

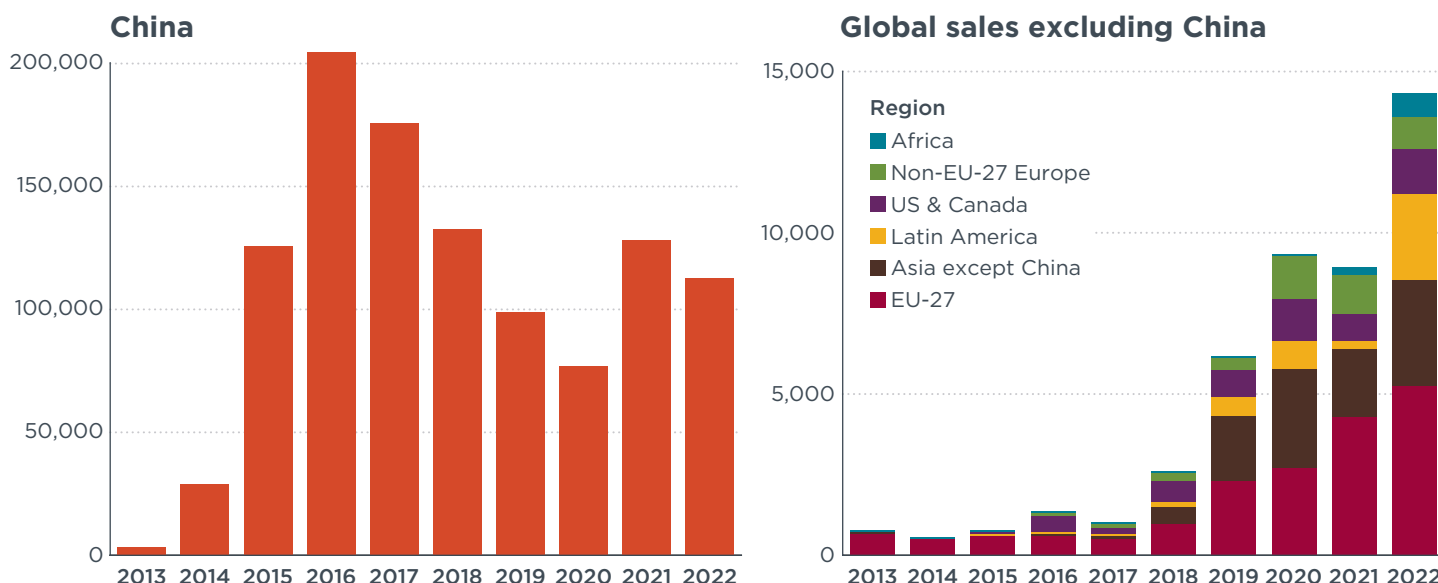
## Zero-emission bus and truck market in Europe: A 2022 update

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This fact sheet provides an overview of the 2022 market for new zero-emission heavy-duty vehicles (ZE-HDVs) in the 27 Member States of the European Union (EU-27)—including buses, heavy trucks, and light and medium trucks.

### GLOBAL STANDING

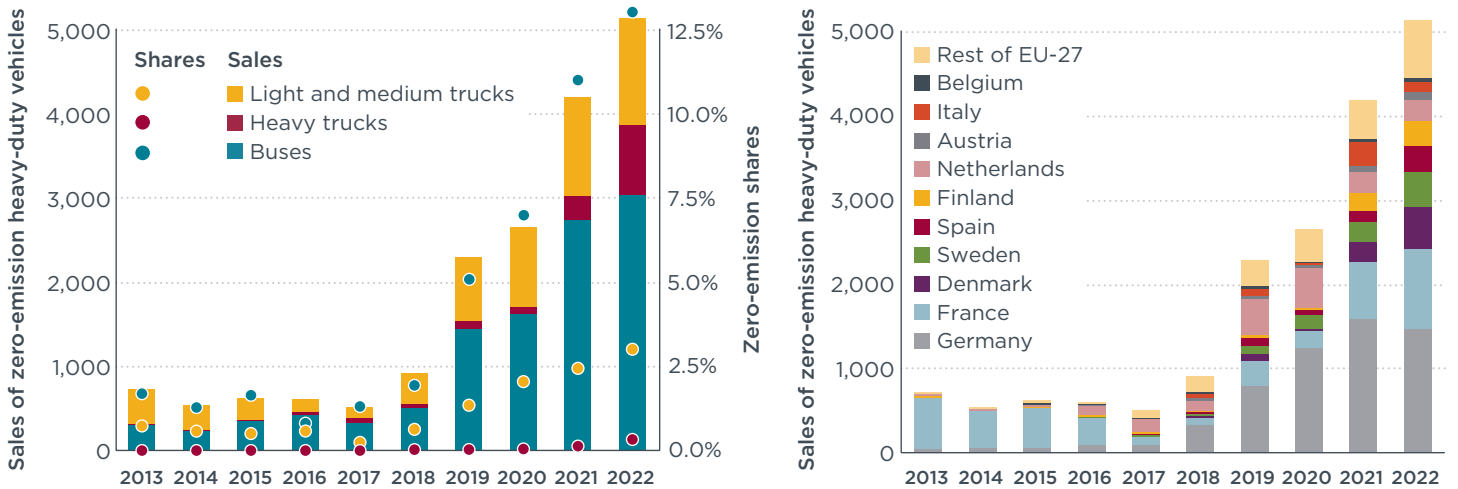
Europe is the second largest market for ZE-HDVs globally, trailing China—who were responsible for 89% of global sales in 2022—by a wide margin (Figure 1). Of the 127,000 ZE-HDVs sold globally in 2022, Europe was responsible for 4.1%, an increase from a share of 3.1% the previous year. The next biggest markets for ZE-HDVs were in the rest of Asia (2.6% of sales), Latin America (2.1%), and the United States and Canada (1.1%). Sales in Asia, excluding China, were concentrated in India (70% of sales in the region) and South Korea (17%), while almost all sales in Latin America took place in Chile and Colombia, both of which had roughly the same sales volume and almost all of which were zero-emission buses.



**Figure 1.** Sales of zero-emission heavy-duty vehicles in China (left) and rest of the world by region (right).

## ZE-HDV SALES ACROSS THE EU-27

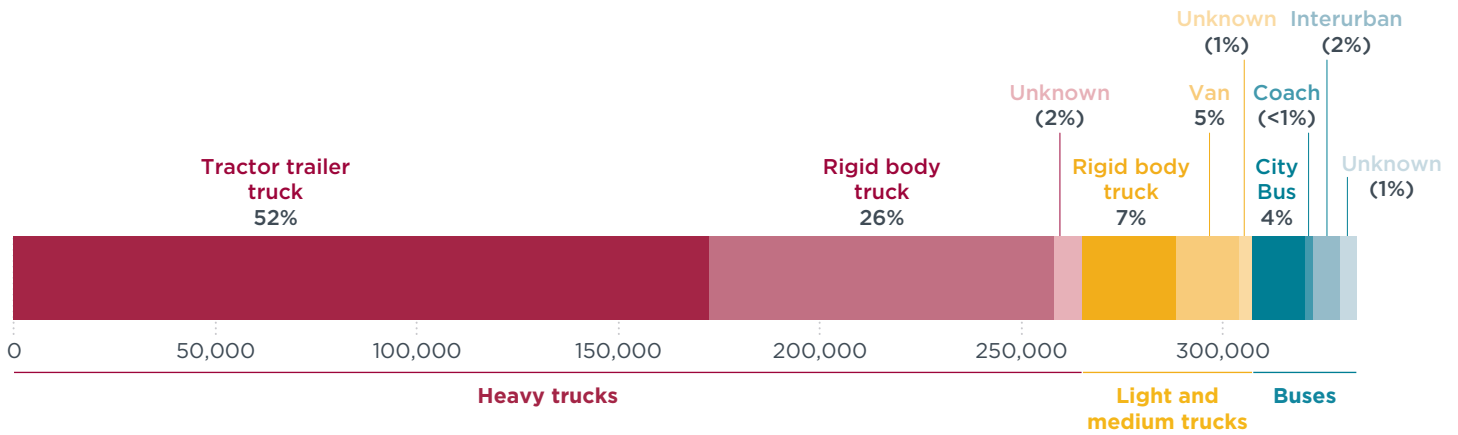
In the EU-27, sales of ZE-HDVs increased by 23% in 2022 relative to 2021, breaching 5,000 sales for the first time (Figure 2). This growth rate exceeds the 2% increase in sales across all HDVs sold over the same period. The main driver of this growth was from heavy trucks with sales of over 800, up from 300 the year previous. In contrast, 265,000 conventional heavy trucks were sold in 2022, so zero-emission heavy trucks made up just 0.3% of total sales. Zero-emission buses increased their sales volume by 300, or 11%, surpassing 3,000 sales in 2022 and representing a 13% zero-emission share of all bus sales. Sales of conventional buses contracted by 1,800 over the same period. Zero-emission light and medium truck sales stagnated with little change compared to the year previous, holding a 3% sales share in 2022.



**Figure 2.** Sales and shares of zero-emission heavy-duty vehicles by vehicle type and Member State. Bars represent sales (left-axis), dots represent shares (right-axis).

Germany remains the biggest market for ZE-HDVs, despite a contraction in zero-emission sales of 8% in 2022 relative to 2021. Nearly 1,500 ZE-HDVs were sold in Germany in 2022, making up 30% of total ZE-HDV sales in the EU-27. The greatest reduction of ZE-HDV sales was seen in Italy, where sales were reduced by 30% over the same period, while the greatest increases were seen in Denmark, Spain, and Sweden, where the sales volume of ZE-HDVs in each country doubled. A notable share of zero-emission heavy trucks were sold in Sweden and the Netherlands, which combined were responsible for one third of EU-27 zero-emission heavy trucks sales, despite only having a 5% share of conventional heavy truck sales. Both countries have a national subsidy scheme in place; in Sweden 20% of the purchase price of a zero-emission truck is subsidized, while up to 60% of the difference between a zero-emission truck and its conventional counterpart is subsidized in the Netherlands. However, there are many other examples of similar or more generous subsidy programs in Europe, indicating this is not the only factor driving their performance.

## MARKET DISTRIBUTION



**Figure 3.** New heavy-duty vehicle registrations in the EU-27 by vehicle group in 2022.

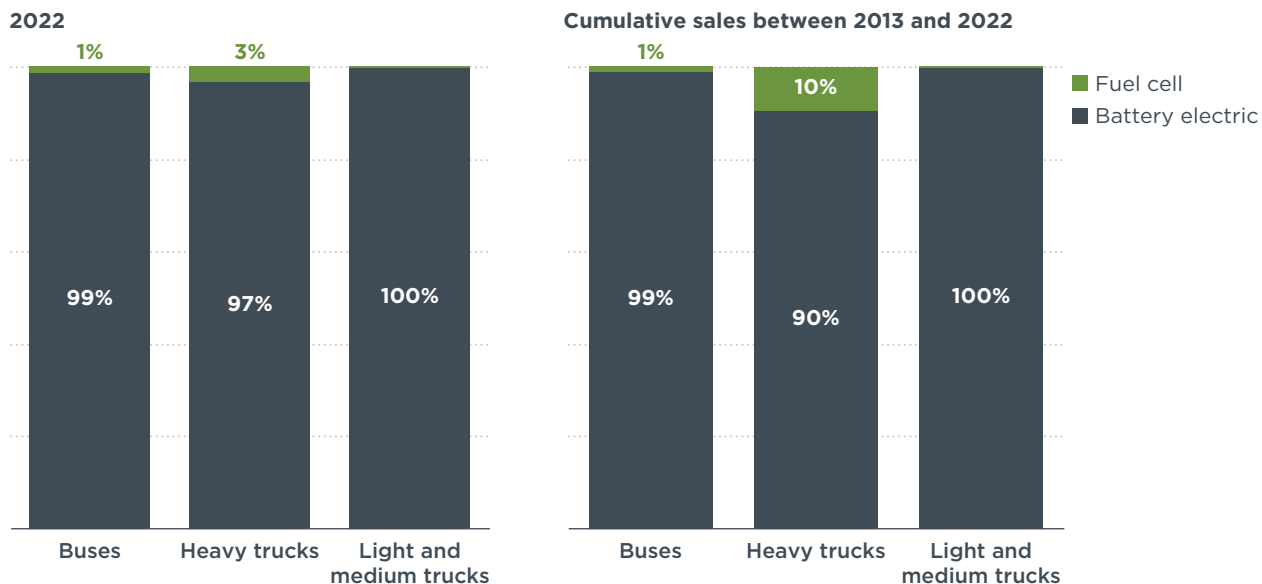
The total sale of HDVs in the EU-27 (including conventional and zero-emission) increased by 2% between 2021 and 2022 to over 320,000 vehicles; this is still lower than the pre-pandemic level sales, which peaked at 370,000 in 2019. Of all HDV sales in 2022, heavy trucks comprised 80%, the vast majority of which were tractor-trailer trucks (about 175,000) with half as many rigid body vehicles. Within light and medium trucks, a slight majority were rigid trucks, roughly 23,000, compared to 15,000 vans (Figure 3).

Under the proposed CO<sub>2</sub> standards, approximately 90% of the sales of heavy trucks will be covered, and 75% of light and medium trucks. Several vehicle categories are not covered by the proposed standards, such as vocational vehicles and trucks with a gross vehicle weight below 5 tonnes. Vehicles that are covered under the proposal would have to reduce their emissions by 43% in 2030, 64% in 2035, and 90% in 2040 (relative to either a 2019 or 2025 baseline).

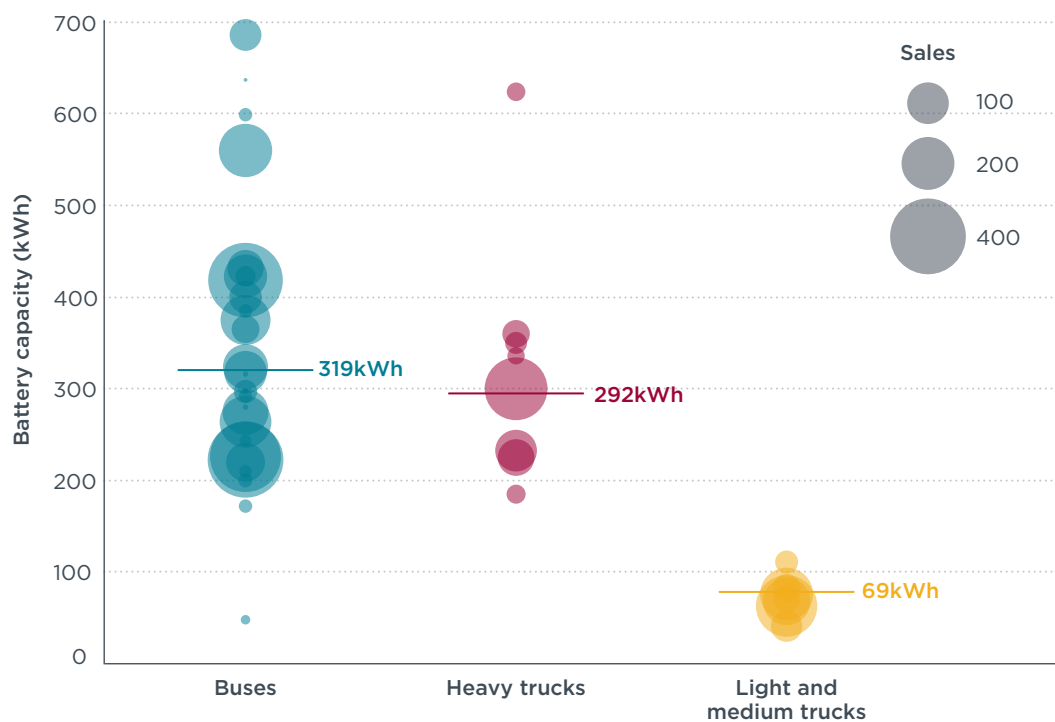
The bus market in 2022 was roughly half comprised of city buses, at 13,000 sales, with 2,000 coaches and 6,000 interurban buses. Under the CO<sub>2</sub> standards proposal, all bus categories would be covered; City buses and interurban buses would have to comply with a 100% zero-emission sales target by 2030, while coaches would follow the same trajectory for trucks.

## ALTERNATIVE DRIVETRAIN TECHNOLOGY

Battery electric vehicles dominated ZE-HDVs sales across all vehicle types (Figure 4) at over 5,000 sales in 2022, with a small and falling share of hydrogen fuel cell vehicles seen in the bus and heavy-truck sectors (100 sales). Almost all fuel cell HDVs were sold in Germany and the Netherlands in 2022. The majority of fuel cell trucks had a 6x2 axle configuration, whereas 4x2 trucks represented the vast majority of conventional truck sales. The sale of battery electric ZE-HDVs was much more heterogeneous across Member States than fuel cell vehicles; roughly half of sales of battery electric heavy trucks had a 4x2 axle configuration, and nearly all the remaining trucks were 6x2.



**Figure 4.** Technology shares of zero-emission heavy-duty vehicle sales in Europe.



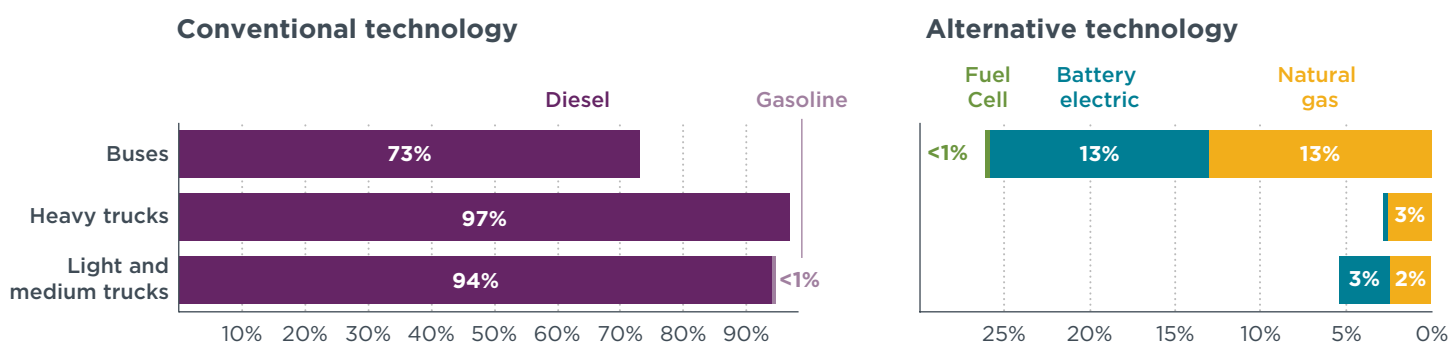
**Figure 5.** Battery size distribution of battery-electric heavy-duty vehicle sales in Europe in 2022.

The average battery sizes in ZE-HDVs have remained almost unchanged since 2021 (Figure 5). Zero-emission buses have a slightly higher average battery capacity than heavy-trucks (319 kWh compared to 292 kWh). The battery sizes of light and medium trucks are concentrated around 69 kWh, less than a quarter of the capacity of those used in heavy trucks and buses, reflecting the much shorter daily mileages and loads that these vehicles perform.

Three suppliers were responsible for over 70% of the batteries provided to European ZE-HDVs in 2022: CATL (based in China), LG Chem (South Korea), and SAFT (France). LFP batteries, that is batteries which have a chemical composition of lithium-iron-phosphate, remain the dominant form of chemistry in batteries for ZE-HDVs, holding roughly a 55% share of all ZE-HDV batteries sold. In comparison, more than 95% of ZE-HDVs in China use LFP batteries. The remainder are NMC (nickel-manganese-cobalt)

batteries. LFP batteries have a lower energy density than their NMC counterparts but benefit from a lower cost, lower propensity to overheat, and a higher cycle life (that is, the number of cycles of discharge and charge the battery goes through before reaching an 80% state of charge).

The sale of natural gas buses has continued to grow in the bus sector, increasing from a 12% share in 2021 to 13% in 2022, equal to that of battery electric buses which grew from 11% to 13% over the same period (Figure 6). The rise in alternative fueled buses coincides with the introduction of the Clean Vehicles Directive, which requires a share of publicly procured vehicles across all Member States to be classified as ‘clean’, i.e., not fueled by diesel or gasoline. As a natural gas is considered clean under the nomenclature of the Directive, several Member States, most notably France, Spain, and Italy, retain a relatively high share of natural gas vehicles as part of their new bus fleet. In the truck market, the share of natural gas heavy trucks has fallen from a 4% share to 3% between 2021 and 2022, while it has stagnated in the light and medium trucks sector.



**Figure 6.** Conventional and alternative technology shares of new heavy-duty vehicle registrations.

## MANUFACTURERS

A disparity exists between the manufacturers of conventional and zero-emission HDVs; the manufacturers who currently have the highest share of conventional vehicle sales do not show the same performance with ZE-HDVs (Figure 7). This is most apparent in the bus market, where many manufacturers who sell a small share of conventional buses are responsible for the majority of zero-emission sales. Chinese manufacturers, such as BYD and Yutong, have been selling an increasing share of zero-emission buses in Europe.

The top seven heavy-truck manufacturers are responsible for over 95% of the annual sale of conventional vehicles, but only 78% of total zero-emission heavy truck sales. Volvo Trucks and Renault Trucks, who are owned by the same parent company, were responsible for over 50% of the sale of zero-emission heavy trucks. However, Scania and Mercedes-Benz both have the aim of only selling zero-emission trucks by 2040.

Zero-emission sales of light and medium trucks has been dominated by StreetScooter—who have supplied zero-emission trucks exclusively to Germany’s DHL fleet—since 2020, followed by sales of the Ford Transit, which have also been heavily concentrated in Germany.

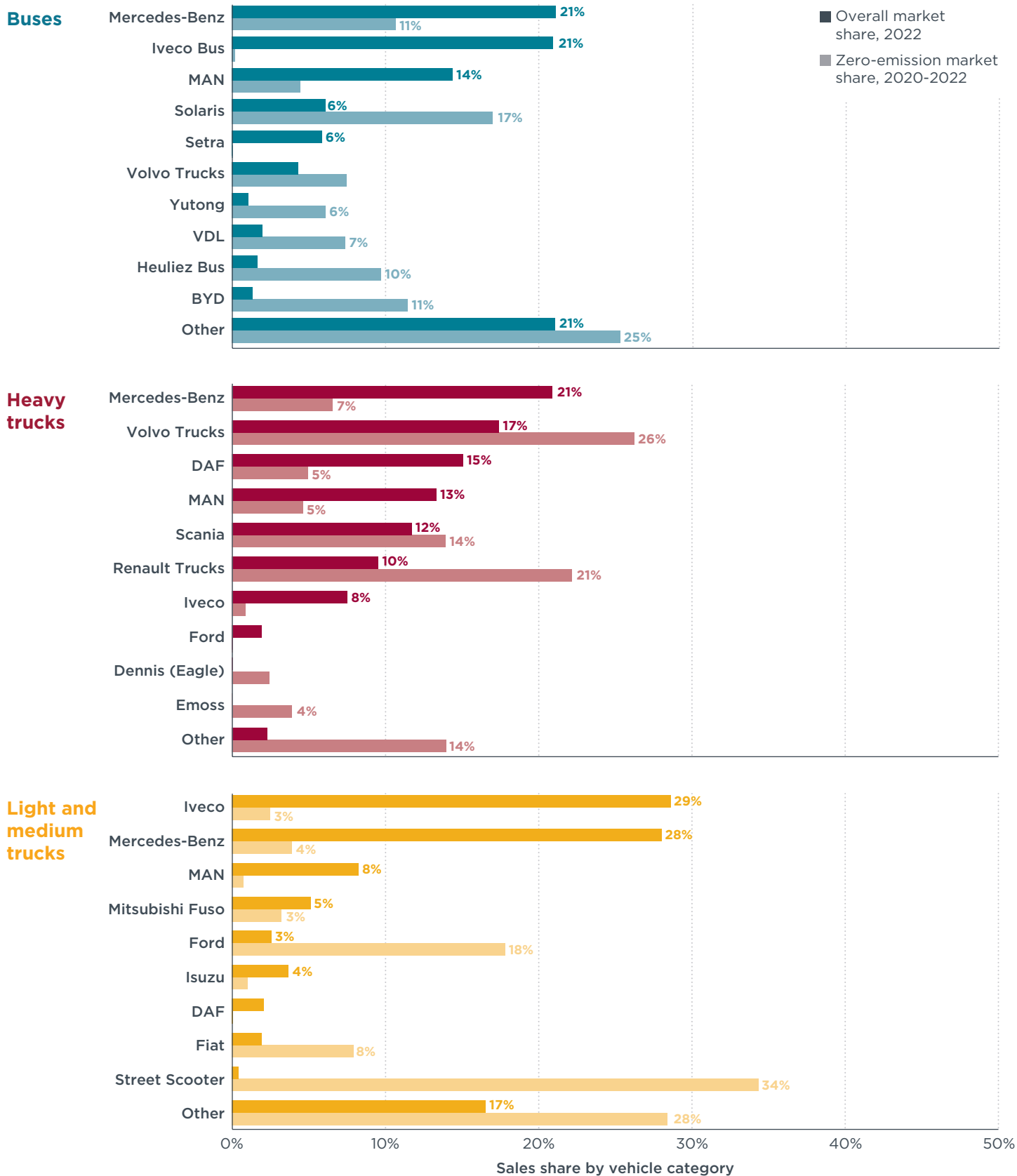
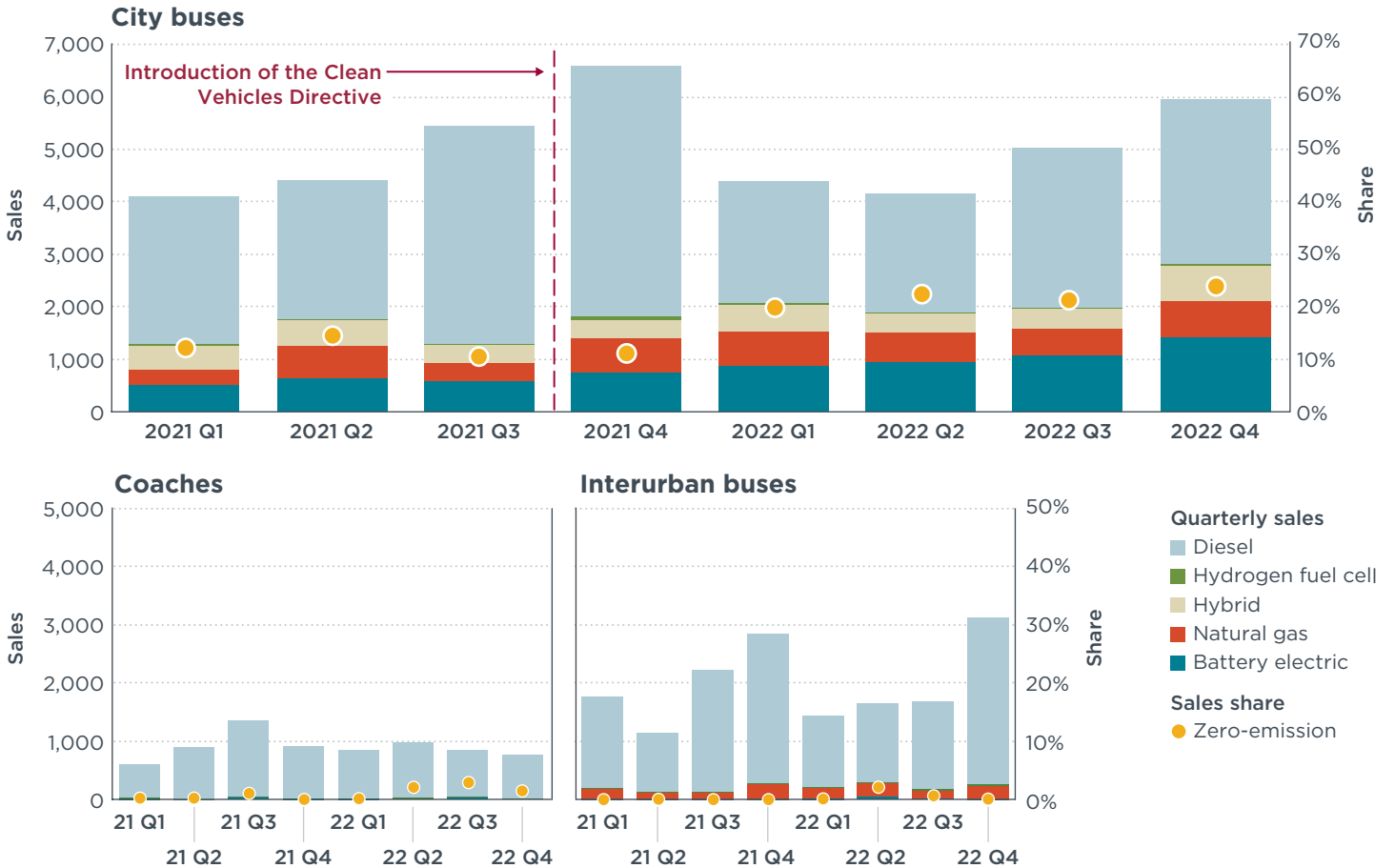


Figure 7. European heavy-duty vehicle market share by manufacturer.

## SPOTLIGHT: BUSES AND COACHES

The sale of zero-emission buses has been concentrated almost entirely in the city bus sector. In 2022, over 3,000 zero-emission city buses were sold representing nearly 30% of all vehicles sold (Figure 8). The sales share doubled over 2021 values, potentially driven by the introduction of the Clean Vehicles Directive, which requires all public procurements to purchase between 24% and 45% alternatively fueled buses between August 2021 and December 2025. Half of these targets must be met through zero-emission vehicle purchases, and in January 2026, the targets will increase to 33%–65%, with differentiated targets by Member State. The sales share of zero-emission vehicles in coaches and interurban buses is considerably lower; almost all coaches are powered by diesel, and only a small share of interurban buses are fueled by natural gas.



**Figure 8.** Sales and zero-emission share of buses by vehicle category and quarter since 2021.

Averaged over all sectors, buses and coaches had a zero-emission share of 13% in 2022, up from 11% in 2021, and 7% in 2020. Member States are adopting zero-emission technology buses at different rates (Figure 9). In 2022, Finland, Denmark, and Bulgaria each had a majority of sales of battery electric buses. Most fuel cell buses were registered in the Netherlands, with a small volume sold in Germany, Austria, and Poland. A number of Member States continue to invest in natural gas technologies, particularly in France, Spain, and Italy. Estonia had by far the highest share natural gas buses of any Member State, with a share of over 80%.

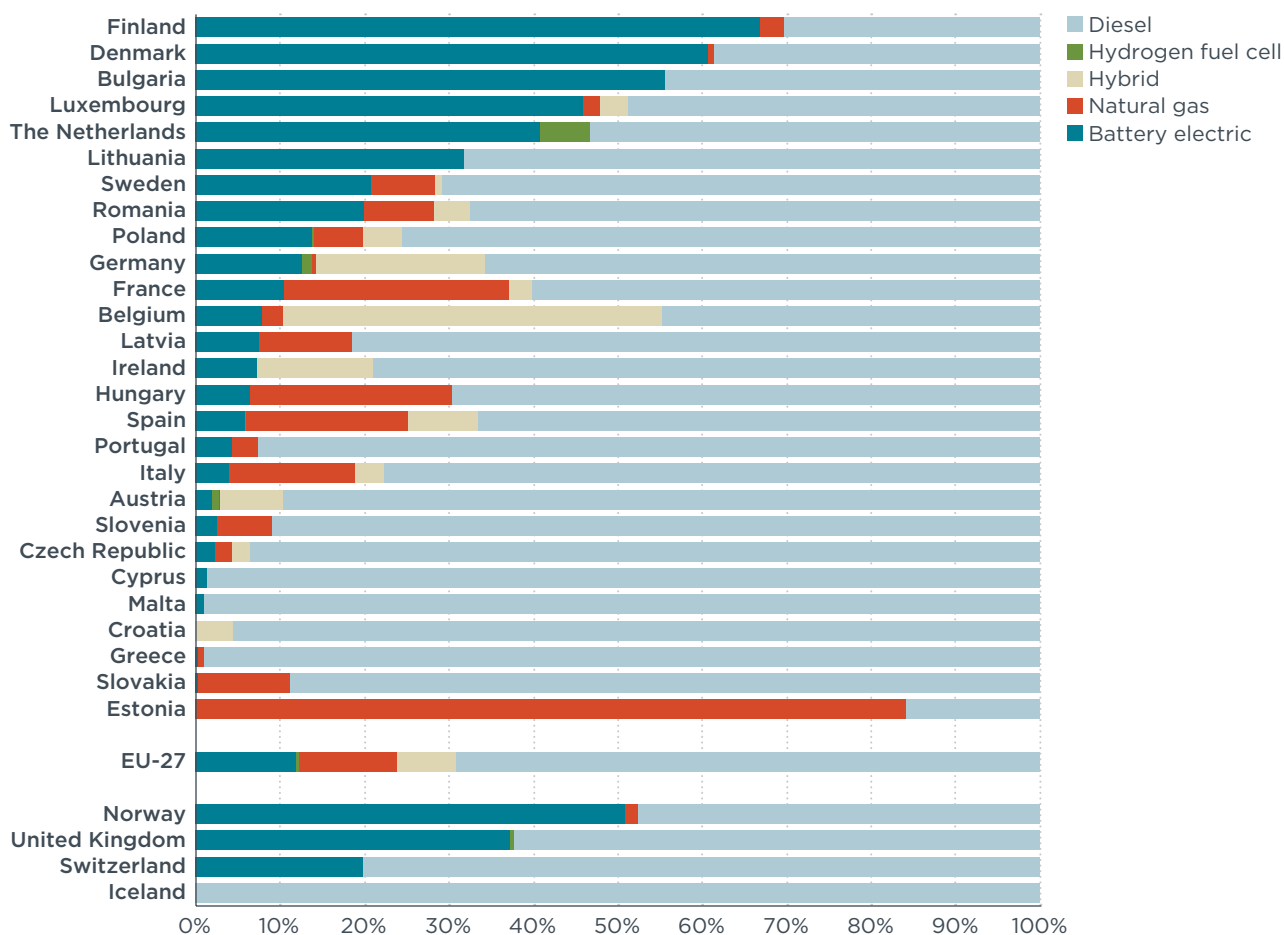


Figure 9. Sales of buses and coaches in Europe by powertrain in 2022.



## DEFINITIONS, DATA SOURCES, METHODOLOGY, AND ASSUMPTIONS

**Technical scope:** This factsheet focuses on new heavy-duty vehicle registrations. Buses include all buses and coaches with a gross vehicle weight above 3.5t, heavy trucks include trucks with a gross vehicle weight greater than 12 tons, and light and medium trucks include trucks with a gross vehicle weight between 3.5 and 12 tons.

**Geographic scope:** This fact sheet covers the 27 Member States of the European Union. Bulgaria is excluded in the data for trucks but included for buses.

**Data Sources** Global sales of ZE-HDVs sourced from EV Volumes. Data pertaining to the split of European bus sales by segment supplied by Chatrou CME Solutions. All other data supplied by IHS Markit; Copyright © IHS Markit, 2023.

**Definitions** Urban buses are characterized by having a low floor, while coaches have a high floor. Interurban buses have either a low or high floor but usually operate longer distances than urban buses and have fewer stops.

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