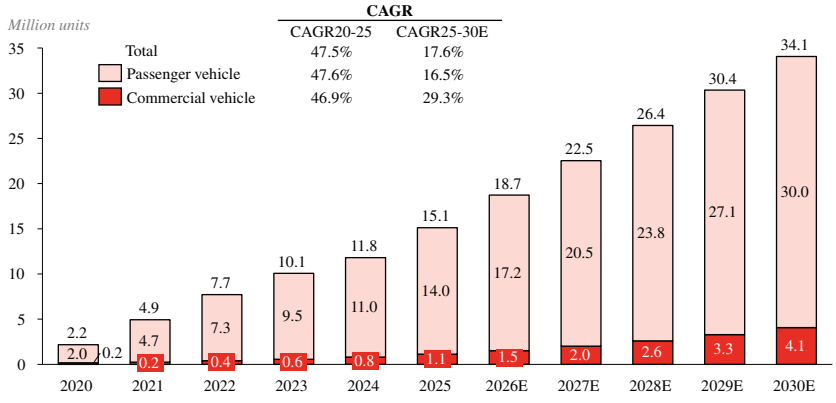
The information and statistics set out in this section and other sections of this document were extracted from the report prepared by CIC, which was commissioned by us, and from various official governmental publications and other publicly available publications. We engaged CIC to prepare the CIC report, an independent industry report, in connection with the [**REDACTED**]. *The information from official government sources has not been independently verified by us or any other parties involved in the* [**REDACTED**]*, or any of our or their respective directors, senior management, representatives, advisers or any other persons involved in the* [**REDACTED**] *and no representation is given as to its accuracy.*

THE GLOBAL AND CHINA'S BATTERY ELECTRIC VEHICLE INDUSTRY

Overview

In recent years, battery electric vehicles, or BEVs, have evolved from a developing trend into a mainstream market presence, gaining rapid traction across major global markets. The sustained growth of the BEV industry is driven by multiple factors. Governments worldwide have continuously introduced policy measures such as purchase subsidies, tax incentives, and exemptions from travel restrictions to accelerate BEV adoption. Global carbon neutrality objectives and energy saving and emission reduction requirements have strengthened the market demand for clean transportation. Successive breakthroughs in core technologies, including batteries, electric drive systems, and intelligent connectivity, have significantly enhanced BEV performance and user experience. Meanwhile, large-scale production and a maturing industrial value chain have gradually reduced the costs of core components and complete vehicles, further driving BEV penetration and market expansion. The global BEV sales increased from 2.2 million units in 2020 to 15.1 million units in 2025, at a CAGR of 47.5%, and is expected to reach 34.1 million units in 2030, at a CAGR of 17.6% from 2025 to 2030.

Global Sales Volume of BEV, by Types of Use, 2020-2030E

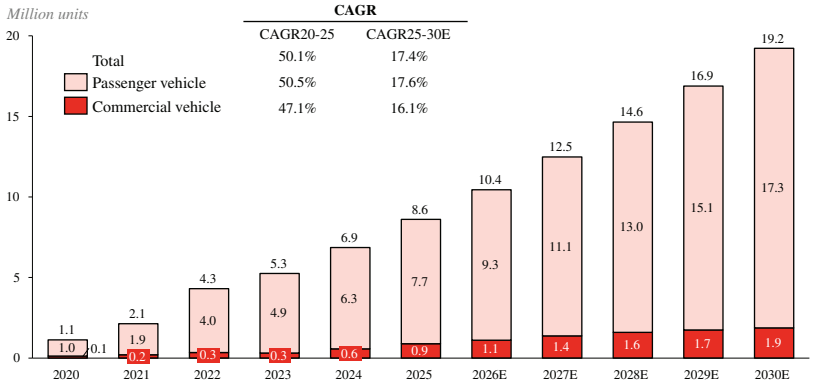


Source: International Energy Agency, CIC

China has become a leader in global automotive electrification, being the first to bridge the user awareness gap. It is expected to pioneer the development of the global BEV industry across multiple dimensions — product, technology, and supply chain — for the foreseeable future. The BEV sales in China increased from 1.1 million units in 2020 to 8.6 million units in 2025, at a CAGR of 50.1%, and is expected to reach 19.2 million units in 2030, at a CAGR of 17.4% from 2025 to 2030. China's BEV market has continued to expand, supported by a maturing supply chain, broader model offerings, improving vehicle performance and enhanced energy replenishment infrastructure. As BEV application scenarios become more diversified, demand for efficient and convenient energy replenishment solutions has increased, particularly in high-frequency operational scenarios where

vehicle utilisation and downtime are key considerations. Against this backdrop, batteryswapping vehicles have recorded rapid growth in China. Battery-swapping vehicles accounted for approximately 4.8% of China's BEV sales in 2025, and this proportion is expected to increase to 6.6% in 2030. In particular, battery-swapping operational vehicles accounted for approximately 5.7% of China's operational BEV sales in 2025, and this proportion is expected to reach 19.7% in 2030.

Sales Volume of BEV in China, by Types of Use, 2020-2030E



(1) Sales volume refers to the volume of retail sales.

Source: China Passenger Car Association, CIC

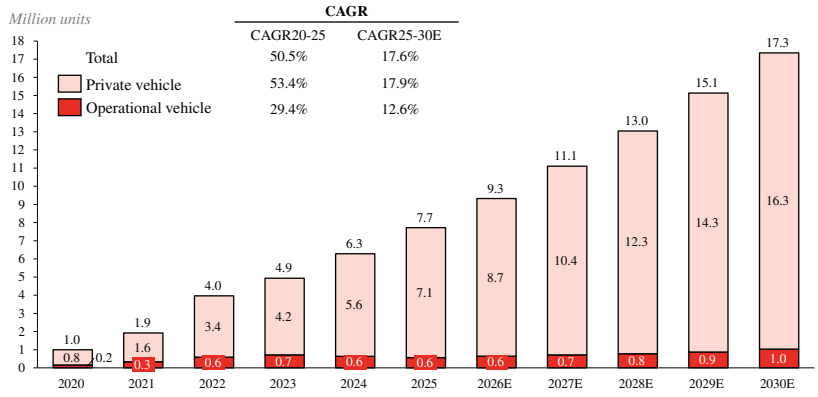
Introduction to Application Scenarios of BEVs

Driven by global and China's electrification trends, BEV application scenarios have become more diverse and can be categorized into passenger vehicles and commercial vehicles by type of use.

Passenger vehicles are the core segment for BEV penetration, comprising operational vehicles and private vehicles. Operational vehicles mainly include taxis and ride-hailing vehicles. This category features long daily mileage and high usage frequency; electrification can significantly reduce energy and maintenance costs and plays an active role in building urban low-carbon transportation systems. In recent years, the electrification rate in the operational vehicle market has continuously risen, driven by policies and proactive corporate planning. Meanwhile, advancements in autonomous driving technology are giving rise to a new operating model — robotaxi — which is expected to become an important component of smart mobility in the future.

Private vehicles are primarily used for daily family travel and inter-city commuting. With increasing driving range and improvements in the charging and swapping network, consumer acceptance of private BEVs continues to grow, making them a significant driver of market size expansion. The BEV passenger vehicle sales in China increased from 1.0 million units in 2020 to 7.7 million units in 2025, at a CAGR of 50.5%, and is expected to reach 17.3 million units in 2030, at a CAGR of 17.6% from 2025 to 2030.

Sales Volume of Passenger BEV in China, by Types of Use, 2020-2030E



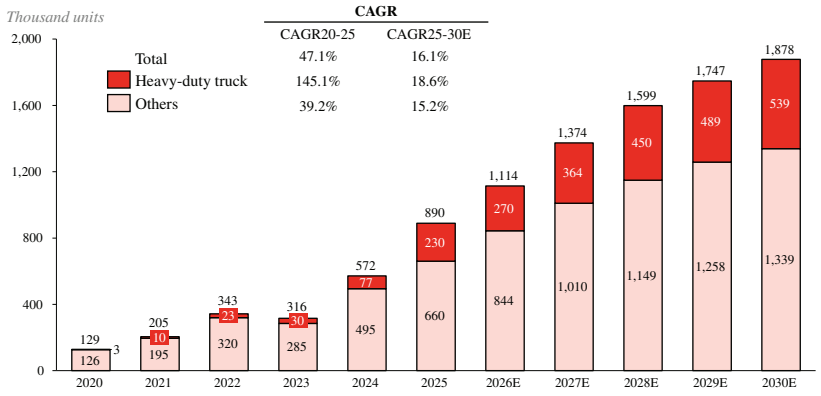
(1) Sales volume refers to the volume of retail sales.

Source: China Passenger Car Association, CIC

Commercial BEVs mainly cover coaches, trucks, and other commercial vehicles. Benefiting from high cost sensitivity in logistics transportation and policies restricting high-emission vehicles in some regions, the application share of BEV light trucks and urban delivery vehicles in segments such as last-mile logistics and urban delivery has been increasing. Heavy-duty trucks are gradually being electrified in application scenarios such as port transportation, mining operations, and trunk route logistics, particularly in operating modes with fixed routes and heavy loads. This shift is being driven by a combination of policy incentives, market economics, and technological progress. In China, both central and local governments are promoting the replacement of aging fuel-powered heavy-duty trucks through purchase subsidies, scrappage incentives, and differentiated road access privileges for new energy trucks. Meanwhile, the improving economics of oil-to-electricity replacement — supported by lower electricity costs, reduced maintenance requirements, and increased operational efficiency — are encouraging logistics operators to accelerate fleet electrification. Additionally, battery-powered trucks help reduce carbon emissions while delivering significant economic benefits. Ongoing advancements in battery performance and energy replenishment infrastructure, such as battery-swapping solutions, further minimize operational downtime and expand the suitability of battery electric heavy-duty trucks for long-haul and high-frequency freight scenarios, collectively strengthening the foundation for market growth. Moreover, the electrification of specialized vehicles, such as sanitation trucks and cold chain transportation vehicles, is also accelerating, leading to a steady increase in the penetration rate of BEV models in the commercial vehicle segment.

Commercial BEV sales in China increased from 129 thousand units in 2020 to 890 thousand units in 2025, at a CAGR of 47.1%, and are expected to reach 1,878 thousand units in 2030, at a CAGR of 16.1% from 2025 to 2030. The battery electric heavy-duty truck sales reached 230 thousand units in 2025, and are expected to reach 539 thousand units in 2030, at a CAGR of 18.6% from 2025 to 2030. The penetration rate of battery-swapping heavy-duty trucks among battery electric heavy-duty trucks is expected to increase from approximately 26.5% in 2025 to approximately 38.2% in 2030.

Sales Volume of BEV commercial vehicles in China, by Types of Use, 2020-2030E



(1) Sales volume refers to the volume of retail sales.

Source: China Passenger Car Association, CIC

OVERVIEW OF THE BATTERY-SWAPPING INDUSTRY

Comparison of Major Transportation Energy Replenishment Methods

Battery-swapping and battery-charging are the two major energy replenishment methods for BEVs. In the early stages of the BEV industry's development, battery-charging became the mainstream method due to lower construction costs and relatively uniform technical standards. Industry participants have continued to advance charging technologies. For example, BYD has announced megawatt flash charging technology, which can significantly reduce charging times. These advancements contribute to the ongoing evolution of charging standards and enhance the overall user experience across the BEV ecosystem, with battery charging remaining dominant today. Meanwhile, with the rapid increase in BEV ownership and increasingly diverse application scenarios, the sole reliance on battery-charging has limitations in certain contexts. To satisfy higher user demands for replenishment efficiency, cost, and convenience, the parallel development of the battery-swapping model has emerged as a critical supplement.

Compared with battery-charging, the battery-swapping method completes energy replenishment by directly swapping the battery, offering an obvious advantage in speed — often swapping can be completed within 10 minutes — thereby shortening vehicle downtime and significantly enhancing both the BEVs' economic benefits and user experience. Battery swapping typically relies on highly standardized automatic battery-swapping stations. The process is less affected by weather than battery-charging where ambient temperature can affect charging speed. The mechanized system within the station executes fast removal, installation, and testing of the battery to ensure the safety and consistency of the energy replenishment process. For the battery-swapping station operator, the fixed asset investment for a station with equivalent power capacity is usually higher than for a charging station. However, by leveraging the high throughput and performance per unit area of a battery-swapping station in high-frequency application scenarios, its per-unit output can be significantly higher. The battery-swapping model enables centralized management to achieve uniform standards for battery charging, discharging, and maintenance, extending battery lifespan. Through testing battery status and tiered deployment, the utilization rate of batteries across different tiers can be increased, reducing the entire lifecycle cost of the battery. Simultaneously, in the battery-swapping model, centralized battery operations allow for methods such as off-peak charging and smart power adjustment to reduce grid load, resulting in lower investment for grid reconstruction and enhancing asset turnover and overall cycle economic benefits. The major characteristics of battery-swapping and battery-charging models are illustrated below:

Comparison of Battery-swapping and Battery-charging Models

		Battery Swapping Model	Charging Model
Definition		The battery swapping mode benefits from rapid replenishment without affecting the battery or power grid. Reduced replenishment time enhances operational efficiency.	Charging the internal batteries of electric vehicles by connecting to charging piles
Attributes dimension	Energy replenishment duration	Battery swap model: within **10 minutes**	Fast charging model: **15-60 minutes** Slow charging model: **6-10 hours**
	Impact on batteries	Enables **extended battery life**, facilitates **cascading utilization**, and optimizes overall battery performance	Fast charging, with its high voltage and high current, may **negatively impact battery life** .
	Impact on power grids	Slow charging, **power grid-friendly**	The high energy consumption and cooling needs may result in **increased noise**, **EMC radiation**, and impose **greater burdens on power grids** .

Source: CIC

The battery-swapping model features energy replenishment characteristics similar to refueling conventional vehicles. As autonomous-driving technologies continue to develop, autonomous mobility and commercial transportation applications are gradually moving from road testing and pilot operation toward early-stage commercial deployment in approved operating areas. At the current stage, such applications are mainly concentrated in Robotaxi, autonomous shuttle, autonomous logistics and autonomous heavy-duty truck scenarios, where vehicles are typically operated under fleet-based management and require higher operating continuity. Compared with conventional charging, battery swapping provides a faster, more standardized and more predictable energy replenishment process, with lower reliance on human intervention. This makes battery swapping more suitable for autonomous fleets that need to coordinate vehicle operation, replenishment scheduling and asset utilization. Looking forward, as autonomous-driving applications continue to expand, battery swapping is expected to become an important energy replenishment solution for driverless fleet operations, particularly in high-frequency operational passenger vehicle and commercial vehicle scenarios. It is expected to play an increasingly important role in the BEV energy replenishment market, driving the global automotive electrification process alongside the battery-charging model.

Analysis of Application Scenarios for Battery-swapping Technology

Application of battery-swapping in the operational vehicle market

Among BEV passenger vehicles, operational vehicles have a stronger demand for the battery-swapping model. Operational vehicles refer to passenger vehicles used for commercial purposes, such as taxis and ride-hailing vehicles. They are characterized by long daily mileage, cost sensitivity, and sensitivity to recharging time. In the charging model, operational vehicles often face the following pain points:

- *Long recharging time impacting revenue*. Operational vehicles are used at high frequency, often requiring continuous operation for long periods, and their daily mileage far exceeds their single-charge range. In the charging model, charging time occupies a significant portion of operating hours, directly impacting revenue. Long queue times at charging stations in core areas also disrupt operating schedules.

- *Operational vulnerability to extreme weather*. The performance of BEVs is inherently sensitive to ambient temperature. In extremely high or low temperatures, battery efficiency declines, resulting in a reduced driving range and more frequent need for energy replenishment. At the same time, charging efficiency can deteriorate, extending vehicle downtime. Together, these factors — unpredictable range and prolonged charging during seasonal extremes — significantly disrupt operational planning and vehicle availability.

In the battery-swapping model, operational vehicle downtime is significantly reduced, enhancing utilization and operating efficiency. The battery-swapping model also mitigates the range and charging-efficiency volatility caused by extreme temperatures. By providing standardized in-station environmental control and rapid energy replenishment, it supports all-season operational continuity and enhances the stability of fleet attendance planning. The battery-swapping model can further reduce energy costs and enhance uptime efficiency through standardized operating procedures and intelligent scheduling systems. In addition, the development of Robotaxi services is expected to further strengthen the application of battery swapping in the operational vehicle market. Robotaxi fleets are more suitable for platform-led scheduling and standardised fleet management, and require rapid, stable and predictable energy replenishment to support high operating continuity. Battery swapping can shorten replenishment time and reduce operational uncertainty, making it more compatible with driverless mobility fleets than conventional charging in high-frequency operating scenarios. Battery-swapping-compatible vehicles have already been used in certain Robotaxi testing and pilot operation scenarios, and are expected to become an increasingly important application direction for battery-swapping operational vehicles as Robotaxi services expand and supporting vehicle-station deployment accelerates.

Application of battery-swapping in the commercial vehicle market

Currently, battery-swapping commercial vehicles are primarily heavy-duty trucks. Heavy-duty trucks are a significant source of transportation-related carbon emissions. Their electrification is a key goal for achieving carbon neutrality in the logistics industry. Heavy-duty trucks are typically used for long-distance transportation, logistics distribution, or heavy-load operations, and their battery capacity is usually much larger than that of passenger vehicles. Consequently, even with DC fast charging, recharging times remain considerably long, greatly affecting operating efficiency. Given their specific application scenarios and operational needs, the battery-swapping model is more suitable for heavy-duty trucks than the charging model.

- *Replenishing large-capacity batteries rapidly*. Battery-swapping heavy-duty trucks can complete a swap within minutes, allowing large-capacity batteries to be replenished rapidly. This satisfies the requirements for continuous operation in high-intensity transportation scenarios such as ports, mines, and line-haul logistics, ensuring the timeliness and economic efficiency of high-frequency transport tasks.

- *Simpler deployment of battery-swapping stations*. Heavy-duty trucks usually operate on relatively fixed routes, facilitating the planning and deployment of battery-swapping stations and reducing the difficulty and cost of building a swapping network. This also allows operators to accurately plan routes and replenishment times, further improving fleet operating efficiency and controllability.

- *Weight and safety*. The battery-swapping model avoids the need for heavy-duty trucks to carry aged or excess spare batteries long-term, reducing vehicle weight and improving performance. In addition, centrally managed batteries can be monitored and maintained in a professional environment, reducing safety hazards caused by aging or failure.

- *Battery standardization*. Heavy-duty trucks used in fixed heavy-load commercial scenarios have specific requirements for vehicle range and replenishment efficiency, leading to a relatively higher degree of battery standardization, making them more amenable to battery-swapping technology.

The battery-swapping model effectively satisfies the operational needs of heavy-duty trucks for high intensity, long range, and high economic efficiency. With continuous improvements in battery-swapping technology and infrastructure, it is expected to become an important solution for the electrification of heavy-duty trucks, providing strong support for green logistics and transportation. The development of autonomous heavy-duty trucks may further support the application of battery swapping in commercial vehicle scenarios. At the current stage, autonomous

heavy-duty trucks are more likely to be adopted first in closed or semi-closed scenarios such as ports, mines and industrial parks, where routes and operating conditions are relatively defined. As autonomous-driving technologies, fleet dispatching systems and battery-swapping networks continue to improve, autonomous heavy-duty truck applications may gradually extend toward trunk logistics and other longer-distance transportation scenarios. In these scenarios, battery swapping can reduce replenishment downtime and support more continuous fleet operation.

Application of battery-swapping in the private vehicle market

The application of the battery-swapping model in the private vehicle sector focuses on consumer experience and asset flexibility.

- *Improving travel convenience*. For consumers requiring daily commuting, inter-city travel, or long-distance highway driving, the battery-swapping model allows replenishment within minutes, significantly reducing wait times and improving convenience. During peak travel periods such as holidays, the capacity of battery-swapping stations can be enhanced by temporarily deploying additional batteries and optimizing operation and maintenance coordination.

- *Differentiated service and experience*. Certain vehicle operators create differentiated service and experience through self-built battery-swapping networks, establishing battery-swapping as a brand moat.

- *Reducing initial vehicle purchase cost*. In vehicle-battery separation model, such separation helps reduce the initial purchase cost, alleviating consumers' financial burden. Vehicle owners can avoid bearing battery aging costs, instead obtaining energy services through battery leasing or pay-per-use swapping models.

Application of battery-swapping in other markets

The battery-swapping model has also been gradually applied to medium- and light-duty trucks, city buses, and special-purpose municipal vehicles. These vehicles are mostly used in fixed-route, high-frequency operational scenarios and have strong energy replenishment needs and high cost sensitivity. The battery-swapping model can effectively reduce recharging wait times, enhance vehicle utilization, extend battery life, and lower overall operating costs through centralized battery management.

Comparison of Models Adopting Battery-swapping Technology

Current mainstream battery-swapping model include chassis battery-swapping, modular battery-swapping, side battery-swapping, and ceiling-mounted battery-swapping. Each has distinct characteristics in structural design, applicable vehicle models, operating efficiency, and capital investment. The selection and application of these model depend primarily on vehicle types, operational scenarios, and the degree of standardization of the vehicle and batteries. The following is a comparison of typical battery-swapping model:

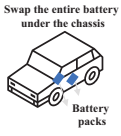
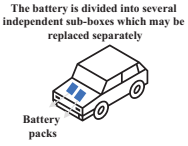
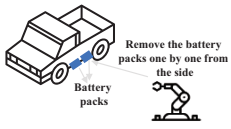
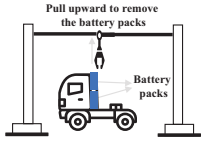
- *Chassis battery-swapping*. Chassis battery-swapping is the mainstream model for passenger vehicles with a relatively high degree of technical maturity. This solution integrates the battery pack into the middle section of the vehicle chassis. Automatic equipment is used to unlock, remove, and install the battery from beneath the vehicle. It is suitable for a wide range of passenger vehicles and offers advantages such as fast swapping speed, a high degree of automation, and suitability for large-scale promotion. In addition, the under-chassis battery layout helps optimize the vehicle's center of gravity and improve driving stability. This model requires high uniformity in chassis structure and battery standardization, involves relatively high upfront investment for equipment and retrofitting, and demands precise construction and maintenance of swapping stations.

- *Modular battery-swapping*. Modular battery-swapping splits a complete battery pack into multiple small, independent standardized modules, replenishing energy by replacing these modules individually. It is mainly used in passenger vehicles. Its advantage is flexibility, allowing power capacity to be allocated according to needs. The light weight of a single module facilitates manual or mechanical operation. However, the mechanical structure is relatively complex, requires multiple connection/disconnection operations.

- *Side battery-swapping*. Side battery-swapping involves removing and replacing the battery through a slide rail or mechanical arm on the vehicle's side. The technical path for side-swapping is relatively simple, involves fewer changes to the vehicle chassis structure, and is more commonly used by commercial vehicles. Its advantages include a relatively compact layout of mechanical equipment, suitability for construction in areas with limited space, and relatively low construction cost. This model has a reasonable degree of automation but takes longer to complete a swap. Battery protection relies more on the vehicle chassis, with higher requirements for sealing and process alignment.

- *Ceiling-mounted battery-swapping*. Ceiling-mounted battery-swapping involves replacing the entire battery from the top or rear side of the vehicle using mechanical lifting. It is mainly suitable for heavy-duty trucks and buses with large-capacity batteries. This method can complete the swap of very large capacity batteries at once, satisfying the range demands of long-haul transportation vehicles. This model has higher requirements for the precision, stability, and safety of the lifting and installation equipment, requires relatively high investment cost for swapping equipment, and has strict requirements for the station site and operating conditions.

Comparison of Battery-Swapping Technology Model for BEVs

Battery-swapping mode	Chassis battery-swapping	Modular battery-swapping	Side battery-swapping	Ceiling-mounted battery-swapping
Applicable vehicle models	Passenger vehicles, commercial vehicles	Mainly passenger vehicles	Mainly commercial vehicles	Mainly commercial vehicles
Battery-swapping illustration				
Battery-swapping time	1-3 minutes	5-10 minutes	5-10 minutes for passenger vehicles, < 5 minutes for commercial vehicles	3-5 minutes
Degree of automation	Fully automatic	Semi-automatic	Semi-automatic	Fully automatic/ Semi-automatic
Application scenarios	Taxis, ride-hailing vehicles, private cars, etc.	Taxis, ride-hailing vehicles, private cars, etc.	Logistics vehicles, heavy-duty trucks, etc.	Buses, heavy-duty trucks, etc.

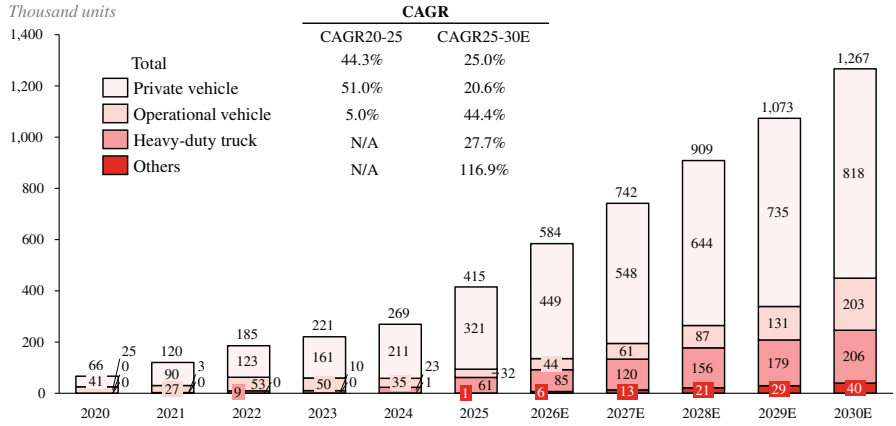
Source: CIC

Sales Volume of Battery-swapping Vehicles in China

Driven by macro policies and market demand, the sales volume of battery-swapping vehicles is expected to continue growing at a relatively high rate. The sales volume of battery-swapping vehicles in China increased from 66 thousand units in 2020 to 415 thousand units in 2025, at a CAGR of 44.3%, and is expected to reach 1,267 thousand units by 2030, at a CAGR of 25.0% from 2025 to 2030. The adoption of battery-swapping vehicles in operational scenarios such as taxis and ride-hailing fleets is expected to continue increasing, as such vehicles have high daily mileage, high utilisation requirements and greater sensitivity to downtime. Battery swapping can shorten replenishment time and improve fleet operating efficiency, while fleet-based procurement and platform-led deployment may support batch adoption. The development of Robotaxi services is also expected to create additional demand, as Robotaxi fleets require rapid, stable and predictable energy replenishment and may integrate battery swapping with automated dispatch, vehicle inspection, billing and metering. Accordingly, the battery-swapping operational vehicle segment is expected to

grow faster than the overall battery-swapping vehicle market. The sales of battery-swapping operational vehicles in China reached 32 thousand units in 2025, and is expected to reach 203 thousand units by 2030, at a CAGR of 44.4% from 2025 to 2030.

Sales Volume[(1)] of Battery-swapping Vehicles in China, by Types of Use, 2020-2030E



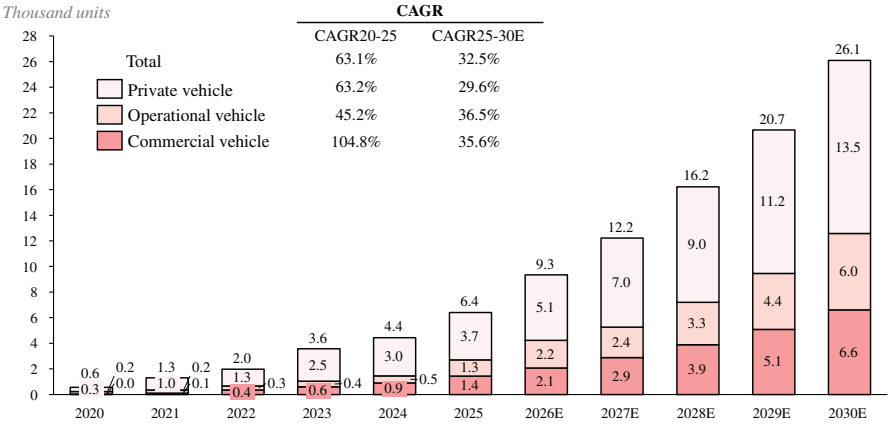
(1) Sales volume refers to the volume of retail sales.

Source: China Passenger Car Association, CIC

Number of Battery-swapping Stations for BEVs in China

With the rapid adoption of BEVs in the domestic market and increasing sales of battery-swapping vehicles, the construction of battery-swapping stations, as the core infrastructure of the BEV battery-swapping industry, has been accelerating. Such stations are set to become key infrastructure within the new energy transportation system. Currently, the domestic battery-swapping network has achieved preliminary coverage in both commercial and passenger vehicle markets. The operational layout is gradually improving, forming a core network structure focused on key cities and transportation trunk routes. With the rapidly growing ownership of battery-swapping vehicles and rising user demand for fast and convenient charging and swapping services, the number of domestic battery-swapping stations is expected to maintain rapid growth, providing solid support for the popularization of battery-swapping vehicles and the improvement of the industry ecosystem, thereby boosting the continuous development of relevant upstream and downstream industry value chains. In China, the number of BEV battery-swapping stations increased from 0.6 thousand in 2020 to 6.4 thousand in 2025, representing a CAGR of 63.1% from 2020 to 2025. The number for 2025 included 3.7 thousand stations for private vehicles, 1.3 thousand stations for operational vehicles and 1.4 thousand stations for commercial vehicles. The number of BEV battery-swapping stations in China is expected to reach 26.1 thousand stations in 2030, at a CAGR of 32.5% from 2025 to 2030. The number of battery-swapping stations for operational vehicles is expected to reach 6.0 thousand in 2030, with a CAGR of 36.5% from 2025 to 2030.

Number of Battery-swapping Stations for BEVs in China, by Types of Use, 2020-2030E

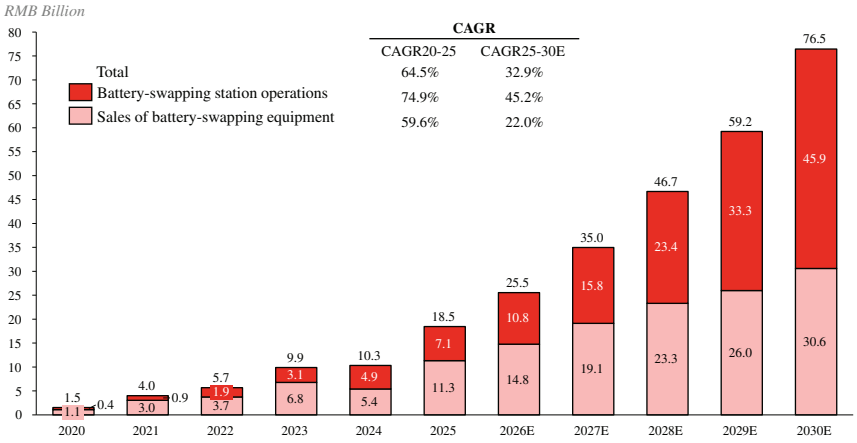


Source: Ministry of Industry and Information Technology, CIC

Market Size of the Battery-swapping Industry in China

The battery-swapping market in China has experienced rapid growth in recent years. The market size of the battery-swapping industry in China increased from RMB1.5 billion in 2020 to RMB18.5 billion in 2025, at a CAGR of 64.5%, and is expected to reach RMB76.5 billion in 2030, at a CAGR of 32.9% from 2025 to 2030.

Market Size of the BEV Battery-swapping Market in China, by Constituents, 2020-2030E



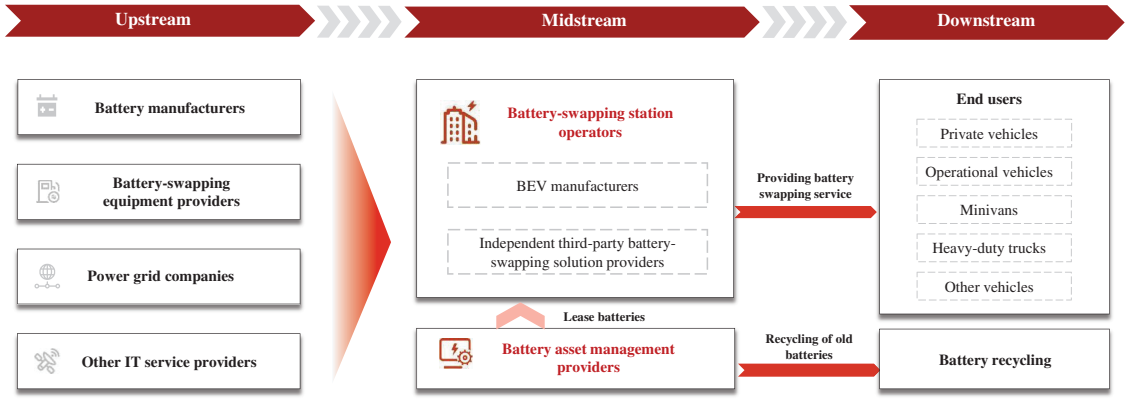
Source: CIC

The battery-swapping markets outside China are still in preliminary development stages with relatively small market sizes. China has established the world's most comprehensive and largest battery-swapping network, leading globally in both the number of stations and the scale of application. Against the backdrop of continuously increasing global BEV sales and less stable power grids in regions such as the United States, Europe, and Southeast Asia, demand for the battery-swapping model is high, indicating significant market potential.

Value Chain of Battery-swapping Industry

The upstream segment of the battery-swapping industry value chain includes battery manufacturers, battery-swapping equipment providers, power grid companies, and other IT service providers. The midstream mainly comprises battery-swapping station operators and battery asset management providers. The downstream includes end-users and the battery recycling sector. Battery-swapping station operators in the midstream can be further divided into BEV manufacturers and independent third-party battery-swapping solution providers. Independent third-party battery-swapping solution providers are core industry participants, providing services to various upstream and downstream stakeholders.

Value Chain of Battery-swapping Industry



Source: CIC

Notes: An independent third-party battery-swapping solution provider refers to a battery-swapping station operator that is independent from BEV manufacturers andprovides open, cross-brand battery-swapping solutions and services, including but not limited to battery-swapping station operation, battery-swapping equipment,vehicle-station adaptation and operating platforms.

Growth Drivers for China's Battery-swapping Industry

The rapid growth of China's battery-swapping industry is mainly driven by the following factors:

- *Policy support*. Since 2020, authorities including the National Development and Reform Commission and the Ministry of Industry and Information Technology have introduced policies supporting the battery-swapping industry. These policies support growth by promoting battery-swapping applications in public-sector and high-frequency operational scenarios, improving charging and swapping infrastructure networks, and encouraging compatible vehicle models and technical standards. In 2025, relevant authorities further promoted charging and swapping infrastructure deployment and introduced national safety requirements for commercial vehicle battery swapping, supporting wider application of the model.

- *Rapid market demand growth and improved user acceptance*. With the rapid increase in BEV numbers, demand for more convenient and efficient replenishment methods is rising. The battery-swapping model is widely recognized for its advantages of quick replenishment and reduced vehicle downtime, especially in high-frequency scenarios including taxis and ride-hailing. It alleviates issues of insufficient charging stations and grid load pressure while providing a faster user experience.

- *Continuous improvement of battery-swapping infrastructure*. The development of battery-swapping infrastructure is key to advancing the model. With increasing numbers of stations in major cities and regions, network coverage is expanding. The construction of various station types enhances accessibility and convenience, shortens user wait times, improves market acceptance, and provides solid infrastructure support for the entire industry.

- *Diverse battery-swapping compatible vehicle models*. BEV manufacturers in China have intensified efforts to develop and launch vehicle models supporting battery swaps, providing the market with a wider range of product choices. This diversification satisfies different consumer needs and enhances the competitiveness of the battery-swapping model.

- *Declining battery costs and enhanced economics*. Power battery costs have steadily decreased in recent years, driven by technological advances and economies of scale in manufacturing. Coupled with ongoing improvements in battery-swapping system design and operations, these developments are strengthening the overall economics and competitiveness of the battery-swapping model.

- *Advancement of autonomous driving technologies*. As autonomous driving technologies mature and pilot deployments expand, the demand for efficient, low-intervention energy replenishment is increasing. Battery-swapping provides a fast, standardized and largely human-free replenishment process, making it well suited to future driverless fleets and broadening the potential application space of the battery-swapping model.

Development Trend of China's Battery-swapping Industry

The development trends of China's BEV battery-swapping industry are as follows:

- *Technological development*. Battery-swapping technology is constantly evolving, leading to continuously shortened swapping times. Simultaneously, the technology is becoming increasingly intelligent and automated. The new generation of battery-swapping stations integrates automated robotic arms, visual recognition, and smart management systems, greatly enhancing process efficiency, accuracy, stability, and user experience. Intelligent and automated battery-swapping technology is gradually becoming the industry standard, laying a foundation for wider application.

- *Expansion into autonomous and driverless fleet applications*. As autonomous-driving technologies continue to advance, battery swapping is expected to become increasingly relevant to autonomous mobility and commercial transportation scenarios, including Robotaxi fleets, autonomous heavy-duty trucks and other driverless commercial vehicle applications. The battery-swapping industry is expected to evolve from serving conventional operational vehicles toward supporting more automated, fleet-based and high-frequency vehicle opetation models, further broadening the long-term application scope of battery swapping.

- *Energy storage + networking capability and grid synergy*. Battery-swapping stations, with their centralized battery reserves, are inherent energy storage units. As they become networked, their grid auxiliary function becomes increasingly prominent. Through intelligent scheduling, they can achieve peak shaving and valley filling, smoothing the load curve and easing supply-demand pressure. As flexible energy storage nodes, they can operate synergistically with renewables such as wind and solar, improving clean energy utilization. They also serve as a key bridge between vehicles and the grid.

Competitive Landscape of China's Battery-swapping Industry

Major participants

China's battery-swapping industry is mainly composed of BEV manufacturers and independent third-party battery-swapping solution providers. BEV manufacturers design, construct, and operate battery-swapping stations predominantly based on their own vehicle designs, standard systems, and customer base development. This approach allows them to closely align battery packs with vehicle specifications and maintain a closed-loop system that ensures safety, reliability, and a consistent service experience. It also enhances the overall vehicle value and user experience through exclusive energy replenishment services, thereby strengthening consumer loyalty and brand value. However, BEV manufacturers primarily serve their own brands, leading to limited compatibility across different vehicle models and challenges in establishing a widespread battery-swapping ecosystem. This model typically focuses on the private vehicle segment.

Independent third-party battery-swapping solution providers offer greater openness and cross-brand compatibility. In technology integration and equipment supply, they collaborate closely with BEV manufacturers on standardized equipment such as battery boxes and connectors, reducing development costs and R&D cycles for vehicle makers and accelerating the launch of battery-swapping models. On the operating system side, these providers deliver end-to-end solutions: front-end R&D and manufacturing of swapping equipment, and back-end big data-driven platforms that integrate intelligent scheduling, battery health monitoring, and user management. Advanced algorithms optimise battery cycling efficiency and station load, and analyse peak/valley electricity prices to enable sophisticated power scheduling and intelligent pricing, improving economic efficiency and helping to balance grid load. Professional local operation teams handle daily station operations and provide rapid incident response to protect the user experience. Many providers also pursue full battery lifecycle value and risk management, with dedicated teams for battery maintenance, performance testing, and cascade utilisation to ensure battery safety and availability.

In large-scale operation scenarios, a core competitive factor is the large-scale construction and efficient operation of battery-swapping stations. Independent third-party providers, by serving multiple brands and models, can share construction and operation costs and accumulate vast operational data to optimize station deployment, improve operating efficiency and energy utilization, thereby consolidating technological and operational advantages. Their accumulated experience across different regions and models also enhances standardization and project execution capabilities, enabling quick responses to evolving market demands.

As the market develops, industry entry barriers are rising. Through large-scale deployment and cooperation with multiple BEV manufacturers, existing players have significantly strengthened their technological and commercial advantages. High capital investment, the complexity of achieving bilateral technology adaptation with numerous manufacturers, and lengthy product verification cycles create high capital and technical barriers for potential new entrants.

Competitive Landscape

In 2025, the Company ranked third in China in terms of revenue generated from battery-swapping station operation services. The following table sets forth the ranking of the top five players in the battery-swapping industry in China in 2025. In China's battery-swapping industry, independent third-party solution providers operating over 50 battery-swapping stations as of the end of 2025 are generally regarded as leading market participants.

Ranking	Company	Type of Industry Participant	Product Positioning	Price of Battery-Swapping Service[5] (RMB/kWh or RMB/km)	Fastest Battery-Swapping Time	Revenue generated from Battery-Swapping Station Operation Services in 2025 (RMB million)
1	Company A[1]	BEV manufacturer	Private vehicle	kWh based: ~0.79~1.66	2 minutes and 24 seconds	~3,100
2	Company B[2]	Independent Third-Party Battery-Swapping Solution Provider	Operational vehicle & Private vehicle	kWh based: ~0.76~1.37	1 minute and 39 seconds	~1,500
3	**The Company**	**Independent Third-Party Battery-Swapping Solution Provider**	**Operational vehicle**	**Mileage based: ~0.14~0.45 kWh based: ~0.69~1.85**	**20 seconds**	**~502[6]**
4	Company C[3]	Independent Third-Party Battery-Swapping Solution Provider	Commercial vehicle	kWh based: ~0.60~1.35	Less than 4 minutes	~470
5	Company D[4]	BEV manufacturer	Operational vehicle	kWh based: ~0.53~1.40	40 seconds	~190

Source: CIC

(1) Company A is a listed company founded in 2014 and headquartered in Shanghai, China. It focuses on premium electric vehicles, and provides Battery-as-a-Service (BaaS), including battery subscription plans, swap-on-demand energy replenishment, and integrated power solutions covering charging, swapping, and upgradeable battery packs.

(2) Company B is a subsidiary of a listed company, established in 2022 and headquartered in Fujian Province, China. It focuses on passenger vehicle battery-swapping business and mainly provides battery-swapping system solutions, construction and operation of passenger vehicle battery swapping stations, and supporting digital-platform services.

(3) Company C is a state-controlled company, established in 2020 and headquartered in Shanghai, China. It focuses on new-energy commercial vehicles such as electric heavy-duty trucks and electric construction machinery, and mainly provides battery-swapping system solutions, construction and operation of charging and swapping stations, and power-battery asset and full life-cycle management services.

(4) Company D is a subsidiary of a listed BEV manufacturer, established in 2017 and headquartered in Hangzhou, China. It focuses on building a battery-swapping ecosystem and centers on battery sharing and full-lifecycle vehicle operations, and provides cost-effective, efficient and green solutions for the operational market.

(5) The price of The Company's battery-swapping service is based on data from 2023 to April 2026, and the prices of battery-swapping service from Company A to Company D are based on data as of May 29, 2026.

(6) Includes revenue generated from battery-swapping operational services and battery-swapping services through self-owned stations.

China's battery-swapping equipment sales market is relatively fragmented, with most participants — primarily equipment manufacturers and integrators — focusing on equipment provision rather than engaging in battery-swapping station operations. By contrast, the Company is one of the few providers with full battery-swapping station operating capabilities. The Company designs, develops, and sells battery-swapping stations to customers already in — or planning to enter — the energy replenishment industry, and integrates those stations into the Company's proprietary battery-swapping network. After installation, the majority of customers engage the Company to manage ongoing battery-swapping operations. In terms of revenue generated from sales of battery-swapping equipment, the Company achieved a market share of 1.3% in China's battery-swapping equipment sales market in 2025.

Outlook for China's Battery-swapping Products and Technology

After undergoing large-scale verification and technological iterations in the domestic market, China's battery-swapping industry has gradually developed replicable, systematic solutions and mature business models. It is equipped to export innovative energy service models globally, moving from local verification towards international implementation. The concept of highly efficient and intensive energy replenishment represented by the battery-swapping model aligns with global needs for transportation electrification and energy infrastructure upgrading. This creates conditions for market players in China to expand their output from products and projects to standards, platforms, and services, to accelerate their participation in formulating international standards, and to expand overseas markets through diversified cooperation models such as joint ventures, licensing, co-construction, and sharing. This, in turn, promotes the transformation from Chinese solutions to global solutions.

- *Modular technological output and local adaptation*. Chinese battery-swapping companies are shifting from solely exporting equipment to delivering modular, platform-based technical solutions. By encapsulating core hardware (battery-swapping robots, standardized battery bays) and software systems (cloud-based battery management, intelligent scheduling platforms), such solutions can flexibly adapt to various vehicle standards, grid structures, and policy environments in different countries, enabling rapid localized deployment.

- *Participation in international standards formulation*. Leveraging their first-mover advantage, Chinese battery-swapping companies are actively leading or participating in developing international battery-swapping standards and systems, promoting mutual recognition of battery pack physical dimensions, communication protocols, and safety specifications. This aims to establish leadership in the technology sector at the source, reduce overseas expansion compliance costs, and lay the foundation for global battery swap interconnectivity and interoperability.

- *Green transformation empowered by integrated solutions*. Overseas expansion is evolving beyond equipment supply to encompass comprehensive cooperation integrating infrastructure construction, operation and maintenance service training, and financial model innovation. Especially in emerging electrification markets along the Belt and Road Initiative, Southeast Asia, and Latin America, Chinese battery-swapping companies can provide full value-chain services — from power station investment/construction, integrated design for solar/storage/charging/swapping, to battery bank financial solutions — facilitating the low-carbon transformation of local transportation and energy systems.

- *Cooperation with overseas partners*. The path for overseas expansion is shifting from self-construction to strategic cooperation with international vehicle manufacturers, energy giants, and logistics leaders. Through technology licensing and joint ventures,

Chinese battery-swapping companies can integrate proven domestic operation models into partners' existing networks, achieving complementary resource advantages and jointly cultivating regional markets, thereby forming a global battery-swapping ecosystem.

Analysis of Raw Material Costs

The major raw materials and components used in battery-swapping industry include charging cabinets, charging systems, containers, sheet metal parts, connectors and wiring harnesses. These components are generally customized equipment or structural and electrical parts, and their procurement prices are affected by the prices of upstream materials and components.

Cold-rolled steel is an important upstream material for containers, sheet metal parts, cabinet structures and certain mechanical structural parts used in battery-swapping stations. Therefore, cold-rolled steel prices can be used as a reference indicator for the cost trend of such structural parts. The average price of cold-rolled steel in China changed from approximately RMB4,500 per tonne in 2020 to approximately RMB4,000 per tonne in 2025.

Copper is an important upstream material for connectors, wiring harnesses and electrical connection components used in charging systems and charging cabinets. Therefore,copper prices can be used as a reference indicator for the cost trend of such electrical components. The average spot price of copper in China increased from approximately RMB49,000 per tonne in 2020 to approximately RMB79,500 per tonne in 2025, reflecting increased cost pressure on copper-based electrical connection components.

SOURCES OF INFORMATION

CIC was commissioned to conduct research, analyze and prepare the CIC Report on the battery-swapping industry, along with other related economic data. The commissioned report has been independently prepared by CIC without influence from us and other interested parties. We have agreed to pay a fee of RMB1,250,000 to CIC in connection with the preparation of the CIC Report.

During the preparation of the CIC Report, CIC conducted both primary and secondary research through a variety of resources to obtain in-depth knowledge, statistical data and industry insights regarding market trends in the target sector. Primary research involved interviews with key industry experts and leading market participants, while secondary research collected publicly available sources such as publications issued by the Chinese government, annual reports released by relevant industry players, information from industry associations and CIC's proprietary database.

The findings and projections presented in the CIC Report are based on the following key assumptions: (i) the overall global social, economic and political environment is expected to remain stable over the next decade; (ii) major industry drivers will continue to support the growth of the battery-swapping industry throughout the forecast period; and (iii) there will be no force majeure event or regulatory transition that could significantly disrupt or fundamentally alter current market dynamics.