

New Fuels Hold the Key to UK Transport Decarbonisation

By Andy Eastlake, Chief Executive, Zemo Partnership



Renewable and Sustainable, the revolutions in fuels and energy for transport.

When I spoke at APEA Live last November, COP26 (the landmark international climate conference in Glasgow) had just ended and we were able to see with greater clarity what the future holds and what this will mean for our lives and working practices. For sure, we're living through the most dramatic transformation since the industrial revolution and one that will have profound and far-reaching implications on almost all aspects of our lives. The petroleum sector, of course, is in the front line in terms of the transition to a net zero economy.

I've had the privilege of working on the decarbonisation transition in transport for well over a decade (and it was already having a significant impact on my work as an emissions specialist for many years before that).

Zemo Partnership was set up as the Low Carbon Vehicle Partnership (LowCVP) in 2002 as a stakeholder organisation to inform the UK's new Powering Future Vehicles Strategy when this agenda was in its infancy. We changed the name and rebranded



Clean Diesel Refuelling

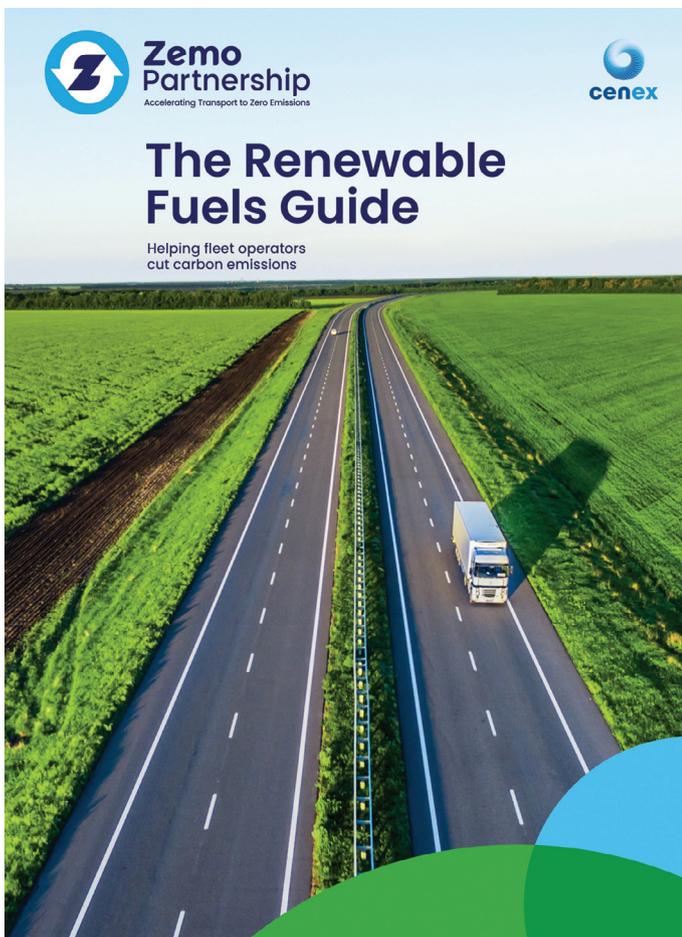
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last year to Zemo Partnership to reflect the new emphasis on a zero emissions target and the increasingly urgent need to accelerate the transition.

Zemo Partnership convenes the broadest range of stakeholders, focusing primarily on the decarbonisation agenda for road transport (the biggest sectoral contributor to UK transport emissions overall). Our 240 member organisations are drawn from a very wide range of stakeholders including the motor and energy industries - both traditional and new entrants - fleet operators and local authorities, all the way through to NGOs. We work closely with the UK Governments as a testing and development ground for potential policies, but importantly our work is grounded in real evidence and understanding from industry in terms of what can be delivered and at what pace. We welcome membership applications from representatives of the petroleum sector who are committed to the decarbonisation transition in transport.

While we acknowledge that there will have to be significant behavioural changes in the context of transport, Zemo's main focus is on the vehicles that will be necessary to enable us to move around and how we produce and power them. We examine the most suitable vehicles for various purposes, and how we can get the best technology and fuels/energy into the market as quickly as possible.

The electrification agenda dominates popular news; indeed, who doesn't want a shiny new EV with zero tailpipe emissions? Certainly, we've made great strides in terms of electrifying the UK's new car and smaller van fleets; the latest statistics showed that a quarter of all new cars sold in December 2021 were battery

electric vehicles (BEVs) and as many as one in three had a plug attached (battery electric and plug-in hybrids combined). Given that electrification is certainly set to be a big part of the answer in terms of transport decarbonisation, getting the electricity to the vehicles for charging whether at home, while parked, or in a traditional forecourt while en route, is a critical development and the Zemo Partnership-convened EV Energy Taskforce (<https://evenergytaskforce.com/>) is working with all the key stakeholders to ensure that we lower the barriers and maximise the many opportunities for the whole energy system that arise from this electric transition.

Currently, however, the vast majority (around 98%) of the vehicles on UK roads are still powered by liquid (mostly) fossil fuels and they will continue to dominate well into the next decade, even after the phase-out of the sale of new fossil fuel vehicles begins in 2030. In the meantime, we need to focus on doing everything we can to cut greenhouse gas emissions from the incumbent fossil-powered fleet. The introduction of mixes of renewable fuels in forecourt petrol and diesel (bioethanol and biodiesel) has been an important step in this direction, including the latest move to E10 in 2021, and together these will have a significant impact in terms of emissions reduction.

Renewable fuels, indeed, can demonstrate over 80% well-to-wheel reductions in greenhouse gas (GHG) emissions and will be critical to ensuring that the UK meets the UK's Fourth and Fifth Carbon Budgets (2023-27 & 2028-2032).

A study by Zemo Partnership into high blend renewable fuels (HBRF) - including biodiesel, hydrotreated vegetable oil (HVO) and biomethane - showed that there are very significant opportunities for sustainable, renewable fuel adoption by heavy duty vehicles and, in particular, trucks and coaches which are currently responsible for around 5% of the UK's total GHG emissions.

It showed that with a market average of 30% HBRF, used in place of fossil fuels (both diesel and natural gas) by 2030, the sector could save an additional 46m tonnes of GHG emissions over the next decade, with savings continuing to 2050. The biggest opportunities are in the heaviest vehicles with the longest journey profiles, which also produce the most GHG emissions.

High blend biodiesel has already made significant inroads in the bus market while both biomethane and HVO adoption in HGV fleets have shown encouraging recent increases, driven partly by requirements for carbon reporting and GHG emissions improvements.

One of the key recommendations of Zemo's report, published in March 2021, was the need for a robust and transparent scheme to provide operators with confidence in the credentials of the renewable fuels they purchase. Consequently, the Partnership developed a new Renewable Fuels Assurance Scheme (RFAS) for high blend renewable fuels. Launched soon after the report, the scheme gives fleet operators robust information about the GHG and wider sustainability performance of renewable fuels supplied in the UK.

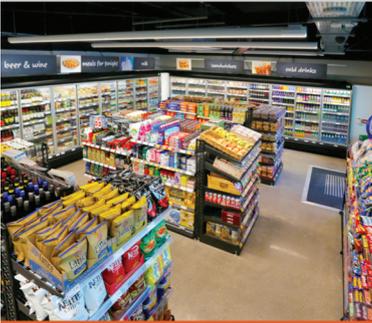
The RFAS approves companies supplying high blend renewable fuels on the basis of meeting three performance criteria, with evidence verified by an independent auditor complementing the safeguards included in the Renewable Transport Fuel Obligation (RTFO).

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A unique feature of the scheme is a 'Renewable Fuel Declaration' which fleet operators receive with batches of the renewable fuel purchased. The declaration includes a colour-coded GHG emission savings banding system, similar to energy efficiency labels, encouraging fleet operators to strive to achieve higher GHG emissions savings.

After piloting the scheme with several renewable fuel suppliers, Argent Energy, CNG Fuels, Green Biofuels Ltd and Air Liquide were the early companies to gain accreditation. By the end of 2021 seven further suppliers were approved and the scheme continues to grow. All these companies are producing biofuels from waste feedstocks, achieving GHG emission savings of between 80% and 90% compared with fossil diesel.

A key consideration in terms of renewable fuels is the compatibility of the vehicles and concept of 'drop-in' fuels. With the retail market



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currently limited to 10% ethanol in petrol and 7% FAME in diesel (due to vehicle warranty specifications) delivering renewable drop-in solutions (like HVO) enables much higher blends and, consequently, much greater GHG savings. The ability to deliver these to depots or retail forecourts will certainly feature in Zemo's future work and the overall strategy for renewable fuels which is currently under development in DfT.

While renewable fuels are a practical, near-term alternative to fossil fuels for some operators, hydrogen has been widely promoted as a longer-term option, particularly for hard-to-electrify vehicles such as long-distance HGVs and coaches (as well as planes, trains and ships).

Zemo has focused significant resource in the last year on the prospects for hydrogen as a transport fuel and to determine what will be needed for it to make a contribution to decarbonisation. It's safe to say that this analysis is not simple!

A study we published in August 2021 looked at a range of pathways for the production, distribution and dispensing of low carbon hydrogen to transport end-users. It showed, in great detail, the energy requirements and well-to-tank greenhouse gas emissions resulting from each potential pathway, as well as the infrastructure requirements related to each choice.

The report showed that there are some key choices to be made which significantly alter the life cycle impacts of hydrogen used as an energy carrier. Particularly significant is how the fuel is produced; the main options include 'green' hydrogen - using electrolysis powered by renewable electricity - or 'blue' hydrogen, mainly made by reforming fossil natural gas combined with carbon capture and storage (CCS).

The study looked at the energy use together with emissions arising along the full production, distribution and dispensing pathways, including unavoidable - or fugitive - emissions likely to arise during the process. It showed that there's a wide variation in the emissions associated with each of the alternative pathways, depending on the carbon footprint of the energy and feedstocks used.

The research found that renewables-based electrolysis could represent one of the lowest emissions hydrogen pathways in the medium-term. Natural gas reformation using emerging autothermal (ATR) technology with CCS could also significantly reduce emissions compared to current industrial steam methane reforming (SMR) process for so called 'grey' hydrogen.

As a result of follow-up work published later in 2021, Zemo Partnership recommended that Government policy needs to increase its focus on the well-to-wheel (WTW) greenhouse gas emissions and overall energy efficiency performance of potential new fuels for transport.

While renewable hydrogen, renewable electricity and renewable combustion fuels (produced from waste-based feedstocks) can all greatly reduce emissions compared with their fossil-powered counterparts, there are major variations in their effectiveness and efficiency in terms of cutting emissions depending on the choices made over the full life cycle. Significantly, the work showed that the well-to-wheel energy efficiency of hydrogen vehicles is lower than diesel internal combustion (IC) or battery electric vehicles and those using renewable fuels in IC engines.



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Market opportunities to decarbonise heavy duty vehicles using high blend renewable fuels.

Hydrogen vehicles will need to demonstrate considerable complementary benefits such as longer range, superior payload or lower operating costs to compensate for the increase in energy consumption compared with other zero emission powertrain solutions such as battery electric vehicles or even electric road systems.

It's clear that focusing exclusively on cutting tailpipe emissions can risk neglecting the full impacts and the overall energy consumption of the system. With limited renewable electricity supplies and constrained feedstocks available for the production of renewable fuels, it's vital that we adopt energy efficient solutions to maximise the full system benefits wherever possible.

It's clear that the energy and infrastructure for transport is increasingly complex and diverse and that we must work collaboratively with not only the researchers but the whole range of industries including infrastructure providers if we are to make the changes necessary at the right pace and cost.

So, the campaign to decarbonise transport is being fought on many fronts and Zemo Partnership and our members are actively engaged, together with government, in developing many of them.

If you or your organisation has a stake in the transition to net zero and would like to play a constructive part in the journey, do consider joining the Partnership. There's a lot more details at: <https://www.zemo.org.uk/join-us.htm>.