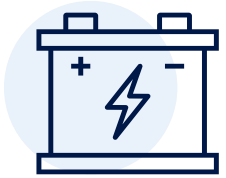
HEAVY COMMERCIAL VEHICLES BOOST FUTURE BATTERY DEMAND

The registration figures for electrically powered medium and heavy commercial vehicles in the European Union increased by 26.6% in 2021 compared to the previous year. [1]

Current market developments show that battery demand in the coming years will also be determined by the increasing electrification of commercial vehicles.



In 2021, 1,243 motor vehicles for the transport of goods with a permissible total weight of over 3.5 t (medium and heavy commercial vehicles, herein collectively abbreviated as "HCVs" for simplicity) that can be electrically charged[1] were newly registered in the EU. [1] Despite this 26.6% increase in registration figures compared to the previous year, diesel drives continue to dominate the HCV class. Accordingly, HCVs were responsible for about 23% of CO_2 emissions from road transport in Europe in 2019, although they account for only about 2% of all vehicles on European roads. [2]

Emissions from heavy commercial vehicle transport to fall by 30% by 2030, according to EU

To meet the goals of the Paris Agreement and the commitments of the European Green Deal, road transport in the EU must be emission-free by 2050. Regulation (EU) 2019/1242 set CO_2 fleet limits for HCVs for the first time. [3] Compared to the values of a benchmark fleet in 2019/20 the regulation provides reduction targets in average CO_2 emissions per kilometre of at least 15% from 2025 and at least 30% from 2030. In addition, from 2025, at least 2% of manufacturer fleets must comprise low or zero-emission vehicles. [4-5] A review and revision of this regulation is scheduled for the fourth quarter of 2022. In addition to a possible tightening of the current limits, reduction targets are also to be defined for the period up to the year 2040. [5-6]

Transformation of the powertrains of commercial vehicles

Major manufacturers of medium and heavy vehicles, such as Scania, MAN, Renault Trucks and Volvo, have announced that 20-50% of their fleets will be zero-emission vehicles by 2030, either battery and/or fuel cell electric. Daimler and DAF also announced an increased number of battery electric vehicles. [7-14] In addition, new stakeholders are entering the market such as Quantron, Orten, and Volta Trucks, building battery electric HCVs or converting conventionally powered vehicles to battery electric ones. [15-19] Consequently, battery-electric HCVs increasingly represent alternatives to conventional diesel-powered vehicles or the use of alternative fuels, such as natural gas, LPG, biofuels, or ethanol.

Regardless of the drivetrain technology, about 22% medium (3.5 to 12 metric tons) and about 78% heavy (over 12 metric tons) commercial vehicles were produced in the EU in 2019. [20] According to a study by T&E, about 70% of all HCVs make trips with daily distances of less than 400 km, mainly regional and urban deliveries and about 30% are used on long-distance trips of more than 400 km. [21]

The quadrants in Figure 1, defined by a permissible total weight of 12 t and a range or daily mileage of 400 km, illustrate the respective use cases.[2] In more than half of the heavy-duty applications, the daily mileage is less than 400 km.

1 Includes full battery electric vehicles, fuel-cell electric vehicles, extended-range vehicles and plug-in hybrids.

2 Simplified view based on an assumed equal distribution of vehicle classes among the use cases.

An evaluation of the currently available and announced battery electric models shows that the manufacturers' portfolios include medium and heavy vehicles as well as those with medium (up to 400 km) and long (over 400 km) ranges. However, the majority of all models have ranges of less than 400 km. With ranges above 400 km, few heavy trucks and no medium trucks can be found. Based on manufacturers' data on existing or announced vehicle models, the average battery size per quadrant was determined and used to calculate the cell demand of battery electric HCVs (Figure 1).[3]

Cell demand of vehicle production results from passenger car production, but commercial vehicles contribute as well

The extrapolated demand for Li-ion cells for the production of battery electric vehicles in the EU is expected to be around 387 GWh in 2030 in the case of moderate vehicle electrification (conservative scenario[4]) and around 777 GWh in the case of high vehicle electrification (progressive scenario[5]). On the one hand, the considered scenarios are based on the regulations currently in place and, on the other hand, on future tightening of fleet emission limits or more ambitious intentions on the part of manufacturers. Figure 2 shows the extrapolated demand up to 2030 as a bar chart. The columns represent the annual cell requirements corresponding to the conservative scenario (blue columns) and the progressive scenario (green columns), respectively. It is easy to see that, despite the renewed decline in 2021 (-7.7% as compared to 2020 [22]), passenger car production continues to be a key factor in the development of demand (heavily coloured areas). In 2030, almost 80% of the demand in both scenarios is accounted for by the production of battery electric passenger cars. The electrification of light commercial vehicles (LCVs) (medium colour) and increasingly also of HCVs (weak colour) results in a cell demand that is expected to range between 86 and 164 GWh in 2030, depending on the scenario, and thus accounts for about one fifth of the total demand.[6]

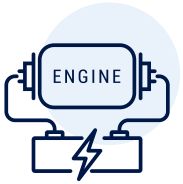
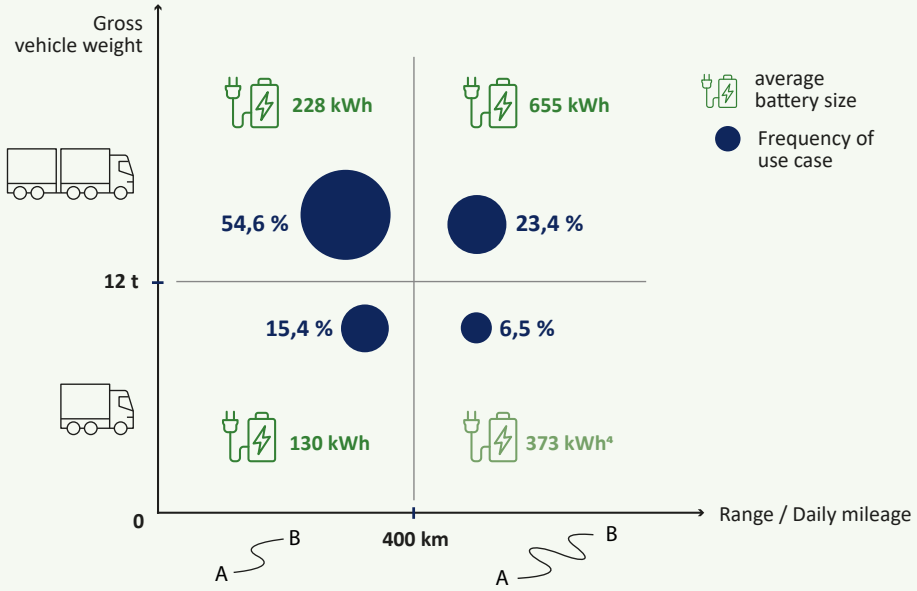


Figure 1: Battery electric vehicles already cover most use cases in heavy-duty transport.



Snapshot of the percentages of medium-haul (up to 400 km) and long-haul transport and their distribution on medium-weight (up to 12 metric tons) and heavy-weight (above 12 metric tons) vehicles. The battery sizes of each quadrant were averaged based on the manufacturers' data.

3 Due to the lack of medium-range models, the battery capacity was determined from the ratio of the battery sizes of the medium-range models relative to the battery size of the heavy-range models.

4 Conservative scenario: Assumed increase in the shares of battery electric vehicles in the respective total vehicle production to 40% (passenger cars), 35% (LCV) and 27.5% (HCV) by 2030. These market shares would presumably be sufficient to achieve the emission reductions currently required by Regulations (EU) 2019/631 and (EU) 2019/1242.

5 Progressive scenario: Assumed increase in the shares of battery electric vehicles in the respective total vehicle production to 81% (passenger cars), 55% (LCV) and 40% (HCV) by 2030. The market share for passenger cars is based on an emission reduction of passenger cars modelled by T&E on the basis of the automakers' plans, which is higher than currently discussed in the context of „Fit for 55". The market share of electrically powered LCVs would be sufficient to meet the EU's proposed vehicle emission reduction. The market share of battery electric HCVs is also in line with the EU's goal of zero-emission road transport by 2050.

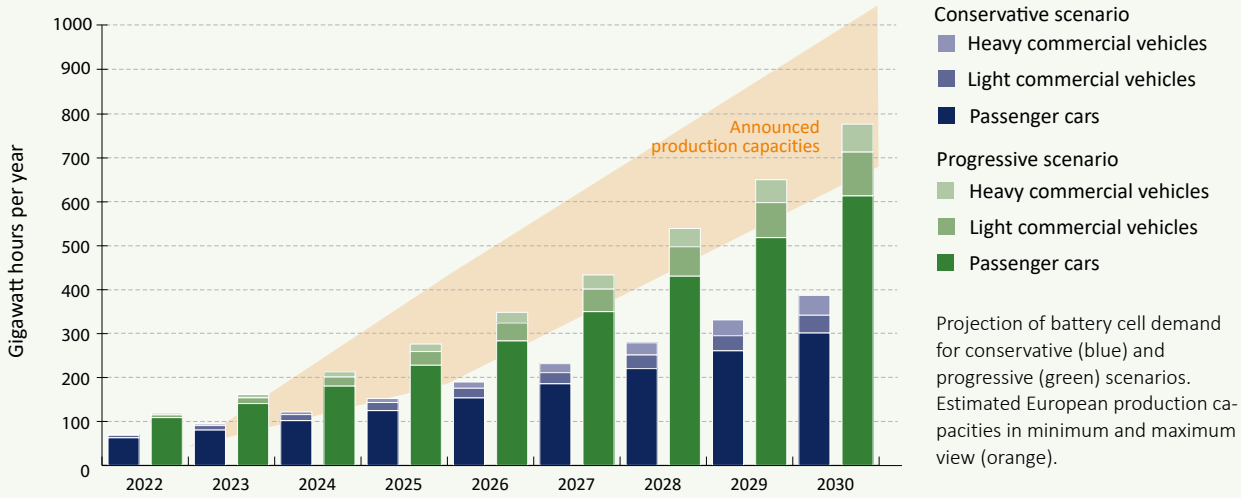
6 Due to the lack of information available so far, the extrapolation of cell requirements did not take into account the usage cycles of the batteries, how quickly/severely they degrade and how often they need to be replaced while the vehicle itself is still in operation.

European cell production is running up and will increase strongly

The momentum in the battery cell market remains high. New production facilities and increased production volumes are continuously being announced by established manufacturers or by those new to the market. In the month of March 2022 alone, two cell manufacturers, Northvolt and ACC, announced their intention to build a third production facility for battery cells in Europe. Northvolt intends to build a new battery gigafactory in Heide, Northern Germany, and ACC intends to build a new battery gigafactory in Termoli, Italy. [23-24]

Li-ion cells produced in Europe accounted for about 9% of global production volume in 2021. [25] With almost 80% of global Li-ion cell production, this continued to take place predominantly in China in 2021. As a result of ambitious plans by battery cell manufacturers to massively build or expand production facilities worldwide in the coming years, annual production capacity globally will increase to up to 2,500 GWh by 2025 and up to 4,000 GWh by 2030. The share of cells produced in Europe in the global production volume is expected to increase to up to 1,071 GWh by 2030 as a result of the announced build-up and expansion of production capacity, accounting for about 27% of the global total (Figure 2, orange area). These increases are based on manufacturer data and assume full implementation of all announcements. Nevertheless, it is taken into account that in practice cell factories will achieve a yield of 90% at a capacity utilization of 85%.

Figure 2: Announced European production capacities will be sufficient to cover the cell demand of the automobile industry in the EU.



Projection of battery cell demand for conservative (blue) and progressive (green) scenarios. Estimated European production capacities in minimum and maximum view (orange).

There are uncertainties regarding several highly ambitious announcements and their realization, in particular beyond 2025. Therefore, the production capacities are displayed in a minimum view and a maximum view. Furthermore, it was assumed that all announcements are maximum values and that in practice, battery cell factories can attain yields of 90% when operating at 85% capacity.

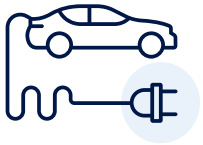
Increasing cell demand necessitates adequate supply of battery raw materials

The current projections illustrate that, in addition to the production of passenger cars and LCVs, the demand for battery cells will also be determined by medium and heavy commercial vehicles in the future. Despite the expected significant increase in demand, the announced production capacities of cell manufacturers are expected to be able to meet demand. However, the supply situation for raw materials and vendor parts remains challenging.

As before, factory capacity utilization in the automotive industry is impacted by pandemic-related delays in supply chains. In the first quarter of 2022, new car registrations in the EU fell by 12.3% compared to the previous year. In March 2022, passenger car registrations fell most significantly by 20.5%. Ongoing supply chain disruptions, aggravated by Russia's invasion of Ukraine, are negatively affecting automotive production. [26]

Current events highlight the vulnerability of supply chains. For this reason, it is equally important for battery cell

production and the automotive industry to establish resilient supply chains for vendor parts and source materials. Due to the increasing demand for battery cells and the high price volatility of necessary primary raw materials, secondary raw materials are playing an increasingly important role. Accordingly, recycling capacities will also make an important contribution to the supply of raw materials in the future.
The accompanying research on battery cell production is currently working on a study on the resilience of supply chains in relation to the raw materials in the battery value chain. This study will analyse the aforementioned correlations in more detail.



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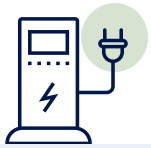

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