Electric Vehicles

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Trend Overview

EV Boom Continues, Leading to Changes in Parts and Restructuring of Entire Automobile Industry

As the global push for carbon neutrality continues to gather pace, the levels of interest and investment in electric vehicles (EVs) across both the public and private sectors are rapidly increasing. In addition to pure-play EV companies such as Tesla (USA), automobile manufacturers such as Toyota (JPN) and Volkswagen (DEU), which have traditionally focused on internal combustion engine vehicles (ICVs) and hybrid electric vehicles (HEVs), have also been pouring investment into the development of EVs.

This Trends report focuses primarily on EVs in the narrow sense of the term (i.e. battery electric vehicles [BEVs]), but also covers certain HEVs and plug-in hybrid electric vehicles (PHEVs). We also analyse the effects of EV popularisation on the ICV automobile industry and automotive parts suppliers. For more information on the business structure and financial/competitive situation of companies engaged with the development of EVs, refer to the Electric Vehicles industry report. For more information relating to EVs, refer to the SPEEDA Trends reports on EV Charging Infrastructure, Next-Generation Batteries, and Battery Recycling.

Types of EVs in a Broad Sense vs Scope of This Report

	Automobiles	Other Vehicles
Battery for Driving	• Battery EVs (BEVs) • Hybrid EVs (HEVs) • Plug-in hybrid EVs (PHEVs)	• Electric forklifts • Electric moped • Automated guided vehicles (AGVs)
No Battery for Driving	• Fuel cell cars • Trolleybuses	• Trains • Monorails • Cable cars

Blue text: EVs in the narrow sense
Blue box: EVs in the broad sense

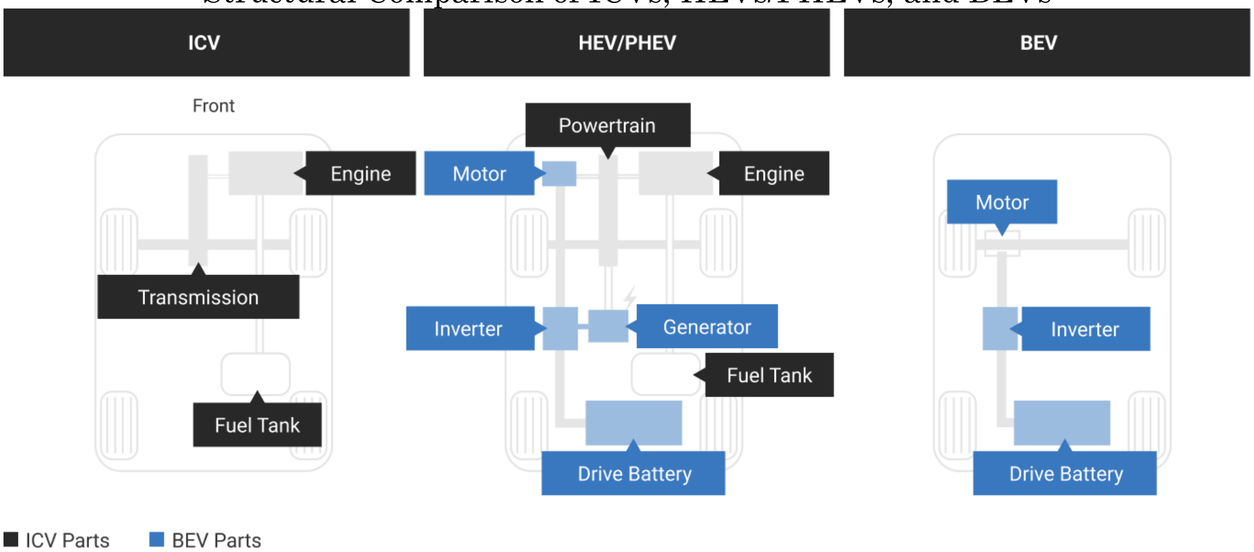
Source: Compiled by Uzabase

Primary Components of EVs: Electric Motor, Battery, and Inverter

Unlike ICVs, which have a petrol/diesel engine and a fuel tank, BEVs come equipped with an electric motor and a battery instead. HEVs and PHEVs, meanwhile, include the driving mechanisms of both ICVs and BEVs. Although both are very similar in structure, the main distinction is the way in which they are charged. HEVs cannot be charged from external power sources, but instead convert the mechanical energy generated by the engine or break activation into electrical energy which is then stored in a battery for later use; as such, the primary power source for HEVs is still the engine, while the motor is secondary. PHEVs, on the other hand, can be charged externally; the electric motor is their primary power source, while the engine is secondary. As a result, the number of batteries used in BEVs, HEVs, and PHEVs differ, as does the extent to which they can utilise the existing charging infrastructure. The matter of infrastructure is particularly relevant in the case of BEVs, which are reliant upon external power supplies for charging purposes. Lack of necessary infrastructure represents one of the largest obstacles to the more widespread adoption of BEVs, with governments addressing this in the form of targets for further expansion (additional information can be found in the EV Charging Infrastructure Trends report).

Another distinctive component of a BEV is an inverter. An inverter is a device that regulates the electric current, voltage, and frequency of the electric input transferred to the motor, thus controlling its speed and torque. The inverter can be considered functionally similar to the transmission in an ICV, which also regulates the engine's RPM, speed, and torque and then passes that to the car’s tyres.

Structural Comparison of ICVs, HEVs/PHEVs, and BEVs



Source: Compiled by Uzabase

The pros and cons of ICVs, HEVs/PHEVs, and BEVs are described in the table below. As will be detailed later in the report, environmental regulations have become more stringent in recent years, and all these types of vehicles have become the target of scrutiny in terms of CO2 emissions. Although ICVs emit more CO2 during driving, the battery manufacturing process for BEVs results in a high volume of CO2 emissions as well. The overall environmental impact also depends on the market penetration of each vehicle type, as well as the power supply infrastructure in each region of the world.

Pros and Cons of ICVs, HEVs/PHEVs, and BEVs

Type	Pros	Cons
ICV	• Cheaper than HEVs/PHEVs or BEVs of the same class • Long cruising range • More interior space compared to HEV/PHEV/BEV • More developed infrastructure (petrol stations) • Quick to refuel (a few minutes)	• High CO2 emissions during driving • Strict regulations, including fines, imposed on CO2 emissions in some countries • High running costs (mainly for fuel, up to 3 times more expensive per kilometre)
HEV/ PHEV	• Long cruising range • Lower environmental impact compared to ICVs (less CO2) • Running costs are lower compared to ICVs • More developed infrastructure (petrol stations) • Quick to refuel (a few minutes) • Subsidies can be received depending on the model • (PHEVs only) Can be charged at home	• Price is higher due combination of components from both ICVs and BEVs • Interior space is limited due to large number of devices installed
BEV	• Does not emit any CO2 during driving • Running costs are low • Various subsidies and incentives applicable • Can be charged at home	• More expensive than other types in the same grade • Short cruising range • Large number of batteries required, limiting interior space • Few charging stations • Battery manufacturing process results in high volume of CO2 emissions; CO2 emissions over the entire vehicle lifecycle are more than double those of ICVs

Source: Compiled by Uzabase

Countries Regulating ICVs and Subsidising BEVs to Comply with Paris Agreement and Build Competitiveness

The Paris Agreement, which aims to limit the increase in the average global temperature to below 2 degrees Celsius, preferably 1.5 degrees Celsius, above pre-industrial levels, was adopted in 2015 in response to growing calls to tackle global warming. Automobiles are key to the push against global warming as they emit significant amounts of CO2, both during use and production. The sources used to power BEVs will thus be crucial to this fight to reduce emissions going forward.

Each country that ratifies the Paris Agreement sets its own Nationally Determined Contribution (NDC) targets. In order to achieve these targets, an increasing number of countries are announcing regulations on the sale of ICVs and BEVs, supplementing those existing fuel consumption and emission regulations (e.g. Corporate Average Fuel Economy [CAFE] standards) that have grown stricter over time. In addition, there has been a rapid increase in institutional investors factoring in environmental, social, and governance (ESG) criteria into their investment decisions. These and other developments have led to a situation where automobile manufacturers are expected to formulate BEV-related plans to contribute to the reduction of global greenhouse gas (GHG) emissions.

As part of their efforts to achieve their NDC targets, as well as to boost the competitiveness of domestic automobile manufacturers and auto parts suppliers, countries have announced a wide range of targets, regulations, subsidies, and tax incentives, as summarised in the below table.

Country	Policy	Government Incentives and Benefits
USA	• President Biden signed an executive order in August 2021 for at least 50% of all new passenger vehicles and light trucks sold to be BEVs, PHEVs, and FCVs by 2030. • 15 states including California and Massachusetts introduced a ZEV programme, imposing a minimum ZEV requirement of 16% or more on manufacturers with annual sales of more than 4,500 vehicles. • In August 2022, the state of California adopted a measure regarding the sale of vehicles that only run on petrol, which will be phased out in stages over 2026–35.	• Tax credit of up to USD 7,500 per vehicle established with US Inflation Reduction Act in August 2022 for qualifying EV purchases, contingent upon sales price, income caps, and vehicle production requirements (e.g. North America-based component production and material procurement relating to batteries). Projected disbursement over the next decade is USD 8.9 billion. • The Biden administration announced a USD 5 billion investment over five years (from 2022) towards increasing the number of EV battery chargers to 500,000 by 2030.
EU	• In July 2021, the European Commission proposed an amendment that would effectively ban the production and sale of passenger and light commercial ICVs and HEVs from 2035 onwards. • In February 2023, Germany filed a request to allow the sale of new ICVs using e-fuel after 2035, with the country reaching an agreement with the EU in the following month. Note that several EU countries, including Italy and Poland, have expressed reservations and a negative stance towards granting approval for this request.	-
Germany	• In 2016, the Bundestag adopted a resolution to ban sales of all diesel and petrol engine cars by 2030 (not legally binding, but adopted with overall support). • In December 2021, the federal government coalition set a target for 15 million BEVs by 2030 (upward revision of Merkel-era target of 7–10 million vehicles, inclusive of PHEVs).	• Subsidies of up to EUR 6,000 for BEVs and up to EUR 4,500 for PHEVs, registered from June 2020 until end-2025. As an economic measure to combat the COVID-19 pandemic, subsidies were increased to a maximum of EUR 9,000 for BEVs and EUR 6,750 for PHEVs from July 2020. Will conclude in 2023 or later when allocated resources are depleted, with subsidy amounts reduced and PHEVs removed from eligibility. • EVs registered from 2016 onwards are exempt from car tax for a maximum of 10 years through 2030. Tax exemption for company vehicles also applicable through 2030.
France	• In 2017, the government announced its intention to ban all sales of petrol and diesel vehicles by 2040. • Set a target for manufacturing at least 1 million EVs domestically by 2027.	• In June 2020, introduced subsidies of up to EUR 7,000 for new BEVs and EUR 2,000 for PHEVs with a cruising range of at least 50 km and a price cap of EUR 50,000. In mid-2021, subsidies were reduced to EUR 6,000 and an extension was announced until the end of 2022. From 2023, subsidies were reduced to a maximum of EUR 5,000. • In October 2023, a new decree took effect, limiting subsidies to those models that meet CO2 emission standards for the manufacturing and transport processes. • An environmental incentive of EUR 1,000 for the purchase of used EVs introduced from December 2020.
UK	• In September 2023, the government announced its intention to ban passenger cars and vans with diesel and petrol engines by 2035, a postponement from the 2030 target that had previously been brought forward.	• Under the Plug-in Car Grant (PiCG), subsidies for the purchase of BEVs were reduced to GBP 2,500 in March 2021, then further to GBP 1,500 in Decmber 2021, with the grant officially ending in June 2022.
China	• In 2019, the government introduced "NEV regulations" mandating that 10% (2019, rising by 2 percentage points annually thereafter) of production/import volume be NEVs (EV, PHEV, FCV) for OEMs with annual domestic production/ import volume in China of 30,000 units or more. • In October 2020, the government announced plans to phase out petrol engine vehicles in favour of NEVs and HEVs by increasing the share of NEVs in new vehicle sales to more than 20% by 2025 and more than 50% by 2035.	• The subsidy for the purchase of NEVs was reduced in stages, with a 10% reduction in 2020, 20% in 2021, and 30% in 2022. The purchase subsidy program was abolished in end-2022. • In June 2023, the 10% vehicle acquisition tax exemption applicable to NEV purchases was extended for staged implementation through 2027. Exemptions to be capped at CNY 30,000 per vehicle in 2024–25, before decreasing to CNY 15,000 in 2026–27. Total tax exemptions over 2024–27 projected at CNY 520 billion.
Japan	• In March 2020, the government established fuel efficiency standards aimed at improving the fuel efficiency of new vehicles by around 30% over FY2016-30 (19.2 km/litre > 25.4 km/litre). • In January 2021, then-Prime Minister Yoshihide Suga announced the government's intention for 100% of new vehicle sales to be EVs by 2035. EVs here include not only BEVs but also HEVs, PHEVs, and FCVs. • The government plans to reveal a new taxation framework by around 2025 after EVs have further permeated the market.	• From FY2022, subsidies will be increased to JPY 850,000 for BEVs (initially JPY 400,000; raised to JPY 800,000 in the December 2020 supplementary budget), JPY 550,000 for light BEVs and PHEVs (up from JPY 200,000) and JPY 2.55 million for FCVs (up from JPY 2.25 million).

Source: Compiled by Uzabase based on materials published by each country

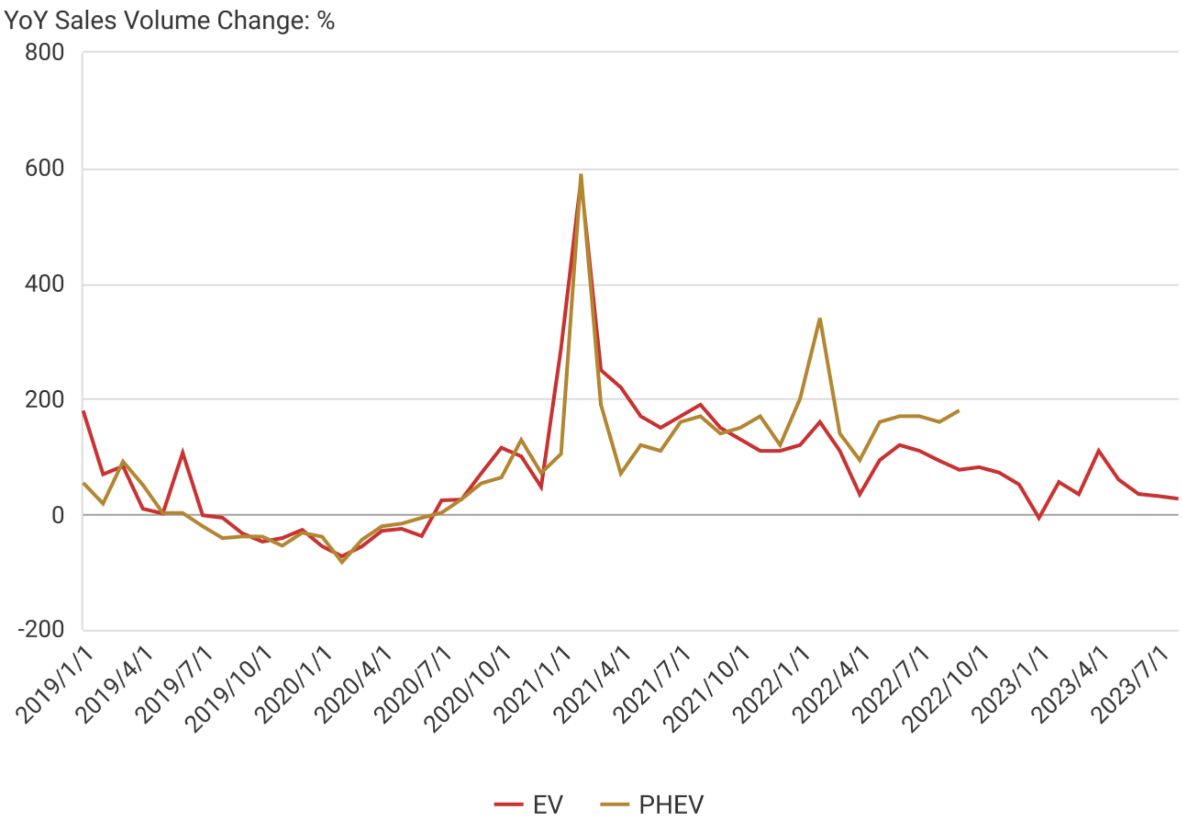
Role of National Subsidies Wanes Amid Widespread EV Use; Industry Protection Measures on the Rise

There are some indications that governments want to reduce industry reliance on subsidies and strengthen competitiveness in the global arena, with a gradual reduction of subsidies underway in countries such as the UK and others throughout Europe. In China, the government roughly halved its purchase subsidies for the domestic New Energy Vehicle (NEV) category that includes EVs and PHEVs in June 2019. It also introduced a ban on subsidies by local governments, subsequently terminating the national purchase subsidy policy after a pandemic-influenced extension through end-2022. Meanwhile, slowing growth in vehicle sales prompted adjustments to the new vehicle acquisition tax exemption, applicable to consumer NEV purchases, with staged implementation of the measure extended through 2027.

According to the International Energy Agency (IEA) publication Global EV Outlook 2023, government expenditure (e.g. subsidies) accounted for more than 20% of total global expenditure on EVs in 2017. Since then, sales of EVs have increased and consumer expenditure has thus grown significantly, while growth in government expenditure has been relatively marginal. As a result, the share of total expenditure on EVs accounted for by governments had fallen below 10% in 2022.

Meanwhile, governments in key markets have taken measures to protect national industries and regional supply chains, with potential implications for further growth in EV use. Passed in 2022, the US Inflation Reduction Act (IRA) specifies conditions to determine eligibility for tax credits, established through the Act and applicable to new EV purchases. For a vehicle to qualify, final assembly must be undertaken in North America, a certain percentage of components must be manufactured in that region, and critical minerals used in the production of batteries must be sourced from designated eligible countries (the US or those with which it has a free trade agreement). As a result, the IRA has shaped the regional market by effectively requiring that players have or develop the necessary assembly and supply chain capacity within North America.

Sales of EVs and PHEVs in China



Source: Compiled by Uzabase based on Ministry of Industry and Information Technology (MIIT) data
Note 1: Figures represent combined totals of passenger and commercial vehicles.
Note 2: EV figures from October 2022 include all components of the NEV category.

EU to Allow ICVs Using E-fuel, Impact on Production Trends Currently Remains Limited

Various countries and regions have been working on policies to completely ban the sale of ICVs by around 2030–40. However, in February 2023, Germany requested that the EU allow the sale of ICVs after 2035 under the condition that they use synthetic e-fuels. The following month, these conditions were reflected in proposed legislation approved and adopted by the European Commission.

This partial acceptance of ICVs will prove beneficial to the automobile industry as it will allow greater room for the use of existing elements and infrastructure involved in the manufacture of vehicles. However, e-fuel remains in its infancy, and even by 2050 is likely to remain more expensive than gasoline (refer to the Clean Fuels Trends report). As such, while some countries and regions will likely act in line with these EU policy changes in the future, current indications point to limited impact on manufacturers' production schedules and targets.

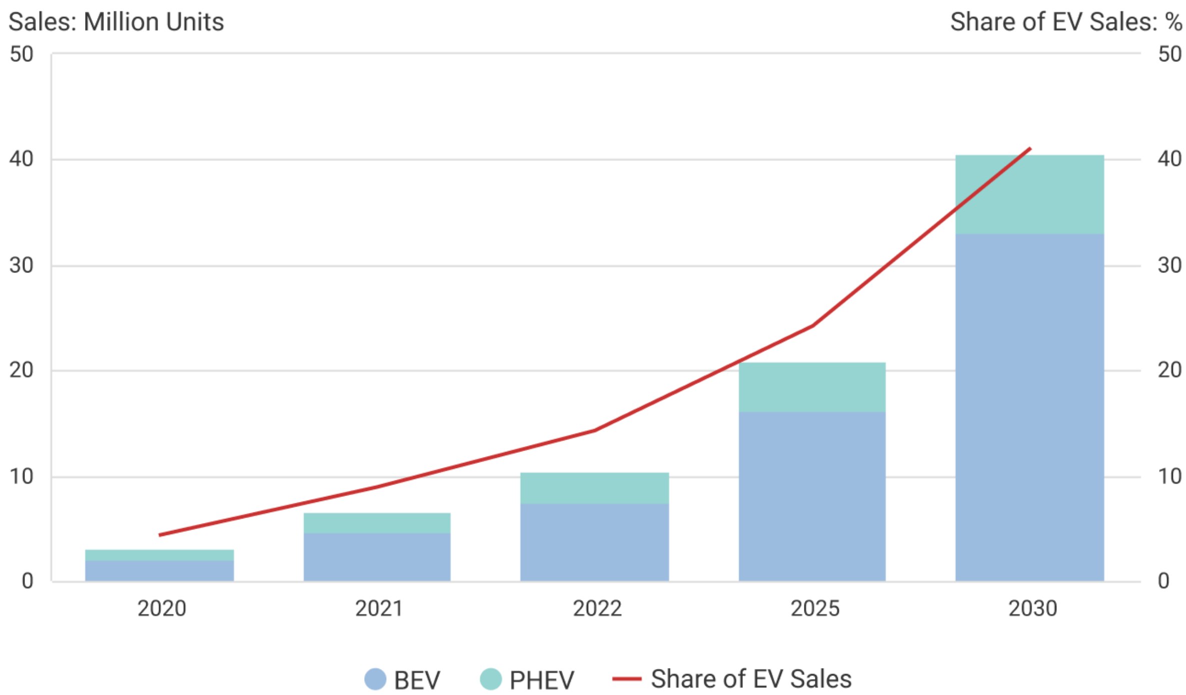
Monetisation

EVs Projected to Account for 41% of Total Automobile Market by 2030

According to IEA calculations (based on the Announced Pledges Scenario, or APS), while BEVs and PHEVs combined to account for less than 10% of total vehicle sales in 2021, the share for these EVs is projected to grow to 41% by 2030. A look at details of this projection reveals that BEVs are expected to comprise roughly 80% and PHEVs roughly 20%, while by region, China and Europe are expected to drive sales growth. The rapidly rising expectations for and investment in BEVs are being driven by global efforts to reduce GHG emissions.

At the same time, estimates of figures for the five major global automobile manufacturers indicate a projected sales volume of approximately 16.2 million units and target share of 40% for BEVs by 2030, with these projections representing a significant deviation from the aforementioned IEA calculations.

EV Sales Volume Forecasts



Source: Compiled by Uzabase based on APS values published in IEA's "Global EV Data Explorer"

Manufacturers Must Cut Costs to Offset Reduced Subsidies and Secure Profits

Although many countries have recently extended the duration of their subsidies, tax breaks, and other incentives for purchasing EVs in response to the COVID-19 pandemic, they are expected to be abolished or restricted in the coming years. Given this trend towards subsidy reduction, even if the share of BEVs in total automobile sales increases, manufacturers will still need to cut costs to maintain profitability.

BloombergNEF (BNEF) forecasts that lithium-ion battery packs—which currently account for a large share of EV costs despite significant price reductions over 2013–21 (USD 684 to USD 132 per kWh)—will drop below USD 100 per kWh by 2024. Given a battery capacity of around 40–50 kWh for BEVs, the drop in prices for the 2021–24 period alone represents cost reductions in the neighbourhood of USD 1,300–1,600 per vehicle.

Raw material prices are also an influential factor in cutting the cost of batteries. From 2022, the prices of both lithium and nickel skyrocketed, with the price of nickel in particular soaring following the Russia-Ukraine conflict, given that Russia is a leading producer of nickel. This led to an increase in battery unit prices, prompting automobile manufacturers such as Tesla to increase their prices from March 2022. The situation shifted in 2023, however, with lithium prices falling sharply and nickel prices turning to a gradual downtrend, and this may cause automobile prices to decline going forward.

Other measures to reduce production costs include cutting the cost of motors, inverters, and related systems. ICVs are controlled by a combination of engines and gears, so it is necessary to reduce the cost of drive-related components in an integrated manner. BEVs, on the other hand, are controlled by a combination of motors, batteries, semiconductors, and software, which are converted into electrical and electronic signals. As such, it is easier to incrementally reduce overall costs by cutting the costs of individual components. Each Tesla model, for example, has a long model cycle without so-called full model changes. In addition to the high efficiency associated with this model cycle, the cost of components can be reduced due to the frequent model changes.

Consideration of Full Life Cycle CO2 Emissions Becoming More Important as LCA Spreads

In recent years, Life Cycle Assessment (LCA), a more comprehensive approach to evaluating the environmental impact of Evs, is becoming more widespread. LCA quantifies the effects on the environment produced by automobiles at each stage, from resource mining to waste processing and recycling.

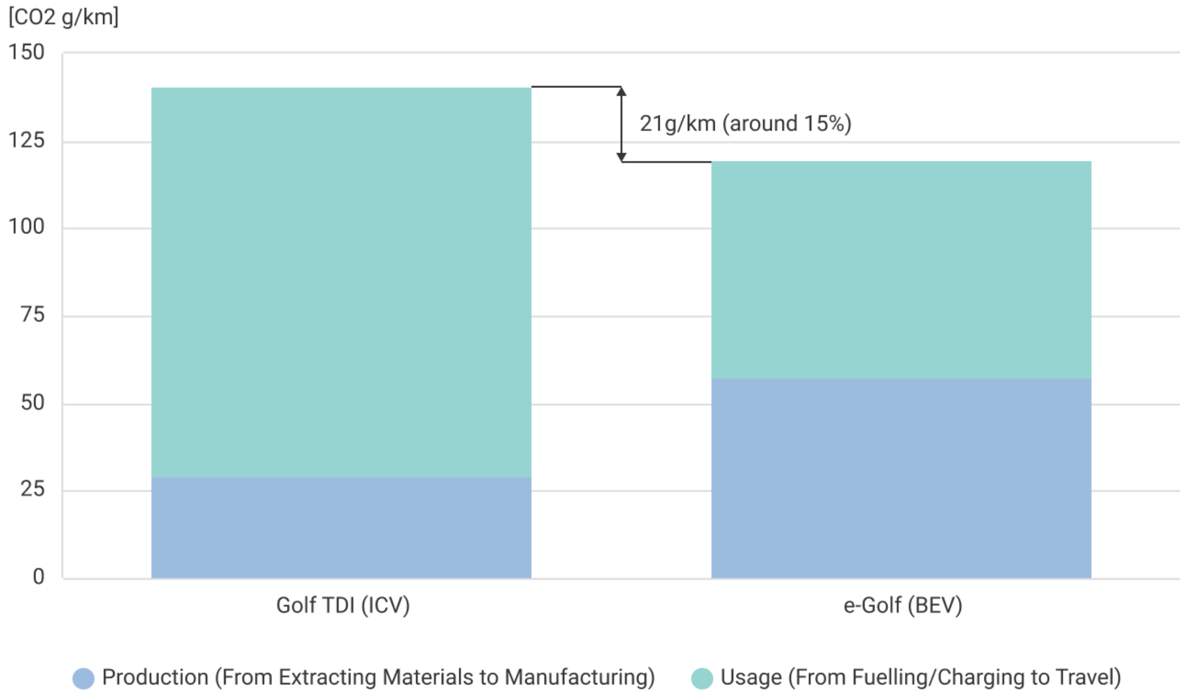
As a real-world example of implementing LCA, Volkswagen published a study on CO2 emissions from its Golf TDI (diesel) and e-Golf (BEV) models in 2019. The study shows that, based on the energy mix in the EU, if a vehicle travels a total of 200,000 km throughout its life cycle, a BEV would produce about 15% less CO2 emissions per every kilometre travelled compared to an ICV. Furthermore, if any rare metals and rare earths used in BEVs and their batteries are properly extracted during the end-of-life processing and recycling stages, their total CO2 emissions can be additionally reduced by up to 25%.

Mazda (JPN), on the other hand, has provided its own estimations of CO2 emissions for BEVs in comparison to ICVs, HEVs/PHEVs, and other vehicles equipped with an IC engine, based on academic research. According to these calculations, a small BEV with a battery capacity of around 35.5kWh would produce the same amount of CO2 emissions as an ICV once the battery has been replaced due to ageing. Volvo (SWE) has also published an analysis of GHG emissions between ICVs and EVs of the aforementioned types, assessing the potential break-even point(*) for such emissions. Figures in the analysis vary considerably depending on the characteristics of the electricity used for charging, with estimates ranging from 77,000 km (EU28 Electricity Mix) to 110,000 km (Global Electricity Mix) In this context, it is clear that decarbonisation of the electricity for charging EVs is key to the reduction of CO2 emissions stemming from their use.

In the EU, EV batteries will be required to display a carbon footprint declaration from around 2025. The EU is also planning to introduce maximum life cycle carbon footprint thresholds starting around 2028. As such, it is becoming more important to consider not only the cost of the battery itself but also the cost of meeting LCA criteria in terms of battery optimisation and BEV manufacturing.

Note (*): The point an EV becomes cleaner than an ICV in terms of its lifetime carbon footprint.

LCA Results for Golf TDI and e-Golf CO2 Emissions



Source: Compiled by Uzabase based on Volkswagen, "Electric Vehicles with Lowest CO2 Emissions"

Future

Demand for Engine- and Transmission-Related Components Declining; Demand for Batteries, Motors, and Semiconductors Rising

EVs are structurally different from ICVs, and thus their popularisation will naturally result in lower demand for certain ICV components and higher demand for others.

As for HEVs and PHEVs, many parts would be unaffected, except for some auxiliary equipment, given that they are equipped with both an engine and a motor. However, even if their quantity does not change, some parts will see significant qualitative changes, with examples including the electrification of the hydraulic system to reduce the load on the engine, and the usage of aluminium and plastic materials to reduce the weight of automotive body parts.

As shown in the table below, BEVs require fewer parts compared to ICVs as they do not require an engine or transmission. On the other hand, as they run solely on batteries, they require up to twenty times more battery capacity than HEVs and PHEVs, which increases their costs.

Structural parts such as the body and chassis remain key components in the case of BEVs. Tesla and BYD (CHN) have announced the development of models that are also structurally different from conventional ICVs, where the battery pack itself is utilised as a structural component of the vehicle, given that it is also built to be strong and durable for safety reasons. In addition, efforts to boost efficiency in EV manufacturing have resulted in the adoption of "gigacasting", a process for the high-pressure aluminium die casting of multiple body parts in a large singular piece. Already implemented by majors including Tesla, the approach looks set for adoption by more companies as Toyota considers its use for models to be sold in 2026 and Honda (JPN) targets models set for launch in the late 2020s. Compared to traditional production methods in which sheet metal is moulded to produce distinct body and other vehicle parts, this method leads to an overall reduction in the number of body parts required for manufacture.

Impact of EV Popularisation on Automotive Parts

Component		Effects from HEV/PHEV			Effects from BEV			Details
Engine	Engine		0				-	ICV engine downsizing for use in HEVs/PHEVs
	Alternator			-			-	Generally unnecessary, replaced with integrated starter generators (ISGs) and belted starter generators (BSGs) in HEVs
	Starter			-			-	
	Fuel tank		0				-	
	Fuel line		0				-	
	Exhaust (muffler, etc.)		0				-	
	Water pump	+			+			Increased due to multiple cooling systems
	Radiator	+			+			Increased due to multiple cooling systems
Powertrain	Transmission		0				-	
	Oil pump/power steering pump		0			0		Electrification progressing to reduce engine load
Electric Parts	Engine control system		0				-	
	Spark plug		0				-	
	Motor	+			+			Engine auxilliary equipment also being replaced
	Motor control unit	+			+			
	Inverter	+			+			
Suspension	Brakes		0			0		Switch to regenerative brakes
	Suspension		0			0		
Chassis	Body parts		0			0		Weight reduction due to the use of aluminium and carbon fibre reinforced materials
	Rear door, sunroof		0			0		Weight reduction due to switch to plastics
Other	Lamp		0			0		Switch to LEDs
	AC		0			0		Electrification progressing to reduce engine load

Source: Compiled by Uzabase
Note: "+" and "–" indications represent shifts in demand influenced by the move from ICVs to HEVs/PEVs and BEVs (increase and decrease, respectively); zeroes indicate no direct shift.

Tier 1 Suppliers of Core EV Components Transforming into Mega Suppliers; In-House Production and Horizontal Integration by Automobile Manufacturers Also Being Seen

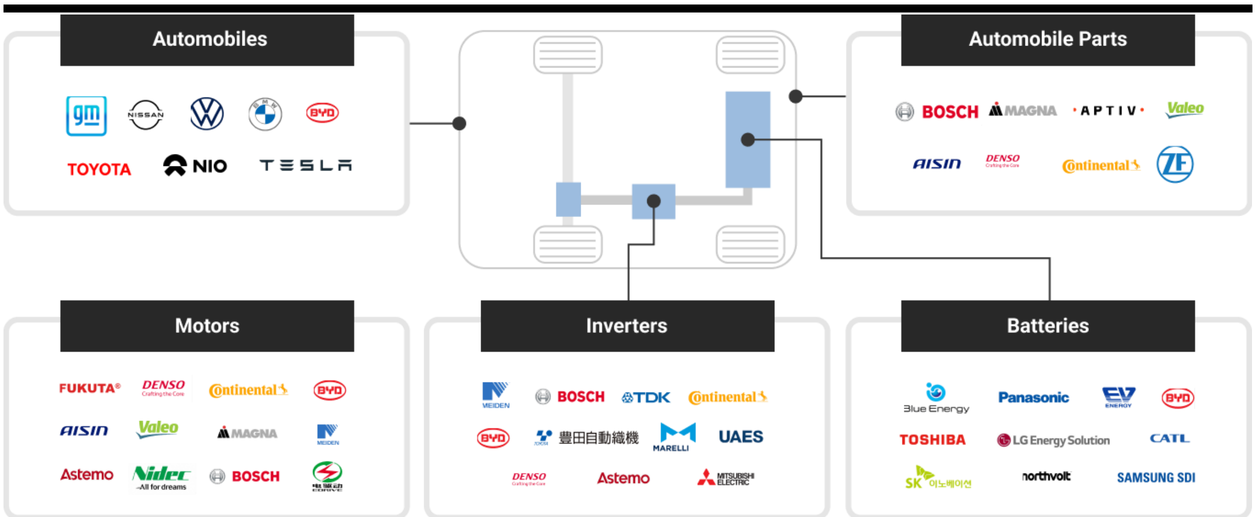
Looking at the list of companies manufacturing major EV parts, it is clear that electrical components such as motors, inverters, and related systems are only handled by a limited number of Tier 1 suppliers. Due to the growing importance of these parts in automobiles, these Tier 1 companies are also transforming into much larger "mega suppliers".

As a specific example, Toyota announced in 2020 that it would transfer its major electronic parts business (inverters, motors, and semiconductor components) to Denso (JPN). The purpose is to increase the overall competitiveness of the business by consolidating the electronic parts manufacturing in the hands of Denso, which already has a higher level of expertise in the field. In 2021, Hitachi Automotive Systems (JPN), Keihin (JPN), Showa (JPN), and Nissin Kogyo (JPN) merged to form Hitachi Astemo (JPN). The group has become a major supplier of a comprehensive range of key components, including electrical components, powertrains, and brakesAt the same time, automobile manufacturers have been making moves to boost their rates of in-house production. As mentioned above, in addition to forming alliances and establishing joint ventures with battery manufacturers, automobile manufacturers are planning to produce batteries in-house.

There are also examples of companies entering the market from peripheral fields. Sony (JPN), for example, has indicated it will establish a joint venture with Honda to enter the North American market for BEVs, aiming to commence delivery of mass-produced vehicles starting in Spring 2026. Apple (USA) has also been considering entering the automotive space for some time now and has reportedly approached several potential manufacturing partners. Hon Hai Precision Industry (TWN; Foxconn), a leading contract manufacturer (EMS) for Apple, has also announced Mobility in Harmony (MIH), an open EV platform that aims to generate business opportunities in the EV domain, and is also looking to expand its business through partnerships with component manufacturers such as Denso.

The automotive industry has entered a period of major transformation, and companies are exploring different business models and strategies in order to remain competitive. These include taking advantage of core and accumulated technologies to manufacture products in-house, outsourcing manufacturing in order to reduce technical debt, and horizontal and vertical integration.

Main Players in the EV Industry



Source: Compiled by Uzabase

China's EV Battery Market: Lifted Restrictions on Foreign Investment, Reducing Costs in Line with Subsidy Cuts

CATL and BYD control the majority of the battery market in China, with their shares in terms of capacity in 2022 amounting to approximately 48% and 23%, respectively. However, this is also starting to change due to the full entry of foreign automobile manufacturers into the Chinese market and the government's plans to curtail subsidies.

The entry of foreign automobile manufacturers was made possible after the restrictions on foreign ownership in NEV manufacturing were lifted from 2018; the restrictions on passenger car manufacturing were removed in 2022. Following these regulatory changes, Tesla established an independently owned EV plant in Shanghai in 2018, while Volkswagen, Mercedes-Benz (DEU), and Toyota have all started moving into the Chinese EV market. To gain the initiative in the market, these auto OEMs have not only been forming partnerships with local battery suppliers, such as BYD and CATL, but they have also been investing and acquiring players with a relatively small market share.

The staged elimination of subsidies has once again put the spotlight on the issue of lowering the price of batteries, which remain the most expensive component of an EV. Until now, CATL's focus on ternary (nickel-cobalt-manganese) lithium-ion batteries has given it a competitive edge in terms of a longer cruising range. However, interest in LFPs has increased in recent years given their potential in terms of cutting costs, improving safety, and longer cycle life.

CATL's LFP batteries have been adopted for use in Tesla's Model 3, while BYD has developed the Blade Battery, a next-generation iron phosphate LFP battery that is not only safer than a ternary battery but also offers an equivalently long cruising range. Toyota, collaborating on development with BYD, has announced plans to equip models set for launch in the Chinese market with LFP batteries.

Activity Among Foreign-Owned Automobile Manufacturers in the Chinese EV Market

Foreign-Owned Automaker	Initiatives in the Chinese EV Market
TESLA	• Established independently owned plant in Shanghai and partnered with CATL for battery supply. Plans to manufacture not only ternary batteries but also iron phosphate batteries. • Considering partners for domestic Chinese production of its 4680-type cylindrical automotive battery. • Began the export of Model 3 and Model Y vehicles manufactured in Shanghai to North America.
VW	• Owns a 50% stake in Anhui Jianghuai Automobile Group ("JAC Motors"), a Chinese state-owned automaker. Raised its stake in a joint venture with JAC to 75%. • Acquired a 26.47% stake in Guoxuan Hi-Tech, one of the top 5 Chinese car battery manufacturers by market share. • Considering the export of EVs manufactured in China to Europe and other markets. • Partnered with Chinese automaker Xpeng for the sale in China of VW-branded EVs based on the latter's platform, to commence around 2026.
Mercedes-Benz	• Acquired a roughly 3% stake in Farasis Energy, one of the top 10 Chinese battery manufacturers by market share, and formed a strategic tie-up.
TOYOTA	• Entered into a comprehensive partnership with CATL. Began discussions about collaboration in a wide range of fields, including battery supply, technology development, and battery recycling. • Established a joint venture with BYD aimed at R&D of EVs. • Prime Planet Energy & Solutions, a joint venture with Panasonic, bolstering production capacity of lithium-ion batteries in Japan and China.
HONDA The Power of Dreams	• Acquired a roughly 1% stake in CATL. Collaborating on joint development and stable supply of EV batteries.
NISSAN	• Partnered with car battery manufacturer Sunwoda to jointly develop next-generation batteries for e-Power vehicles.

Source: Compiled by Uzabase