

NEW ENERGY WORLD

ISSN 2753-7757 (Online)

On the move: decarbonising the UK's transport

5/4/2023

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▲ In the near-term, renewable fuels could decarbonise buses; in the longer-term, hydrogen might substitute ICE buses, particularly in rural or long-distance routes

Photo: Zemo Partnership

How exactly is the move to alternative, low-carbon fuels for UK road and rail users going to play out in the next few years? Here, Gloria Esposito, Head of Sustainability at Zemo Partnership, a public-private partnership that aims to accelerate transport to zero emissions, discusses the options for cars and vans, heavy goods vehicles (HGVs), non-road vehicles and the railway.

Today, low-carbon fuels contribute about a third of all carbon savings from domestic transport. As electrification ramps up in specific transport sectors, the long-term role of fuels will clearly change and the UK government is currently considering what a coherent future strategy should look like.

The Renewable Transport Fuel Obligation (RTFO) is, at present, the key measure driving the supply of low-carbon fuels. The RTFO has set a target for these fuels to supply 14.6% of all road transport demand by 2032.

Today, low-carbon fuels are mainly blended into retail petrol and diesel, notably bioethanol (E10) and biodiesel (B7). They are also supplied as pure or blended products to heavy-duty vehicle fleets, and operators of non-road mobile machinery (examples are biodiesel B20, hydrotreated vegetable oil (HVO) and biomethane).

The UK's 2021 Transport Decarbonisation Plan recognised the need to maximise the benefits of sustainable low-carbon fuels, setting out the

government's commitments to develop a strategy for them to 2050 and thus send a clear signal about the vision for the sector.

Engaging stakeholders

To help inform the government's strategy considerations, Zemo Partnership carried out a widespread stakeholder engagement process, asking a range of questions about the potential role of different low-carbon fuels across different transport modes, with the aim of understanding what needs to be done to realise their full potential in contributing to the transport decarbonisation targets.

Over 150 organisations from 13 different stakeholder groups provided input through a series of 28 workshops.

Participants noted that early reductions in greenhouse gas (GHG) emissions are essential to pave the way to meeting carbon budgets and net zero emission transport targets in the long term, and that low-carbon fuels have the potential to deliver some of these. However, urgent actions are needed to scale up low-carbon fuel adoption, with key opportunities in areas such as harder-to-electrify long-haul HGVs, coaches and non-road mobile machinery (NRMM), as well as in the rail sector, which stakeholders believe will be challenging to fully electrify.

There are also near and medium-term opportunities for renewable fuels to displace existing fossil fuels in the legacy internal combustion engine (ICE) car and van fleet, although volumes are expected to decline as phase-out dates for diesel/petrol ICE engines from 2030/2035 take greater effect.

Buses, too, represent an opportunity for renewable fuels, with biomethane highlighted as representing a near-term opportunity and renewable, drop-in diesel substitutes offering a potential solution for legacy ICE buses. There are longer-term opportunities for hydrogen, especially where battery electric vehicles (BEVs) might be challenging, such as for rural or long-distance

routes. There are also medium to long-term opportunities for hydrogen (again from renewable sources) use in buses and other heavy vehicles, particularly those used on rural or long-distance routes.

Urgent actions are needed to scale-up low-carbon fuel adoption, with key opportunities in areas such as harder-to-electrify long-haul HGVs, coaches, non-road mobile machinery as well as in the rail sector.

How can the UK maximise the potential afforded by low carbon fuels?

Policy certainty and stability, of course, was viewed as an essential building block for progress. An important element of this is the agreement of common standards for ensuring low-carbon fuels' sustainability performance.

Zemo Partnership's Renewable Fuels Assurance Scheme (RFAS) is one response to the need for common standards and market confidence. The RFAS verifies claims made by companies supplying renewable fuels to heavy-duty vehicle and equipment operators regarding their products' GHG emission savings and provenance of raw material feedstocks.

In the current energy crisis, 'home grown' renewable fuels can support our energy security needs and generate jobs and industrial growth, with long-term investable potential, given a clear policy commitment.

Which are the renewable fuels of the future?

Stakeholders expect a variety of liquid and gaseous low-carbon fuels to play a role over the next three decades and the majority think that this will take place through a range of fuel pathways (from feedstock generation to fuel production, distribution and combustion).

There was wide agreement that biofuels use in road transport should be maximised over the next decade to rapidly reduce GHG emissions, while electrification and its infrastructure is still a nascent market. Some participants favour the use of liquid biofuels for road transport, before shifting biomass feedstocks to 'harder to decarbonise' sectors such as aviation from 2030 onwards.

The right fuel for the right use case

Stakeholders were asked to comment on the prospects for the adoption of low-carbon fuels across different sectors of road transport.

The expected growth in electrification of cars and vans over the next decade is seen as an opportunity to liberate some bio/renewable diesel to other sectors and, particularly, for use in HGVs over the medium-term. However, HGVs have a very wide range of operations and duty cycles, requiring the right fuel to be matched with the right application, so a range of low-carbon fuel options are likely to be required.

High blends of biodiesel and drop-in renewable biodiesel offer an attractive route for 'harder to electrify' HGVs operating the longest, high mileage duty cycles and with the highest payloads. Biomethane is already used for a variety of trucking operations and it, too, could have an important part to play in the medium-term to power heavier, long-distance vehicles and articulated HGVs in particular.

A role for hydrogen?

Zemo's stakeholder workshop participants were also asked for their views on the prospects for green hydrogen produced from renewable energy sources. Stakeholders commented that there may be a medium or long-term role for hydrogen, but this is highly dependent on investment in vehicles and infrastructure and their subsequent deployment rates. Currently, there is no attractive economic case for operators considering running their fleet on green hydrogen.

Low-carbon fuels for other transport modes

Stakeholders commented that the UK's railways will be challenging to fully electrify in the next 30 years, particularly on remote, lesser-used and rural lines. Many passenger and freight trains are very infrequently replaced and new diesel trains manufactured today are likely to continue to operate beyond 2050. Freight rail, too, has demanding operational requirements, so for this and a range of rail use cases, drop-in renewable diesel may be the only practical decarbonisation option into the longer-term.

While renewable hydrogen has been proposed as an alternative – in common with many potential road uses – there are a range of challenges in terms of the use of hydrogen for rail transport relating to its storage, refuelling and safety.

Zemo's stakeholder workshops also discussed the potential role of bio/renewable fuels in the NRMM sector (one that has recently been the focus of greater attention, having been largely ignored because of its diversity, complexity and modest impact on overall GHG emissions). NRMM often operate in urban environments, so air quality considerations may also be a significant factor.

NRMM, like trains, can have an asset life of up to 30 years. Moreover, their applications, use profiles and locations are very diverse and, consequently, they present bespoke challenges in terms of the move to zero emission technologies. As a result, stakeholders expect diesel ICE engines will continue to dominate the NRMM market for some time, creating an opportunity for drop-in renewable diesel, which may be the only practical alternative.

In the medium to long-term, some stakeholders commented that for certain applications, such as tractors, hydrogen-ICE engines or biomethane could become realistic alternatives for a zero carbon solution.

What are the main barriers to low-carbon fuel deployment?

For end-users, there was general agreement that, currently, the cost of low-carbon fuels is the primary factor influencing purchase behaviour. Typically, they are more expensive and, for some users, up-front investment is also likely to be needed, for example in new fuel storage tanks and vehicle adaptations.

Ensuring that there is a business case for the lifetime of a vehicle asset is considered vital to encourage the use of low-carbon fuels. Consequently, many stakeholders pointed to the need for fiscal incentives to be made available to support uptake.

For fuel producers, suppliers and investors, the existence of an assured market demand for low-carbon fuels – and its scalability and longevity – determines the business case. Investments in fuel production and marketing are also more likely to be taken where there is greater certainty over future prices, so more visibility in terms of future revenue streams and fiscal policy is needed.

Stakeholders also pointed to the need for greater certainty around the availability of the raw materials and feedstocks needed to make low-carbon fuels. With increasing global competition for biogenic feedstocks, in particular used cooking oil (UCO), future supply availability for particular markets is uncertain.

The rapid transformation in energy markets as a result of the 'electrification revolution' is further complicating the picture as competition between transport and industrial sectors for renewable electricity and green hydrogen is inevitably going to grow.

The role of government

Where all stakeholder groups were agreed was around the fact that there is a critical and central role for government policy in terms of the future potential and deployment of low-carbon fuels. They called on the government to publish its strategy soon and, within it, to send clear and long-term signals of support and commitment to the role of low-carbon fuels in helping to meet the net zero goal.

They called on government to identify a vision for what the low-carbon fuels landscape will look like in 2050, to set near, medium and long-term opportunities for decarbonisation across transport modes and to draw a clear roadmap and directions to achieve the vision. A variety of policies and regulations will be needed to support low-carbon fuel production and use.

The strategy, they said, needs to include a clear recognition of the importance of life-cycle greenhouse gas emission considerations when making fuel choices and a commitment to raise awareness in this regard. Stakeholders strongly support the idea that the RTFO should evolve from a volume renewable fuel-based target to a GHG-based emissions target.

As for the targets, stakeholders called on the RTFO to be more ambitious and extend beyond 2032 to provide greater long-term security for participants in the market to deliver on the government's net zero ambitions.

Click [here](#) to view the full report on Zemo's low-carbon fuel strategy workshops.

Editor's note: The UK government last week unveiled a [package of measures](#) designed to 'turbocharge' the country's progress towards decarbonising transport. The measures support the shift to electric vehicles (EVs), as well as the production of sustainable aviation fuel (SAF) in the UK. The government also put out for consultation its new [Zero Emission Vehicle Mandate](#) and reiterated its plan to phase out the sale of all new petrol and

diesel powered cars by 2030 and all non-zero emission cars by 2035; in addition noting it has no plans at this juncture to follow the EU's example of allowing the sale of new cars running on e-fuels beyond 2035.



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