Global EV Sales for 2022 & EV Fastening on the Front Line

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Global Sales Growth was Slower in 2022 But Remained High

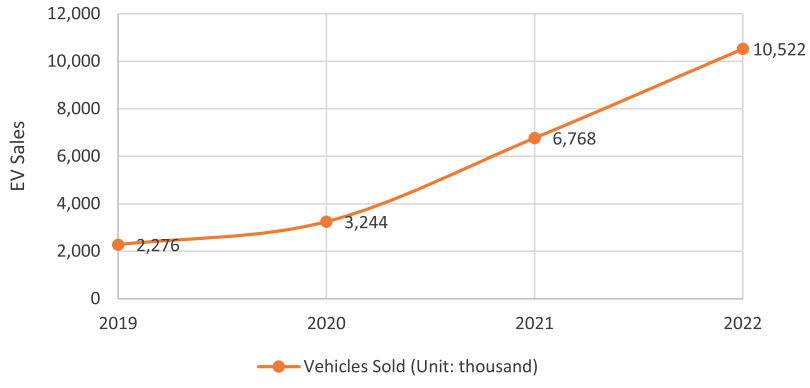
Electric vehicles mainly include pure electric vehicles and plug-in hybrids. Global EV sales (**Figure 1**) grew from 2.276 million vehicles in 2019 (up 9%) before the pandemic, went on to 3.244 million vehicles in 2020 (up 43%), then doubled to 6.768 million vehicles in 2021 (up 109%), and jumped to 10.522 million vehicles in 2022 (up 55%) approaching the end of the pandemic.

In terms of EV market share in global vehicle sales, from 2019 to 2022, the EV share went from 2.5% to 4.2%, 8.3% and 13% respectively. Here we can tell that EV sales doubled during the pandemic years. Although the market share growth slowed down to 56% in 2022, it still shows the strength of the demand for electric vehicles.

Astounding EV Demand in China Regardless of Economic Crisis

As shown in **Figure 2**, European EV sales surged 151% in 2020. Then, the growth began to slow down, dropping to 66% in 2021 and only 15% in 2022, mainly because the war between Russia and Ukraine exacerbated parts shortage at the time. China's EV sales soared 155% in 2021, then the growth slowed to 82% in 2022. However, China's astounding demand for EVs is evident in the fact that China's sales in 2022 were 2.3 times higher than Europe's and 5.5 times higher than the U.S. and Canada's. The U.S. grew just 11% in 2020, then accelerated to 111% growth in 2021 and slowed to 48% growth in 2022.

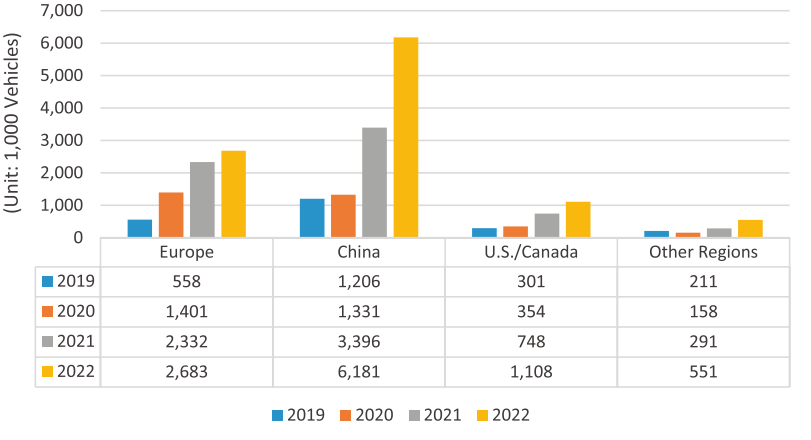
Fig 1. **Global EVs Sales 2019-2022**



Norway and Indonesia Show Strong Potential for EVs

Other regions' EV sales (**Figure 2**) grew 161% from the beginning to the end of the pandemic. Notably, Norway's domestic EV market share was high at 78%. It was 27% for China, 20% for Europe, and 7% for the US. In terms of growth rate, Indonesia grew the fastest, up 10 times to 10,000 vehicles; India grew twice as fast to 50,000 vehicles; New Zealand grew 1.5 times as fast to 23,000 vehicles.

Fig 2. **EV Sales 2019-2022 by Regions**



	Europe	China	U.S./Canada	Other Regions
2019	558	1,206	301	211
2020	1,401	1,331	354	158
2021	2,332	3,396	748	291
2022	2,683	6,181	1,108	551

Most Global Automakers Achieved Double-Digit Sales Growth

In terms of EV sales by major carmakers in 2022 (**Figure 3**), BYD was up 211% to 1.85 million

vehicles, followed by Tesla with 40% growth to 1.3 million vehicles, VW Group in third place with 10% growth to 850,000 vehicles, GM Wuling in fourth place with 13% growth to 600,000 vehicles, and Stellantis in fifth place with 34% growth to 500,000 vehicles, followed by Hyundai by a small gap.

The rest of the carmakers included BMW, up 32% to 450,000 vehicles, Geely up 251% to 350,000 vehicles, Changan Automobile, up 134% to 250,000 vehicles, Ford up 55% to 200,000 vehicles, and Nio up 33% to 150,000 vehicles. Global EV sales continued to grow throughout 2022, with the exception of Great Wall Motor which dropped 4 percent and Toyota which dropped 13 percent.

BYD Taking up Most of the Top 10 Chart and Eyeing Tesla

In terms of EV models (**Figure 4**) , Tesla and BYD series are arguably the most sought-after vehicles in the world. Tesla's Model Y and Model 3 are the top two in the 10 most popular EV models. Model Y sales grew from 410,000 vehicles in 2020 to 770,000 vehicles worldwide, while Model 3 sales dropped from 500,000 vehicles to 470,000. Adding these two models together, Tesla's sales increased from 910,000 vehicles in 2020 to 1.24 million vehicles in 2022, a 36% increase.

Fig 3. **Global EV Sales By OEM in 2022**

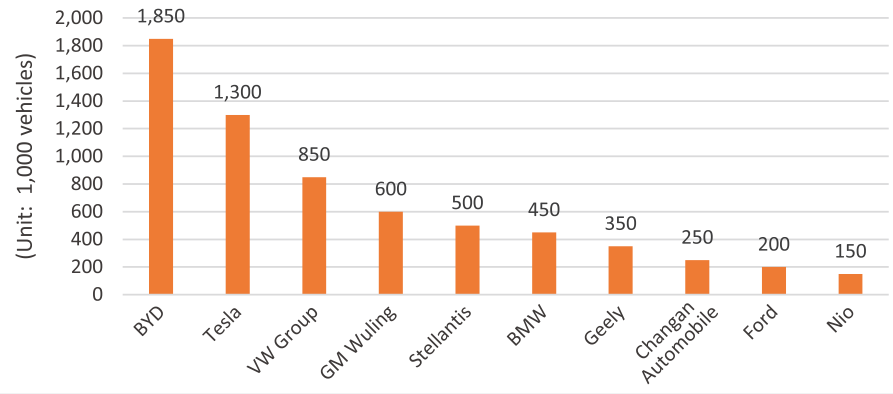
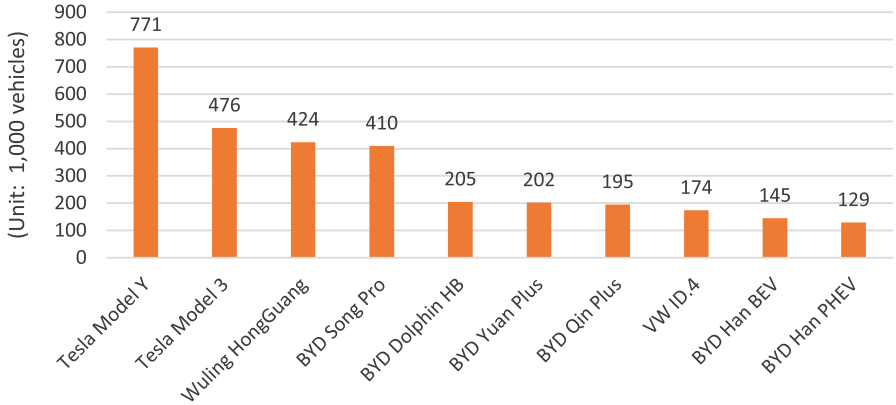


Fig 4. **Global Sales of EV Models in 2022**



BYD is Tesla's biggest rival, with as many as six models in the top 10, accounting for more than half of the rankings. Adding up the global sales of the six models in 2022, the total reached 1.28 million vehicles, up 178 percent and exceeded Tesla's total. BYD's growth rate in the past year was nearly 5 times that of Tesla!

Future EV Demand is Still Growing

China rolled out multiple incentive policies in 2022 that stimulated EV sales to grow 82%. Europe, the second largest EV market, has been hit by geopolitics and seen its growth shrink significantly. In the U.S., EV sales were up 48% due to subsidies for vehicle owners and the rollout of consumer-preferred vehicle models.

Based on the data by several market research firms, global EV sales are expected to grow about 30 percent to 14 million vehicles by 2023. Although global EV sales are expected to grow at a slower rate this year than in the past two years, they still make a significant momentum for growth. If political tensions in Europe subside, and if countries make efforts to reduce inflationary pressures, the potential for EV demand is still worth looking forward to.

EV Fastening on the Front Line

The differences between electric and fuel vehicles have changed the design of automotive fasteners. **Instead of using traditional transmissions, EVs use motors with electronic controllers, increasing the need for circuit boards. These circuit boards are often set into a light aluminum casting, which require micro-screws for fastening.** These thread-forming screws must deliver performance in a miniaturized setting to replace welding, gluing and clipping. Some threaded self-forming screws also have the function of heat sinks and are vibration resistant.

Carmakers have adopted boron steel as a core material for lightweighting vehicle bodies, allowing for thinner and stronger materials. It requires corresponding technology to bond alloys to the car bodies. Some carmakers have signed confidentiality agreements with fastener suppliers to provide fasteners for the assembly of power electronics systems (including circuit boards, electrical contacts, DC adaptors, HV/LV filters, battery packs, on-board charger circuit boards, sealing covers for internal cooling device and housing covers). It is worth noting that **the use of recycled plastics is emerging among carmakers, and the performance design of corresponding fasteners has changed due to the different material combinations from the original ones.**

A final point of interest is the charging station for EVs. A home wall-mounted EV charging station uses about 50 fastening elements. If the charging station is mounted to a wooden wall, wood screws or drywall anchors are often used. If installed on a concrete wall, expansion anchors, cement screw or chemical anchors would be used. If the station is installed outdoors, stainless steel screws or coated screws are used. The need for fasteners that will come with charging stations should not be overlooked. ■