

Task force 41 Electric Freight Vehicles

The European Truck Market and Potential Powertrain Technologies

Market share of alternative freight vehicle powertrains

In 2019, 2.48 million Light and Heavy-Duty Vehicles were newly registered in Europe, 85% of which were Light-Duty Vehicles (LDV) under 3.5 tons gross vehicle weight (GVW). Most of the vehicles are powered by a diesel engine (92.8% LDV, 97.9% HDV). In the LDV-segment, gasoline is the next preferred fuel with 4.4% of newly registered vehicles. The main markets are especially Spain, Italy, France and the UK. In the HDV-segment, the share of gasoline is very low (0.2%). The alternative fuels, like CNG, LPG, biofuels and ethanol, had a share of approximately 1.4% in the overall commercial vehicle registration in 2019. The niche in market is made up of Hybrid Electric Vehicles (HEV) with 0.2% of new registrations. However, the market share in the LDV has risen to almost 160% compared to the previous year (4,577 hybrid-electric vans in 2019). Another high increase was recorded by plug-in electric commercial vehicles (BEV, FCEV, REEV, PHEV) with 26,107 plug-in electric LDV and 747 plug-in electric HDV newly registered in 2019. The year-on-year increase was stronger in the HDV segment (+109%) than in the LDV segment. The main markets for these vehicles are primarily Germany, followed by the Netherlands and France. [1, 2]

The diesel engine is by far the main drive train in the commercial vehicle segment. It is an efficient internal combustion engine and since the introduction of the Euro standards (1988), Euro 6 and exhaust after-treatment pollutant emissions from heavy-duty vehicles dropped significantly [3]. Nevertheless, in order to achieve the European CO₂ fleet targets, not only technological progress of the diesel engine itself is necessary, but also low- and zero-emission vehicles need to be promoted on the market. In some countries incentives and subsidies are offered to encourage EV sales for the heavy-duty segment.

The IAA Commercial Vehicle Fair in 2018 characterized an increasing electrification strategy for commercial vehicles. Different manufactures showcased their first battery-electric vehicle concepts. Especially in the LDV segment, vans from Volkswagen, Daimler, MAN, IVECO, Nissan and Renault are already in series production. Prototypical BEVs have also been developed for the medium and heavy-duty segments and are currently being tested in various pilot projects with customers. For example, Daimler is testing its electrified Actros model with different logistic companies like DACHSER and Hermes [4]. Since 2018, MAN Truck & Bus has also been testing the eTGM model in cooperation with its Austrian partner, the Council for sustainable logistics (CNL) [5]. The start of production (SOP) of these medium and heavy duty vehicles is set for mid-2020 and 2021. However, electric heavy articulated tractors and semitrailer trucks are currently manufactured and sold primarily by small suppliers such as the Swiss E-Force One AG and the German Framo GmbH [6, 7]. These are so-called electric vehicle converters, which replace the combustion engine of trucks from MAN, Daimler and Co. with their electric powertrain. In the future the heavy freight vehicle market may also be shaped by American start-ups such as Tesla, Thor and Nikola Motors. They promise higher ranges for their vehicle concepts than the current market average in the respective vehicle segment. Figure 1 shows the availability of different battery-electric commercial vehicles by brand and segment. The availability is characterized by the current status of production readiness and the announced year of market entry by the manufactures.

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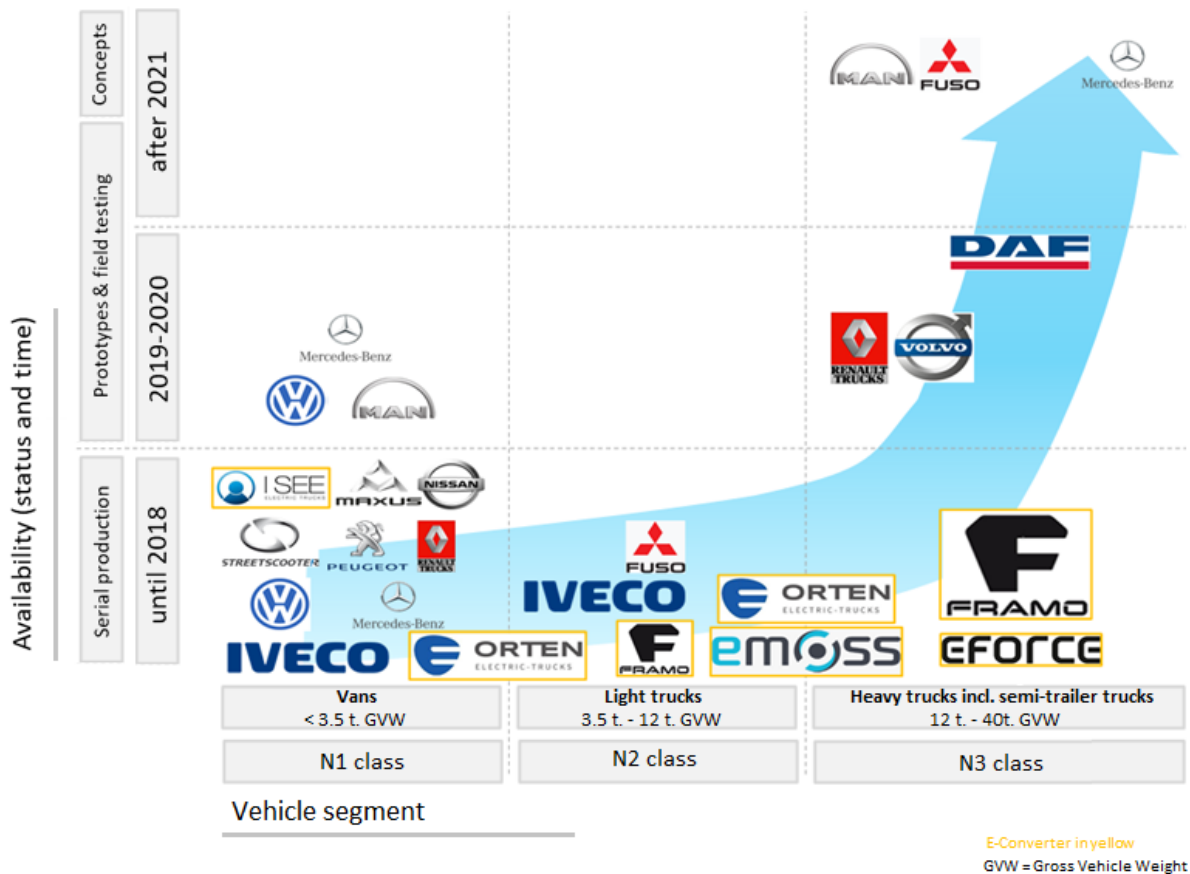


Figure 1: Roadmap battery-electric freight vehicles - Availability of battery-electric freight vehicles by brand and segment

In the media, the first long-term strategies of the manufacturers have appeared with information on the planned investments. For example, Daimler, the world's largest commercial vehicle manufacturer, plans to phase out all diesel engines in its trucks and buses (in addition to passenger cars) in almost all regions of the world (primarily Europe, Japan and North America) by 2039. In the future, trucks will be powered either by a traction battery system (BEV) or fuel cell systems (FCEV). The first battery-electric vans are already in production and can be ordered. From 2022, the first trucks with electric powertrains are also to be offered in series production in Europe. By 2030, mass-produced fuel cell trucks are to be added. [8] The VW Group subsidiary TRATON, which is the largest producer of commercial vehicles in Europe and to which the commercial vehicle brands MAN and Scania belong, wants to invest one billion Euros in the development of electric mobility (primarily as BEVs) by 2025 and expects that by 2030 to 2035 a third of its commercial vehicles could be driven with electric motors. [9] The pioneers in the European market with battery electric vehicles are Nissan with the model e-NV200 and Renault with the models Master Z.E. and the trucks D Z. & Wide Z.E. The model e-NV200 has been on the market since 2014 and has already been sold 17,500 times (until end of 2019). Therefore, the production line of the corresponding diesel version (NV200) was closed at the end of 2019. [10]

The US group Paccar is represented in Europe with the DAF brand in the heavy segment and is focusing on fully electric powertrain in their long term strategy. Volvo Trucks and IVECO sees LNG as the diesel alternative for today's trucks in addition to the electric motor.

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In 2019, IVECO presented for the first time an battery-electric semitrailer tractor (Model Tre) developed in cooperation with the start-up company Nikola Motors from the USA. Nikola Motors is actually focusing on fuel cells in its company strategy and has already been able to attract many investors, such as the german tier-1-supplier Bosch. IVECO sees the development activities of the BEV as a basis for the start of FCEV and aims to bring fuel cell powertrain into series production by 2023. [11] The South Korean manufacturer Hyundai is currently not highly represented in the European commercial vehicle market. In Switzerland, however, 50 heavy fuel cell trucks are currently being tested by Hyundai. By the year 2025, 1600 heavy-duty trucks with a gross vehicle weight of 34 tons are planned to be operated in Switzerland. [12] Long-established companies such as Hyundai and start-ups companies such as Nikola Motors are examples that illustrate that the shift to alternative powertrains in the European commercial vehicle market will also involve new players.

The market developments show that electrification efforts are beginning to take hold in the entire commercial vehicle segment. However, compared to the passenger car market, the manufacturers' strategies differ in some respects. Mainly BEV, FCEV or both are mentioned as the future powertrains. Based on the collected OEM announcement and strategies on the potential of alternative powertrains, their effect on the future EU sales market was extrapolated. For this purpose, the manufacturer-specific powertrain strategies and announcements were weighted with regard to the current market shares of the manufacturers. Most manufacturers mentioned 2030 or later as the time when the alternative powertrain will enter the market. Figure 2 shows the projection of the current powertrain strategies of the commercial vehicle manufacturers weighted with regard to the EU-market shares of the manufacturers.

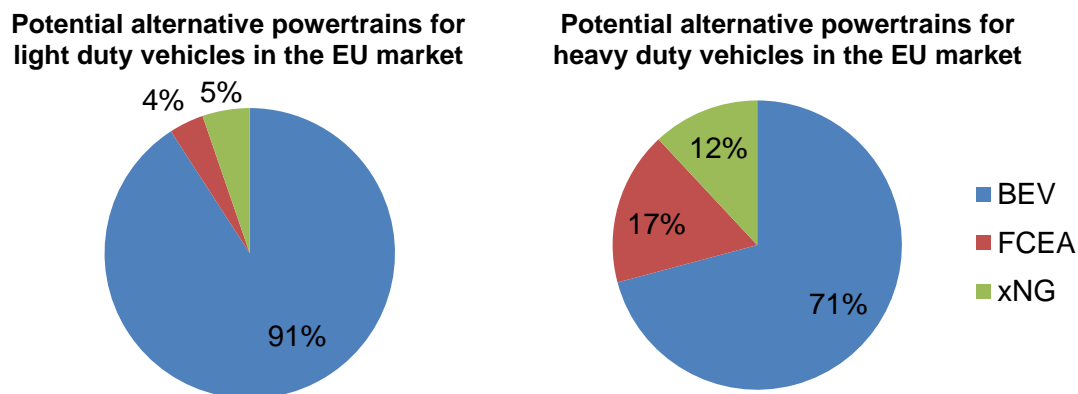


Figure 2: Potential alternative powertrain technology for freight vehicles in the EU market, based on manufacture strategies and announcement

The aim of the illustration in Figure 2 is to show which alternative to diesel could potentially enter the EU-market in 2030 or later, assuming that diesel is not selected then. In the light and heavy commercial vehicle segment, BEVs are seen as the powertrains of the future. In the heavy-duty segment, in addition fuel cell electric truck is also considered to have significant potential as a future powertrain. From a vehicle design perspective, fuel cell makes particular sense in heavy-duty traffic, where longer distances are covered and more demanding payload profiles are required compared to light-duty traffic. The higher gravimetric energy density of the fuel cell compared to the battery offers systemic advantages for the vehicle design.

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However, it should be noted that figure 2 does not show a sales or stock market. Rather, it should be considered for orientation and weighting of the manufacturer-specific powertrain strategies.

From the essential user perspective, the alternatives in the cost-sensitive truck market must first achieve competitiveness. To achieve this, the total operating costs of the trucks must be reduced and a nationwide electricity charging network must be made available on European motorways. To this end, a targeted subsidy program for vehicle and infrastructure must be established and expanded.

References

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