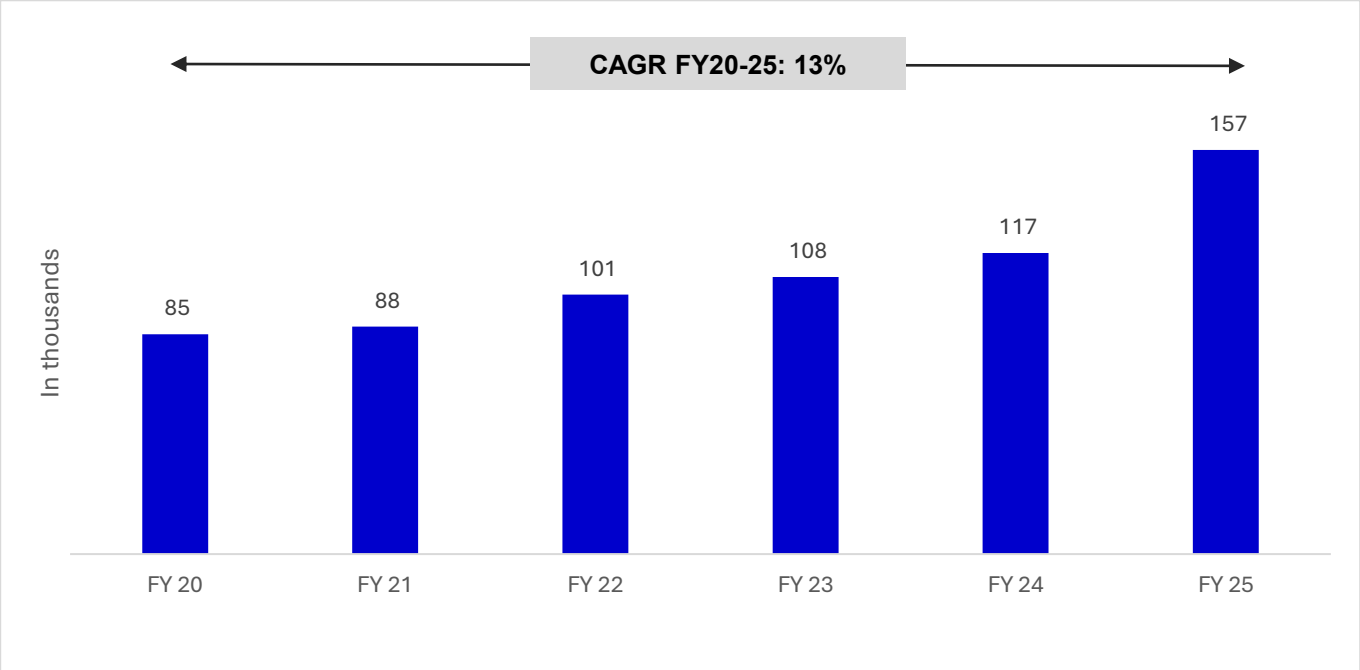


Source: Nexdigm data

Review and Outlook of Indian Generator (Genset) Industry

As of FY2025, the Indian genset market by volume was 157 thousand units, up from 85 thousand units in CY2020, registering a CAGR of 13% during the period. The growth is attributed to rising demand for backup power in key sectors such as real estate, data centers, healthcare, infrastructure, manufacturing, and telecom. Frequent power supply disruptions and inadequate grid infrastructure in several regions continue to reinforce the need for reliable backup power solutions.
Policy interventions such as the implementation of CPCB IV+ emission norms are playing a pivotal role in reshaping the competitive landscape. These regulations are gradually phasing out older, inefficient gensets and consolidating the market in favor of Tier-1 OEMs capable of complying with stringent emission standards. While this initially impacted smaller player, it has paved the way for product innovation and a shift towards fuel-efficient and hybrid genset technologies. After the introduction of CPCB IV+ norms in July 2024, the genset market expanded by about 34.3% due to inventory build-up and steady demand. Growth in the power generation segment during the year was supported by advance buying, higher project sales for data centers, increased adoption of CPCB IV+ products, and the impact of price hikes

Review of the Indian genset sales by volume (FY2020-25)

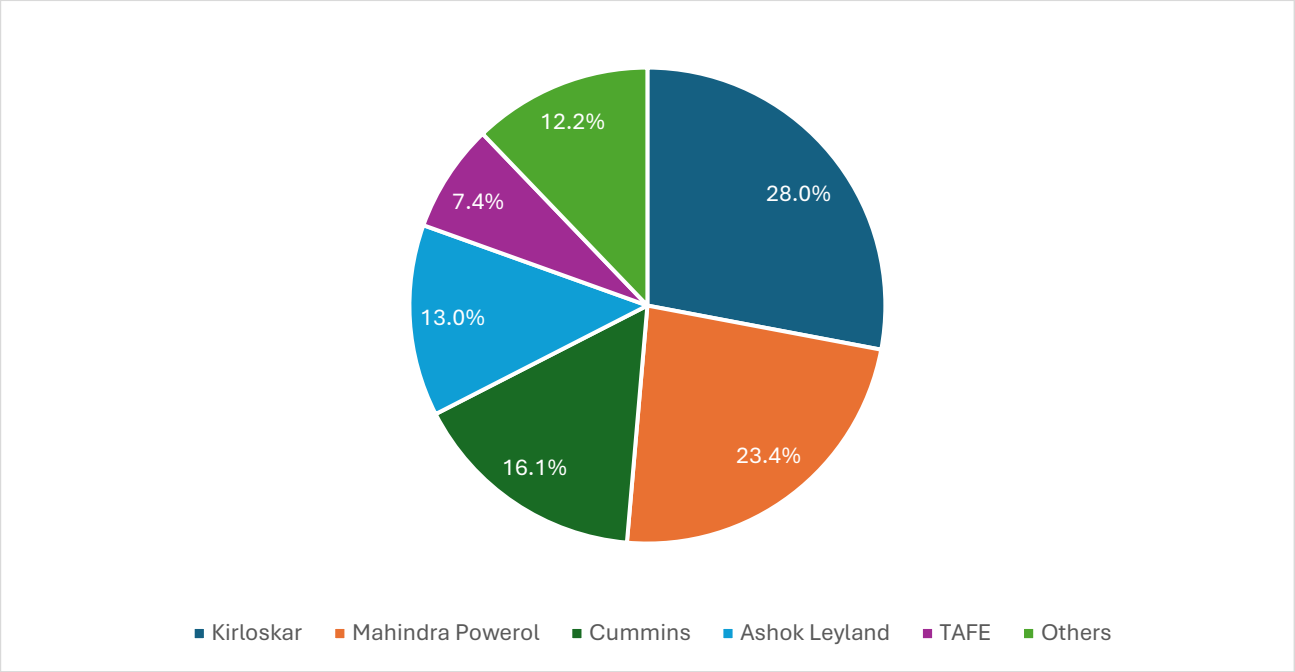


Note: All categories of generator sets, including those powered by petrol, diesel, solar, gas, hybrid systems, and other alternative fuels, used across residential, commercial, industrial, and defense applications. This includes only fixed gensets 5 kVA to over 7,150 kVA. The definition covers generators used for primary, backup, or emergency power supply purposes.

Source: Nexdigm data

Review of the Indian genset sales by players (FY2025)

The Indian genset market remains competitive, with a clear tiering between large national OEMs and regional brands. Kirloskar commands a significant 28% market share which can be attributed to its robust domestic manufacturing base, wide dealer network, and established brand recognition. Kirloskar has remained a preferred choice across sectors such as construction, real estate, agriculture, and small-scale industries, owing to its cost-effective and fuel-efficient product range. Mahindra Powerol follows with a 23.4% market share, leveraging its strong performance in telecom and infrastructure-related applications. Cummins, with an 16.1% share, continues to be a leading player in the high and medium kVA segments followed by Ashok Leyland Power Solutions with 13% and TAFE with modest but notable 7.4% share. The remaining 12.2% of the market is fragmented among smaller regional and unorganized players who serve niche demands and compete on price. These players typically have a localized presence and are prominent in low kVA gensets used in residential and small commercial setups.



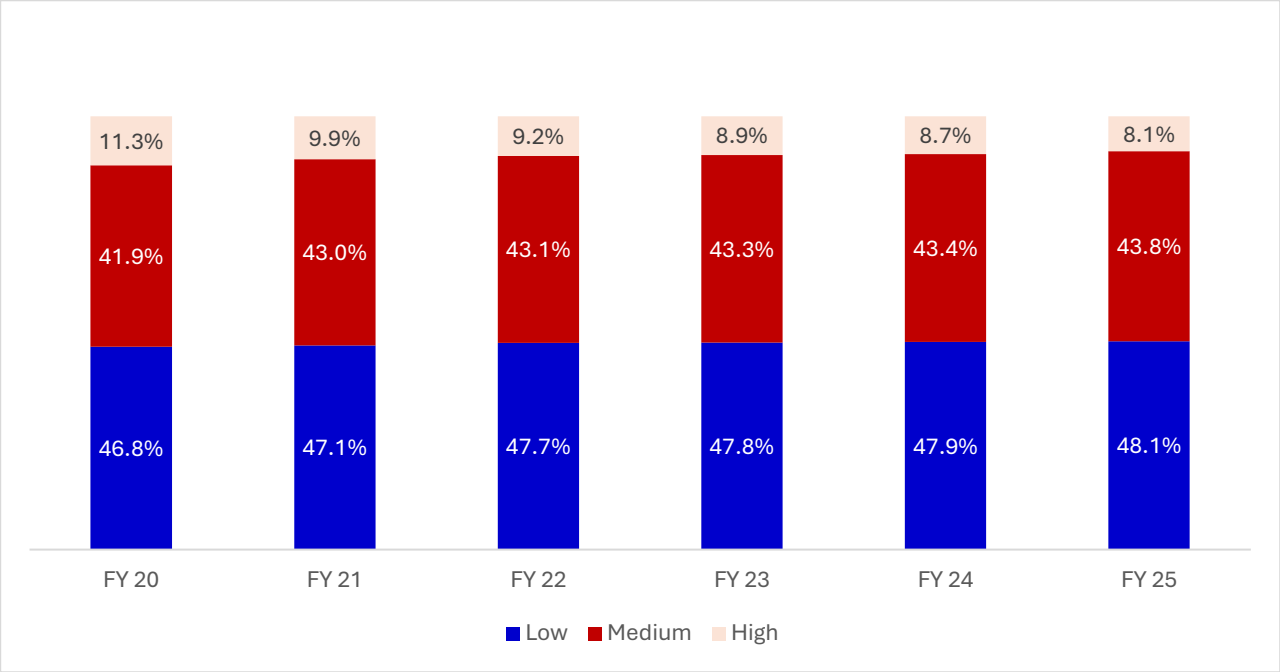
Source: Nexdigm data

Review of the Indian genset sales by power rating kVA

Indian genset market continues to be dominated by low and medium kVA segments, which together constitute over 90% of the total genset sales. The demand pattern is primarily driven by the need for backup power across telecom, residential, commercial, and institutional applications where grid reliability is inconsistent.

Low kVA gensets (typically less than 125kVA) accounted for the largest share, contributing 48.1% of total sales in 2025 consistently maintained a dominant position since 2020. Medium kVA gensets (125kVA-650kVA) made up 43.8% of the market in 2025, reflecting stable demand from real estate, mid-sized manufacturing units, hospitals, hospitality, and infrastructure segments. High kVA gensets (above 750

kVA), though forming a smaller share at 8.1% in 2025, continue to find applications in large industrial plants, IT/ITES parks, metro rail, data centers, and heavy infrastructure projects.

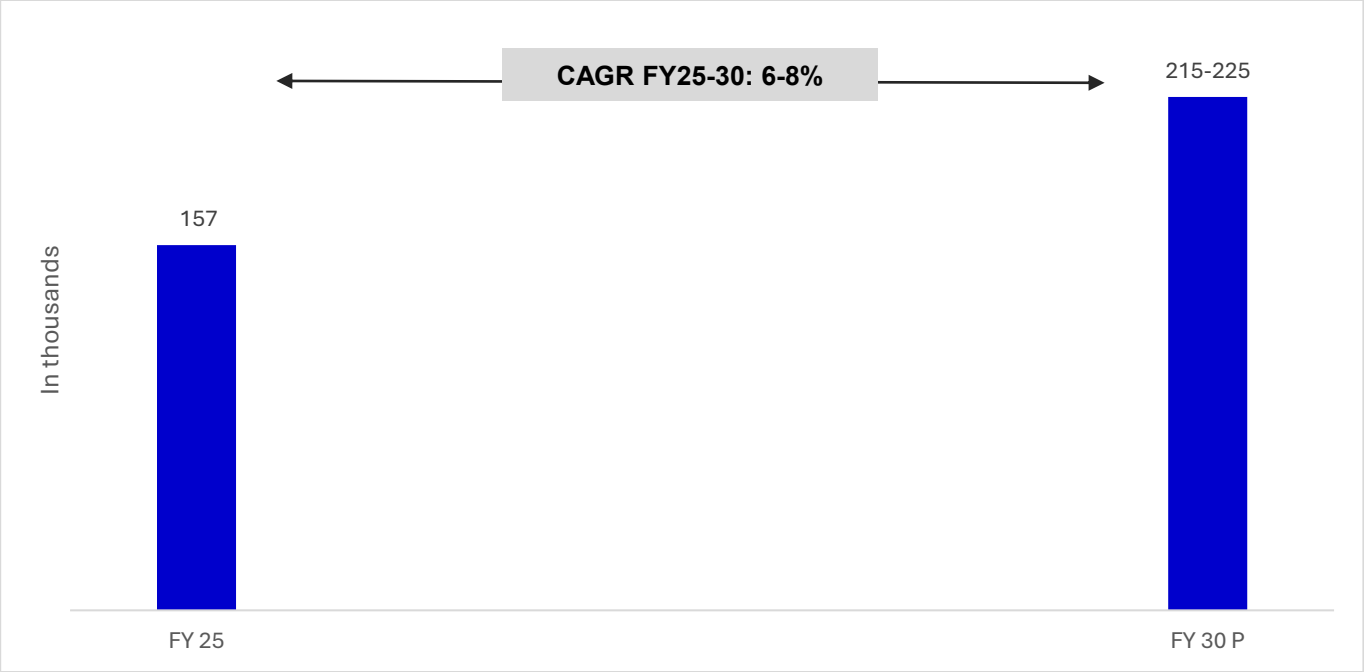


Source: Nexdigm data

India Genset Industry Outlook FY2025-30

Indian genset industry is set to witness sustained growth from FY2025-30, driven by a confluence of factors including expanding industrial and commercial sectors, infrastructure development, and the persistent need for reliable power backup solutions with market is projected to reach 215-225 thousand units by 2030.

CAGR FY25-30: 3-5%



Source: Nexdigm data

Review and Outlook of Global Power Tools Industry

Power tools are devices that operate on an additional source of power apart from manual labor. Electric motors, and compressed air (pneumatic) are the most used technologies in the power tool. Compared with conventional hand tools that solely depend on manual labor, power tools are more time-efficient and precise. Power tools make heavy-load tasks easier and more efficient.

Power tools typically include power drills, impact wrenches, hammers, saws, routers and grinders, which are used in the construction, automotive, aerospace, shipbuilding and other industries. They are also used in the residential applications for home repairs, do-it-yourself (DIY) projects, etc. In industries such as construction, mining, manufacturing, and even household activities, power tools are becoming an essential component of day-to-day operations, offering speed, precision, and convenience.

Power drills are used for boring holes, driving screws, and electrical fittings, among other tasks, while impact wrenches are heavy-duty fastening devices used extensively in repairs, equipment maintenance and product assembly. Saws, which consist of a tough blade, wire or chain with a hard-toothed edge, are used to cut through material. Routers are used to rout out an area from hard materials such as plastic or wood to make patterns, grooves, etc. They are portable electric power tools mainly used in carpentry, with a flat base and a rotating blade extending past the base. Grinders, as the name suggests, can grind metal and cut tiles, stucco and pavers, and can also be used for deburring, finishing and polishing.

Review of the global power tool market size (CY2020-24)

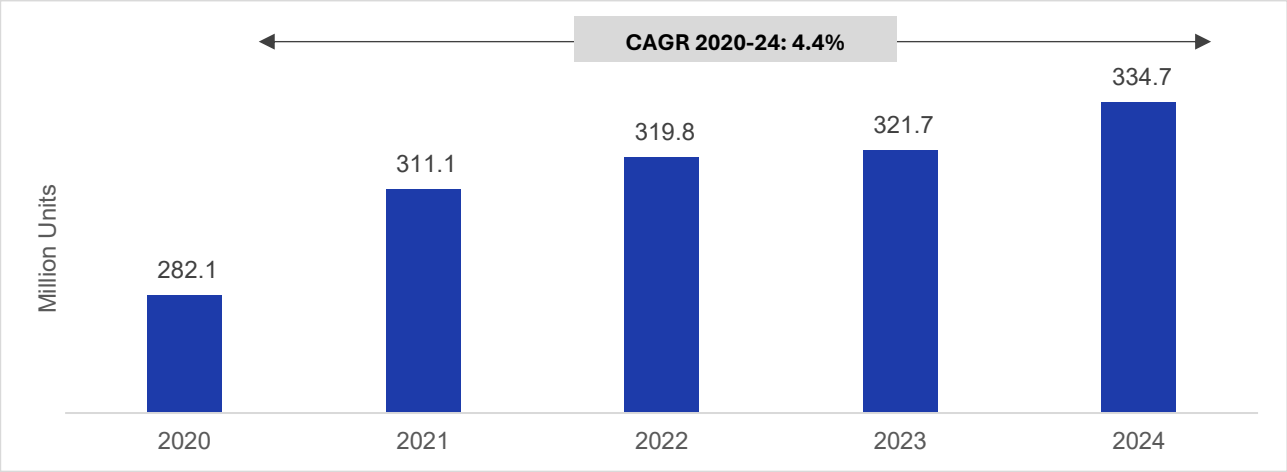
As the world steadily moves toward automation, there is a noticeable shift from manual labor to machine-driven efficiency across various sectors. Developed regions like the US and Europe have accelerated the adoption of tools and machinery to ensure productivity and maintain output quality. In industries such as construction, mining, manufacturing, and even household activities, power tools are becoming an essential component of day-to-day operations, offering speed, precision, and convenience.

This increasing reliance on machinery is not just a response to workforce constraints, but also a part of broader trends favoring technological advancement, process optimization, and safety improvements. Whether it’s a cordless drill used in home renovations or a hydraulic breaker on a mining site, power tools are central to enabling efficient work in less time and with less physical effort. This evolving landscape provides an impetus for market growth across tool types, and user segments.

The global power tools market includes corded and cordless, pneumatic, and hydraulic tools, which may be portable or stationary depending on the application. The global power tools market grew from 269.8 million units in 2019 to 311.1 million units in 2021, registering a CAGR of 7.4%. This sharp rise during the period was largely fueled by the COVID-19 pandemic, as the extended lockdowns and remote work drove the DIY home improvement and repair projects, driving demand for cordless drills, saws, and multi-tools in the residential segment. The shift to e-commerce platforms further supported growth by making power tools more accessible to consumers and small businesses during retail shutdowns. These combined trends created a strong surge in demand across both household and professional applications during the pandemic.

Between 2022 and 2023, the power tools market witnessed moderate growth due to post-pandemic saturation, especially in the DIY segment. High inflation, rising interest rates, and economic uncertainty in key markets like the US and Europe led to cautious spending. Construction activity weakened due to higher material costs and labor shortages. Distributors also focused on clearing excess inventory from the COVID-19 surge, reducing new orders and impacting overall market growth. In 2024, the power tools market rebounded with a growth rate of 4.1%, driven by renewed construction and infrastructure activities, easing inflation, and improved consumer confidence.

Review of the global power tool sales by volume (CY2020-24)

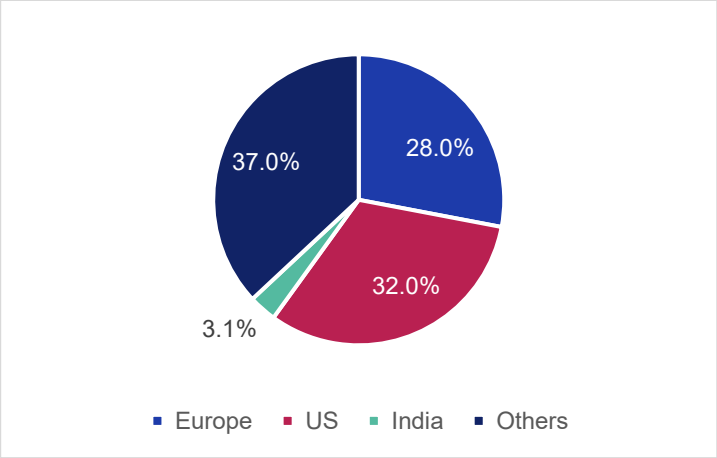


Note: The global power tools market includes corded and cordless, pneumatic, and hydraulic tools, which may be portable or stationary depending on the application. These tools are powered by external sources such as electricity, compressed air, or gasoline.
Source: Nexdigm data

Global power tools sales regional split (CY2024)

The United States leads the global power tools market with a 32% share, followed by Europe at 28%. While India currently holds a smaller share of 3.1%, it is considered a high-growth market with strong future potential. India's growth is driven by rapid industrialization, real estate expansion, and strong government support for manufacturing like National Manufacturing Policy, which aims to raise the manufacturing share in GDP and PLI scheme target to strengthen India's manufacturing base and align it with global standards.

Review of the global power tool sales by region (CY2024)



Source: Nexdigm data

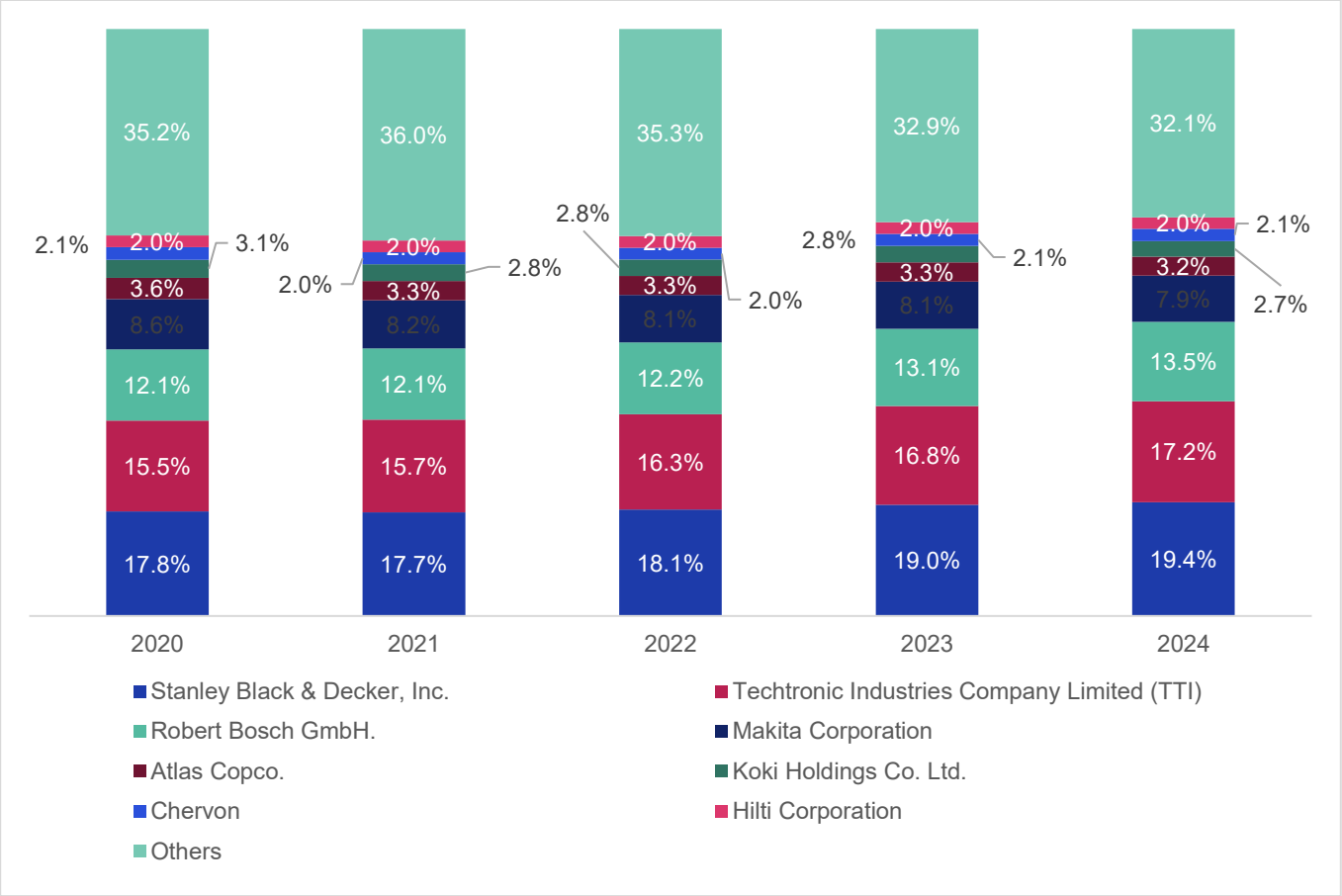
North America holds around 37-40% of the global market, with the US alone contributing 85-90% of this share, followed by Canada and Mexico. The market's expansion has been fueled by rising DIY trends and growing e-commerce penetration, which have improved access to power tools and broadened adoption across consumer and professional segments.

Competitive Landscape

Stanley Black & Decker Inc. is the global leader in the power tools market, holding a 19.4% share worldwide. The company owns several brands, including DEWALT, CRAFTSMAN, STANLEY, BLACK+DECKER, Cub Cadet, Hustler, and Troy-Bilt. DEWALT, offering over 300 tools and 800 accessories, leads the market. From 2019 to 2024, Stanley Black & Decker's sales grew by 38%, driven by strong brand loyalty, premium pricing, and a broad product range.

Techtronic Industries Company Limited (TTI) is the second-largest player in the power tools market, with a strong focus on cordless technology. The company operates multiple brands, including MILWAUKEE, RYOBI, and AEG, with MILWAUKEE being the flagship brand. Bosch is also a leading player in the power tools market and holds an extensive global presence operating in over 60 countries. Other notable players include Makita, Atlas Copco and Chervon among others.

Global power tool sales by key players (CY2020-24)



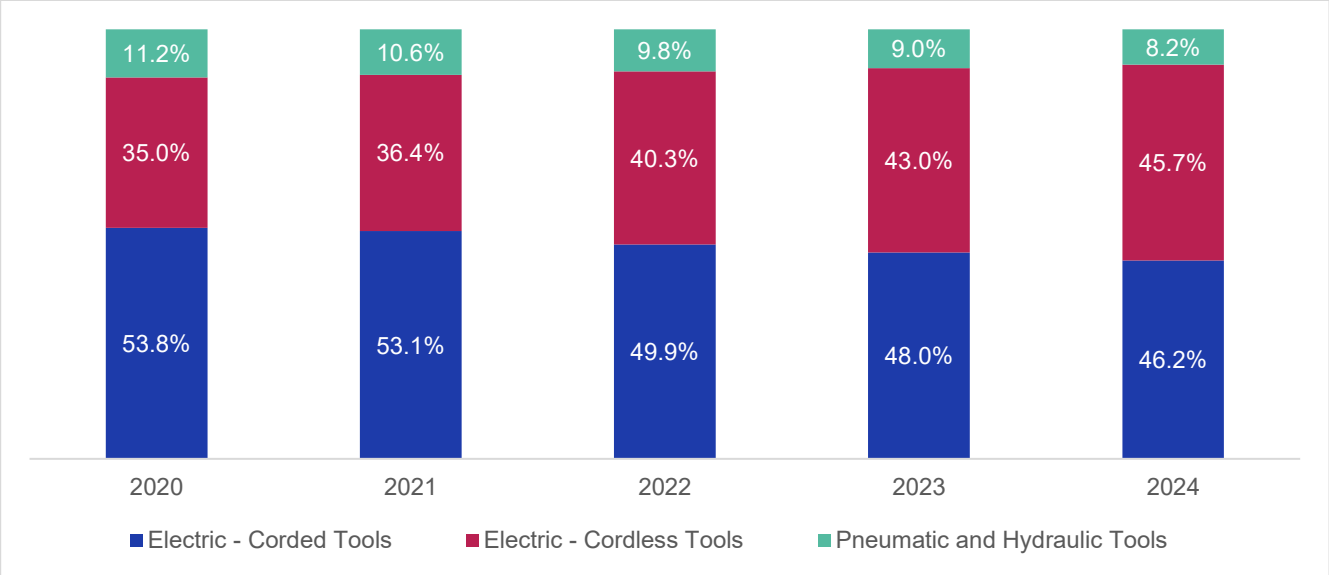
Source: Nexdigm data

Global power tool sales by type

Power tools can be categorized into corded, cordless, pneumatic, and hydraulic tools, each defined by their power source and usage wise. Corded power tools use electricity as a source of operation, although they are portable, they need an electric power source. Whereas cordless tools are battery operated and do not need a power source. They are recharged after every use or have swappable batteries. Electric Cordless Tools have shown the most dramatic increase in market share, rising from 32.4% in 2019 to 45.7% in 2024. This surge reflects rising demand for portable, user-friendly tools, enabled by significant advancements in lithium-ion battery technology. The cordless format is increasingly favored across both DIY and professional users due to its flexibility, mobility, and improved performance. Electric Corded Tools, while still holding the largest share, declined from 56.2% in 2019 to 46.2% in 2024. This drop illustrates a gradual shift away from traditional corded formats as users adopt more versatile cordless options.

Pneumatic and Hydraulic Tools saw their share fall from 11.3% in 2019 to 8.2% in 2024. This segment's decline reflects a broader industry shift toward electric-powered alternatives, driven by lower maintenance requirements, easier portability, and simplified infrastructure needs.

Review of global power tool sales by type (CY2024)



Source: Nexdigm data

Growth drivers for global power tool industry

Growing DIY Culture: The growing do-it-yourself (DIY) culture has emerged as a notable growth driver for the power tools industry, particularly in developed markets. Driven by a combination of lifestyle changes, increased digital access to YouTube tutorials, step by step guides, and a heightened focus on home improvement.

Advancements in Battery Technology: The development of lithium-ion (Li-ion) batteries marked a major turning point, offering a superior combination of energy density, charge retention, and recharge cycles compared to older technologies. This drives the shift from corded to cordless power tools driven which not only enhanced tool mobility and convenience but also expanded the range of applications across both professional and consumer segments.

Rising Construction and Infrastructure Development: The global surge in construction and infrastructure development has become a key driver of growth for the power tools industry. In emerging economies such as India, Latin America, and parts of Africa, the scale of construction is accelerating rapidly. This is largely supported by robust economic growth and proactive government policies. In contrast, developed markets are prioritizing the renovation and upgrade of aging infrastructure systems. Also, the rise in labor costs in these markets is also expected to increase demand for efficiency-boosting power tools. These efforts combinedly drive the market for power tools globally.

E-commerce Growth: As digital retail channels continue to expand in reach and sophistication, they are reshaping traditional distribution models and significantly broadening market access. E-commerce platforms have made it easier than ever for both individual consumers and small-scale contractors to get access to power tools online, driving the growth of the industry.

Trends impacting global power tool industry

Shift Toward Cordless Tools: Cordless power tools are gaining traction in the market due to improvements in battery technology and growing user demand for flexibility and mobility. Cordless tools offer similar performance compared to corded counterparts due to high-capacity lithium-ion batteries and efficient energy management

systems. Combined with smart features such as adaptive speed control, app connectivity, and battery optimization, cordless power tools are becoming the preferred choice across construction, manufacturing, and DIY use cases.

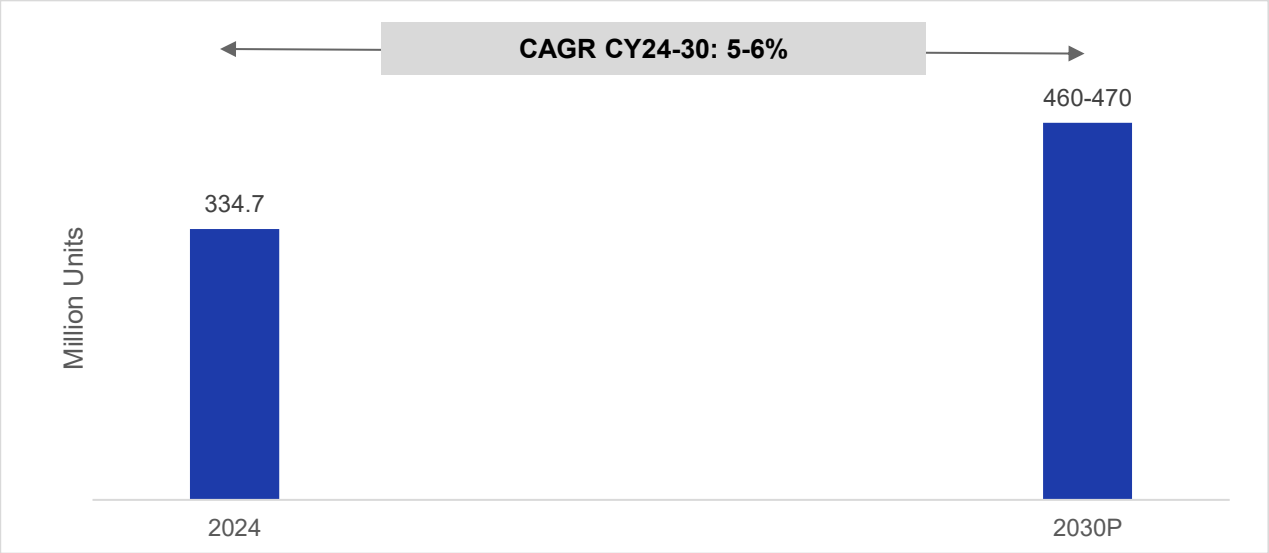
Integration of IoT and AI (smart tools): Power tools are becoming increasingly connected, with many models now equipped with sensors, Bluetooth, and app-based controls that allow for real-time monitoring, diagnostics, and customization. Through companion mobile applications, users can track battery usage, adjust performance settings, receive maintenance alerts, and even geo-locate lost tools. For example, Makita – Auto-Start Wireless System (AWS) which utilizes Bluetooth technology to enable wireless communication between power tools and dust extractors.

Adoption of Brushless Motor Technology: Unlike traditional brushed motors, brushless motors eliminate friction and wear by using electronic circuitry instead of mechanical brushes. This not only extends the life of the tool but also improves energy efficiency, power output, and operational precision.

Global Power Tool Industry Outlook CY24-CY30

The global power tools market is expected to reach 460-470 million units by 2030, growing at a CAGR of 5-6%. This expansion is driven by a combination of factors including infrastructure revival, industrial growth, and the rising adoption of power tools across both consumer and professional segments. In the United States, the Infrastructure Investment and Jobs Act has allocated more than USD 1.2 trillion to infrastructure improvements, significantly boosting the demand for industrial-grade power tools.

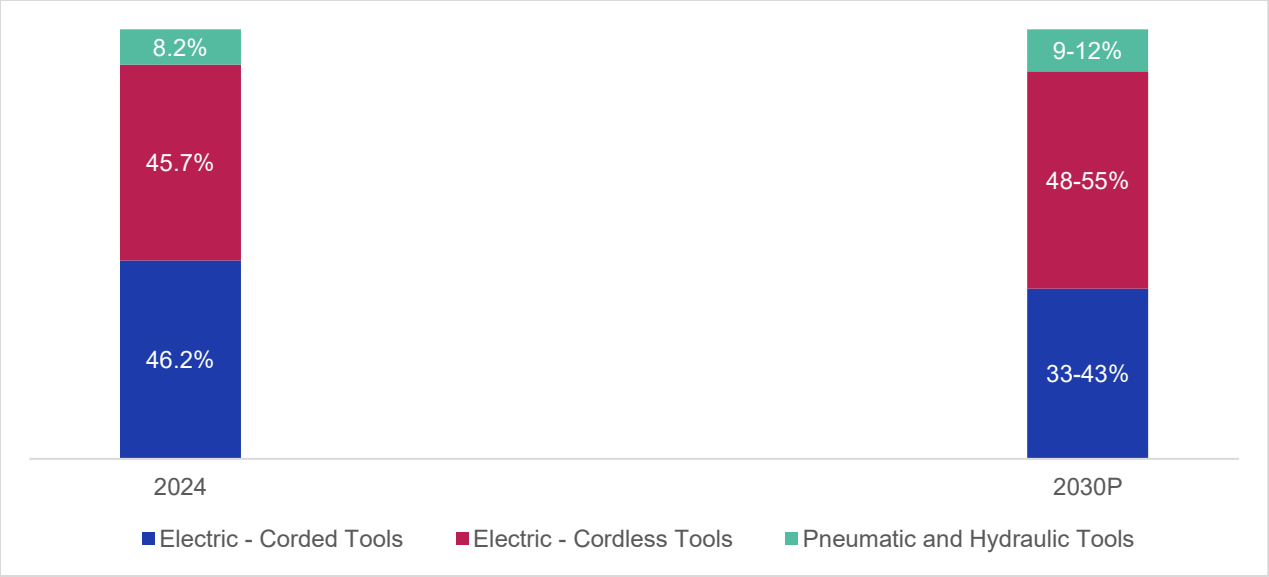
Global power tool outlook (CY2024-30P)



Source: Nexdigm data

On the consumer side, cordless tools are expected to lead the market and are estimated to account for over 48 to 55% of total power tool sales by 2030, supported by continuous advancements in lithium-ion battery technology. Additionally, the rising popularity of DIY activities in developed countries is strengthening residential demand. In the United States, approximately 55% of homeowners regularly undertake DIY projects, contributing to higher sales in the household and semi-professional segments. Pneumatic and Hydraulic tools are expected to account between 9-12% in 2030 from 8.2% in 2024 with the market expected to be driven by increasing industrial automation, the adoption of smart technologies, and the rise of sustainable manufacturing practices. Also, with the growth of industrial manufacturing activities and expected rise in infrastructure development, the need for Pneumatic and Hydraulic tools are expected to grow.

Global power tool outlook by type (CY2024-30P)

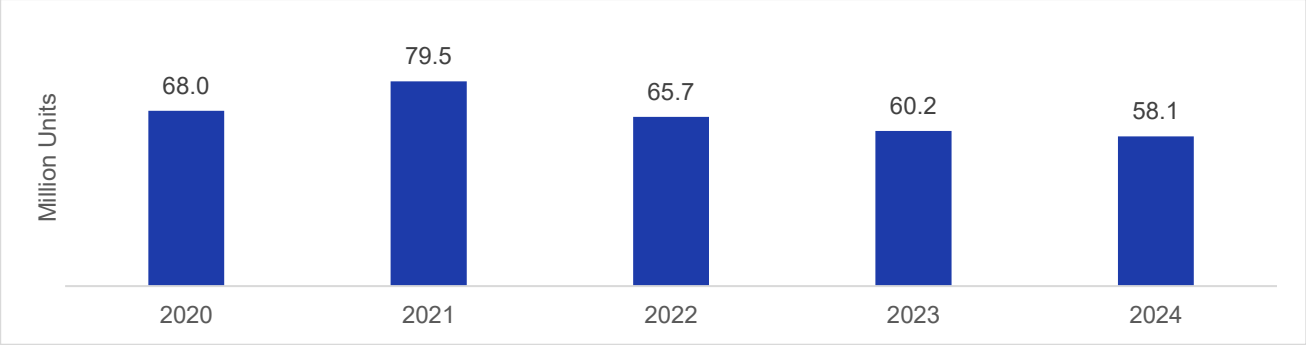


Source: Nexdigm data

Review and Outlook of Global Outdoor Power Equipment Industry

The global Outdoor Power Equipment (OPE) market includes powered machines and tools typically driven by gasoline engines, electric motors, or battery systems, and is used across residential and commercial settings for various outdoor tasks such as lawn care, landscaping, gardening, forestry, and snow management. The sector encompasses a wide range of products, including lawn mowers, chain saws, trimmers, blowers, and other equipment used for outdoor maintenance and landscaping.

Review of the global outdoor power equipment market size (CY2020-24)



Note: OPE refers to powered machines and tools designed for various outdoor tasks such as lawn care, landscaping, gardening, forestry, and snow management. These tools are typically powered by gasoline engines, electric motors, or battery systems and are widely used in both residential and commercial applications.
Source: Nexdigm data

The global OPE market grew from 60.5 million units in 2019 to 79.5 million units in 2021, registering CAGR of 14.6%. This period saw significant market expansion driven by rising consumer interest in home improvement and landscaping, especially during the COVID-19 pandemic. With lockdowns and work-from-home policies in place, people spent more time at home, which led to a surge in DIY gardening, lawn care, and outdoor maintenance activities. This behavioral shift fueled residential demand for equipment such as lawn mowers, trimmers, and leaf blowers.

As global per capita income rises particularly in key markets like the US, Europe, India, and China, there is a noticeable surge in interest toward home improvements, landscaping, and the development of green spaces. This trend is directly boosting the demand for outdoor power equipment (OPE) across both residential and commercial sectors. Further, these equipment are used for snow removal in the northern parts of America and Europe to clear snow from sidewalks and driveways. In America, the individuals prefer to maintain their outdoor spaces themselves, driving demand for user-friendly OPE.

Between 2022 and 2024 the global OPE market experienced a slowdown after the strong pandemic-driven growth seen in earlier years. One of the main reasons was market saturation, as many consumers who purchased OPE tools during COVID-19 did not need replacements in the short term, leading to weaker follow-up demand, particularly in the residential segment.

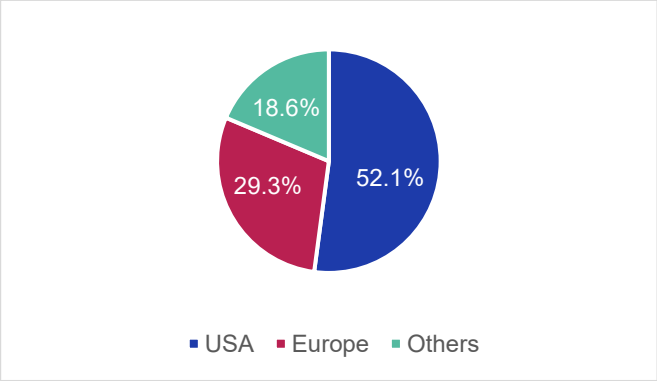
Commercial buyers also held off on large-scale procurement amid uncertainty in construction and real estate sectors owing to macroeconomic headwinds such as rising interest rates, inflation, and global supply chain disruptions. Furthermore, while the push for electric and battery-powered equipment continued, the higher upfront costs and limited battery infrastructure in some regions slowed widespread adoption. These combined factors contributed to a temporary contraction in OPE sales volumes during this period.

Global OPE sales regional split (CY2024)

In 2024, the U.S held the largest share of the global OPE market at 52.1%, representing more than half of the total market. Also, the U.S accounts for ~90% of the overall North America OPE market. According to US Census Bureau 2023, the house ownerships rates are at around 65%. Thus, the higher house ownership rates, widespread large residential lawns, and a mature landscaping industry is driving the market in the US.

Europe accounts for 29.3% of the market in 2024, supported by growing urban gardening trends, and government incentives for zero-emission tools. Germany, France, and the UK lead in battery-powered and robotic mower adoption. Others, including China, India, Southeast Asia, Australia, Latin America, and the Middle East, make up 18.6% of the market in 2024.

Review of the global power tool sales by region (CY2024)



Source: Nexdigm data

Growth drivers for global OPE industry

The demand for OPE is driven by a combination of factors, including demographic, economic, environmental, and technological trends.

Increasing suburbanization and urban development: The growth of suburban areas is leading to an increase in lawn care and landscaping activities, driving demand for OPE such as lawn mowers, trimmers, and edgers. Further, rapid urbanization in developing regions is significantly boosting demand for OPE in both public and private sectors. As cities expand, there is increased need for mechanized tools to maintain parks, roadsides, residential complexes, and public spaces. Similarly, countries in Southeast Asia, Latin America, and the Middle East are investing in infrastructure upgrades, green belts, and urban landscaping projects. These developments are creating steady demand for durable, efficient tools in commercial landscaping, municipal maintenance, and construction site clearing.

Increasing demand for convenience and aging population: Both US and European consumers are looking for OPE that is easy to use, maintain, and store, driving demand for convenient and user-friendly equipment. Further, the aging population in the US and Europe is driving demand for easier-to-use and more convenient OPE, such as robotic mowers and automated lawn care systems.

Trends impacting global OPE industry

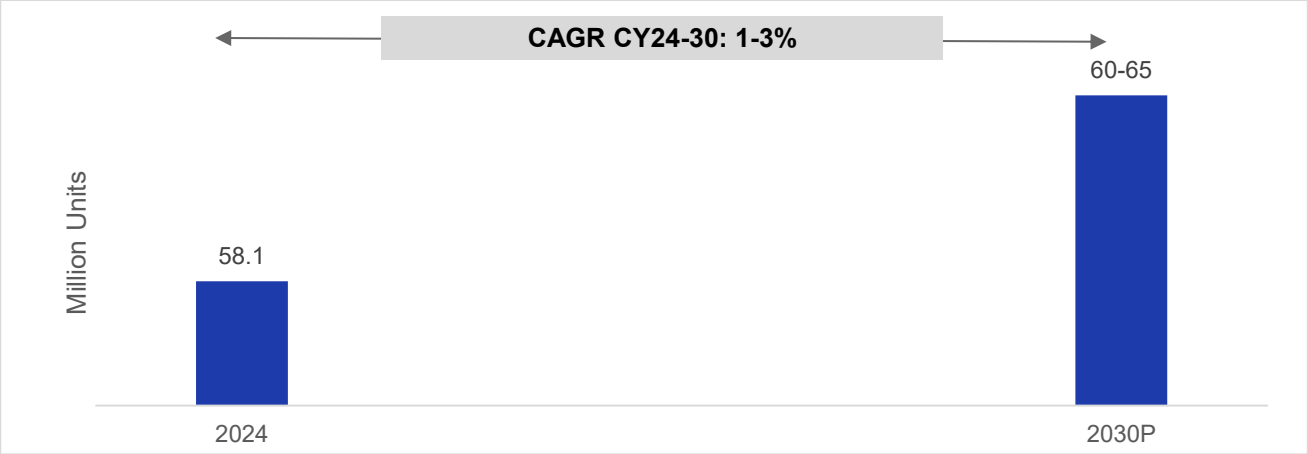
Electrification: The shift from gas to battery-powered equipment is accelerating due to environmental concerns and regulatory mandates. For example, California's statewide ban on new gas-powered lawn equipment starting 2024 is setting the trend globally. Brands like EGO, Greenworks, and Makita are leading the charge, EGO's 56V ARC Lithium battery platform powers everything from chainsaws to snow blowers, while Makita's XGT and LXT lines offer cross-compatible batteries for prosumers and commercial users.

Growth of Robotic and Smart Equipment: Robotic and smart tools are gaining traction as users seek convenience and automation. Husqvarna's Automower, Worx, and Robomow offer app-controlled, GPS-enabled mowers ideal for residential lawns. In the commercial space, brands like John Deere and Toro are integrating IoT and telematics to help professionals monitor, manage, and maintain fleets more efficiently. The Outdoor Power Equipment market is undergoing rapid technological evolution, driven by consumer demand for convenience, efficiency, and sustainability. Leading manufacturers integrating smart features such as IoT connectivity, GPS navigation, automation, and AI-enabled controls into their products to enhance user experience.

Global OPE outlook (CY2024-30P)

From 2024 to 2030, the global OPE market is projected to grow from 58.1 million units in 2024 to 60-65 million units in 2030, registering a modest growth at 1-3% CAGR. This limited growth is primarily due to market maturity in key regions and the high installed base of equipment, especially in North America and Europe, where much of the short-term demand will be driven by replacements rather than new purchases. However, sustainability regulations, and smart technology integration will support the market in terms of electrification. Some key challenges include intense price competition, higher upfront costs for electric tools, and slower adoption in cost-sensitive or infrastructure-limited markets such as parts of Asia and Latin America. As a result, the industry is expected to experience value-driven growth, led by premium, low-emission, and feature-rich equipment offerings rather than large volume gains.

Global OPE outlook (CY2024-30P)



Source: Nexdigm data

Review and outlook of the SEDEMAC specific components

Introduction

SEDEMAC is one of the Indian-origin suppliers who have initiated, introduced, and scaled breakthrough innovations for the industry. SEDEMAC is a technology company specialized in developing control products for engines and powertrains for on-road and off-road applications. Some of the large markets catered by the company at present are Automobiles (Both ICE and EV), Gensets, Power Tools, E-Bikes and Outdoor Power Equipment. SEDEMAC is supplier of control-intensive, critical-to-the-application electronic control units (ECUs) to leading original equipment manufacturers (OEMs) in the mobility and industrial markets in India, as well, as the United States and Europe. Within critical-to-the-application components, SEDEMAC focuses on control-intensive components that are application specific and manage complex systems in real time. Starting off as a lab-based enterprise out of Indian Institute of Technology (IIT) Bombay in 2007, the company has evolved as renowned player in the control technology space. Their product portfolio includes sensor less integrated starter generators, ECUs for fuel injection, motor controller and generator controllers that are mission critical components used to help generate and regulate power.

There are two principal Tier-I supplier categories. The first group comprises companies that acquire proven technologies from global manufacturers with the ability to adapt these designs to serve their customers or who partner with technology companies primarily for technologies and product designs, without significant, in-house R&D capability through a JV. While these suppliers can offer improvements by leveraging externally sourced technology, their capacity for step-change innovation is fundamentally constrained by reliance on third-party and limited in-house engineering resources. The second major group includes suppliers who have had the history of proposing and commercializing new technologies, maintaining full design ownership and often driving technology adoption among OEMs. These organizations possess deep technical capability, capacity to introduce new technology platforms and carry out end-to-end design and development of their products. However, the scale and legacy systems can sometimes inhibit rapid adaptation to customer-specific requirements for suppliers who are dependent on their global parent group. Most of the major technology transformations in these sectors such as the adoption of various critical systems in vehicles or major electrification shifts have largely depended on Tier-I suppliers. SEDEMAC is an Indian tier I supplier with in-house R&D capability and the suppliers selected to provide Tier 1 systems (i.e., direct to OEM production lines) are central to an industry's technical evolution. Also, supplier agility is typically seen as a significant positive by OEMs.

In the automotive/mobility market, OEMs choose the technologies and core components that define their product architecture. Major changes to core/key technologies do not occur frequently due to the significant effort and time involved in the integration, validation involved at the OEM end. Such transitions are usually triggered by regulatory requirements (for example, emissions, safety or efficiency standards) or could be non-regulatory in nature, driven by OEM or end-user preferences. These changes in the core technologies of the equipment require significant validation and especially in case of non-regulatory changes, there is a significant risk of acceptability from OEMs. As a result, only suppliers with strong R&D capability will be able to initiate or persuade innovation and new technology development. Critical, control technologies and products undergo extensive validation before their commercial introduction. OEMs introducing such solutions invest significant resources in their implementation, integration, and validation, thereby creating a barrier to switching to alternative technologies. Typically, automotive OEMs are highly selective in qualifying suppliers with respect to critical products given the risks of switching

suppliers, especially where product reliability is critical. Also, supplier relationships with customers are built on providing innovation through cutting-edge technologies which helps the customers to remain competitive in the market. SEDEMAC is among the few suppliers to have introduced multiple, innovative control intensive technologies to large OEM programs.

With the increasing complexity of powertrains, rising regulatory scrutiny along with the growing consumer demand for efficiency, safety, and connectivity have significantly accelerated the adoption of advanced electronic control solutions within the modern age mobility systems. These electronic control solutions are an integral part for managing everything from engine performance and emissions control to energy storage, electric drivetrains, and remote diagnostics. These solutions are enabled through continuous innovations and development of new technologies. Technology in a simple sense is a way to do something. Technology will be agnostic to products and applications. Technology enables never-seen-before applications or invents a significantly superior way of doing an established job. Once technology is proven, it can transcend geographical boundaries and does not need a linear investment of resources. Proven technologies integrated into a system can become a key differentiator, enabling companies to establish and maintain a competitive edge. This, in turn, can lead to improved market positioning and a strong business foundation, driving long-term success. In the technology space, the first-mover advantage often proves critical as continual improvements, developments create barriers for competitors and other following technologies.

Control technologies are highly application-specific and are engineered to meet the unique demands of different end-use categories. A controls solution typically revolves around an Electronic Control Unit (ECU), which is essentially an intelligent electronic device acting as a brain of the system in which it is integrated into. We are all surrounded by ECUs in our daily lives right from the washing machines, air-conditioners, refrigerators to the vehicles we use. Some of these ECUs are critical to the application i.e. if they fail then the device itself fails to operate. For example, a failure in the ECU which controls an engine of a vehicle will lead to the vehicle coming to a standstill and will need action from someone to get it started again. For markets which are quality centric like the mobility industry, low PPM figures are a key indicator of reliability and scalability. Below are two examples of control technologies:

Engine Control technologies:

Engine control technologies include the ways of controlling engines to meet the performance requirements (Power, Emissions, Fuel Efficiency etc.). These are typically met by the Engine control Unit (ECU) via control of Air-Fuel ratio, Fuel injection quantity, Ignition timing etc. based on the information available through the sensors in the system (e.g. Throttle position sensor (TPS), Manifold air pressure sensor (MAP), Temperature sensors etc.).

With the changes in regulatory norms, on-board diagnostics, learning mechanisms to adapt to flex fuels etc. are increasingly added as features in the ECUs.

Motor Control technologies:

Motor control technologies include the ways of controlling motors / electric machines to meet the performance requirements (Torque / Speed). These are typically met by the Motor control Unit (MCU) via control of the phase voltages / currents through the motor.

Overview of the SEDEMAC specific components

SEDEMAC specializes in developing novel control technologies across various segments in both the automotive and non-automotive sectors. The company develops critical-to-application control products (mission critical control products) that are essential to control and optimize numerous function/factors of a vehicle operation, requiring high levels of reliability and performance. Critical-to-the-application components are those without which a piece of equipment cannot fulfil its primary function for the end user. For example, an engine ECU (electronic control unit) is indispensable for the mobility of an engine-powered vehicle; if it fails, the vehicle will not move. In contrast, components like dashboards, though important, are not fundamental to the main function. SEDEMAC supplies critical-to-the-application electronic components and systems to leading original equipment manufacturers, including those in established and stable markets where the supplier ecosystem and underlying technologies tend to change infrequently

In the automotive sector, their product portfolio includes integrated starter generator controllers (ISG) and electronic fuel injection (EFI) ECUs for ICE powered two-wheelers and three-wheelers. Additionally, they offer motor and motor controllers for e2W, e3W, eLCV and e-bikes. Beyond the automotive sector, the company caters to the power tools and generators (genset) industry, providing genset controllers and EFI ECUs for gensets, as well as motor controllers for battery-operated/cordless power tools.

Control Products	2W/3W ICE	2W/3W EV	LCV EV	E-bikes	Genset	Power tools
ISG	Y					
EFI ECU	Y					
Motor control unit (MCU)		Y	Y	Y		
Motors		Y				
Genset controllers					Y	
EFI ECU					Y	
Motor control unit (MCU)						

Y = Commercialized Technology/Products

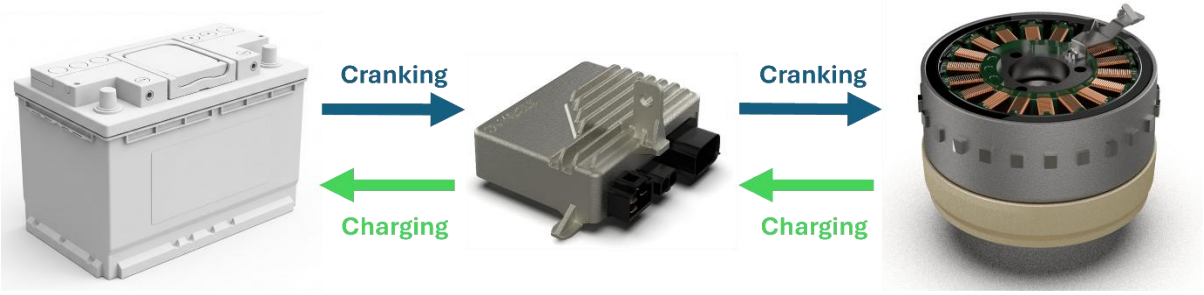
Control products for ICE powered 2W & 3W

The 2W and 3W ICE segments have witnessed significant growth in recent years, driven by increasing demand for affordable and efficient transportation solutions. As industry continues to evolve, the integration of electronic and electrical products has become a key focus area for manufacturers. The 2W and 3W ICE segments have traditionally been dominated by mechanical systems. However, with the increasing need for improved performance, safety, and efficiency, manufacturers are now incorporating advanced electronic and electrical products into their vehicles. Some of the key drivers of this trend include emission regulations, safety requirements, performance needs, connected mobility and electrification. Some of the key electronic and electrical products that are gaining traction in the two-wheeler and three-wheeler ICE segments include Electronic Fuel Injection (EFI), Anti-lock Braking Systems (ABS), Combi brake system (CBS), telematics and others. The integration of electronic and electrical products in two-wheelers and three-wheelers is a growing trend that offers several benefits, including improved performance, reduced emissions, and enhanced safety.

Integrated starter-generator (ISG) Controller/ECU

A conventional 2/3 wheeled engine powered vehicle has two electrical machines – one machine (starter motor) to crank/start the engine and another (alternator) to charge the battery when the engine is running. The alternator, commonly referred to as 'Magneto' in the 2W/3W industry, is crankshaft mounted and thus directly coupled to the engine.

The Integrated Starter-Generator (ISG) technology eliminates the conventional starter motor and components of its assembly by using the electric machine, otherwise used as an alternator alone in starter motor system-based vehicles, also as a motor to crank/start the engine. The working of the electric machine as a motor at start and as a generator subsequently is enabled by an ISG controller/ECU. During engine starts, the ISG ECU helps convert electrical energy to mechanical energy as it actuates the electrical machine which in turn rotates the engine while the engine runs. ISG ECU helps use the electrical energy converted by the Magneto from the engine's mechanical energy to charge the battery and is critical to the application as the vehicle may not be able to start (crank) or charge the battery once started and lead to degraded performance if the ISG ECU fails to function properly.



Energy Conversion in an ISG system
Image source: SEDEMAC

The associated benefits include users experiencing silent, quick and reliable starts. Benefits to OEMs include improved system robustness through component elimination. ISG systems can also enable features like idle start-stop improving fuel efficiency and torque assist which can improve the rider experience. These benefits have propelled the ISG adoption from 0% in fiscal 2018 to around 36% in fiscal 2025 in the Indian domestic 2/3 wheeled vehicles.

Sensor vs sensor-less ISG

The magnetos used in the vehicular systems have a permanent magnet-based rotor and a stator. These types of brushless machines require commutation – i.e. determining which stator coils to excite based on the information of the position of the stator with respect to the rotor. This is generally done with the help of physical sensors (hall effect-based sensors mounted on the stator). Temperature, dust, sometimes oil (if the crankcase is wet) will be present in the environment where these hall effect sensors are assembled which can cause failures of these sensors and in turn lead to loss of control of the magneto and then the vehicle itself. Most of the motorcycles today are built in with oil-dipped magneto.

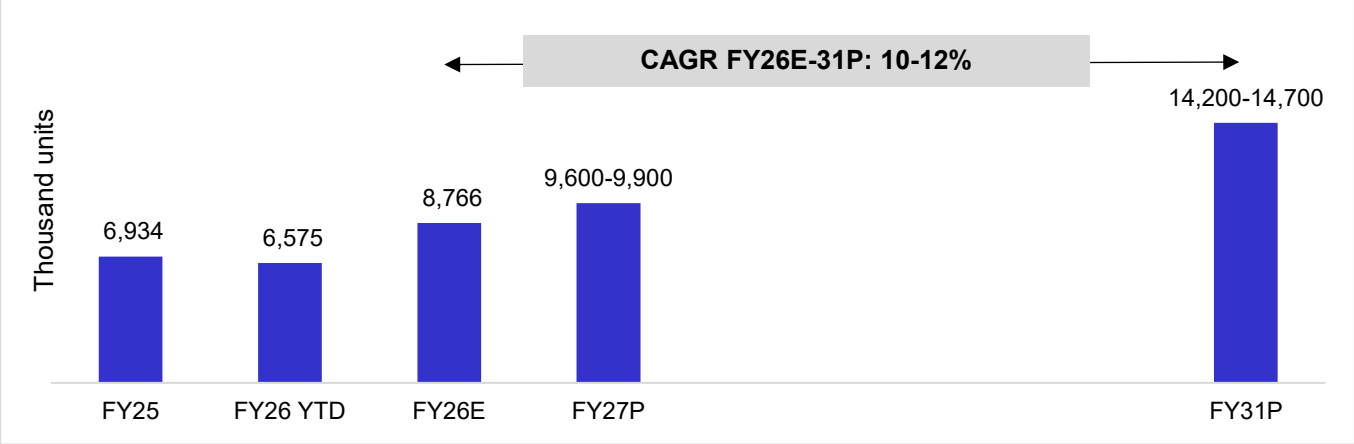
Whereas Sensor-Less Commutation (SLC) technology, can control motors without the hall effect sensors in low speed, high torque applications including ICE vehicles as well as electric. wet (oil dipped) magneto is a common configuration in motorcycles and is one of the most prominent failure modes in electric machines with hall effect sensors. Thus, the use of sensor-less technology/commutation eliminates the chances of failure, thereby improving

reliability which is otherwise possible in sensor-based technology. SEDEMAC the first company in India to develop, design and manufacture sensor less commutation (SLC) based ISG ECUs for 2W and 3W internal combustion engine (ICE) powered vehicles.

Review and outlook of ISG ECU for 2W and 3W ICE Segment, fiscal 2025-31P

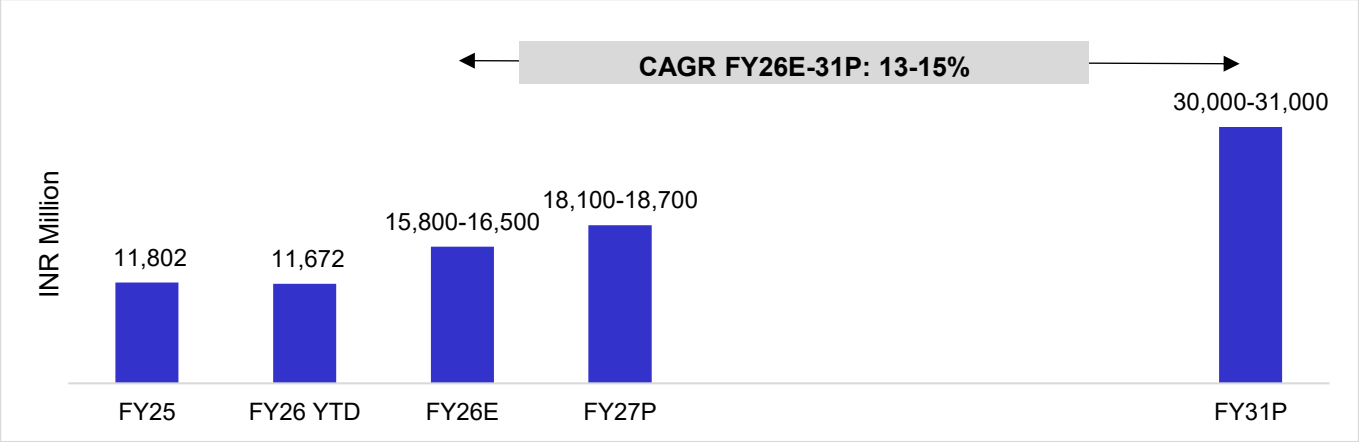
Segment	Component	Market	Channel
2W and 3W	ISG	Domestic	OE

ISG ECU in ICE vehicles market size (volume), domestic (fiscal 2025-31P)



Source: CRISIL Intelligence

ISG ECU in ICE vehicles market size (value), domestic (fiscal 2025-31P)



Source: CRISIL Intelligence

In fiscal 2025, close to ~7 million vehicles sold in India had ISGs, which is more than 35% of the total ICE 2W and 3W sales. Key suppliers of ISG are SEDEMAC, Shindengen, and Denso. SEDEMAC supplies sensors less ISG

solutions whereas most of the others have sensors in them. SEDEMAC holds ~35% market share on domestic ISG ECU market for 2W and 3W combined (in terms of volume) and are among the top 4 players in fiscal 2026 YTD. The penetration of ISG has grown in the domestic market with models like TVS Jupiter, TVS Ntorq, Honda Activa, Honda Shine and Suzuki Burgman migrating to ISG. The demand for ISG is driven by growing technological advancements and the need for advanced control solutions in vehicles. Technological advancements are giving rise to products that are more efficient, compact and offer improved performance. ISGs are more efficient, and compact compared to traditional starter motor set-up, making them an attractive option for two-wheeler and three-wheeler manufacturers. Further, fewer moving parts compared to traditional starter motors and generators, resulting in lower maintenance costs and increased reliability. Also growing demand for more powerful vehicles, particularly in the premium segment, is driving the need for more efficient and compact power generation solutions like ISGs. ISGs offer improved performance, including faster starting, smoother operation, and reduced vibration, which is driving their adoption in the two-wheeler and three-wheeler segments.

The market for ISG is valued at INR 11,672 million in fiscal 2026 YTD and is expected to reach INR 30,000-31,000 million by fiscal 2031 growing at a CAGR or 13-15%. The volumes for ISG are expected to reach 14,200-14,700thousand units by fiscal 2031, from over 6,500 thousand units in fiscal 2026 YTD. The penetration of ISG is expected to surpass 50% by fiscal 2031 in the ICE segment driven by the growing adoption of ISG in the new and existing models. Attractive features like idle start-stop, and improved performance make it an ideal choice for premium vehicles. Technology is also expected to make in-roads into the mass market segments also, where this could be offered as a choice of variant. Further, on-going innovations in the control unit front, where bundled solutions are offered as a single unit for multiple controls can further drive the adoption of ISG as integrated units in the 2W and 3W segment.

ECU for Electronic Fuel Injection (EFI)

Vehicular mass emission norms have gone through significant revisions over the last few years. The relevant regulatory landscape shifts like the introduction of Bharat Stage VI (BS VI) emission norms in India from April 2020 and fuel efficiency improvement mandates have led to wide, 100% adoption of the EFI technology within the Indian 2W/3W industry.

Similarly, the adoption of stricter emission norms in the genset industry, is driving the adoption of EFI in the genset industry. EFI can improve the reliability of starts irrespective of the ambient temperature and pressure without having to rely on seasonal setting modifications and can also provide better fuel efficiency.

An EFI Electronic Control Unit (ECU) in an Electronic Fuel Injection (EFI) system is a controller that in real time monitors the system, governs fuel delivery and engine operations based on data from various sensors. It controls the quantity and timing of the fuel injection into the engine cylinders and ignition of the mixture within the engine cylinder through an electronic spark. The ECU can also provide adherence to on-board diagnostics (OBD) regulations which aid the service centers to debug and resolve problems in the vehicular system. It is thus critical to the application as the engine will not function leading to vehicle being immobile if the EFI ECU fails to function properly. Key suppliers of EFI ECU in the 2W/3W space are SEDEMAC, Astemo, Bosch, Vitesco, Varroc-Dellorto, Marelli, Mikuni among others.

The development of complex technologies, such as ECUs, has led suppliers to employ diverse strategies. Some companies opt to develop these products entirely in-house, overseeing every stage from research and design to assembly. In contrast, others form partnerships with domestic or international suppliers, either through joint ventures or technology licensing agreements, to access the necessary expertise and support for production.



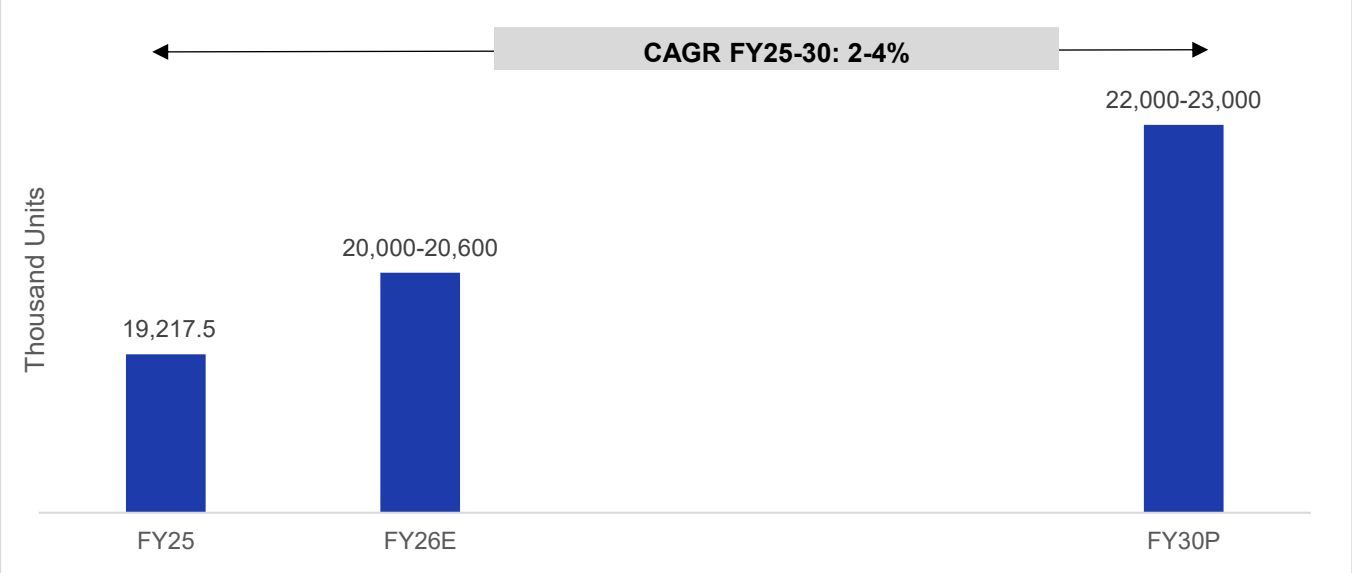
Image source: SEDEMAC

Review and outlook of EFI ECU for 2W and 3W ICE Segment, fiscal 2025-30P

EFI ECU is applicable for all on-road vehicles including 2W and 3W owning to the BS VI regulation mandating the use of EFI since fiscal 2021.

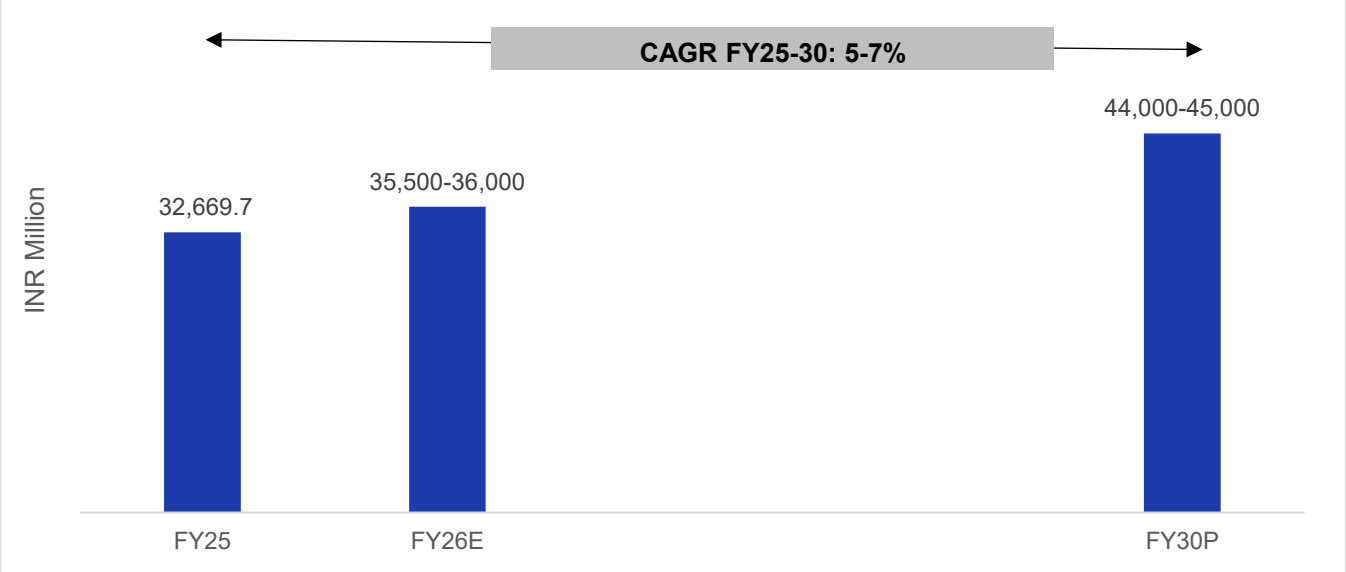
Segment	Component	Market	Channel
2W and 3W	EFI ECU	Domestic	OE

EFI ECU in ICE vehicles market size (volume), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

EFI ECU in ICE vehicles market size (value), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

The market for EFI ECU was valued at INR 32,669.7 million in fiscal 2025 and is expected to reach INR 44,000-45,000 million by fiscal 2030 growing at a CAGR of 5-7%. The penetration for EFI ECU is 100% in domestic 2W and 3W market owning to the mandate of EFI since fiscal 2021 due to BS VI regulations.

ISG+EFI Integrated ECU:

The integration of electronics offers a cost advantage for OEMs, making it a preferred approach. By consolidating components, OEMs can reduce the number of parts to be maintained during series production, while also optimizing the available space within the vehicle. Examples of such integration include the combination of Vehicle Control Units (VCUs) with Motor Control Units (MCUs) and the development of Integrated e-Axles, which streamline vehicle design and production.

One such integrated solution that could drive the ISG adoption is the ISG+EFI ECU combination. Since an EFI ECU is used in almost all 2W/3Ws sold in India, integrating the EFI with ISG provides both the functionalities at a reduced cost to the OEM. SEDEMAC sensorless ISG, ISG+EFI ECUs, are installed on more than9.2million small engine two-wheeler/ three-wheeler (2W/3W) from fiscal 2018 to Q3 fiscal 2026 used in India and company is amongst the key suppliers to OEMs.

Very few companies in the world have an integrated ISG+EFI for the 2W/3W market. Key suppliers of offering integrated ISG and EFI controllers are SEDEMAC, Shindengen and Astemo.

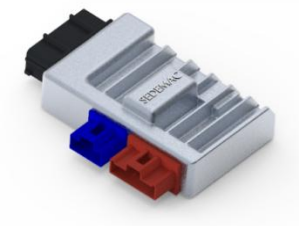


Image source: SEDEMAC

Review and outlook of global control products for ICE vehicles (EFI and ISG)

The ASEAN market is a critical hub from two-wheelers, with countries like Indonesia, Vietnam, Thailand Malaysia and Philippines having enormous two-wheeler and three-wheeler populations. Historically, these markets were dominated by carbureted engines due to cost effectiveness and simpler technology. However, the increasing urbanization, rising pollution concerns and the adoption of stricter emission standards, the region is embracing more advanced technologies including EFI and ISG.

Globally, countries have been progressively tightening their emission standards and as a result EFI has become a requirement for new vehicles to meet these stricter limits. Markets including Japan, Europe., US and India have stringent emission norms, making EFI indispensable for compliance. For example, Europe follows the Euro 5 for L category vehicles mandatory from 2021. While the regulations do not mandate EFI, the precision in fuel delivery, the need for closed-loop control, the ability to meet PM limits and the requirements for sophisticated OBD systems mean that EFI is necessity to comply with Euro 5. Leading manufacturers including Ducati and Vespa have transitioned to using EFI. China has also rapidly advanced its national emission standards for two-wheelers and three wheelers. China VI implemented from 2018, aligns with Euro 5 levels of pollutants. China VI standards include strict limits of CO, HC, NOx, and PM along with OBD systems. These requirements make it extremely difficult to use carburetors and hence EFI is becoming the prevailing technology. Similarly, many ASEAN countries are adopting or moving towards Euro 4 and Euro 5 equivalent standards. As these countries aim to tackle air pollution, they are progressively tightening their emission regulations. The move to Euro 4 or Euro 5 equivalent standards inherently means that EFI is the only viable technology to meet the required emission reductions. For example, emission norms in Malaysia are aligned wit Euro 4 levels and EFI is available in the top models of the country. Similarly, Vietnam, Indonesia, Thailand and Philippines are following similar trends, with new models increasingly featuring EFI to comply with national regulations.

As manufacturers introduce advanced models and features to attract customers, ISG is seen as a premium and desirable technology. The silent and smooth start offered by ISG enhances the overall riding experience. Honda has been a major driving force behind the adoption of ISG (which they market as ACG starter) in the ASEAN market. They were among the manufacturers to widely introduce idle start-stop systems in their scooters in the key ASEAN market like Thailand, Indonesia and Vietnam. Honda’s strategy to democratize this technology by

introducing it to high volume commuter models, not just premium models has made the ISG equipped scooters accessible to broader consumer base. Similarly, Honda's eSP engine architecture integrates the ISG and EFI technologies, has become a cornerstone of their modern two-wheeler line-up. Honda introduced ISG in popular models like Beat, Vision, SH series, and Scoopy in ASEAN. Yamaha has also been a significant player in bringing ISG technology to the ASEAN market through their SMG system. Similar to Honda's eSP, Yamaha's Blue Core engine philosophy often incorporates ISG to achieve goals of fuel efficiency. Yamaha has introduced ISG in popular models such as the Aerox and NMAX in ASEAN. Honda and Yamaha together dominate the ASEAN market (Thailand, Vietnam and Indonesia) contributing to over 75% of the total sales and many of their top selling models have ISG.

Other Products

Voltage Regulator Rectifier (VRR)

As mentioned earlier, a conventional 2/3 wheeled ICE vehicle has two electrical machines – one starter motor to crank/start the engine and second, alternator to charge the battery when the engine is running. This generator also commonly referred to as 'Magneto' in the 2W/3W industry, which is crankshaft mounted and thus directly coupled to the engine.

The electrical energy generated by the magneto when the engine is running is alternating, unregulated and varying with the engine speed making it unsuitable for charging the battery as is. Thus, in such vehicles, there is a need of a device which can rectify (convert AC to DC) and regulate (stabilize) this voltage from the magneto to be able to charge the battery. These sorts of devices are called Voltage Regulator and Rectifiers (VRRs). Depending on the type of magneto, VRRs can be 1-ph or 3-ph compatible. In the domestic market, key suppliers include SEDEMAC, Flash, Napino, Shindengen and INEL.

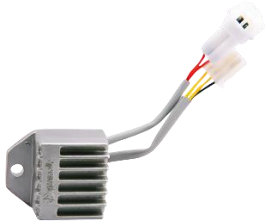


Image source: SEDEMAC

Other Controllers

Other key controllers used in the ICE 2W/3W include engine control unit, Transistor Controlled Ignition (TCI) controllers, Turn indicators (Flashers), Gas Level Indicators for CNG vehicles etc.

Controllers for engine powered Commercial Vehicles (CVs)

Aftertreatment Control Module (ACM):

In diesel engines especially larger ones, there is a need for an aftertreatment system to be able to process the harmful gases from the engine before releasing them to the atmosphere. With the BS-VI regulatory norms, this aftertreatment system has become active and mandatory in all diesel engine-based vehicles sold in India.

In this system, an ACM monitors the system through the sensors and electrical signals available and actively regenerates the selective catalytic reduction (SCR) catalyst by dosing-controlled quantities of AdBlue fluid in the SCR. This controller also monitors the diesel particulate filter and when it clogs, the ECU commands injection of some diesel fuel directly in the DPF line and burns the clogging out. This is critical to the system controller which if failed, will lead to additional emissions and harmful gases being released to the environment.



Image source: SEDEMAC

Control products for Electric Vehicles (EVs)

Motor Control Unit (MCU)

A Motor Control Unit (MCU) is a type of electronic control unit (ECU) that controls the operation of an electric powertrain (motor) in an electric vehicle. For small EVs, its electronic architecture is very similar to that of the Integrated Starter-Generator (ISG) controller, both of which act as inverters.

In an EV, the MCU plays a vital role by interfacing with various sensors and controllers to regulate the electric motor's operation. It continuously monitors crucial system parameters such as temperature, current, and voltage to ensure optimal motor performance and prevent potential issues. As a critical component of every electric vehicle, the MCU manages the flow of electrical energy to the motor, precisely controlling its speed, torque, and direction to deliver efficient and reliable operation. Motor controllers vary in voltage, power, and current capabilities, and can be broadly categorized as follows:

Vehicle class	Rated Voltage (V)	Rated current (A rms)	Peak current (A rms)	Peak power (kW)
2W	48/72	30~110	100~320	1.5~5
3W	48/72	110~200	320~400	7~10
LCVs	48/72/96/144	150~250	350~500	10~30
PV	336	75~200	150~400	30~100
Buses / Trucks	540	200~400	300~700	150~300

Motor Control Units (MCU) are also used to control auxiliary electric motors such as those for power steering, HVAC blowers, fuel pumps etc.

MCUs are used in motor powered vehicles such as electric bicycles (eBike), electric two-wheeler (e2W), electric three-wheeler (e3W) and electric light commercial vehicle (eLCV) and e-buses applications at present. Currently, all MCUs used for traction application in EVs use information from some sort of physical sensor to perform commutation. However, similar to ISG, these can also migrate to sensor-less technologies in the near future. Key suppliers of MCU in the smaller EV space (e2W/3W. e-bike etc) are SEDEMAC, Sterling-GTake, Bosch, Vitesco, Varroc and others.



Image source: SEDEMAC

Integrated MCU+VCU for e-bikes

As observed in the case of EFI + ISG ECU, integrated units offered various benefits to OEMs including cost and reducing the overall number of components.

An MCU-integrated Vehicle Control Unit (VCU) for e-bikes combines the functionality of a Motor Control Unit (MCU) and a VCU into a single integrated unit, streamlining control and communication within the e-bike's electrical system. The key suppliers include SEDEMAC ASI and GTake.



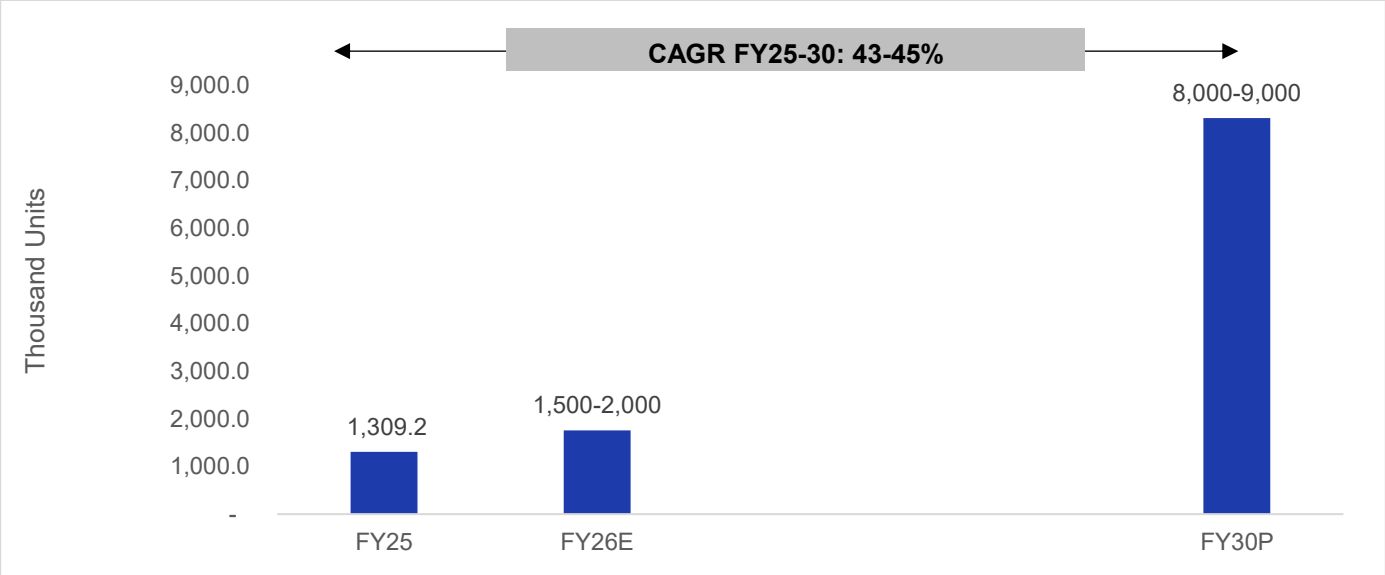
Image source: SEDEMAC

Review and outlook of MCU for 2W and 3W EV Segment, fiscal 2025-30P

Control products for EVs include motors and MCU used in the 2W and 3W segments. Motors and MCU are present in all EVs sold in India as traction motors drivers the vehicles and MCU units helps in regulation the operation of motors.

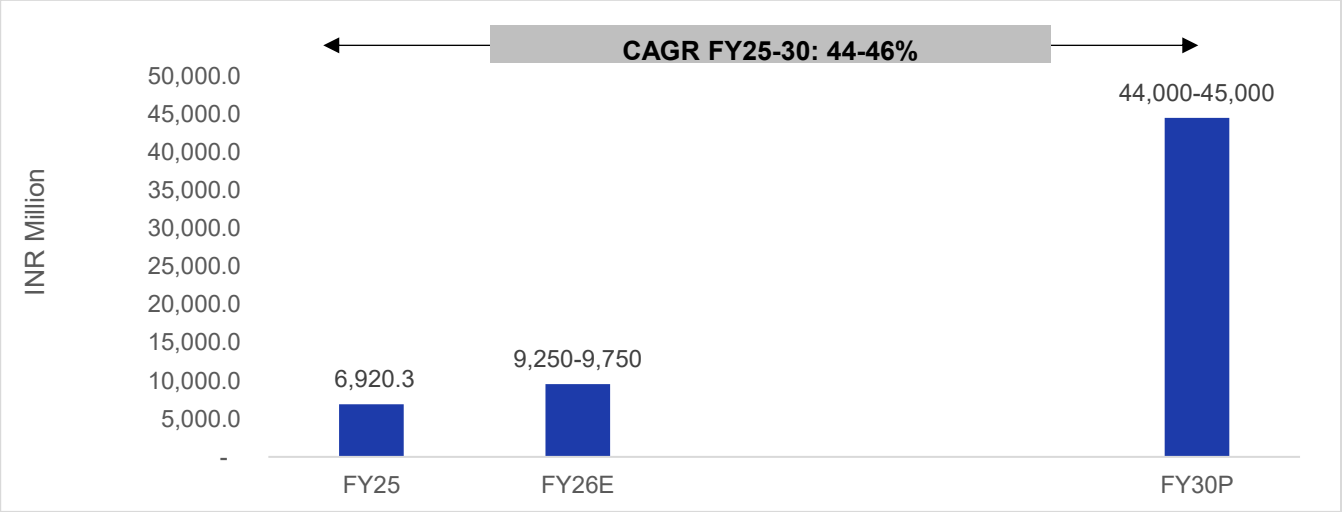
Segment	Component	Market	Channel
e2W and e3W	Motor control unit (MCU) and motors	Domestic	OE

MCU in EVs market size (volume), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

MCU in EVs market size (value), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

The market for motor controllers was valued at INR 6,920.3 million in fiscal 2025 and is expected to reach INR 44,000-45,000 million by fiscal 2030 growing at a CAGR of 44-46%. The volumes for motor controllers are expected to reach 8,000-9,000 units, growing at a CAGR of 43-45%. These components play a critical role in powering and controlling the vehicle's electric propulsion system. With the growing adoption of electric vehicles (EVs) in India, the importance of these components has increased, and government have proposed various initiatives including PLI and PMP schemes to boost domestic manufacturing capability. The growth of these components would be directly proportional to the growth of EV market as these are critical components for the EV powertrain. Any fluctuation in the EV uptake or the associated regulations would directly impact on the market for these components.

Motors

Electric Vehicles use motors for propulsion by converting electrical energy from batteries into mechanical energy. The major types of motors used in e-bikes, e-scooters, low-speed e2Ws and e3Ws include Brushless DC Motor (BLDC), Permanent Magnet Synchronous Motor (PMSM) and are either hub mounted, or mid drive mounted with a mechanism to transfer torque to the wheels. The motor selection depends on the vehicle type, required torque, thermal management, efficiency goals, cost constraints and other factors.

Brushless Direct Current (BLDC) motor

The BLDC motor consists of a rotor with permanent magnets, a stator with windings, and a motor controller that regulates the current flowing through the windings. The motor controller uses sensors to detect the position of the rotor and adjust the current accordingly, causing the magnetic field in the stator to interact with the magnetic field from the rotor and generate torque for propulsion of the vehicle. It works by using electronic commutation to control the current flowing through the winding, eliminating the need for brushes used in traditional DC motors. BLDC motor offers high efficiency and reliability. Additionally, the BLDC motor has a high-power density. Like the PMSM motor, they too require rare earth magnets.

Permanent Magnet Synchronous Motor (PMSM):
PMSM works by utilizing the interaction between the permanent magnets mounted on the rotor and the electromagnets on the stator to generate torque that propels the vehicle. It has a rotor with permanent magnets, windings on the stator and motor controller that regulates the current flowing through the windings. The motor controller sends current to the stator windings, which creates a magnetic field that interacts with the magnetic field of the rotor. This interaction creates torque that rotates the rotor, propelling the vehicle.
PMSM is the most widely used motor in electric vehicles due to its high efficiency as the use of permanent magnets eliminates the need for copper winding in the rotor, thereby reducing losses and increasing the efficiency of the motor. Also, the absence of torque ripples results in less noise during the operation. High-performance motor control provides smooth rotation over the entire speed range of the motor, fast acceleration & deceleration, and full torque control at zero speed. Additionally, the PMSM has a high-power density. However, it requires a motor controller, which can increase the cost and complexity of the system. Also, they rely on permanent magnets which are usually rare earth magnets like neodymium, dysprosium, and samarium that are expensive and imported by India. These magnets are subject to demagnetization over time, thereby reducing the efficiency of the motor.
Key suppliers of motors are Bosch, Nidec, Sona Comstar, Lucas TVS, Bafang, Yamaha and others.



eBike Hub Motor

Image source: SEDEMAC

Rare earth magnet-free motors

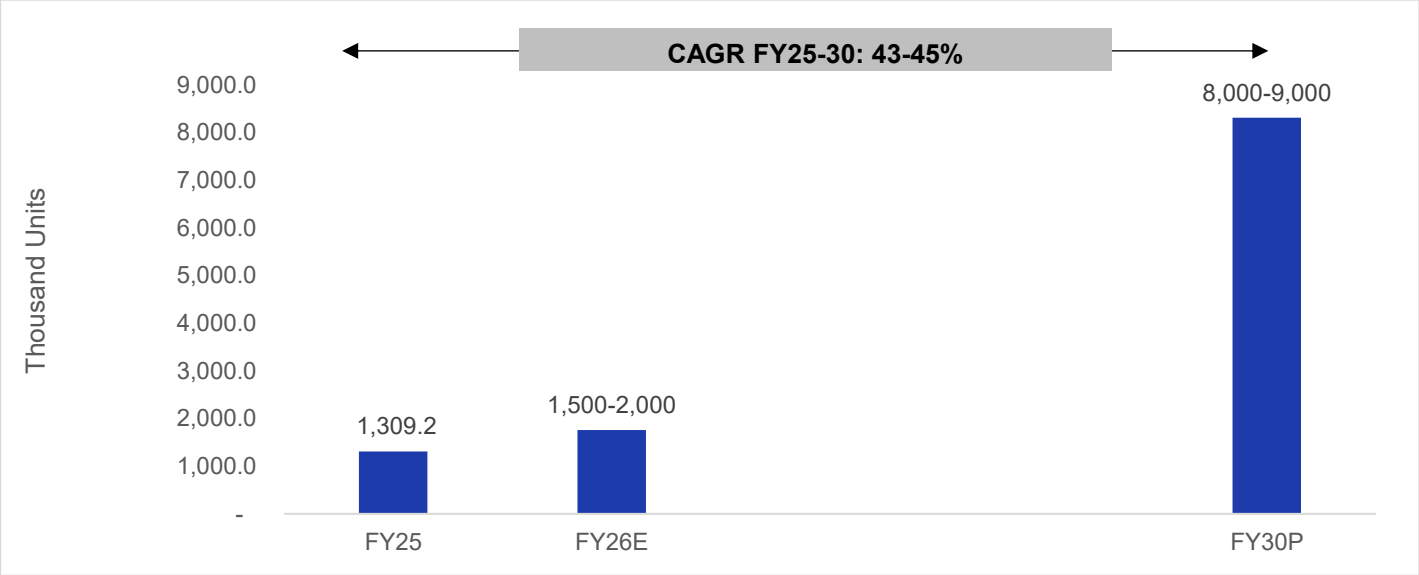
Rare earth magnets have been a crucial component in the development of high-performance electric motors, particularly in applications such as electric vehicles. However, the increasing demand for rare earth elements

(REEs) and higher import dependency has raised concerns over supply chain security, and material costs. In response, manufacturers have been exploring alternative motor designs that eliminate the need for rare earth magnets. This strategic shift is aimed at reducing reliance on imported REE, lowering costs and mitigating supply chain risks. Key developments in this aspect include development of rare earth magnet free motors which uses ferrite based permanent magnets and motor technologies that eliminate the need of magnets. While challenges remain, ongoing research and development are expected to drive innovation and commercialization of these alternative motor technologies. Rare earth magnet-free motors offer a promising solution to reduce dependence on critical materials, improve sustainability, and increase design flexibility.

Review and outlook of Motors, fiscal 2025-30P

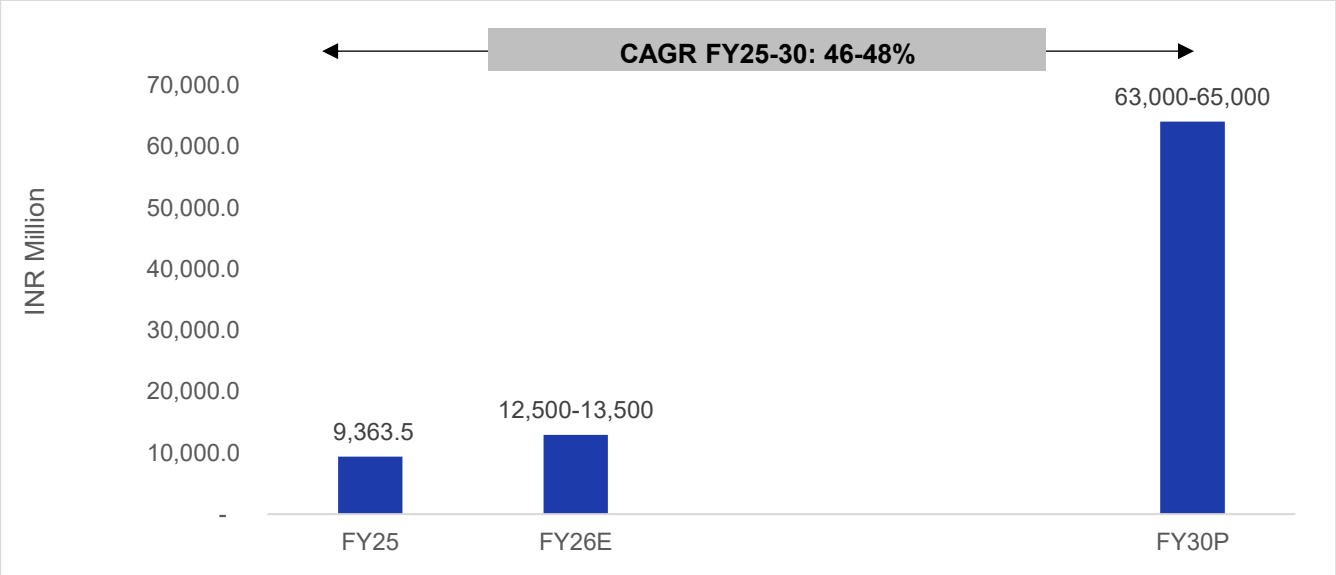
Segment	Component	Market	Channel
e2W and e3W	Motors	Domestic	OE

Motors in EVs market size (volume), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

Motors in EVs market size (value), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

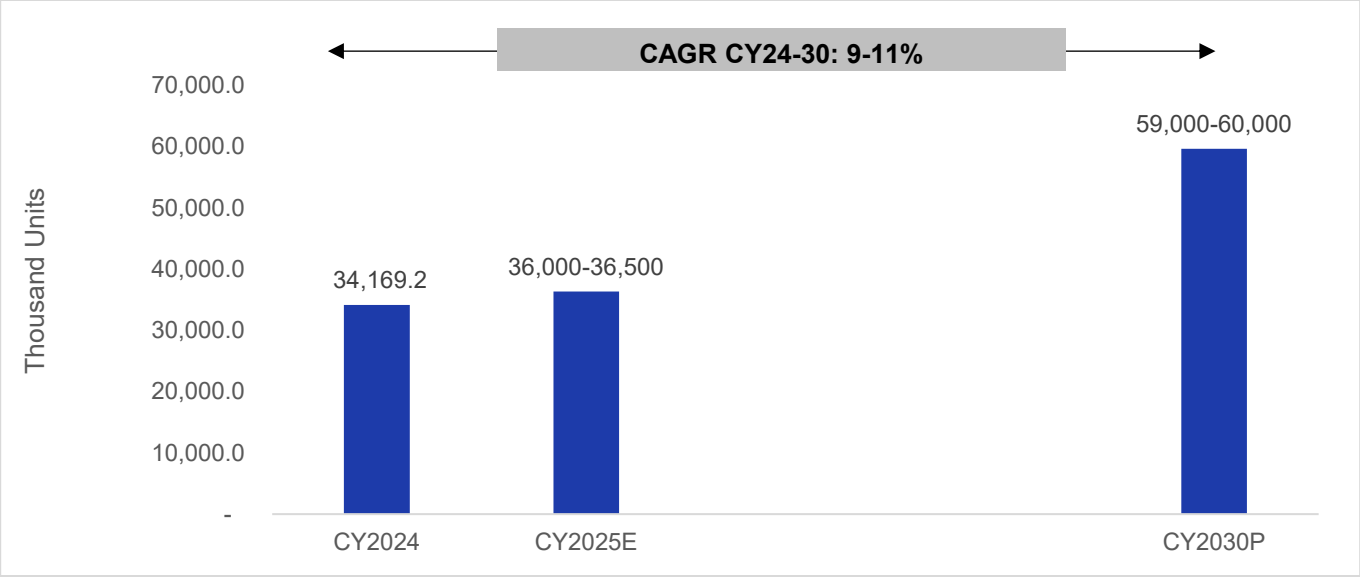
The domestic market for motors was INR 9,363.5 million in fiscal 2025. The market is expected to grow at a CAGR of 46-48% between fiscal 2025 and fiscal 2030 to reach INR 63,000-65,000 million by fiscal 2030. Motor is the driving unit of an EV. In the motors market, there are mid-drive and hub motors, Basis the OEM preference, the type of motors used in the vehicle might vary. Although we are still dependent on imports of raw materials, especially permanent magnets made from area earth elements, for many of other parts, we have achieved a minimum level of localization aided by government support through various schemes including PMP, PLI and FAME. To reduce the dependance on imports, many companies including SEDEMAC, Ola Electric, Chara Technologies, Sterling Gtake E-Mobility, Ather Energy have started working on the rare earth magnet free motors.

Domestic electric two-wheeler sales are expected to log a 45-50% CAGR from fiscal 2025 to fiscal 2030, and e-two-wheeler penetration is expected to cross 20% by fiscal 2030, supporting market for EV-based components. Major OEMs are already in the process of developing electric vehicles in-house or acquiring stakes in existing electric vehicle start-ups to diversify their offerings. The overall e-3W market has grown at a significant 33% CAGR between fiscal 2018 and fiscal 2023; and is expected to grow at 12-15% CAGR between fiscal 2025 and fiscal 2030 to reach 35-40% penetration in fiscal 2030. e-3Ws with high assured utilization rates are more profitable for businesses, as they become economical to operate at higher utilization. E-commerce giants prefer e-rikshaws for clean and economical last-mile connectivity. This e-three-wheeler sub-segment, which sells passenger-transporting e-autos and cargo-carrying three-wheelers, continues to witness strong growth owing to the sustained demand for passenger transportation and from last-mile operators for e-commerce applications, food deliveries and other applications.

Control products for electric vehicles, global, CY2024-2030P

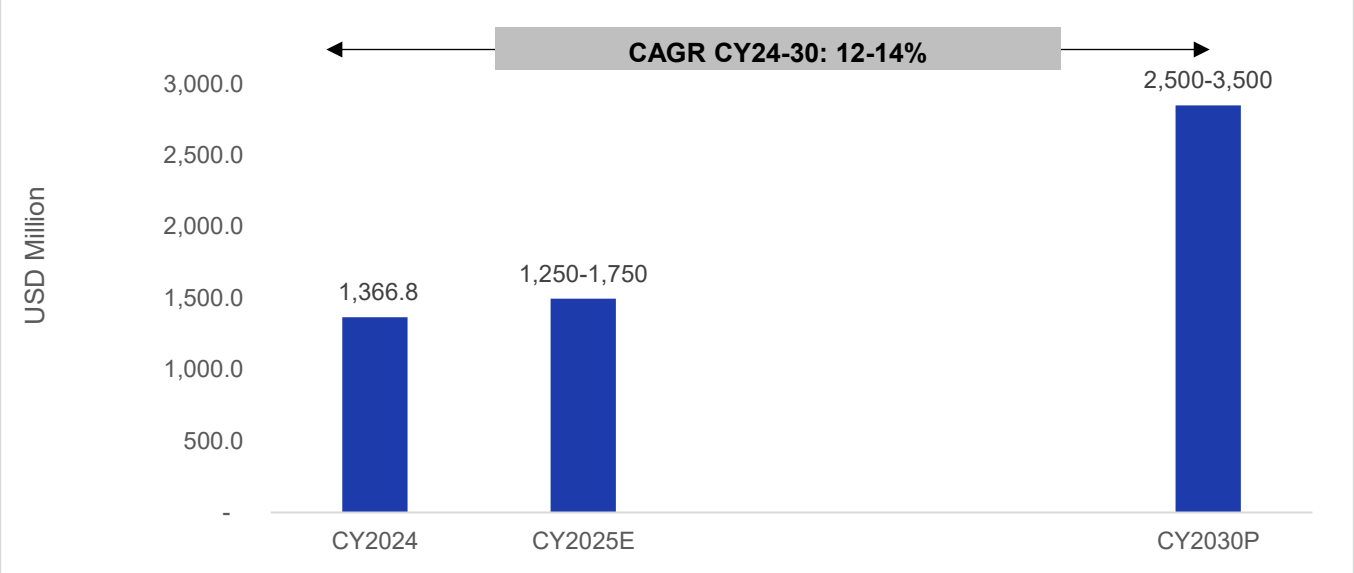
Motor controller for e-bikes, global, CY2024-2030P

Market size for motor controllers in e-bikes (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

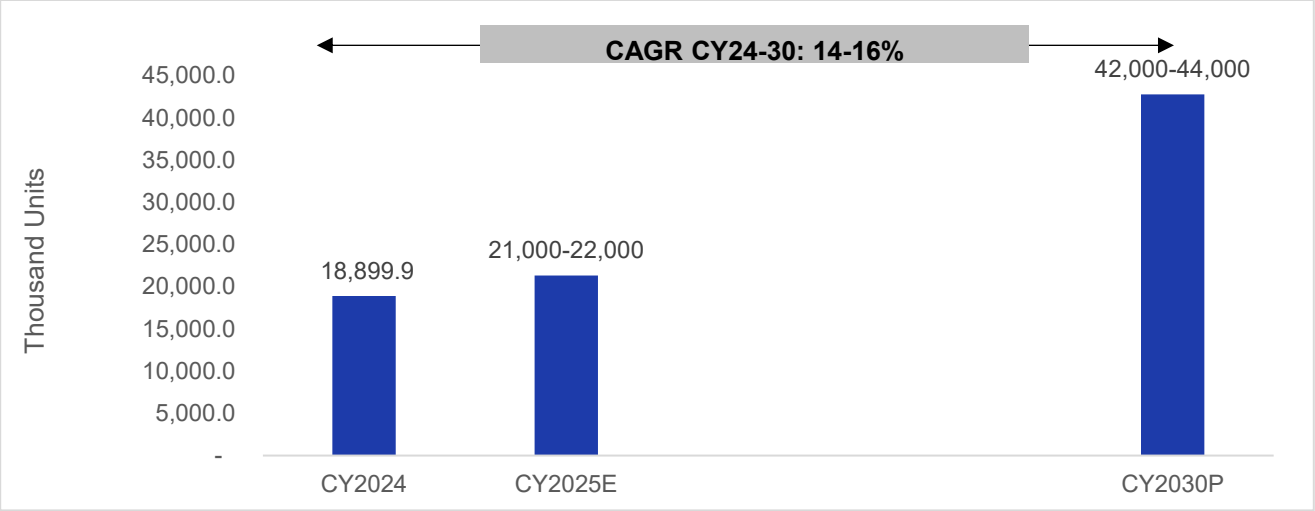
Market size for motor controllers in e-bikes (value), global (CY2024-2030P)



Source: CRISIL Intelligence

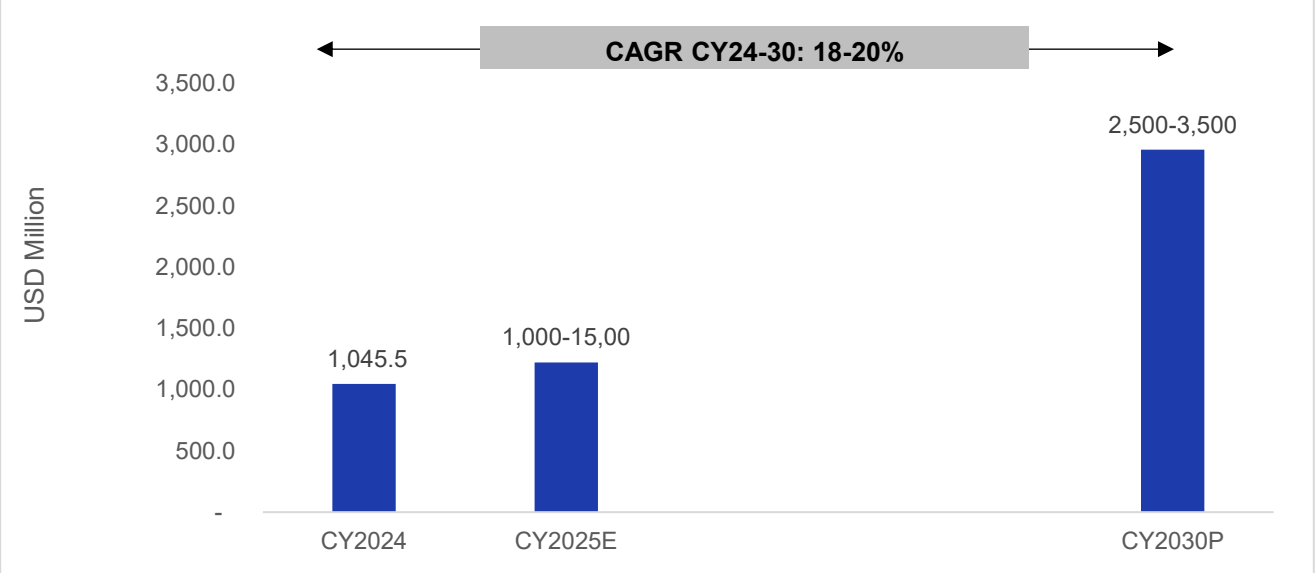
Motor controller for e2W and e3W, global, CY2024-2030P

Market size for motor controllers in e2W and e3W (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

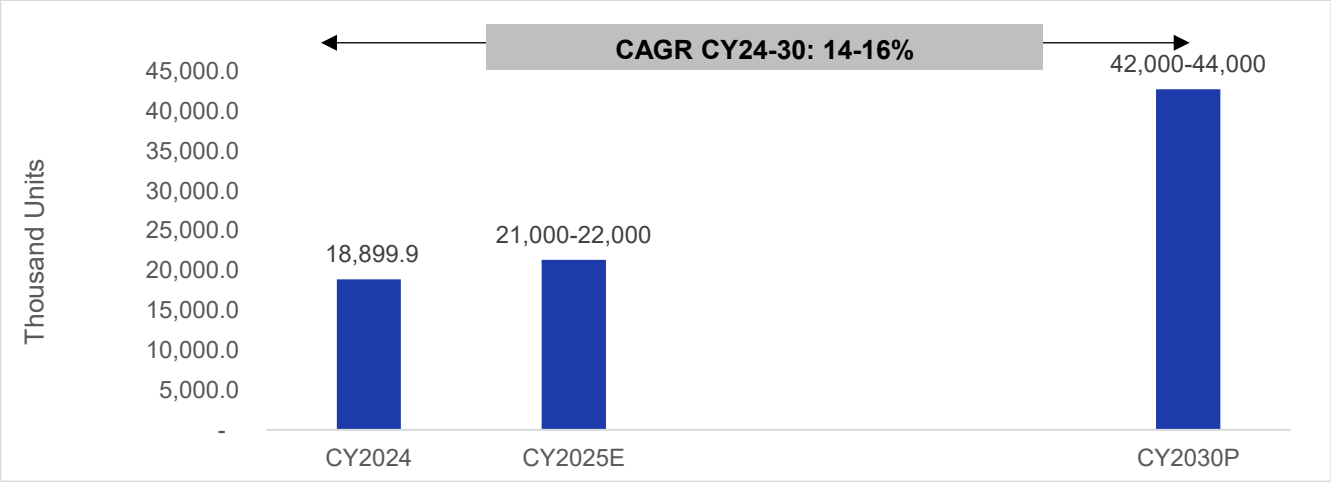
Market size for motor controllers in e2W and e3W (value), global (CY2024-2030P)



Source: CRISIL Intelligence

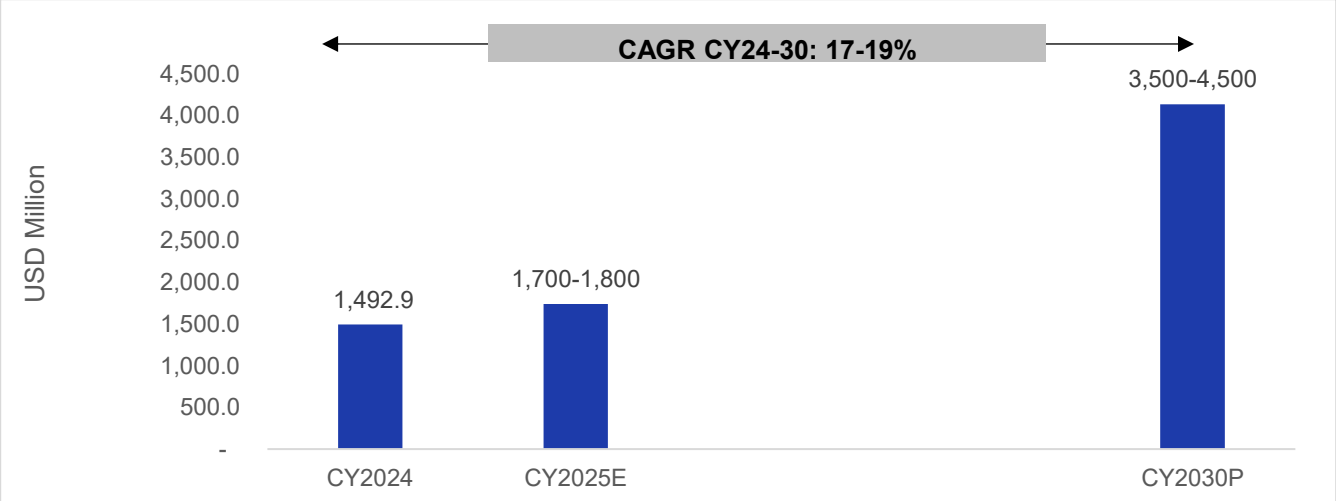
Motors for e2W and e3W, global, CY2024-2030P

Market size for motors in e2W and e3W (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

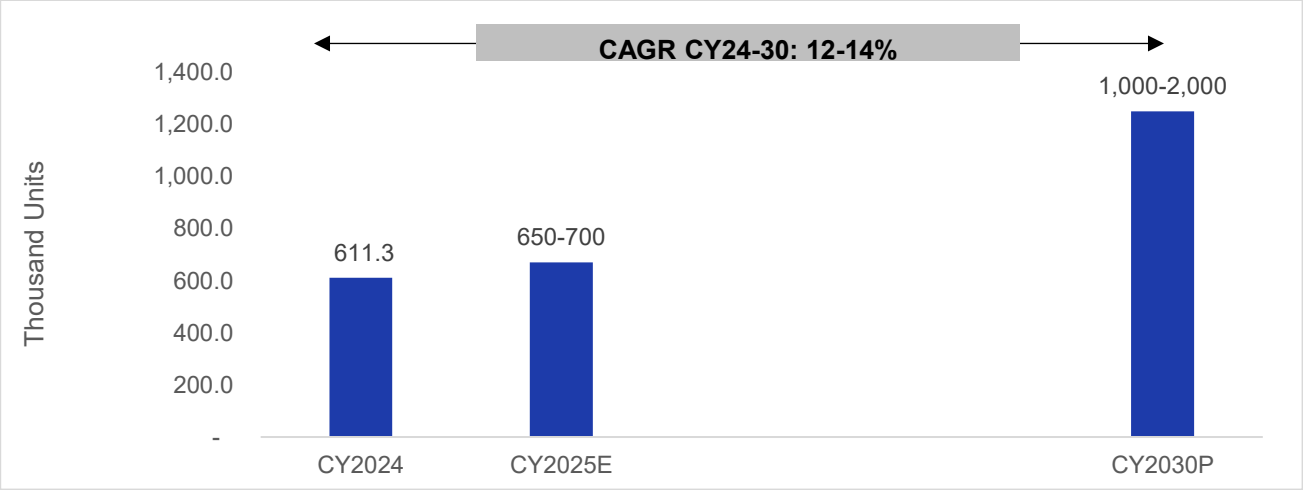
Market size for motors in e2W and e3W (value), global (CY2024-2030P)



Source: CRISIL Intelligence

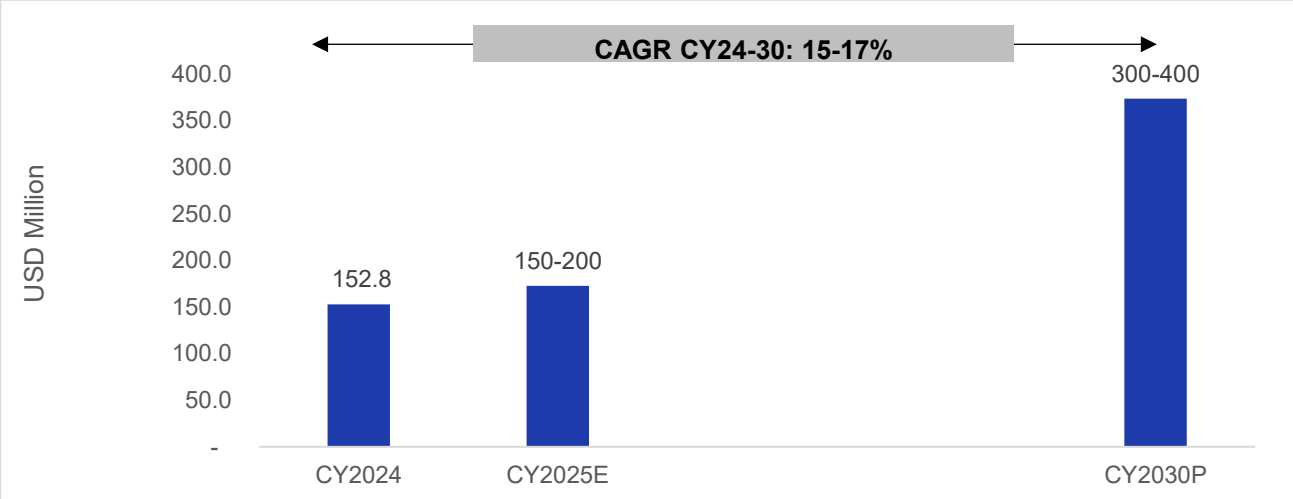
Motor controller for eLCV, global, CY2024-2030P

Market size for motors in eLCV (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

Market size for motors in eLCV (value), global (CY2024-2030P)



Source: CRISIL Intelligence

Growth Drivers for global electric vehicles:

- Technological advancements in battery technologies, which improve battery energy density and range, can effectively address range anxiety. Furthermore, the growing fast-charging infrastructure, innovations in battery swapping, and declining battery prices all contribute to making the overall cost of the vehicle and total cost of ownership (TCO) more competitive.
- Increasing public awareness of air pollution and government/corporate mandates to reduce carbon footprint, particularly for logistics and last-mile delivery, are driving the adoption of electric vehicles.
- The global e-bike industry grew at a healthy 14.5% CAGR during CY2020 to CY2024 period. The global e-bike industry is projected to grow at a faster pace of 9-11% CAGR to reach 59-61 million units by CY30.
- e2Ws clocked a sizeable 18% CAGR during the same period and reached 17.9 million units by CY2024. With the faster rise in EV sales the EV penetration increased from 16% in CY2020 to 26%

by CY 2024. the EV penetration is expected to reach 32-37% levels by CY2029 from the 26% penetration levels witnessed in CY2024.

- The e3Ws witnessed a healthy 31% growth during CY2020-CY2024 period and the share of EVs grew from 10.4% in CY2020 to 22.4% by CY2024. The share of EVs is expected to reach 48-53% from the current 22% levels.
- The e-LCV industry witnessed a sharp growth at 31.5% CAGR to reach 0.61 million units by CY2024 from 0.35 million units in CY2022. The global electric light commercial vehicle (eLCV) market is poised for significant growth, with a CAGR of 12-14% between CY2024 and CY2030. This robust growth, built on an already substantial base, is expected to propel the market to reach 1-1.5 million units by CY2030.

The rising EV penetration across segments is driving the need for critical components including motors and MCUs globally.

Motor Control Units (MCUs) for Powertools

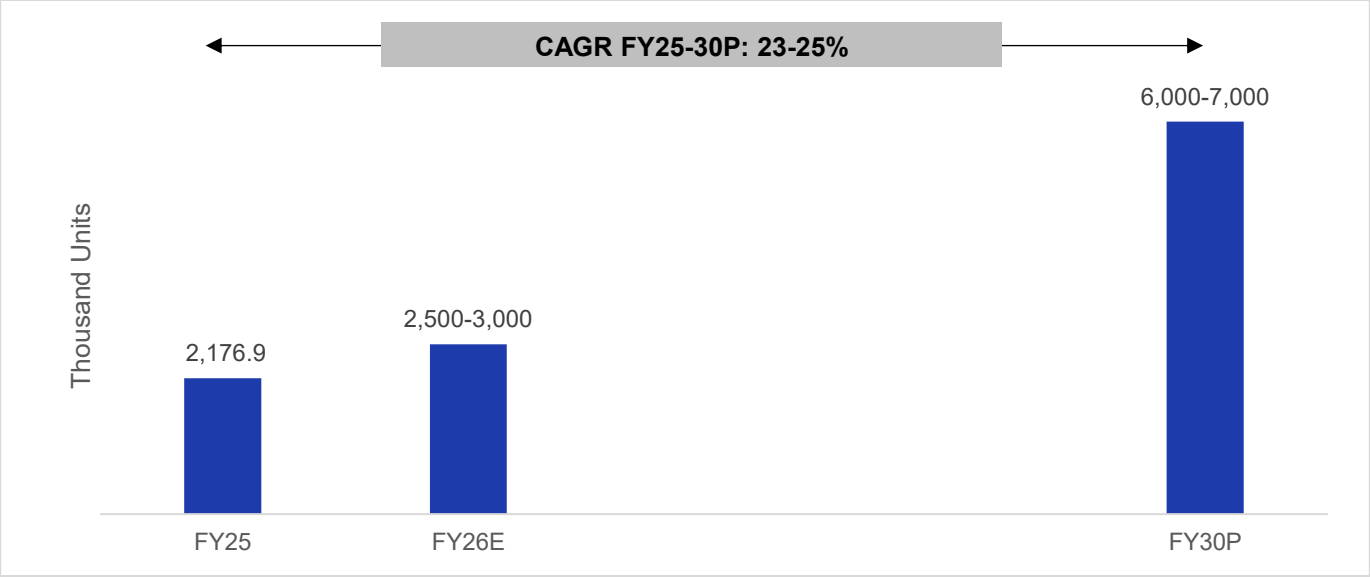
Power tools refer to the tools that utilize external power sources to perform tasks, rather than relying solely on manual labour. Some examples include electric drill, screwdriver, chain saw among others. Handheld powertools are seeing a significant shift towards cordless/battery-operated configuration from traditional electric or corded systems.

Battery operated powertools predominantly use Brushless Direct Current (BLDC) Motors. These motors require commutation i.e. sequencing of the currents through the stator windings to be able to rotate. This commutation is achieved through the position feedback from hall effect sensors. However, these sensors, as in the case of ICE 2W magnetos, can fail due to the dust, vibration and water from the environment. However, a Sensor-Less Commutation (SLC) technology, which can control motors without the hall effect sensors. Hence, the use of sensor-less technology eliminates the chances of failure which is otherwise possible in sensor-based technology due to the environmental impact on hall effect sensors. This improves the overall robustness of the system, potentially reducing the size of the motor used besides improving the cost aspect. MCUs are largely inverters and most of the controllers (ISGs, e2/e3W MCU or powertools MCU) share a common design architecture.

MCUs for powertools, domestic, fiscal 2025-30P

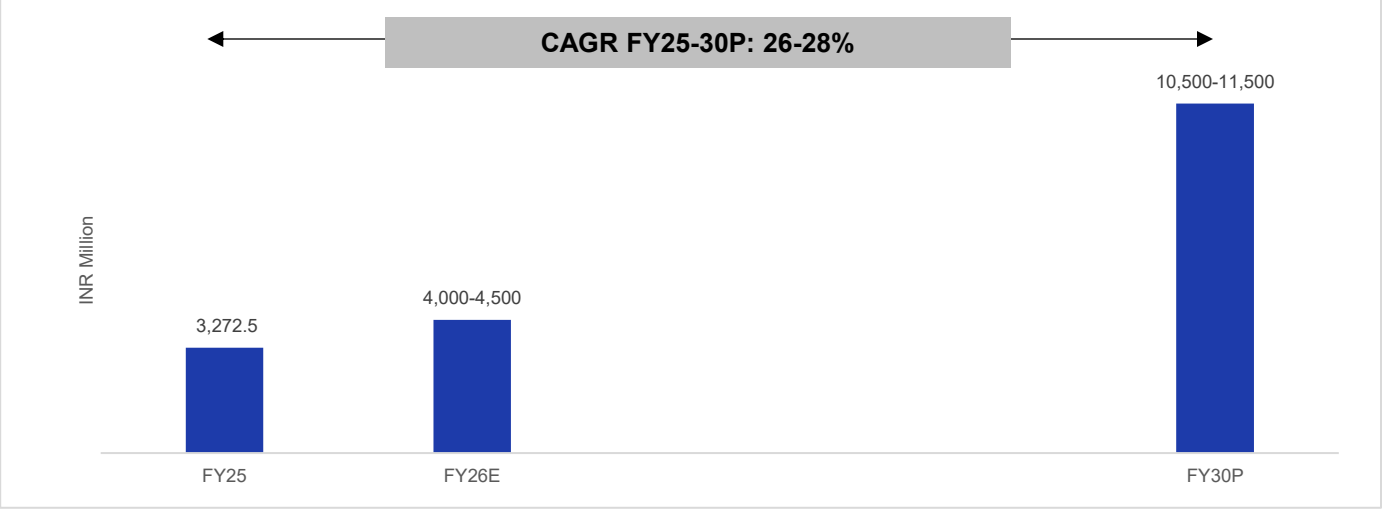
The domestic market for MCU in powertools was valued at INR 3,272.5 million in fiscal 2025 and is estimated to reach INR 10,500-11,500 million by fiscal 2030. The market is majorly driven by the shift to cordless/battery operated powertools owing to its convenience. The penetration of cordless tools is lower in Inda compared to global developed markets like US and Europe. The current penetration was 21% in fiscal 2025 and is estimated to reach 36% in fiscal 2030. The growth in the cordless powertools market owing to the DIY market growth and rising commercial activities associated to construction and infrastructure is expected to drive the market for powertools, thereby driving the market for MCUs in powertools in India.

MCUs in powertools market size (volume), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

MCUs in powertools market size (value), domestic (fiscal 2025-30P)

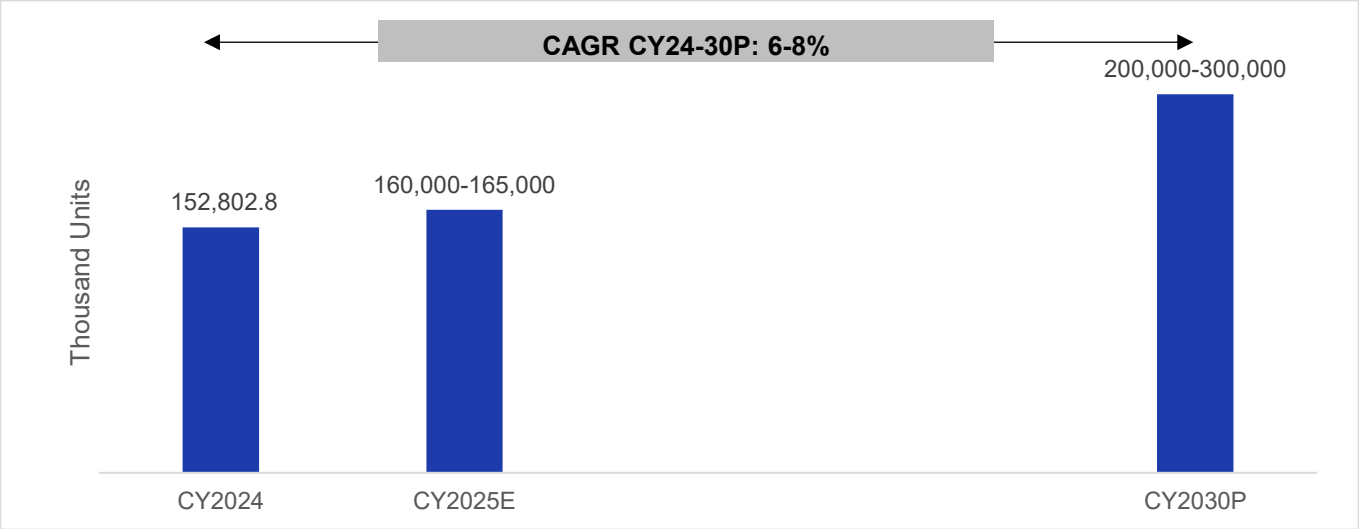


Source: CRISIL Intelligence

MCUs for powertools, global, CY2024-2030P

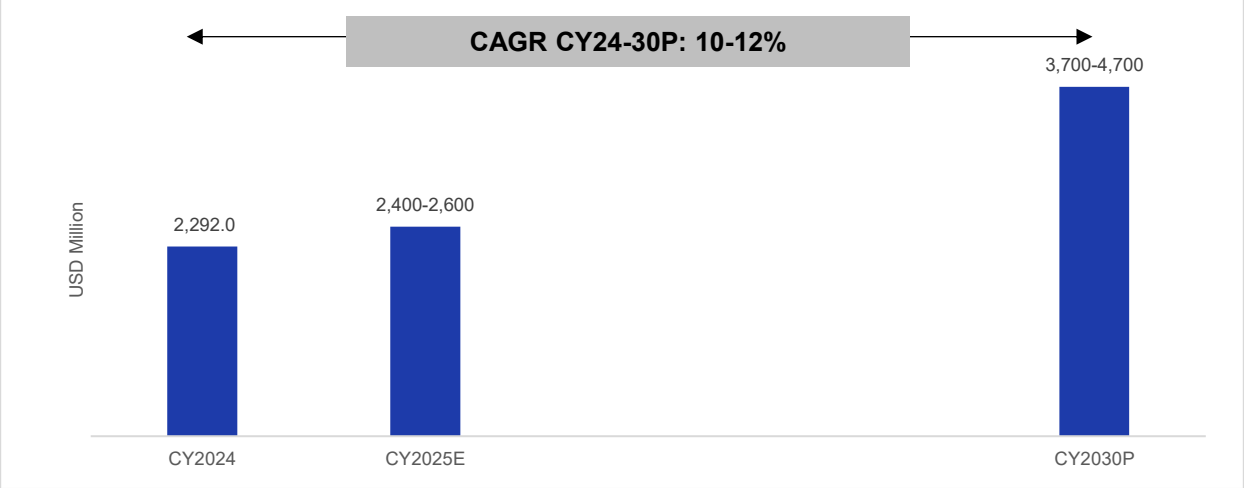
The global market for MCU in powertools was valued at USD 2,292.0 million in CY2024 and is estimated to reach USD 3,700-4,700 million by CY2030. Electric Cordless Tools have shown the most dramatic increase in market share, rising from 32.4% in CY2019 to 45.7% in CY2024. This surge reflects rising demand for portable, user-friendly tools, enabled by significant advancements in lithium-ion battery technology. Electric Cordless Tools have shown the most dramatic increase in market share, rising from 32.4% in 2019 to 45.7% in 2024. Cordless format is increasingly favoured across both DIY and professional users due to its flexibility, mobility, and improved performance. Cordless tools are expected to lead the market and are estimated to account for over 48 to 55% of total power tool sales by 2030, supported by continuous advancements in lithium-ion battery technology. The strong growth in the cordless powertools segment is expected to drive the market of MCUs in powertools globally.

MCUs in powertools market size (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

MCUs in powertools market size (value), global (CY2024-2030P)



Source: CRISIL Intelligence

Control Units for Generators

Genset Controllers (GCs)

Supervisory controllers for generators are devices that monitor, control, and protect generators, ensuring their optimal performance and longevity. Supervisory controllers with Auto Mains Failure are widely used in diesel generators and other backup power systems. These controllers automatically detect power failures in real time and start the generator and manage load transfers to ensure uninterrupted power supply while continually monitoring of the system and raising alarms in case of anomalies. These Genset controllers (GCs) also have a user interface through keypads and an LCD for configuring settings and also viewing the warnings / faults.

With the implementation of CPCB IV+ emission standards in July 2023, genset manufacturers started investing in advanced engines and emission control technologies to meet these standards. This includes electronic fuel systems, advanced after-treatment systems (ATS), and exhaust gas recirculation (EGR) systems. Most of the gensets produced in India were with mechanical diesel engines as prime movers for decades and although electronic governing (eGov) offered reliable and uniform performance, the solution was expensive and complex to be adopted in the mass market. With transition to stricter emission norms, manufacturers started moving towards electronic governors that use sensors and ECUs for fuel injection, leading to better performance in terms of speed regulation, load response, and fuel efficiency. Key suppliers are SEDEMAC, DeepSea, SmartGen, ComAp, Datakom and Fortrust.. SEDEMAC is the largest supplier of genset controllers in India with an estimated market share of 75-77%.

SEDEMAC also offers a telecom market specific genset controllers where the BTS battery is monitored in addition to the utility supply and the generator is started based on the battery state of charge (SoC). Key suppliers include SEDEMAC, DeepSea, SmartGen, ComAp, Datakom and Fortrust.

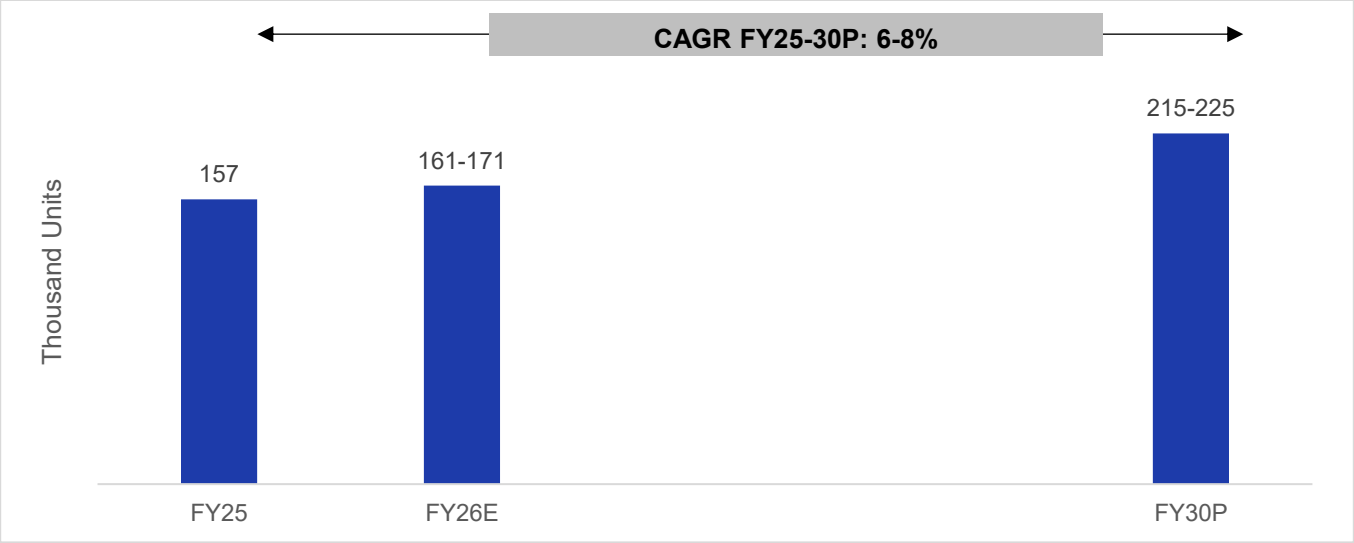


Image source: SEDEMAC

Domestic genset controllers market size, fiscal 2025-30P

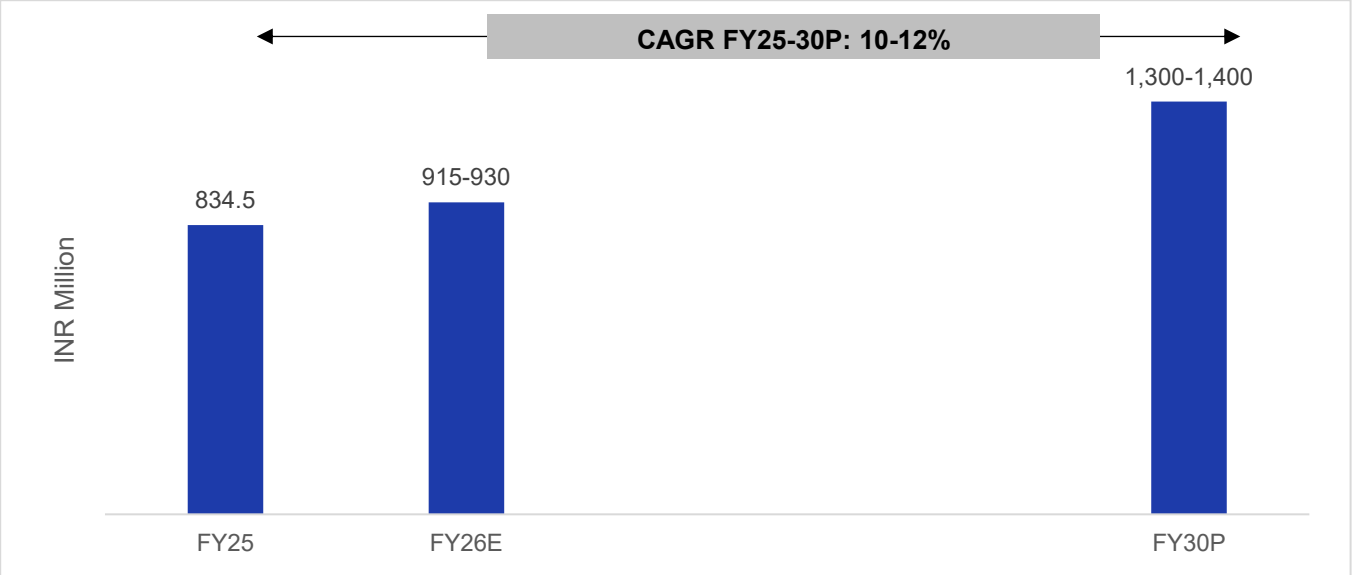
The domestic market for genset controllers was valued at INR 834.5 million in fiscal 2025 and is expected to reach INR 1,300-1,400million by fiscal 2030 growing at a CAGR or 10-12%. The market for genset controllers is majorly driven by the need for automated solutions owing to its convenience. Despite improvement in power infrastructure, many parts of the country, especially tier II and tier III cities, rural areas still face frequent outages and unreliable grid supply. This instability makes the genset essential for business, industries and residencies to ensure continuous. Further, the growing digital economy, IT & Telecom sector is driving the growth of data centers and communications infrastructure in the country. They rely heavily on gensets for continuous power supply to maintain connectivity and prevent service disruption.

Genset controllers market size (volume), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

Genset controllers market size (value), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

ECUs for Electronic Fuel Injection (EFI):

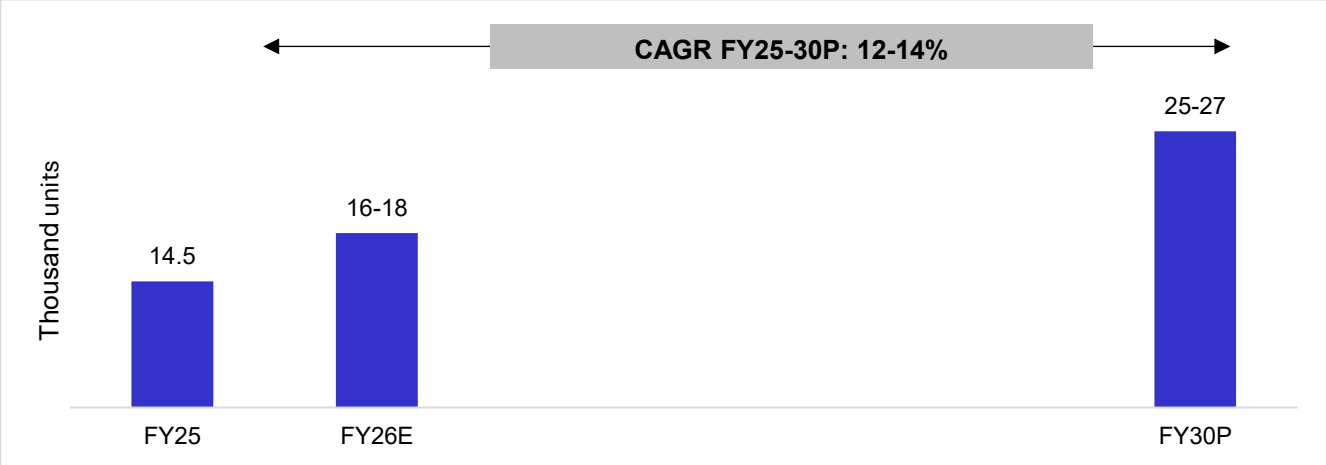
While CPCB IV+ in India mandates the use of EFI and emission control technologies in genset, the Tier 4 regulations in USA only mandates the use of advanced emission control technologies. However, a shift in trend is witnessed where the market is moving towards EFI in both portable and home standby models to offer better features to the end users. These are predominantly gas engine based gensets which are very similar to the gasoline-based engines used in 2W/3W market. EFI can improve reliability of starts irrespective of the ambient temperature and pressure without having to rely on seasonal setting modifications and can also provide better fuel efficiency. The larger industrial gas gensets are already fuel injected. Key suppliers of EFI ECU include SEDEMAC, Vitesco, Walbro and Borg Warner.



Image source: SEDEMAC

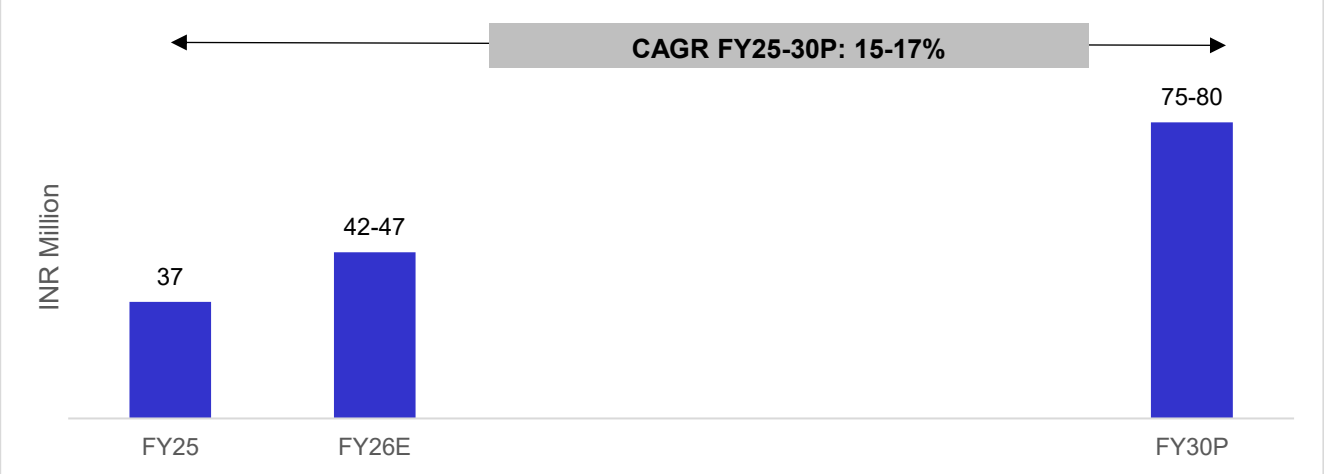
Domestic genset EFI ECU market size, fiscal 2025-30P

EFI ECU market size (volume), domestic (fiscal 2025-30P)



Source: CRISIL Intelligence

EFI ECU market size (value), domestic (fiscal 2025-30P)



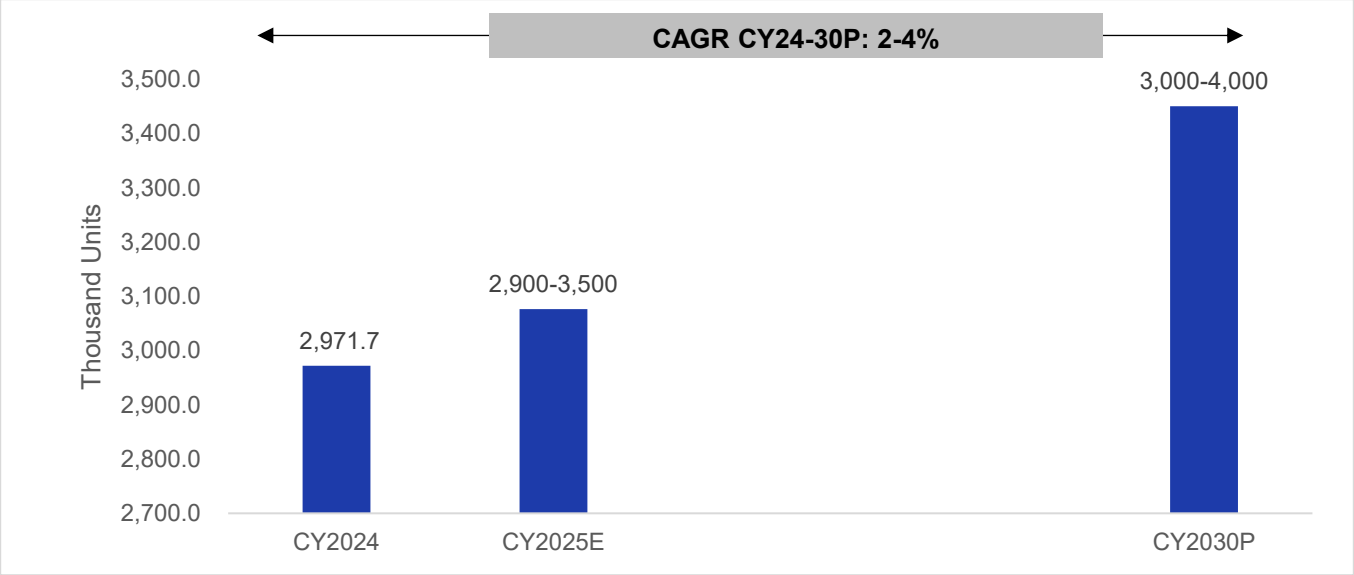
Source: CRISIL Intelligence

The market for EFI ECU in genset was valued at INR 37 million in fiscal 2025 and is estimated to reach INR 75-80 million by fiscal 2030. The rise of gas based and hybrid gensets are driving the market for EFI ECU in the genset market, which is needed to comply with CPCB IV+ norms.

Global genset controllers market size, CY2024-2030P

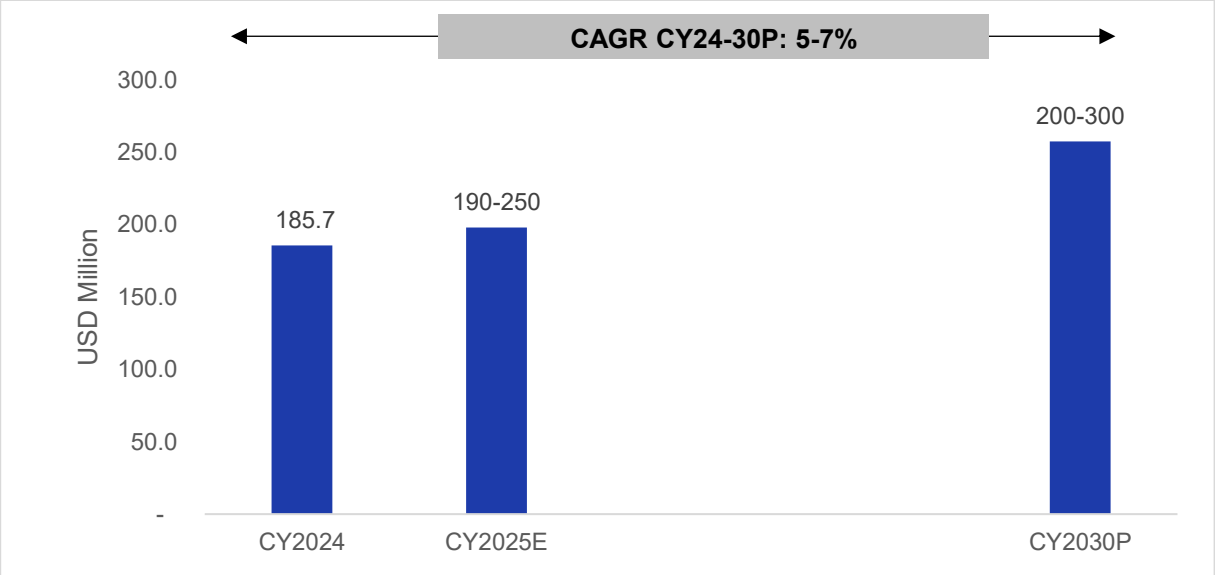
The global market for genset controllers was valued at USD 185.7 million in CY2024. The market Is estimated to grow at a CAGR of 5-7% between CY2024 and CY2030 to reach USD 200-300. The generators market is led by Europe and US. The increasing demand for uninterrupted and reliable power supply is a key demand driver for genset in the US and Europe. Aging grid infrastructure, increasing electricity demand, frequent natural events and extreme weather lead to more frequent and prolonged power outages. This significantly drives the demand for backup genset in residential, commercial and industrial applications. In the developing economies like Asia, India and Africa, the market for gensets is majorly driven by power infrastructure deficits, growing population and increasing demand for reliable power supply.

Genset controllers market size (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

Genset controllers market size (value), global (CY2024-2030P)

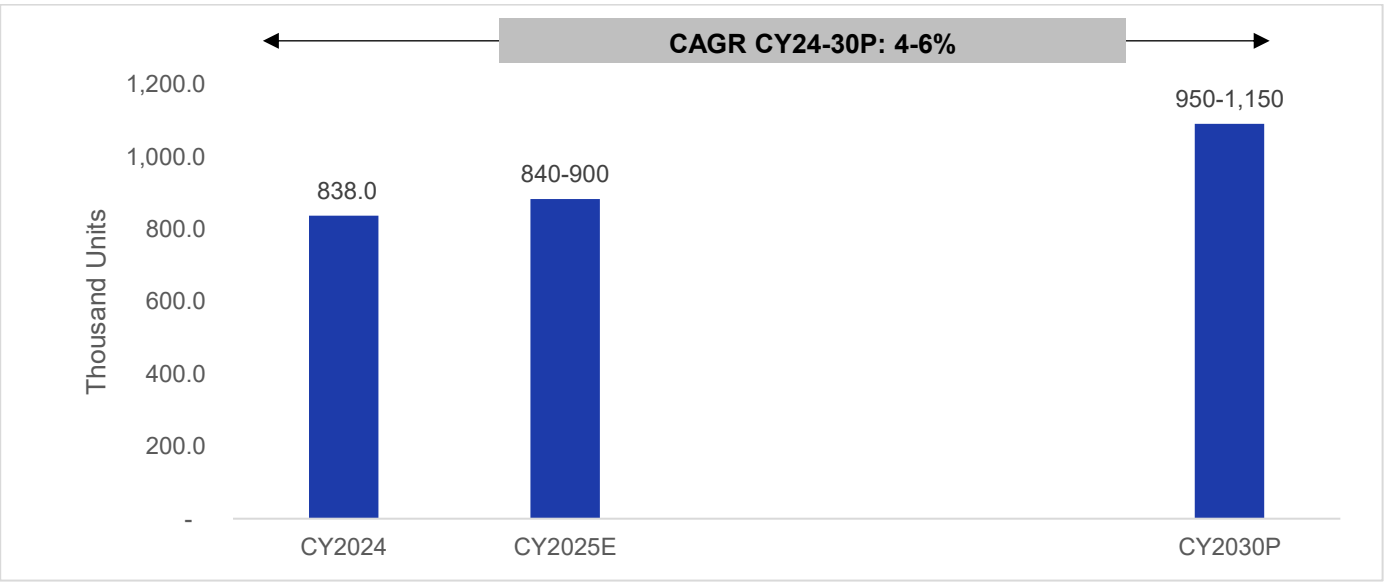


Source: CRISIL Intelligence

Global genset EFI ECU market size, CY2024-2030P

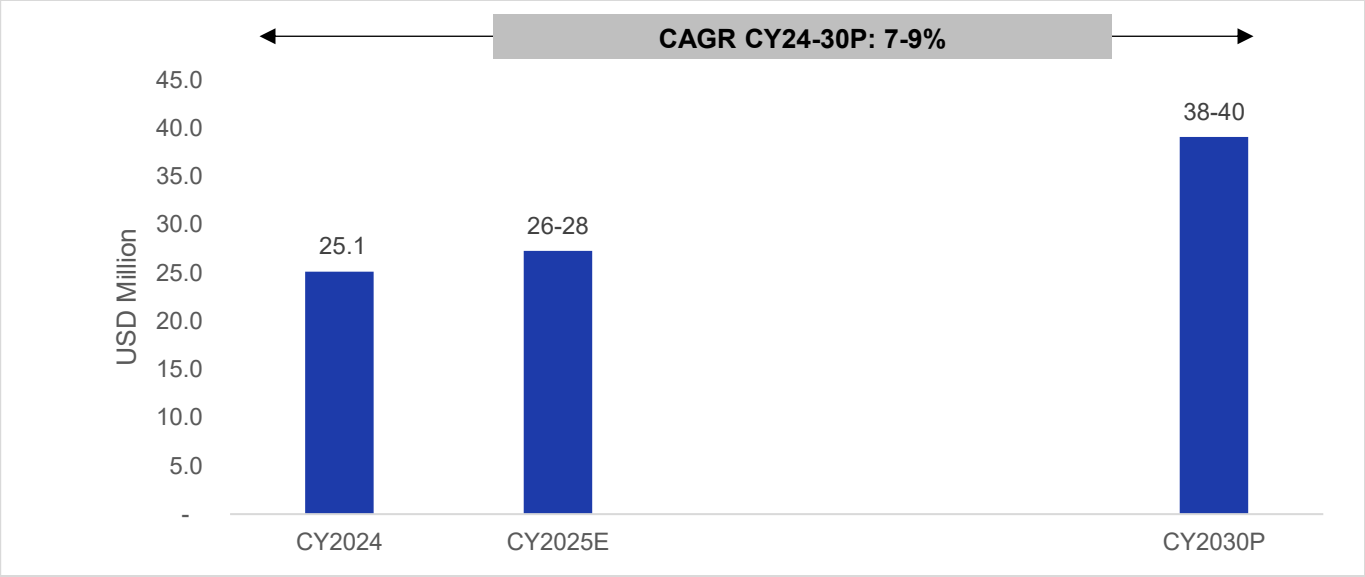
The market for EFI ECU in gensets in valued at USD 25.1 million in CY2024 and is estimated to reach USD 35-45 million by CY2030. The demand for EFI is driven by riding adoption of gas and alternate fuel gensets coupled with stringent emission standards driving the need for efficient and low emissions solutions.

Genset EFI ECU market size (volume), global (CY2024-2030P)



Source: CRISIL Intelligence

Genset EFI ECU market size (value), global (CY2024-2030P)



Source: CRISIL Intelligence

Competitive profiles

Key players in SEDEMAC relevant products are Bosch India, Sona BLW Precision Forgings, and ZF Commercial Vehicle Control Systems India Limited.

SEDEMAC Mechatronics Limited

KEY FACTS	BRIEF PROFILE
Year of incorporation: 2007 **HQ**: Pune, Maharashtra	SEDEMAC is a technology company engaged in the manufacturing of electronic components, primarily critical components are like controllers for automotive and non-auto sectors majorly. The company caters to segments like e-bikes, 2W, 3W and LCV in the automotive sector. SEDEMAC holds ~35% market share on domestic ISG ECU market for 2W and 3W combined (in terms of volume) and are among the top 4 players in fiscal 2025. Their ISG ECUs use sensor less commutation (SLC) technology in 2Ws and 3Ws and they have shipped more than 9.2 million ISG and ISG + EFI ECUs from fiscal 2018 till Q3 fiscal 2026. This technology has made us one of the key proponents of the ISG adoption within the engine powered 2/3Ws in India. The company also patented SmartIgn fresh technology wherein they eliminated the throttle position sensor (TPS) which was used to estimate load and control ignition timing on carbureted vehicles and utilized the engine physics to estimate the load. Company introduced this technology in the Indian 2W/3W industry in 2012, applied for a patent in 2012 which was granted in 2022. SEDEMAC was the first to introduce this SmartIgn technology in the Indian 2/3W industry in 2012. This technology has been sold for integration in more than 48.8 million vehicles from fiscal 2012 till Q3 fiscal 2026. In the non-auto sector, the company caters to industries like genset and power tools. SEDEMAC have been the key proponent of electronic governing (eGov) in the Indian generator set industry since 2014 where they integrated the eGov function within their genset controllers (GCs) which due to cost optimality allowed the OEMs to adopt a performance improving technology on a wider set of products. SEDEMAC pioneered the introduction of integrated eGov technology in genset controllers in India. Company cumulatively sold more than 1 million genset controller units from fiscal 2015 till Q3 fiscal 2026, with few of them featuring eGov technology. Globally, the company holds ~14% market share in genset supervisory AMF controller + EFI ECU market as of fiscal 2025. SEDEMAC cumulatively sold more than 10 million control intensive** products to automotive (2W, 3W) and genset market. The company is also developing ACM modules, voltage regulator rectifiers and integrated control products for automotive applications. **Capacity:** The company has 2 manufacturing plants and two technical centres in Pune. **Manufacturing facility:**

	1.Chakan, Pune-1 2. Dhayari, Pune-1 **Domestic**: The company generates most of their revenue from the domestic automotive segment. **Exports:** The company exports electronic controllers to North America, Europe along with China. **Global presence:** NA. **Key clients:** Hero MotoCorp, Kirloskar Oil Engines, Mahindra & Mahindra, Briggs & Stratton, TVS, Bajaj, Generac.

*Note: **Control intensive products include genset controllers, ISG ECU, ISG + EFI ECU, EFI ECU, and electric vehicle motor controllers.*

Bosch India Ltd.

KEY FACTS	BRIEF PROFILE
	Bosch India Ltd, formerly known as Motor industries company Ltd (MICO) was established in 1951.The company is a subsidiary of Robert Bosch GmbH, the global parent company. Bosch Ltd is one of the India-based auto component manufacturing company. The company has presence in three business sectors, including Automotive Technology, Industrial Technology and Consumer Goods and Building Technology. The company manufactures diesel and gasoline fuel injection systems, automotive aftermarket products, auto electrical, special purpose machines, packaging machines, electric power tools and security systems. **Capacity:** The company has 17 manufacturing sites and seven development and application centers.
Year of incorporation: 1951 **HQ**: Bengaluru, Karnataka	**Manufacturing facility:** 1.Gangaikondan, Tamil Nadu-1 2.Nashik, Maharashtra-1 3.Naganathapura, Karnataka-1 4.Bidadi, Karnataka-1 5.Jaipur, Rajasthan-1 6.Chennai, TamilNadu-1 **Domestic**: The independent aftermarket segment (IAM) contributes 63% of the total mobility business. The Mobility Aftermarket segment has 50,000 retail touchpoints, spread across 650+ districts, as on FY2024. They have 15,000 authorized workshops and service centers. **Exports:** The contribution of exports to total mobility business is 9% respectively in FY24. **Global presence:** Asia, Europe and North America. Bosch Ltd is largest development center in India outside of Germany.

	Key clients: Bajaj, TVS, Tata Motors, Maruti Suzuki, Audi, Mercedes-Benz, BMW, and Jaguar Land Rover.

Source: Company annual report

Sona BLW Precision Forgings Ltd

KEY FACTS	BRIEF PROFILE
Year of incorporation: 1990 **HQ:** Gurugram, India	The company is an automotive systems and components manufacturer. The company is involved in designing, manufacturing and supplying engineered automotive systems and components such as differential assemblies, gears and conventional and micro hybrid motors, BSG system and EV traction motors across all vehicle categories. The company develops mechanical and electrical hardware systems, components as well as base and application software solutions. **Capacity:** 1. Gears-60.2 million 2. Strater motors-5.8 million 3. Differential assemblies-2.5 million 4. Traction motors- 0.4 million **Manufacturing Facilities:** 1.Gurugram, Haryana-3 2.Chennai, Tamil Nadu-1 3.Pune, Maharashtra-1 4.Manesar, Haryana-1 **Exports:** The contribution of exports to total turnover of the entity is 59% in FY24. **Global presence:** Presence in 3 continents and 7 countries including China, U.S.A, Mexico, Belgium, Serbia, Germany and India **Key clients:** Maruti Suzuki, Tata, TAFE, Mahindra & Mahindra, ITL, John Deere, Escorts, DICV Trucks India, Volvo Eicher, and New Holland India

Source: Company annual report

Schaeffler India Limited

KEY FACTS	BRIEF PROFILE
Year of incorporation: 1962 **HQ**: Pune, Maharashtra	Schaeffler India is a leading manufacturer of automotive and industrial components, and a subsidiary of the German-based Schaeffler Group. The company was established in 1962 and has since become a prominent player in the Indian automotive and industrial sectors. The company specializes in the design, manufacturing, and distribution of high-precision bearings, engine components, and chassis systems for the automotive and industrial sectors. Schaeffler has four plants in India and operate three major widely known product brands - FAG, INA and LuK. The manufacturing plant in Gujarat produces ball bearings, cylindrical roller bearings, and spherical roller bearing and wheel bearings, deep groove

	ball bearings and large size roller bearings and are sold under the name of FAG. Plant in Maharashtra manufactures engine and transmission components for front accessory drive system, chain drive systems, valve train, shift systems and a range of needle roller bearings and elements, under the brand INA. The manufacturing plant in Hosur, produces clutch systems and dual mass flywheels for passenger cars, light commercial vehicles, heavy commercial vehicles and tractors which are sold under the brand of LuK. **Capacity:** The company has 4 manufacturing plants and 3 R&D centers in India. **Manufacturing facility:** 1.Vadodara, Gujarat-1 2. Vadodara, Gujarat-1 3. Pune, Maharashtra -1 4. Hosur, Tamil Nadu -1 **Domestic**: The company generates most of their revenue from domestic automotive technologies and bearings & industrial segment. **Exports:** The contribution of exports to total turnover of the entity is 13% in FY25 **Global presence:** Company operates in over 50 countries around the world **Key clients:** Tata Motors, Maruti Suzuki, Ashok Leyland, TAFE, Mahindra and others

ZF Commercial Vehicle Control Systems India Limited

Key facts	Brief profile
Year of incorporation: 1981 **HQ: Pune, Maharashtra**	ZF India was established as ZF Steering gear (India) Ltd, a joint venture with ZF Lenksysteme GmbH. Initially the company focused on manufacturing and supplying integral hydraulic power steering systems. ZF India is a supplier of technology solution and service provider in the mobility sector. The company has a strong presence in the automotive and industrial segments with expansive manufacturing and engineering footprints. The company manufactures active and passive safety systems, steering system, clutch system, axle system, chassis and suspension components for commercial vehicles, powertrain and chassis components, safety devices for light vehicle industry and gear boxes for wind turbine industry. The company serves majorly PV, CV and the other market segments such as construction and agriculture machinery, wind power, marine propulsion, rail drives and test systems. The company operates through 14 entities including one joint venture partner. **Annual Capacity:** 1. Shock absorber (Chakan, Pune) - ~0.7 million units (as on Fiscal 2018)

	2. front suspension, rear axle, corner module for PV (Chennai) - ~12,500 units **Manufacturing Facilities:** The company having 18 manufacturing facilities and 10 engineering centers across India including Pune, Chennai, Coimbatore and Gurugram. **Global presence:** The company operates from 30 countries. **Key clients**: Ashok Leyland, Daimler India commercial vehicle, Force Motors, Mahindra Trucks and Buses, Tata Motors and Volvo group.

Source: Company annual report

Key financial indicators for fiscal 9M FY 2026

	SEDEMAC MECHATRONICS LIMITED	SCHAEFFLER INDIA	BOSCH INDIA LTD	SONA BLW PRECISION FORGINGS	ZF COMMERCIAL VEHICLE CONTROL SYSTEMS INDIA
Revenue from Operations (INR million)	7,706.65	69,616.50	1,44,690.00	31,919.62	29,637.09
PAT (INR million)	714.98	8,279.90	22,015.00	4,423.31	3,708.26
PAT Margin (%)	9.28	11.89	15.22	13.86	12.51
ROE (%)	20.03*	-	-	-	-
Earnings per share (basic, INR)	16.59*	53.00*	747.01*	7.21*	195.51*
Long term Debt – Equity Ratio	0.17	-	-	-	-
Number of engineers from Premier Institutes	158	NA	NA	NA	NA
Number of Control-Intensive Controllers Sold	28,58,050	NA	NA	NA	NA

**Not Annualized*

Note:

- *For Schaeffler India, 9M refers to January to Sept period of 2025, whereas for others 9M is April to December of 2025*
- *Revenue from operations comprises the total revenue generated from the sale of goods, services and Other Operating revenue.*
- *Profit for the period/year is as per the Restated Financials Information.*
- *Profit after Tax expressed as a percentage of revenue from operations.*
- *RoE % is calculated as profit for the period/year divided by Average Total equity. Average Total equity is average of closing Total equity as on closing day of financial period/year and opening equity of opening day of financial period/year.*
- *Basic earnings per share are as per the restated financials*
- *Debt – equity ratio is calculated as Total Debt divided by Total equity. (Total Debt is current and non-current Borrowings plus current and non-current Lease)*

Source: CRISIL Intelligence, Company annual report

Key financial indicators for fiscal 2025

	SEDEMAC MECHATRONICS LIMITED	SCHAEFFLER INDIA	BOSCH INDIA LTD	SONA BLW PRECISION FORGINGS	ZF COMMERCIAL VEHICLE CONTROL SYSTEMS INDIA
Revenue from Operations (INR million)	6,583.63	82,323.80	180,874.00	35,460.21	38,309.63
PAT (INR million)	470.45	9,388.60	20,152.00	5,996.88	4,607.30
PAT Margin (%)	7.15	11.40	11.14	16.91	12.03
ROE (%)	22.01%	18.52	15.58	14.20	15.35
Earnings per share (basic, INR)	10.93	60.10	683.25	9.92	242.90
Long term Debt – Equity Ratio	0.21	0.01	0.01	0.04	0.02
Number of engineers from Premier Institutes	120.00	NA	NA	NA	NA
Number of Control-Intensive Controllers Sold	2,438,518.00	NA	NA	NA	NA

Note:

- *Schaeffler India financials are reported in Calendar Year (CY) terms, for a period from January to December*
- *Revenue from operations comprises the total revenue generated from the sale of goods, services and Other Operating revenue.*
- *Profit for the period/year is as per the Restated Financials Information.*
- *Profit after Tax expressed as a percentage of revenue from operations.*
- *RoE % is calculated as profit for the period/year divided by Average Total equity. Average Total equity is average of closing Total equity as on closing day of financial period/year and opening equity of opening day of financial period/year.*
- *Basic earnings per share are as per the restated financials*
- *Debt – equity ratio is calculated as Total Debt divided by Total equity. (Total Debt is current and non-current Borrowings plus current and non-current Lease)*

Source: CRISIL Intelligence, Company annual report

Key financial indicators for fiscal 2024

	SEDEMAC MECHATRONICS LIMITED	SCHAEFFLER INDIA	BOSCH INDIA LTD	SONA BLW PRECISION FORGINGS	ZF COMMERCIAL VEHICLE CONTROL SYSTEMS INDIA
Revenue from Operations (INR million)	5,306.53	72,509.10	167,271.00	31,847.70	38,156.47
PAT (INR million)	58.78	8,990.20	24,913.00	5,177.76	4,064.47
PAT Margin (%)	1.11	12.40	14.89	16.26	10.65
ROE (%)	4.92	19.78	21.61	20.34	15.63
Earnings per share (basic, INR)	1.45	57.50	844.68	8.83	214.28
Long term Debt – Equity Ratio	1.45	0.01	0	0.15	0.02
Number of engineers from Premier Institutes	99.00	NA	NA	NA	NA
Number of Control-Intensive Controllers Sold	1,917,339.00	NA	NA	NA	NA

Note:

- *Schaeffler India financials are reported in Calendar Year (CY) terms, for a period from January to December*
- *Revenue from operations comprises the total revenue generated from the sale of goods, services and Other Operating revenue.*
- *Profit for the period/year is as per the Restated Financials Information.*
- *Profit after Tax expressed as a percentage of revenue from operations.*
- *RoE % is calculated as profit for the period/year divided by Average Total equity. Average Total equity is average of closing Total equity as on closing day of financial period/year and opening equity of opening day of financial period/year.*
- *Basic earnings per share are as per the restated financials*
- *Debt – equity ratio is calculated as Total Debt divided by Total equity. (Total Debt is current and non-current Borrowings plus current and non-current Lease)*

Source: CRISIL Intelligence, Company annual report

Key financial indicators for fiscal 2023

	SEDEMAC MECHATRONICS LIMITED	SCHAEFFLER INDIA	BOSCH INDIA LTD	SONA BLW PRECISION FORGINGS	ZF COMMERCIAL VEHICLE CONTROL SYSTEMS INDIA
Revenue from Operations (INR million)	4,230.28	68,674.20	149,293.00	26,550.10	34,442.45
PAT (INR million)	85.73	8,792.10	14,255.00	3,952.97	3,176.72
PAT Margin (%)	2.03	12.80	9.55	14.89	9.22
ROE (%)	7.84	22.15	13.15	18.43%	14.05
Earnings per share (basic, INR)	2.12	56.30	483.32	6.76	167.48
Long term Debt – Equity Ratio	2.12	0.01	0	0.13	0.03
Number of engineers from Premier Institutes	65.00	NA	NA	NA	NA
Number of Control-Intensive Controllers Sold	1,425,155.00	NA	NA	NA	NA

Note:

- *Schaeffler India financials are reported in Calendar Year (CY) terms, for a period from January to December*
- *Revenue from operations comprises the total revenue generated from the sale of goods, services and Other Operating revenue.*
- *Profit for the period/year is as per the Restated Financials Information.*
- *Profit after Tax expressed as a percentage of revenue from operations.*
- *RoE % is calculated as profit for the period/year divided by Average Total equity. Average Total equity is average of closing Total equity as on closing day of financial period/year and opening equity of opening day of financial period/year.*
- *Basic earnings per share are as per the restated financials*
- *Debt – equity ratio is calculated as Total Debt divided by Total equity. (Total Debt is current and non-current Borrowings plus current and non-current Lease)*

Source: CRISIL Intelligence, Company annual report

Threats and Challenges

Demand Side Challenges

Economic Slowdown and Industrial Output Decline

Impact on Sales and Production: The automotive Industry and within it the two-wheeler, three-wheeler, passenger vehicle, and commercial vehicle industry are very closely linked to the performance of the economy. Economic slowdowns result in reduced industrial activities and lower consumer spending, directly affecting automotive segments such as two-wheelers, three-wheelers, passenger vehicles and commercial vehicle sales. We have projected real GDP growth to be 7.4% for fiscal 2026. Any moderation to GDP growth may have an impact on Industrial output and investment and consequentially on the automotive and auto-component Industry.

Above or below normal monsoons

Within the economic spectrum, automotive industry, especially two-wheelers, three-wheelers and passenger vehicles, are very closely linked to the output of the agricultural sectors. While the agricultural sector has a direct dependence on the normalcy of monsoon, the manufacturing and construction sectors are also indirectly impacted by monsoon performance both on demand as well as supply side across various sub-segments on manufacturing. We have considered a normal monsoon scenario while forecasting the outlook for the automotive Industry. If rain is not normal and there is a scenario like El Nino or La Nina impacting farm activities on the rural side, then that could impact farm related incomes as well as sentiments which in turn can affect the demand side factors for two-wheelers, passenger vehicles, three-wheelers and commercial vehicles.

Impact of changing interest rates scenario

A sustained high level of inflation could lead to rate hikes by the central bank thereby impacting interest rates. The transmission of past rate hikes by the Monetary Policy Committee (MPC) have largely played out amid tight liquidity conditions. There could be further rise in market lending rates in the near term on account of many other macroeconomic conditions thereby leading to an increase in lending rates impacting cost of purchase.
The two-wheeler industry has a large contribution of sales from the rural areas primarily for motorcycles. Purchases in these areas are largely cash driven, but we are witnessing a decline in cash transactions as access to financing options has significantly improved in the last few years. Moreover, both public and private players offer attractive interest rates and schemes to promote more sales. If interest rates firm up, there is expected to be pressure on the industry in terms of consumers postponing their purchase decisions.

Increase in vehicle cost of ownership

A vehicle's cost of ownership is determined by its cost of acquisition and cost of operations, and both have a significant impact on the demand. The cost of vehicle acquisition rises when OEMs transfer the impact of increased manufacturing costs to the customers. In the past, industry has seen price hikes owing to several reasons like emission norms implementation, increase in raw material prices and general inflationary hikes. These are also likely to push vehicle prices upwards going forward. Auto finance rates are also pivotal in determining affordability. The cost of operations for a customer is directly impacted by fluctuations in crude oil prices and INR USD exchange rates, that cause rise in fuel import costs and overall fuel prices. Geopolitical issues like the Middle East and Russia-Ukraine war, etc. could also impact fuel prices thereby having a bearing on the vehicle demand and in turn for the metal product suppliers.

Price escalations on account of regulatory push

Based on European emission standards, the Indian government has introduced the Bharat Stage (BS) norms, which are being implemented in a phased manner in the country. For the BS-VI stage 2 norms, applicable from fiscal 2024, companies have invested in the relevant technology, research, and development, and signed joint ventures (JVs) with global players. These norms have resulted in price hike for vehicles across segments owing to the introduction of new technologies to meet new emission regulations. Going forward, new emission norms are likely to be announced, which could potentially raise vehicle prices as well and impact the demand.

Inherent cyclicity of the domestic 2W, 3W and PV industry

The two-wheeler and passenger vehicle industry has close linkages with growth in GDP as well as business cycles impacting incomes of probable customers thereby making the industry susceptible/vulnerable to these changes. This cyclical nature of the two-wheeler and passenger vehicle industry poses constant challenges to the industry players and component suppliers as they have to constantly manage inventory optimally and profitably.

Supply Side Challenges

Raw Material Availability and Cost

Cost Management: Fluctuating prices of raw materials like aluminium, iron and steel pose significant challenges to managing costs. A sudden spike in prices, such as the increase in iron ore prices, can erode profit margins and make it difficult to offer competitive pricing to customers. Metal product manufacturers must either absorb these costs, reducing profitability, or pass them on to customers, potentially losing business to cheaper alternatives.

Supply Chain Disruptions Volatile raw material prices can also lead to supply chain disruptions if suppliers are unable to secure consistent and affordable supplies. This inconsistency can result in production delays and missed deadlines, damaging relationships with OEMs and other key clients.

For instance, the outbreak of the Russia-Ukraine war sent the commodities market into a frenzy, as regions that sourced materials from these countries went into panic mode, with surge in input costs and finished product prices for metal and steel products. The surge in export realizations sent domestic prices on a rally as well, thus impacting procurement prices for domestic consumption.

Furthermore, the conflict such as Gaza and Israel, which produces about 35% of the world’s oil export and 14% of gas exports, can have a wider impact on commodity prices and inflation which can impact manufacturing costs

Skilled Labour Shortage

Skilled labour is one of the most important supply side aspects in the manufacturing sector. Training and retaining skilled workers in areas such as welding, fabricated assembly, surface finishing, precision manufacturing and power electronics industry is a key driving factor for success of any segment of the industry.

Thus, inadequate availability of skilled labour can be one of the significant challenges impacting the power electronics manufacturing industry in India. This shortage can span across various facets, from production to maintenance and innovation, ultimately affecting the industry's growth and global competitiveness.

- Nature of the Shortage: The advancing automotive sector requires a workforce proficient in modern manufacturing technologies, and electronic components. The gap between demand and supply of such skilled labour is monitorable for the success of the industry going forward

- Educational and Training Gaps: The Indian education system and vocational training programs often lag in providing industry-relevant skills. Engineering graduates and technical diploma holders frequently lack hands-on experience with advanced technologies used in manufacturing of electrical and electronics systems.
- Attrition and Retention Issues: Skilled workers tend to migrate to sectors offering better compensation and working conditions, such as IT or international opportunities. The high attrition rates further exacerbate the skill shortage within the industrial sector.
- Demographic and Geographic Disparities: There can be a geographical mismatch in the availability of skilled labour. Industrial hubs may struggle to attract talent from regions with a higher concentration of educational institutions due to relocation issues and urban-rural divide.

Technological Obsolescence

Technological obsolescence refers to the phase-out of technologies as newer, more efficient, and advanced technologies emerge. In India's manufacturing sector, technological obsolescence can be a potential challenge, affecting competitiveness, productivity, and innovation capacity.

Increasing Competition

A surge in new entrants and portfolio expansions by legacy players intensifies competition, making customer acquisition challenging.

Policy and Regulatory Challenges

Changes in tax and duties regime

Changes in duties and tax structures present significant threats to the automotive industry. These changes can have multifaceted impacts on cost structures, supply chains, and overall competitiveness.

This threat is particularly significant due to India's evolving tax landscape and the government's periodic adjustments to import duties and other taxes.

For instance, the initial phase of GST implementation saw significant disruption. Many businesses faced challenges adapting to the new tax structure, leading to temporary slowdowns in the manufacturing value chain.

The Indian government periodically revises import duties on raw materials such as steel and aluminium, which are essential. Increased costs due to higher import duties are often difficult to pass on to customers, especially in a highly competitive market. This squeeze on profit margins forces manufacturers to absorb the additional costs, potentially reducing their financial health and capacity to invest in new technologies or expansion.

Hence, changes in duty and tax structures across the automotive value chain pose significant threats by increasing costs, complicating compliance, and creating market instability.

Ad hoc changes in policies

A challenge that the industry is facing is frequent changes in policies which make it difficult for auto industry stakeholders not only to ensure adherence but also commit investments. Overall policy stability and transparency will be required going forward to ensure smooth technology transition and localization in the country.

About Crisil

Crisil is a global, insights-driven analytics company. Our extraordinary domain expertise and analytical rigour help clients make mission-critical decisions with confidence.

Large and highly respected firms partner with us for the most reliable opinions on risk in India, and for uncovering powerful insights and turning risks into opportunities globally. We are integral to multiplying their opportunities and success.

Headquartered in India, Crisil is majority owned by S&P Global.

Founded in 1987 as India's first credit rating agency, our expertise today extends across businesses: Crisil Ratings, Crisil Intelligence, Crisil Coalition Greenwich and Crisil Integral IQ.

Our globally diverse workforce operates in the Americas, Asia-Pacific, Europe, Australia and the Middle East, setting the standards by which industries are measured.

For more information, visit www.Crisil.com

Connect with us: LINKEDIN / Twitter

About Crisil Intelligence (formerly Market Intelligence & Analytics)

Crisil Intelligence is a leading provider of research, consulting, risk solutions and advanced data analytics, serving clients across government, private and public enterprises. We leverage our expertise in data-driven insights and strong benchmarking capabilities to help clients navigate complex external ecosystems, identify opportunities and mitigate risks. By combining cutting-edge analytics, machine learning and AI capabilities with deep industry knowledge, we empower our clients to make informed decisions, drive business growth and build resilient capacities.

For more information, visit https://intelligence.crisil.com/

Connect with us: LINKEDIN / Twitter

