

Aldersgate Group / Zemo Partnership cross-economy workshop: Faster decarbonisation of heavy road freight

February 2025

Background

In January 2025, Aldersgate Group and Zemo Partnership convened a workshop to explore practitioner experiences of seeking to decarbonise heavy goods vehicles (HGVs). The participants represented views from haulage companies, supermarkets, other major freight users, consulting and trade associations. This briefing note draws together the findings from the workshop and makes recommendations for how the UK government can work with industry to accelerate HGV decarbonisation more effectively. The vehicles discussed were haulage HGVs specifically rather than specialist machinery or construction vehicles, for which different conclusions might apply.

A list of participating organisations is included at the end of this note.

Key workshop findings

1. In the long term, **all HGVs need to be electrified**. This is expected to be feasible eventually, but with major caveats as to whether full electrification of HGVs in 2050 is deliverable.
2. Practical challenges and technology uncertainty **affect delivery timeframes and market confidence**.
3. **Hydrogen** is not widely expected to play a significant role in HGV decarbonisation.
4. **Biomethane, hydrotreated vegetable oil (HVO) and biodiesel** will be important fuel sources, certainly in the short to medium term and potentially up to 2040 and beyond.
5. A range of other possible alternatives (e.g. **modal shift and automation**) influence business models and therefore individual investment choices.
6. More clarity is needed from the government on **technology pathways**, with support being tailored accordingly.
7. Focussed measures are needed in the **2025 Spending Review** to accelerate long-term HGV electrification and short-term decarbonisation through low carbon fuels.

Further details on each of these points are set out in the main section of this briefing document.

1. In the long term, all HGVs need to be electrified. This is expected to be feasible eventually, but with major caveats as to whether full electrification of HGVs in 2050 is deliverable.

Heavy goods vehicles (HGVs) are integral to the UK economy, with 437,000 operational vehicles and 89% of all freight moved by road.¹ The current government's stated aim (not in legislation) is to end the sale of non-zero-emission HGVs by 2035 (under 26 tonnes) and 2040 (over 26 tonnes).²

There was cross-industry agreement at the workshop that overall, a transition to battery-electric HGVs would be desirable, over and above other technology options. Battery-electric vehicles (BEVs) reduce air pollution and reduce lifetime carbon dioxide emissions (200tCO₂e vs. 1,282tCO₂e) for diesel trucks.³ They offer quieter, smoother operation with automatic gears, making them more attractive for drivers compared to diesel vehicles. They also deliver reduced vibration and quicker acceleration, improving safety and comfort. And as other sectors decarbonise, fossil fuel costs are likely to rise, making BEVs more economically competitive.

On the positive side, the declining cost of battery technology is making direct electrification of HGVs increasingly practical for long-term decarbonisation. HGVs can accommodate large batteries of up to 5+ tonnes in weight. Battery swapping, already in use in China, potentially presents an efficient solution and is well-suited to HGV operations, where vehicles are designed to carry heavy payloads.

Driver hour regulations potentially provide natural intervals for charging, which can be aligned with slower, more cost-effective charging options. Depot charging is estimated to be a viable solution for 65–75% of rigid HGV fleets using currently available models.⁴ However, for fast turnover operating models this is less likely to be true, as reflected below.

Electrification also allows for new models of shared infrastructure between transport modes (e.g. with buses and cars), creating economies of scale where this is planned strategically. There is also a potential opportunity for distribution centres and depots to support their own charging operations and contribute to grid stability through energy generation and storage.

On specific vehicles, rigid trucks and local delivery vehicles are already viable candidates for electrification. Articulated HGVs face greater challenges due to heavier duty cycles, weight restrictions, and operational schedules. For example, it was suggested that a logistics hub with 150 ICE trucks currently operating 24/7 may need 250 electric trucks to maintain the same use pattern – i.e. 1.7 vehicles are required to replace every diesel 40-tonne HGV.⁵

¹ www.rha.uk.net/News/Industry-Facts-and-Stats

² www.gov.uk/government/calls-for-evidence/infrastructure-for-zero-emission-heavy-goods-vehicles-and-coaches/infrastructure-for-zero-emission-heavy-goods-vehicles-and-coaches#zero-emission-coaches

³ www.zemo.org.uk/assets/reports/Vehicle%20life%20cycle%20GHG%20emissions%20study%202024.pdf

⁴ www.transportenvironment.org/te-united-kingdom/articles/e-trucks-its-time-for-the-uk-to-make-the-switch

⁵ Workshop participant

2. Practical challenges and technology uncertainty affect delivery timeframes and market confidence.

The total cost of operation of BEVs, including but not limited to their upfront purchase cost, remains a substantial barrier to uptake. Predicting when BEVs will achieve cost parity with traditional vehicles remains challenging, and this difficulty is exacerbated by limited financing options. Participants reported that BEVs currently cost 2-3 times more than diesel equivalents.⁶ A £25,000 plug-in truck grant is available, but this is insufficient to close the affordability gap for many businesses, especially SMEs with very tight margins.⁷

In addition, electricity costs are currently high compared to diesel, and the future evolution of these respective energy costs is very uncertain. There is also substantial uncertainty about the residual value of BEV HGVs, which further deters investment; and the future taxation landscape for electric vehicles is uncertain, particularly as battery costs continue to evolve.

Some operators also struggle to see a pathway to the full electrification of HGVs by 2050 from a wider practical systems perspective. Larger HGVs that travel long distances face significant barriers to operating BEVs in an equivalent way, including payload loss due to battery weight and limited charging opportunities.

Public charging infrastructure is costly and underdeveloped, with only 57 refuelling and charging sites supported through the £200m ZEHID programme.⁸ Grid connection delays of up to 7–8 years are now common, with upgrade costs ranging from £10 million to £65 million for distribution centres; and overall, an estimated £11–24bn investment is needed for depot charging infrastructure to support a zero-emission fleet transition.⁹

Specific issues with Distribution Network Operators (DNOs) include long wait times, lack of transparency, and inadequate prioritisation. Wayleave negotiations for grid connections can also take years. These factors function as a huge disincentive to larger operators looking to transition substantial fleets. The picture is also widely variable in different parts of the UK.

3. Hydrogen is not widely expected play a significant role in HGV decarbonisation.

For a range of reasons including costs and practicalities, most participants did not expect hydrogen to be a serious contender in the UK's decarbonised HGV market, despite being technically viable. Some participants suggested that hydrogen combustion could be explored for niche applications such as off-road machinery, but not for mainstream HGV operations.

High capital expenditure (CAPEX) and operational expenditure (OPEX) make hydrogen infrastructure, vehicles and fuel significantly more expensive than either biomethane trucks or BEVs (one participant cited a fuel cost 6-8 times higher than biomethane). There has also been no clear signal or sufficient incentivisation from the UK government which would help bridge this large market gap.

⁶ Workshop participant

⁷ www.find-government-grants.service.gov.uk/grants/plug-in-van-and-truck-grant-1#eligibility

⁸ www.gov.uk/government/publications/zero-emission-heavy-goods-vehicles-and-infrastructure-competition-winners/zero-emission-heavy-goods-vehicles-and-infrastructure-competition-winners

⁹ www.greenfinanceinstitute.com/wp-content/uploads/2024/06/Delivering-Net-Zero.pdf

4. Biomethane, hydrotreated vegetable oil (HVO) and biodiesel will be important fuel sources, certainly in the short to medium term, and potentially up to 2040 and beyond.

Many regional and long-haul fleet operators are currently relying on biomethane and HVO to meet immediate decarbonisation goals where BEV options are impractical or unaffordable; some companies with stretching 2030 transport decarbonisation targets expect that these fuels will still play a role in delivering at that point. Where waste-based feedstocks are used, biomethane achieves an 88% reduction in greenhouse gas (GHG) emissions on a lifecycle basis, with HVO achieving an 87% reduction.¹⁰ At present, approximately 2,100 HGVs operate on biomethane in the UK, while 5,000 use HVO, indicating a growing reliance on these fuels.¹¹

Biomethane benefits from regional (UK-based) production and relatively limited competition for feedstocks, such as sewage sludge and manure, though there is a lack of clarity on how substantial a market could be supplied from available fuel if considered desirable. HVO (as well as biodiesel), while currently available at a reasonable price and in reasonable supply, is a global market product and faces competition from Sustainable Aviation Fuel (SAF) mandates, which will significantly increase demand for feedstocks (at a premium). Maritime uses are also increasingly driving up demand. HVO is therefore likely to be important in the short term but limited in availability within a few years, while biomethane is expected to be available for longer.

Biomethane, HVO and biodiesel are supported by the Renewable Transport Fuel Obligation, but more clarity is needed from government about the extent to which they expect the fuels to play a significant role in the future, especially given the feasibility challenges around HGV electrification. If HVO is likely to be important to deliver on carbon budgets in the short term, tax incentives would encourage more widespread uptake. Improved grid connection timings would also help here, given that the production of renewable fuels (especially biomethane) involves the use of electricity, so is also constrained by access to the grid.

Participants also proposed that a “well-to-wheel” framework should be used to assess HGV GHG emissions when determining suitable pathways, rather than focusing solely on tailpipe emissions. This reflects the fact that the HGV fleet is complex in its operational profile, so a technology-neutral approach will support the best overall solution.

If biomethane is seen as offering a significant interim role, it will also be important to make clear how a future transition away from relevant infrastructure and vehicles towards full electrification would be managed.

5. A range of other possible alternatives (e.g. modal shift and automation) influence business models and therefore individual investment choices.

Emerging technologies, including autonomous vehicles, could significantly impact operational models and must align with zero-emission objectives. Meanwhile other nations, particularly in Europe, are advancing hydrogen and large-battery technologies. The UK must

¹⁰ Renewable Transport Fuel Obligation standard assumption

¹¹ Zemo Partnership market monitoring

consider international competitiveness and collaboration; and businesses must explore leasing models to reduce upfront costs and manage risks associated with emerging technologies.

Electric road systems (ERS) have been subject to early-stage studies, but to date no trials have been conducted in the UK. Some industry representatives take the view that ERS potentially offers a highly efficient solution, particularly when taken together with automation. However, the reliance on infrastructure along the strategic road network means that this option cannot be progressed by industry alone, and would rely on government to take a lead in further investigations and trials. Given the challenges outlined above of deploying BEV vehicles for the heaviest and longest routes, we encourage DfT and National Highways to give this option further investigation. This could be through economic modelling which compares the costs of ERS to other options, taking into account potential cost reductions in batteries and in different vehicle types.

Other tools are also available to decarbonise freight, such as the increased use of rail, though this wasn't seen as a substantial enough opportunity to affect vehicle investment decisions by road fleet operators.

6. More clarity is needed from the government on technology pathways, with support being tailored accordingly.

To build confidence across the industry in potential electrification of the HGV fleet, the government should develop a comprehensive roadmap for electrifying HGVs. This should address the full range of factors necessary for delivery, including electricity demand forecasts, vehicle requirements and infrastructure upgrades. The Clean Energy 2030 plan offers a helpful model which could be followed, giving detail which is meaningful at regional and individual business level. This level of granularity would provide long-term certainty to encourage investment and prevent stranded assets. It would also expose what can realistically be delivered and on what timeframe, and whether medium-term constraints on electrification mean that additional focus and support should be offered for HVO and/or biomethane pathways. If that is the case, a parallel roadmap should be set out demonstrating the role for HVO and biomethane, and how they will be supported in infrastructure, fuel and vehicle terms. The overall aim should be that the whole spectrum of vehicle operators has access to an appropriate decarbonisation pathway.

In terms of funding, the government has committed £49m (2021–2023) to programmes like ZERFT, APC, and CAM, but more funding and clearer roadmaps would help to accelerate deployment further. Small businesses particularly require targeted funding and guidance to overcome barriers to entry, noting that half of the UK's HGV fleet is operated by small businesses with fewer than 10 employees.¹²

As well as supporting technology adoption, a sustained effort is needed to expand the publicly-available charging network beyond the current sites (57 supported through the ZEHID programme, alongside others installed by private providers). Grid upgrade processes need significant improvement, through anticipatory investment, streamlining planning processes and improving DNO customer service to accelerate grid connections. Connection costs also need to be fairly distributed, given the public benefits of charging infrastructure.

¹² www.greenfinanceinstitute.com/wp-content/uploads/2024/06/Delivering-Net-Zero.pdf

Focus should also be placed on the skills needed to support BEV maintenance and operations: there is currently a significant gap which will become a limiting factor in increasing the number of vehicles on the roads. Industry can take the lead on this, but further support through government skills programmes would speed up progress.

7. Recommendations for the Spending Review (SR)

Supporting decarbonisation of the UK's HGV fleet would play a vital supporting role in driving economic growth. This transition has the potential to fuel innovation, create jobs and stimulate investment, while enabling some of the country's largest companies to decarbonise their overall operations.

There are a number of ways in which the 2025 Spending Review could support HGV decarbonisation. Many of these have relatively low capital costs, but harness the government's regulatory, convening or guarantor capabilities.

Accelerating HGV electrification

- Address the £100bn capital requirement for transitioning the HGV fleet by providing government-backed financing.
- Promote innovative business models, such as vehicle leasing, to reduce upfront costs.
- Invest in workforce training to close the skills gap and facilitate the maintenance of new technologies.
- Cap public charging costs for HGVs to make electrification more financially viable.
- Promote shared infrastructure and lessons from parcel networks to encourage industry-wide cooperation.
- Ensure weight and dimension legislation supports electrification.

Supporting faster short-term decarbonisation through low carbon fuels

- Clarify the expected role that low carbon fuels will play across the economy and different transport modes in coming decades, including for HGVs, and ensure that this system-wide trajectory is reflected appropriately in RTFO targets.
- Signal long-term support for biomethane and HVO, as transitional fuels, potentially through a fuel duty differential for 100% HVO blends (complementary to the existing differential offered to gas fuels), and look to increase support for domestic production through strategic investments.

Participating organisations

Aldersgate Group

Cemex

CNG Fuels

DHL

KPMG

Kuehne + Nagel

Renewable Transport Fuel Association

Road Haulage Association

Tenens

Tesco

Transport & Environment

Voltempo

Waitrose

Welch Group

Zemo Partnership

The Department for Transport was also represented.