

Total cost of ownership for tractor trailers in the United Kingdom: Battery electric vs. diesel

BACKGROUND

Decarbonizing the road freight sector is necessary to meet carbon neutrality targets by mid-century. Transitioning to a zero-emission fleet of road freight vehicles requires a robust demand for such technologies accompanied with proper policy measures to accelerate technology deployment.

As a supplement to a similar analysis of Europe, ICCT analysed the total cost of ownership (TCO) of battery-electric tractor trailers in the United Kingdom, comparing their economic performance to the currently deployed diesel tractor trailers. A variety of policy scenarios were used to conduct an in-depth TCO analysis to predict the year when TCO parity will be achieved between battery-electric tractor trailers and their diesel counterparts in the United Kingdom. The analysis leads to key recommendations to accelerate the deployment of battery-electric trucks.

FINDINGS:

- » **Battery electric long-haul trucks operating in the United Kingdom will reach TCO parity with diesel trucks by the middle of the decade without any policy intervention.** Battery-electric trucks operating in the United Kingdom will reach TCO parity with their diesel counterparts in 2026 (Figure 1, left panel). The continuous reduction in battery cost and improvement in energy density help reduce the TCO of battery-electric tractor trailers. Furthermore, the latter also witness lower maintenance costs relative to diesel trucks, narrowing the TCO gap further (Figure 2, 2026 – no policy interventions).
- » **Battery electric long-haul trucks would still achieve TCO parity with diesel trucks during this decade under several fuel and electricity prices projection scenarios in the United Kingdom during the 2020–2030 timeframe.** In most electricity and diesel fuel prices projection scenarios (Figure 1, right panel), battery-electric tractor trailers would still achieve TCO parity with their diesel counterparts, but with a significant variation in the TCO parity year ranging between 2024 and 2030.
- » **The imposed taxes and surcharges on electricity production and transmission in the United Kingdom have a significant impact on achieving TCO parity.** Electricity prices in the United Kingdom are already among the highest in Europe. In addition, non-recoverable levies and surcharges, excluding VAT, substantially increase the

electricity cost, as they represent more than 33% of the electricity bill in the United Kingdom. This creates challenges for battery-electric tractor trailers to achieve early TCO parity with diesel trucks (Figure 2, 2021 no policy intervention – fuel costs).

» **Several policy measures can help to eliminate the TCO gap.** Providing purchase premiums for battery-electric trucks is a policy already implemented in the United Kingdom, but these premiums have a little impact on the TCO of battery-electric tractor trailers as they are limited to £6,000 per truck. Other policies such as the addition of CO₂ external costs to road tolls can bring forward the year battery-electric tractor trailers achieve TCO parity with diesel trucks (Table 1).

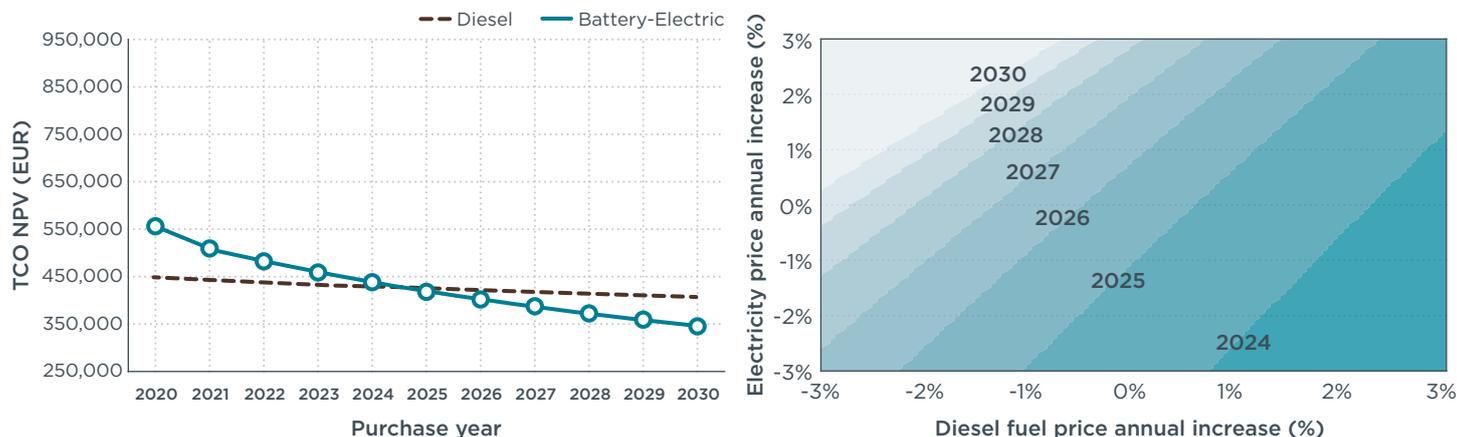


Figure 1. Left panel: Total cost of ownership net present value (NPV) of battery-electric tractor trailers and diesel trucks as a function of year of purchase, from the first ownership perspective (5 years) considering fixed diesel fuel and electricity prices for the 2020–2030 timeframe under currently implemented policies in the United Kingdom. Right panel: Battery-electric and diesel trucks TCO parity year under variable diesel fuel and electricity prices projection for the 2020–2030 timeframe with no policy interventions.

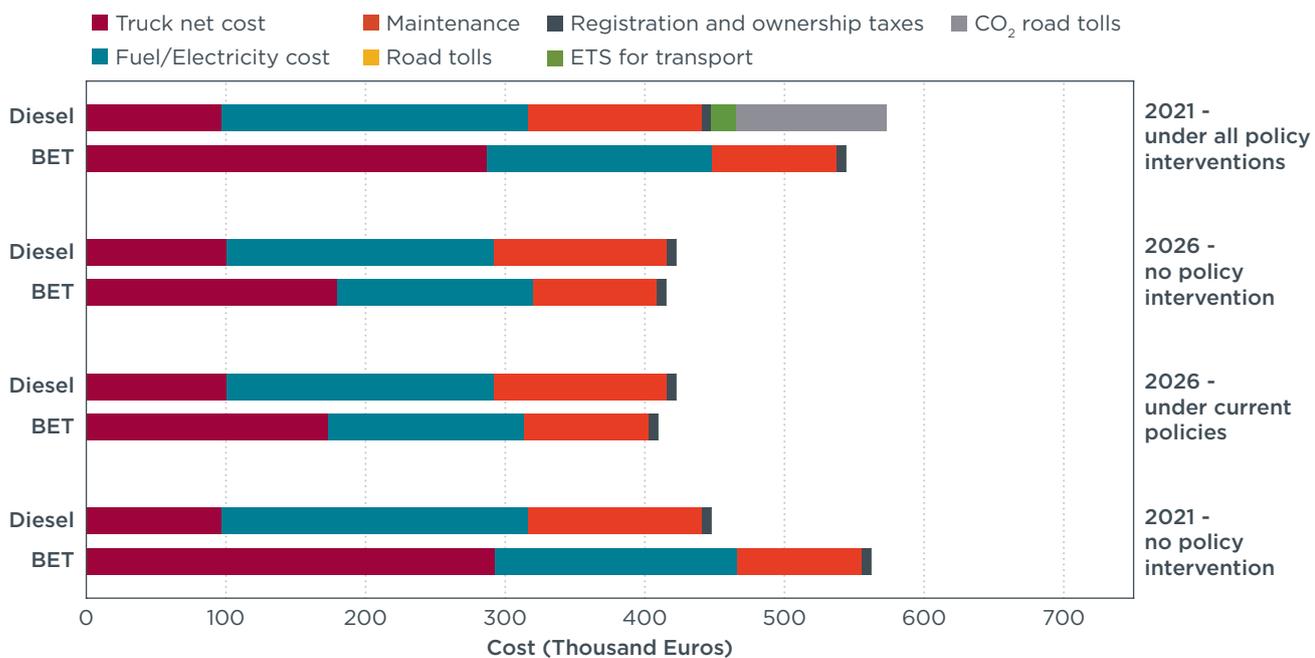


Figure 2. Total cost of ownership breakdown under the following cases: (1) purchase year 2021 with no policy intervention, (2) purchase year when TCO parity is achieved under current policy intervention (2026), (3) purchase year when TCO parity is achieved with no policy intervention (2026), and (4) purchase year when TCO parity is achieved with the full policy package applied (2021).

Table 1. The impact of several policy measures on the year to achieve TCO parity between battery-electric and diesel trucks.

| | No Policy | Purchase incentives | Road tolls exemption (75%) | Addition of CO ₂ external costs to road tolls | ETS for transport | Electricity fiscal incentives | Infrastructure incentives |
|-----------------|-----------|---------------------|----------------------------|--|-------------------|-------------------------------|---------------------------|
| TCO parity year | 2026 | 2026 | 2026 | 2022 | 2025 | 2024 | 2025 |

RECOMMENDATIONS:

- » **Implement the Eurovignette Directive into national law.** The proposed CO₂ charge ranging between 8 cents/km and 16 cents/km as part of the revision to the Eurovignette Directive is a very effective policy measure that captures the externalities of diesel trucks by increasing their operating costs. This policy measure significantly narrows the TCO gap between battery-electric tractor trailers and their diesel counterparts.
- » **Implement fiscal incentives for renewable electricity used for battery-electric tractor trailers charging.** Taxes and surcharges are a significant component of the total electricity prices in the United Kingdom. Partially waiving those levies and surcharges has a substantial impact on the time it takes for battery-electric tractor trailers to achieve TCO parity with diesel trucks. In addition, the revision of Energy Taxation Directive should support the business case for zero-emission trucks by allowing countries to apply tax discounts for the renewable electricity used for charging trucks.
- » **Extend the European Emissions Trading Systems (ETS) to include transport.** The “Fit for 55” package suggests including transport and buildings into the European ETS. So far, Germany is the only member state to impose carbon pricing for transport (25 Euros per tonne of CO₂ equivalent in 2021 which increases to 55 Euros/tonne CO₂e by 2025). Applying such carbon pricing in the United Kingdom

would reduce the time to reach TCO parity by 1 year. Higher carbon pricing must be imposed so ETS for transport can have a considerable impact on the TCO parity year of battery-electric tractor trailers relative to diesel trucks.

- » **Purchase premiums for trucks are a powerful policy measure that should be limited to duration and scope.** Subsidies and incentives are important measures to kick-start the market in the short term, but are not fiscally sustainable in the long term. Thus, they must be limited in duration and scope. Subsidies can be designed as a function of the cost difference between a zero-emission truck and an internal combustion engine equivalent, entailing that the amount of subsidy will decrease with time as battery-electric tractor trailers retail price decreases. It is recommended to include eligibility criteria to earn such subsidies, such as electric range and energy consumption, which can help differentiate performance of vehicles and allocate subsidies more effectively.

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