

Total Cost of Ownership for Medium Electric Freight Vehicles



Purpose

This factsheet provides a total cost of ownership (TCO) comparison between medium-sized electric freight vehicles (EFVs) and conventional freight vehicles (CFVs), weighing between 3.5 and 7.5 tonnes. The TCO is one of the most important factors in the procurement phase.

One of the most important indicators in the purchase decision for logistics operators is the Total Cost of Ownership (TCO) comparison between a CFV and an EFV. As was experienced during the procurement decisions for some EFVs in FREVUE, a similar TCO to a CFV (including subsidies) is often a minimum requirement for buying an EFV.

The aim of the TCO comparison we provide is to see which elements influence the TCO, based on data from operators in FREVUE.

The TCO differs across vehicle type and usage as well as being influenced by several elements, which can be country or even company specific. This factsheet provides a generalised TCO comparison, based on data from several operators.

Evaluation

This TCO comparison is based on data from FREVUE operators, and has the aim of assessing the factors contributing to the TCO.

Conclusion

For a medium-sized electric freight vehicle the TCO comparison shows that under specific circumstances (for example, exempting EFVs from congestion charges), a positive business case for EFVs is possible. Wider uptake of EFVs and mass-production by vehicle manufacturers (planned to commence 2018-2019) could decrease the relatively high purchase price, which would lead to a more favourable TCO for EFVs in this weight class.

Economics

The market for conventional vans is dominated by relatively low-cost products, as there is no market for luxury vans (in contrast to passenger cars and trucks). The relatively expensive large electric van has to compete with a value for money vehicle. Medium-sized EFVs are not yet mass-produced by Original Equipment Manufacturers (OEMs), and retrofitting a conventional vehicle into an electric vehicle results in a relatively high purchase price for EFVs.

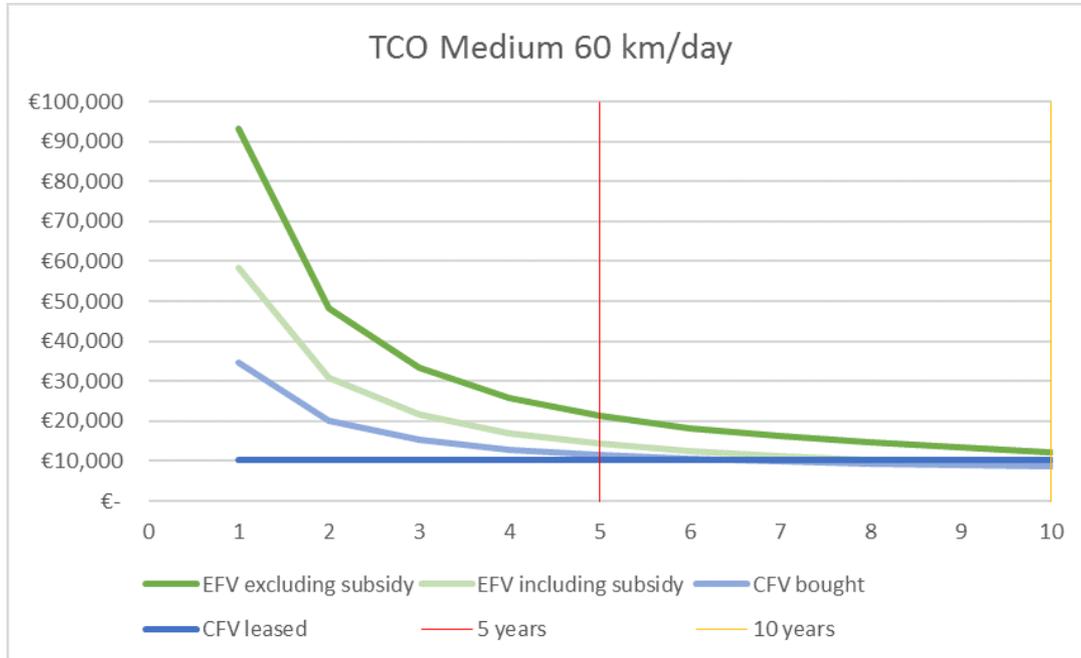


Figure 1. Development of yearly TCO per year-operated medium-sized vehicle (average 60 km per day)

The horizontal axis of Figure 1 shows the yearly total costs of both an EFV and a CFV over ten years. The steep slope in the first years of the EFV graph (compared to the CFV graph) can be explained by the relatively high investment costs (i.e. purchase price and charging infrastructure) for EFVs. Over a longer lifespan, these investment costs are spread out, decreasing the yearly costs. Including subsidies, the EFV eventually breaks even with the comparable CFV after about 10 years of ownership.

Figure 2 shows the subdivision of cost elements for a lifetime of 10 years, the cross-section depicted by the yellow line in Figure 1.

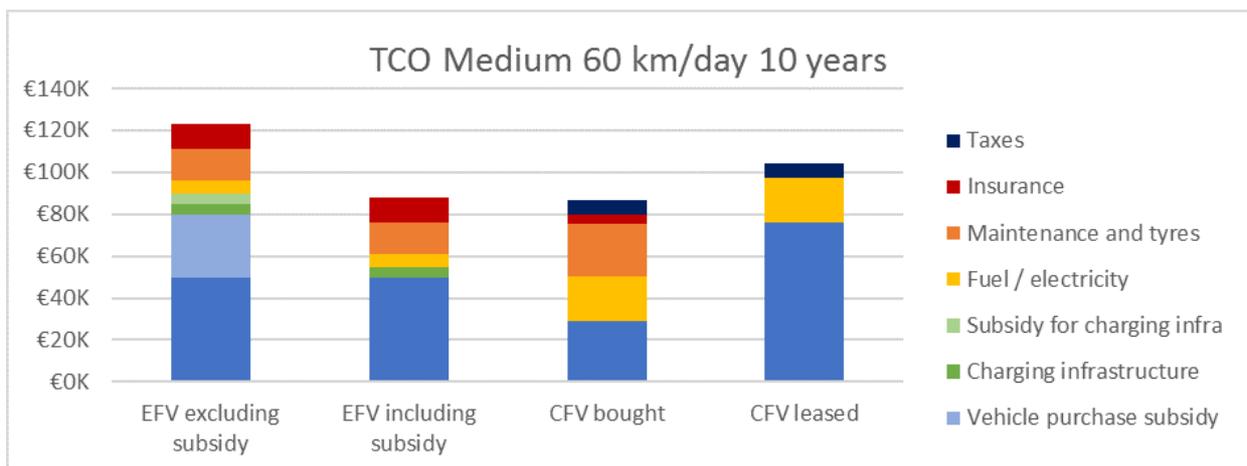


Figure 2. TCO small size vehicle (5-year cross-section – 60 km per day)

Certain elements are not included in Figures 1 and 2. We will discuss the effects on the TCO when changes are made to the average number of kilometres per day, where exemptions in the congestion charge are made for EFVs, when residual value is added to the total, and where extra investments are made in the electricity grid.

As the operational costs for EFVs are lower than for CFVs, the TCO is even more favourable for the EFV when an operator uses the vehicle for a higher number of kilometres per day. Including subsidies, a positive business case for EFVs is possible after six years when driving 120 km per day on average.

Exemption from congestion charges, like those found in London, for electric freight vehicles can clearly support the business case for EFVs. The total cost for the CFV increases considerably, due to the charge.

The residual value of an EFV is one of the main uncertainties operators currently face. For medium-sized vehicles there is usually a good second-hand market, and the average life of vans is quite high in comparison to other commercial vehicles. If the second-hand battery can be used commercially, the TCO for the EFV improves considerably. At present, however, most operators estimate the residual value to be zero to ensure that they do not make a loss when the vehicle finishes operation. Coming years will show what the residual value will be and how this influences the TCO.

While there are many elements that positively influence the business case for medium-sized EFVs, a discussion on the potential risks influencing the business case is required.

Firstly, all TCO comparisons are computed under the assumption that the EFV's batteries do not deteriorate significantly, and that these batteries can be used for five or even ten years without replacement. If this is not feasible, the EFVs' TCO increases with the costs of an extra battery, and will be higher than the CFV's TCO.

Another uncertainty lies in changes to fuel prices. The business case for an EFV profits from an increase in the costs for operating a CFV, and these unpredictable developments are difficult to include in the procurement decision.

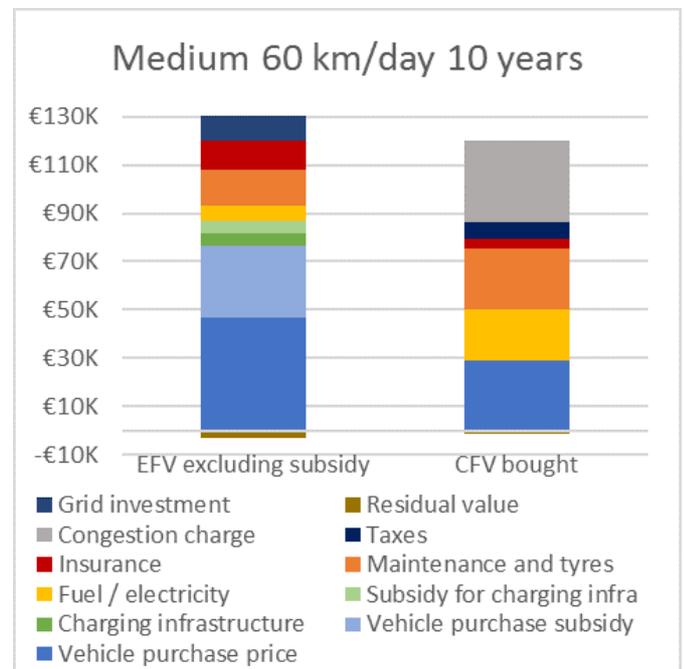


Figure 3. TCO medium size vehicle (including congestion charge, grid investments and residual value – 60 km per day)

Finally, an additional investment in upgrading the electric grid could be necessary. The numbers shown in Figure 3 could be much higher, as we currently spread the additional investment over the maximum number of EFVs that could be charged after the upgrade. As Figure 3 shows, this extra investment can make the difference between finding a feasible business case or not.

Conclusion

For a medium-sized electric freight vehicle, weighing between 3.5 and 7.5 tons, the TCO comparison shows that under specific circumstances a positive business case for using an EFV is possible. Due to lower operational costs, the more kilometres an EFV drives, the more favourable the TCO is for the EFV. Special circumstances, like an exemption to the congestion charge for EFVs, have a positive effect on the business case for the EFV, whereas major grid investments for charging larger fleet sizes negatively affect the business case. Finally, many uncertainties still exist around the residual value.

Further information

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