



# It's time for the UK to make the switch

How sales mandates and demand incentives for battery electric trucks can enhance city, urban and regional freight operations

December 2022

## Executive summary

There is widespread consensus among European truck manufacturers and industry stakeholders that battery electric trucks (BETs) will play a dominant role in decarbonising the road freight sector. Established truck makers such as Daimler, Leyland DAF, Renault Trucks, Scania, MAN and Volvo Trucks are focused on bringing battery-powered trucks to the mass market across all vehicle segments, while new entrants and specialist manufacturers such as Dennis Eagle, Tevva and Volta are bringing innovative new concepts to the urban/short-haul and municipal vehicle markets. The UK has set 2035 as its date for phasing-out sales of all new “non-zero emission” HGVs up to 26 tonnes (and 2040 for such HGVs over 26t) but ambitious intermediate targets need to be set to transition the industry in the most cost-effective way to meet legally binding climate targets and carbon budgets.

*Transport & Environment* appointed Element Energy to examine the techno-economic feasibility of an accelerated switch to BETs. This briefing provides an update and recommendations from the first phase of their research; assessing logistics operations that would not be reliant on public charging infrastructure and thus could, with the right policy environment, potentially be electrified very quickly. A second phase, covering use cases that will need public truck charging infrastructure, will be the subject of a subsequent report, which will include the full findings from both phases.

Our study shows that in this decade, well ahead of the UK's current 2035/40 phase-out dates, 65-75% of the UK's rigid HGVs and 30-35% of our artics will be able to operate sustainably and productively with battery electric trucks without significant reliance on future charging infrastructure anywhere other than their home depot. Together, these back-to-base use cases capture over half of UK HGVs and currently account for around 25-35% of all road freight greenhouse gas emissions.

**The early electrification of back-to-base use cases is a golden opportunity for policymakers and commercial visionaries to de-risk the transition for fleet operators and close the cost gap with diesel for the larger HGVs via a balanced “demand” (user incentives and charging infrastructure support) and “supply” (ZEV mandates) approach.**

This study evaluates a wide range of common operational profiles and develops optimal combinations of battery size, depot-based charging infrastructure and opportunity-charging at pick-up/delivery sites.

For each profile, costs were analysed to assess when BETs become the most cost-effective option (vs diesel). Many duty cycles have been studied, capturing the spread of different HGV operations, and the work uses conservative assumptions around the future cost and performance of battery electric HGVs, making the findings robust. Some examples of Element's main assumptions (all for 2030) are:

- Electricity 22p/kWh (will be lower if by 2030 wholesale price is set by renewables, not gas)
- Diesel costs £1.40-1.55 per litre (exc VAT)
- Batteries cost £80-130 per kWh (well above projected costs for car batteries)
- 22 kW DC chargers cost £2,700 each, 350 kW DC chargers cost £135,000 each (installed)
- £200/kW average grid connection costs (sites close to existing grid could be below £100/kW)
- Battery specific energy 230 Wh/kg

This briefing summarises Element's findings and makes recommendations for UK policymakers to speed up the transition, to support decarbonisation, net zero and air quality agendas but also to cut costs, support UK economic growth and enhance profitability for operators.

### **Increasing the supply of BETs through regulation and mandates**

The phase-out dates of 2035 and 2040 for new non-zero emission HGVs in the UK provide certainty for the industry and are essential to achieve net zero by 2050 but they do little if anything to incentivise uptake ahead of time. Research by Element Energy shows that to remain on a path consistent with limiting global warming to 1.5 degrees, we need at least 50% zero emission HGV sales by 2030 (and 15% by 2025). These values are close to many published OEM sales targets, highlighting their achievability. New analysis by T&E has shown that a 2035 end date for sales of polluting freight trucks in the EU is needed to put trucking on a path to zero carbon by 2050.

ZEV mandates are being deployed (from 2024) in the light-duty vehicle sector. They need to be deployed for HGVs as well, to ensure manufacturers invest quickly in ramped-up production capacity and provide certainty of vehicle availability for operators eager to reap the benefits of a battery electric truck fleet. Supply side regulation is essential to ensure there are sufficient zero emission trucks available. It is also crucial to bring down the individual BET unit costs via economies of scale.

**T&E calls on the UK government to set ambitious interim targets in the form of ZEV mandates from 2025 for new HGV sales.**

### **Supporting demand is key to bridge the total cost of ownership gap in the short term**

While some use cases are already cost-effective, BETs are today usually more expensive to own and operate than diesel trucks, but this situation will change radically over the next ten years, as battery

and other costs fall, and economies of scale are achieved for BET production. The high BET prices highlight the need for effective vehicle purchase incentives (beyond current Plug-In Truck Grant levels) to bridge the total cost of ownership (TCO) gap in the short term. The Government should review and improve the Plug-In Truck Grant through, for example, a wider scope and higher subsidy. Some EU countries already offer much more generous purchase grants (e.g. Germany). Early-adopters should be supported to quickly grow the BET sector through tax incentives, access to low-cost finance and fair and equitable apportionment of the costs of power supply upgrades. **T&E calls on the UK government to push ambitious near-term BET growth by offering effective financial support to battery electric HGV purchases and charging infrastructure provision.**

The UK has some world-leading truck manufacturers and manufacturing facilities, as well as a reputation for excellence in automotive innovation, research and development. Strengthening and expanding this supply chain in the context of the global transition to battery electric trucks should be a strong pillar of UK automotive industrial strategy. **Investment is needed to exploit these opportunities and support future UK economic growth**, in areas such as:

- Enhanced capital allowances for investment in BET manufacturing facilities
- Investment in training, upskilling the UK workforce to produce and maintain BETs
- Accelerated planning process for new BET manufacturing and/or maintenance sites
- Innovation grants for small UK manufacturers to bring new BETs to market as fast as possible
- BET depot and distribution centre / warehouse charging as well as public charging networks for HGVs (not covered in this study).

### **Battery Electric Trucks will be cheaper to run than diesels in city, urban and regional applications by the early 2030s at the latest**

The study has identified many rigid HGV use cases and some articulated HGV use cases that would, if using BETs, have no need for public charging infrastructure and thus can be electrified in the very near future. BETs can perform a wide range of operations without public charging by relying on a combination of depot charging and opportunity charging at the depot between shifts or at third party warehouses while waiting or loading/unloading where necessary. The study also accounts for range requirements, payload, stop type and trip variability as they all influence the ability to quickly shift to electric.

Total Cost of Ownership (TCO) modelling has been used to estimate, for a variety of different use cases (archetypes) and under various cost projection scenarios, the year in which purchasing a battery electric truck (instead of a diesel-powered one) is likely to be the most commercially astute decision for a fleet manager. **With our modest additional policy interventions, all the use cases studied become cost competitive for BETs in the 2020s.**

**Without new policy interventions, even with greatly delayed battery cost reductions and low diesel fuel price scenarios, the study shows that BETs will be cost competitive with diesel**

**across many urban and regional HGV duty cycles (those not reliant on public charging) by the early 2030s.** Repetitive duty cycles, with plenty of downtime for charging, reach TCO parity with diesel first (early 2020's) while more intensive, longer distance use cases reach TCO parity last. **By targeting policy measures now at these slightly harder to electrify use cases, their TCO parity dates can be brought forward by several years, as can all the associated economic and environmental benefits.**

A wider package of policy measures would close the TCO gap over the first ownership period even more quickly. The key supply and demand-side policies are described above but complementary demand-side measures could also be considered:

- **Road charging per km with initial exemptions for ZEVs (and CO<sub>2</sub> variation).** Charging diesel trucks with a fair yet effective price on CO<sub>2</sub> emissions, while exempting zero emission vehicles, would significantly bring forward the BET TCO parity dates. Once BET market penetration is high and TCO is lower than for diesel (around 2030), ZEV exemptions could be phased out.
- **Congestion charges/zero emission zone charges** with exemptions for zero emission HGVs, with co-benefits of improved air quality.
- **Amendments to vehicle weight and dimensions regulations.** Options to allow BETs to operate as longer and/or heavier vehicles than diesel equivalents (including but not limited to the up to two tonnes increases in gross vehicle weight already announced for some HGVs) should be considered and pursued where relevant. These are inevitably complex issues, particularly to avoid unwelcome increases in axle loadings and road wear, allow sufficient manoeuvrability and protect other road users, but solutions exist elsewhere and can be adopted in the UK.
- **Driver hours regulations.** Some limited flexibility in the driver hours regulations could allow charging locations to offer greater freedom of movement for battery electric trucks.

### **Battery Electric Trucks are here – it is time for the UK to make the switch**

Our study shows that a very wide range of the UK's HGV fleets will be able to operate sustainably and cost-effectively with battery electric trucks (and without significant reliance on future public truck charging infrastructure) well ahead of the 2035/40 phase-out dates. There is now a golden opportunity for policymakers and commercial visionaries to further accelerate this switch via a mixed approach of user incentives and charging infrastructure support and increasing the supply of BETs, including setting ambitious interim targets in the form of ZEV mandates from 2025 for new HGV sales.

This study shows that implementing these policy recommendations would:

- Encourage the integration of vehicle and infrastructure specification.
- Encourage an optimised system that mitigates the risk of deploying infrastructure that is over-sized and underutilised or relies on vehicles that are prohibitively expensive.
- Bridge the TCO gap with diesel in the short term, enabling a scale up that will achieve the necessary cost reductions in the medium and long term.

## Further information

Richard Hebditch

UK Director

Transport & Environment

[richard.hebditch@transportenvironment.org](mailto:richard.hebditch@transportenvironment.org)

Square de Meeûs, 18, 2nd floor | B-1050 | Brussels | Belgium

[www.transportenvironment.org](http://www.transportenvironment.org) | @transenv | fb: Transport & Environment