

The Green Pages

NEW FUELS GUIDE



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Welcome to the latest edition of our new fuels supplement

At the PEIMF, we support our members with education and help on traditional petroleum products and services and INSITE is always packed with information.

'The Green Pages' is a series of regular special supplements, in which we endeavour to cover many aspects of new and alternative fuels, during the huge changes and developments in the industry.

Electric vehicle charging is in everyone's consciousness, but there is a lot more going on, for both fuelling and the infrastructure involved.

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Enabling customers to achieve Net Zero

For PEIMF committee member Robin Futcher, 'Net Zero' week in July served as motivation to promote the following message regarding the importance of driving new technologies.

The stark truth is that we are facing a global climate crisis. So unless we all start to contribute to reaching net zero the future will be bleak.

As Managing Director of our company, I pledge that we will use our influence within the industry to invoke change and drive forward new technologies such as

hydrogen. Additionally in the short term, we will encourage our customers to embrace this transition by utilising alternative fuels, such as HVO, wherever possible.

FREE GUIDANCE

Finally to supplement this, we will provide free technical guidance to enable our customers to audit their own installations; in an effort to further reduce the risk of their environmental impact.

By 2026, we aim to have migrated our entire network to only offering support to those customers operating with

renewable fuels. By 2030 we hope to have transitioned at least 50% of our commercial customers over to Hydrogen.

We can all play our part, and we encourage you to embrace the ethos of #netzeroweek and share your commitment to change.

Robin Futcher is managing Director of Commercial Fuel Solutions Ltd; specialists in the design, development, manufacture and distribution of fuel storage and transfer systems. They provide a range of professional solutions to suit all areas of industry, with systems recognised for durability, performance and reliability.

www.commercialfuelsolutions.co.uk



Accelerating the move to zero emission mobility in the UK

We are a not-for-profit, independent partnership, jointly funded by government and our members, whose breadth of backgrounds and perspectives make us unique.

We are collaborative, bringing together government, industry, NGOs, experts and the widest range of key stakeholders at the highest levels, with a shared vision of accelerating transport to zero emissions.

We shape government policy, regulation and initiatives, influence business strategy and provide information and advice to those working to reduce emissions, improve air quality, and combat climate change through cleaner mobility.

Active since 2003 as the Low Carbon Vehicle Partnership, we've played a pivotal role successfully delivering the UK's low emission transport targets.

In February this year, acutely aware of the growing climate emergency and that 'low' is now not enough, we relaunched as Zemo Partnership, embracing a bold new chapter and the need for accelerated change to zero emissions.

From personal transport to freight, fleet and fuels, we are determined to create a shift in the way people think about mobility – and steer them towards a future of zero emissions, sustainable transport that's better for all.

ZEMO PARTNERSHIP'S MISSION IS:

"Driving the decisions today that result in practical changes for a cleaner, more sustainable transport world tomorrow".

OUR AIMS ARE:

- To facilitate cross-sectoral engagement between industry and other stakeholders with the aims of:
 - Developing collaborative initiatives that develop the market for low carbon vehicles and fuels
 - Building understanding and consensus regarding the optimal pathways to low carbon road transport
 - Influencing Government and other decision makers on future policy directions and optimal policy mechanisms



- To encourage research, demonstration and commercialisation of low carbon automotive technologies in the UK and help UK businesses to participate in emerging markets
- To contribute towards the setting and achievement of UK Government targets for carbon reduction from the road transport sector
- To coordinate an effective flow of information within and between industry and other stakeholders to:
 - Raise awareness of recent developments and new opportunities
 - Improve knowledge and awareness of key issues
 - Increase stakeholder understanding about the mission of the Partnership and its achievements.

Zemo Partnership reviews its activities, based on the overall objectives, on an annual basis. Progress is reported periodically to the board, which comprises:

- Automotive manufacturers
- Automotive supplier
- Consultant or technology provider or after service
- Fuel or energy supplier
- Transport operators and consumer organisation
- Public sector (including trusts, agencies NDPBs and local government)
- Environmental, academic and other organisations

ZEMO PARTNERSHIP NAME LAUNCH IN FEBRUARY THIS YEAR FROM LOWCVP

FIRST VIRTUAL ANNUAL CONFERENCE 2020

TOWARDS NET ZERO
Business, Commercial Vehicle Working Group Manager and Neil Smith, Head of Commercial at the Low Carbon Vehicle Partnership outline the latest trends and technologies for decarbonising the freight sector.

LowCVP is currently looking into the potential role along pilot electric fleet for high speed & surface, including bioethanol, in decarbonising the road freight sector.

ELECTRIC VEHICLE ENERGY TASKFORCE:

Bringing senior cross sector stakeholders together to guide Government and industry on ensuring our energy system is fully ready for the mass take up of EV.

OUR NEW ENERGY INFRASTRUCTURE WORKING GROUP:

Brings members and Government together to actively support the decarbonisation of the entire road transport sector.

- Electrification of depot based fleets: workshops
- Guidance on local energy and transport planning: working group
- Standards for smart charging and cyber security
- Data requirements for smart charging

FUELS WORKING GROUP:

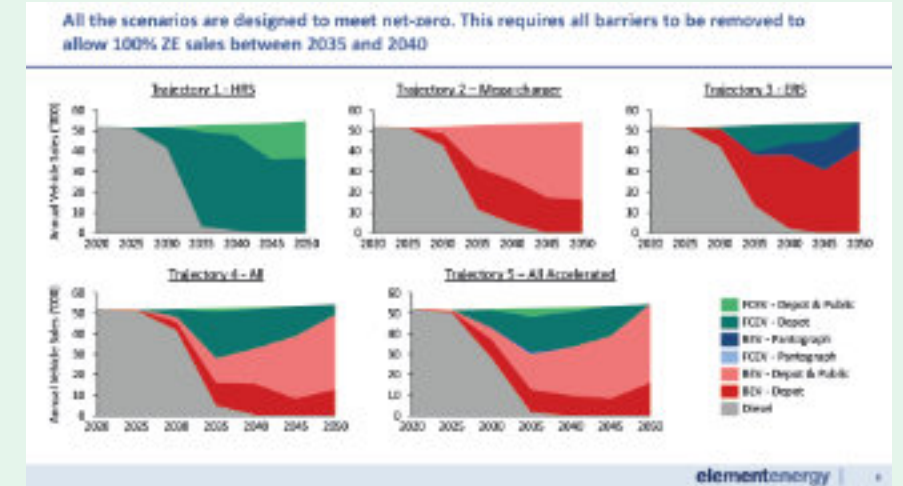
Developing schemes and initiatives to increase the adoption of sustainable low carbon fuels, such as biofuels and renewable hydrogen.

- Transport energy network report and roadmap
- Renewable fuels guide
- The Role of hydrogen in net zero transport
- E10 Petrol consultation and announcement
- Innovations in sustainable fuels webinars

Decarbonising UK freight
Zemo Partnership Webinar
1st March 2021

greg.archer@transportenvironment.org
@greggarcher

Accelerating the Shift to Zero-Emission HGVs Zemo Webinar
1st March 2021
elementenergy
Richard Riley
richard.riley@element-energy.co.uk



BUS AND COACH WORKING GROUP:

Accelerating the introduction of ultra-low and zero emission buses

- Electrification of bus fleets webinars
- Bus decarbonisation taskforce
- Low emission freight trial report
- Electrification of commercial fleets
- Zero emission vehicle policy
- Freight emission reduction group
- Supporting HGV decarbonisation

PASSENGER CAR WORKING GROUP:

Working with manufacturers, fleet operators, suppliers, environment and consumer groups to accelerate the adoption of zero emission cars.

- Consultation on ending the sale of new petrol, diesel and hybrid cars & vans
- Powered light vehicles
- Launch of 'new car environmental label' 2020
- PR launch & dealer guide for new car environmental label

COLLABORATIVE INITIATIVES:

Joint working group projects where content crosses over multiple sectors or falls outside existing work areas, overseen by the Members Council

- Vehicle life cycle analysis webinars
- CAZ workshop for local authorities
- Government consultation analysis & response

Jaguar Land Rover to develop hydrogen-powered Defender fuel cell prototype

- Jaguar Land Rover has announced hydrogen concept to be based on new Land Rover Defender
- Hydrogen fuel cell electric vehicle (FCEV) prototype to begin testing
- Hydrogen FCEVs forecast to top 10 million by 2030 with 10,000 refuelling stations worldwide*
- Project part of company's aim to achieve zero tailpipe emissions by 2036 and net zero carbon emissions across supply chain, products and operations by 2039



Jaguar Land Rover is developing a prototype hydrogen fuel cell electric vehicle (FCEV) based on the new Land Rover Defender, with testing scheduled to begin this year.

The FCEV concept is part of Jaguar Land Rover's aim to achieve zero tailpipe emissions by 2036, and net zero carbon emissions across its supply chain, products and operations by 2039; in line with their Reimagine strategy.

FCEVs, which generate electricity from hydrogen to power an electric motor, are complimentary to battery electric vehicles (BEVs) on the journey to net zero vehicle emissions.

Hydrogen-powered FCEVs provide high energy density and rapid refuelling, and minimal loss of range in low temperatures, making the technology ideal for larger, longer-range vehicles, or those operated in hot or cold environments.

Since 2018, the global number of FCEVs on the road has nearly doubled while hydrogen refuelling stations have increased greatly. By 2030, forecasts predict hydrogen-powered FCEV deployment could top 10 million with 10,000 refuelling stations worldwide.

Jaguar Land Rover's advanced engineering project, known as Project Zeus, is part funded by the government-backed Advanced Propulsion Centre.

This will allow engineers to understand how a hydrogen powertrain can be optimised to deliver the performance and capability expected by its customers; from range to refuelling, and towing to off-road ability.

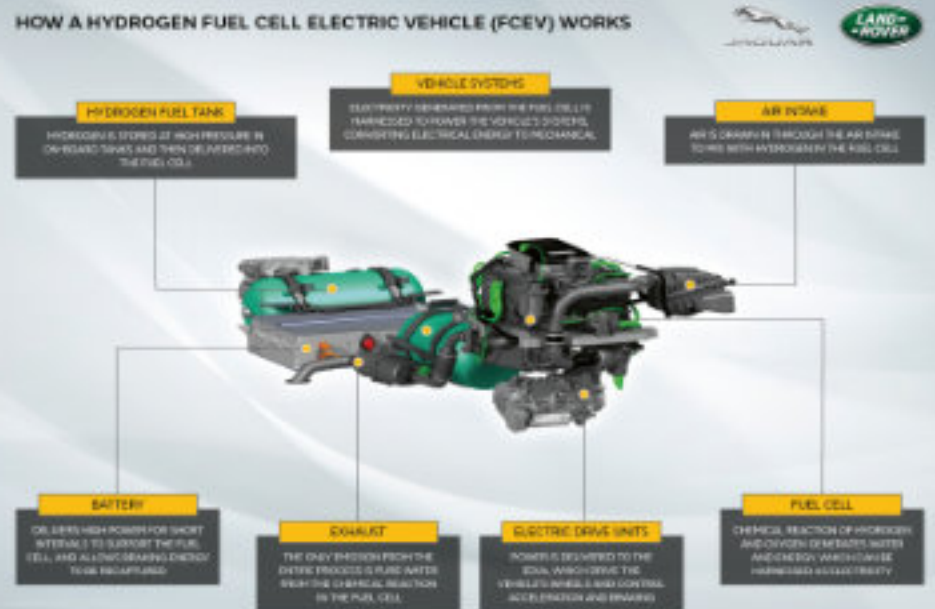
The zero tailpipe emission prototype New Defender FCEV will begin testing towards the end of 2021 in the UK to verify key attributes such as off-road capability and fuel consumption.

To deliver Project Zeus, Jaguar Land Rover has teamed up with world class R&D partners, including Delta Motorsport, AVL, Marelli Automotive Systems and the UK Battery Industrialisation Centre (UKBIC) to research, develop and create the prototype FCEV.

Ralph Clague, Head of Hydrogen and Fuel Cells, Jaguar Land Rover says;

"We know hydrogen has a role to play in the future powertrain mix across the whole transport industry, and alongside battery electric vehicles, it offers another zero tailpipe emission solution for the specific capabilities and requirements of Jaguar Land Rover's world class line-up of vehicles."

The work done alongside our partners in Project Zeus will help us on our journey to become a net zero carbon business by 2039, as we prepare for the next generation of zero tailpipe emissions vehicle."



Charging an electric vehicle should not be a postcode lottery

'Zero Emission Vehicles' - published in July, is a report in which MPs on the Transport Committee deliver a set of recommendations to Government to boost the production and purchase of electric vehicles, as the net zero deadline approaches.

Questions remain on whether the Government's current plans are enough to deliver the public charging infrastructure needed across all regions of the UK and whether it will benefit everyone, says the report. Accessible and reliable charging infrastructure must be available by 2030, but drivers who live in rural or remote areas or who don't have off-street parking risk being left behind.

Unless charging habits change, or the National Grid is strengthened, concerns exist that the charging needs from millions of new electric vehicles will cause blackouts to parts of the country.

THE GOVERNMENT MUST:

- Work with the National Grid to map national coverage to eradicate 'not-spot' areas and identify locations where the Grid will not cope with additional usage
- Make public charge provision a requirement of local development and provide funding for local planning and transport bodies to hire staff with a mandate to deliver charging infrastructure
- Protect the consumer from excessive charges and multiple accounts when charging in public
- Address the discrepancy between the 5% VAT incurred for home charging and 20% VAT for on-street
- Insist that industry uses price to change consumer charging behaviour to a 'little but often' approach and at times when the National Grid can meet total demand
- Boost the manufacturing and sales of new electric vehicles by requiring those who sell the fewest electric vehicles to buy credits from those who produce the most; such credit to then be used to reduce the purchase price of electric vehicles (the 'ZEV Mandate').



With charging at home substantially cheaper than on-street charging, pricing must be fair for people who charge their electric vehicles in public spaces. The Committee welcomes the Government's commitment to regulate interoperability between charge points and pricing transparency for public charge points later this year. However, mandating industry to use pricing to move consumer behaviour towards a 'little and often' refuelling habit will also help.

Government must also introduce a zero-emission vehicle mandate as a matter of priority if it is to hit its target of 100% new zero emission vehicles (ZEVs) by 2035. A ZEV mandate would incentivise car manufacturers to steadily increase sales of zero emission vehicles towards the 2030 target for all new vehicles to have 'significant zero emission capability'. This would bring ZEV vehicles within reach of more consumers encouraged by cost-effective ways to support purchases compared to taxpayer-funded incentives.

A stronger marketplace generated by an increased vehicle supply from global manufacturers to the UK market would also bring down costs.

CHAIR'S COMMENT

Chair of the Transport Committee, Huw Merriman MP said:

"As car usage returns to pre-pandemic levels, we must keep our sights locked on the target: all new cars and vans should be electric by 2035 at the latest. To help consumers see their route to a zero-emission world, choosing to run an electric vehicle must be as seamless as possible. Today we offer a set of recommendations to help Government hit the accelerator on its ambition. "Putting guarantees in place on infrastructure is crucial but one report after another flags concerns to Government about the provision of electric car charging infrastructure. Let ours be the last: it's time that ministers set out the route map to delivering a network of services for everyone across the UK."

Continued overleaf

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“The Government’s inclusion of a ZEV mandate in a recent consultation is welcome but not enough on its own. Charging electric vehicles should be convenient, straightforward and inexpensive and drivers must not be disadvantaged by where they live or how

they charge their vehicles. Shifting the subsidy from the taxpayer to the manufacturer will incentivise those who deliver the fewest electric vehicles in our showrooms to up their game. “Unless the National Grid gains more capacity, consumer behaviour will have to

alter so that charging takes place when supply can meet the additional demand. The alternative will be blackouts in parts of the country. We also cannot have a repeat of the broadband and mobile ‘not spot’ lottery which would mean those in remote parts cannot join the electric vehicle revolution.”

The report notes that the move to electric vehicles can only be one strand in the UK’s net zero ambitions. The Government has now published its Transport Decarbonisation Plan and further papers are expected. Having considered zero emission vehicles, the Committee will turn its attention to road pricing. The Committee will continue to scrutinise government work in this area, particularly in the run up to the UK hosting COP26 in the Autumn.

Conclusions and recommendations

UPTAKE OF ZERO EMISSION VEHICLES

1. A healthy used electric vehicle market is critical to ensuring that electric vehicles are not the sole preserve of people who can afford new models. The Government’s position is that current incentives to stimulate the sale of new EVs are sufficient to support the development of the second-hand EV market. However, electric vehicles that will be traded on the second-hand market in three to five years’ time are likely to be more expensive to buy upfront than comparable ICE models. To drive mass consumer uptake of ZEVs, the Government must ensure that the market facilitates the supply of affordable new and used electric vehicles.
2. In order to ensure that the Government achieves the targets set out in the Transport Decarbonisation Plan, it may need to intervene to support the second-hand market in electric vehicles until price parity with comparable ICE vehicles is reached.
3. A zero emission vehicle mandate would:
 - be revenue neutral;
 - provide certainty to allow manufacturers to invest in the UK and supply a sufficient volume of ZEVs to meet the UK’s decarbonisation commitments;
 - reduce costs for consumers by increasing the supply of electric vehicles; and
 - free taxpayers from the annual £135 million cost of the plug-in car grant.
4. In order to achieve its 2030 and 2035 targets, the Government must introduce a ZEV mandate to incentivise manufacturers to sell an increasing proportion of ZEVs or to purchase tradeable credits year-on-year, reaching some 100% ZEV sales by 2030.
5. The Government must define ‘significant zero emissions capability’ for the automotive manufacturing industry, while ensuring that only the cleanest possible hybrid technology is



available until 2035. It should also maintain a technology neutral approach to the transition to ZEVs and explore the potential of alternative fuels, such as hydrogen or other alternatives to petrol and diesel, where possible.

CHARGING INFRASTRUCTURE

6. Drivers who do not have access to off-street parking and who live in rural or remote areas may struggle to charge their vehicles. To ensure that a comprehensive network of electric vehicle charging infrastructure is in place by 2030, sub-national transport bodies and local authorities will need to implement strategies to deliver a range of practical and accessible charging solutions to suit local needs.
7. As part of its electric vehicle charging infrastructure strategy, the Government must explain:
 - a) how it will support all regions and local authorities to deliver sufficient and well-maintained charging infrastructure solutions tailored to local needs, so that no area is left behind; and
 - b) how it will ensure that the roll-out of charging infrastructure keeps pace with the increase in EVs and that the right types of chargers are in the right locations.
8. To facilitate the roll-out of charging infrastructure, the Government must:
 - a) use the upcoming Planning Bill to make public charge point provision a requirement of local plans;
 - b) make funding for the on-street residential charging scheme dependent upon local authorities having detailed charge point plans in place which support rapid charging options; and
 - c) ring-fence a portion of the £90m local charging scheme to allow local authorities to employ dedicated ‘charge point champions’ to deliver local charging infrastructure strategies.



9. The Government must work with National Grid to map the electricity network to assess potential weak areas, especially in rural locations, and to develop a plan to prevent ‘not-spots’ from emerging similar to those during the roll-out of broadband and mobile coverage.
10. Project Rapid, which specifies the number of charge points on the strategic road network by 2023 and beyond, is welcome. However, the spending priorities for the £950 million rapid charging fund are currently obscure. Given the time and expense involved in upgrading grid connections, it is crucial that this money is distributed to unlock investment, provide fully future-proofed grid capacity and secure public confidence in charging infrastructure.
11. The electric vehicle charging infrastructure strategy must set out:
 - a) how the £950 million rapid charging fund will be spent to facilitate the implementation of charging infrastructure; and
 - b) the measures that the Government is taking to identify and address under-provision at locations outside the strategic road network, where grid connection costs and grid upgrades are expensive and the business case for investment is weak.
12. The Government must amend the wayleave regime for installing charging infrastructure to ensure that that regime does not act as a barrier to roll-out.
13. Charging an electric vehicle should be convenient, straightforward, and inexpensive. To boost consumer confidence in the charging network, to maximise convenience and value for motorists and to facilitate connectivity, all charge points should be interoperable and provide a seamless experience for drivers. We welcome the Government’s commitment to regulate interoperability and pricing transparency for public charge points later in 2021.



14. In the charging infrastructure strategy, the Government must explain how it will improve the consumer experience at public charge points and ensure that
 - a) drivers can seamlessly access any charging network in any location at any time; and
 - b) charge point operators are not disincentivised from investing in charging infrastructure.
15. People who rely on public charging infrastructure should get value for money and should not be disadvantaged by unfair pricing mechanisms.
16. The Government must explain how it plans to tackle the potential price differential faced by people who cannot charge their vehicles at home and are compelled to rely on on-street public charge points. It could do this by:
 - a) protecting the consumer from excessive costs where there are risks of local monopolies emerging; and
 - b) addressing the discrepancy between the 5% VAT incurred on electricity at home compared with the 20% VAT incurred at public charge points.



MANAGING ENERGY DEMAND AND SMART CHARGING

17. We welcome the Government’s commitment to mandate that all new private charge points should be equipped with smart functionality and to introduce the relevant legislation later in 2021.
18. The Government must mandate industry to:
 - a) use price as a lever to shift consumer behaviour away from conventional refuelling habits towards ‘a little but often’ approach; and
 - b) incentivise consumers to charge at times when there is less demand on the electricity grid.

UK Hydrogen strategy

As the Prime Minister made clear when he launched his ‘Ten point plan’ for a ‘Green industrial revolution’ last year, developing a thriving low carbon hydrogen sector in the UK is a key plank of the government’s plan to build back better with a cleaner, greener energy system. With the potential to overcome some of the trickiest decarbonisation challenges facing our economy, including our vital industrial sectors, and secure economic opportunities across the UK, low carbon hydrogen has a critical role to play in our transition to net zero.

Here we look at the section within the report, relating specifically to transport.

Use of hydrogen in transport

Hydrogen is likely to be fundamental to achieving net zero in transport, potentially complementing electrification across modes of transport such as buses, trains and heavy goods vehicles (HGVs). It is also likely to provide solutions for sectors that will not be able to fully decarbonise otherwise, including aviation and shipping.

Low carbon hydrogen can provide an alternative to petrol, diesel and kerosene as it can be used directly in combustion engines, fuel cells and turbines or as feedstock for production of transport fuels, including ammonia and sustainable aviation fuels.

We expect low carbon hydrogen to play a key role in decarbonising the sector, which is the largest single contributor to UK domestic GHG emissions and was responsible for 27 per cent of emissions in 2019.

Transport is also a crucial early market for hydrogen; driving some of the earliest low carbon production in the UK. There are over 300 hydrogen vehicles on UK roads, mostly passenger cars and buses, and the government is supporting hydrogen use in transport with a £23 million ‘Hydrogen for transport’ programme. Our latest analysis places transport as one of the biggest components of the hydrogen economy in future.



Scaling up the hydrogen economy

How will we develop and scale up hydrogen in transport over the 2020s?

We expect that the role of hydrogen in transport will evolve over the course of the 2020s and beyond. To date, road transport has been a leading early market for hydrogen in the UK. Going forward, we expect hydrogen vehicles, particularly depot-based transport including buses, to constitute the bulk of 2020s hydrogen demand from the mobility sector. Fuel cell hydrogen buses have a range similar to their diesel counterparts. Back-to-depot operating means hydrogen refuelling infrastructure can be more centralised and is likely to be compatible with distributed hydrogen production expected in this period.

Concurrently, we will undertake a range of research and innovation activity which will focus on difficult to decarbonise transport modes, such as heavy road freight. As we demonstrate and understand these larger-scale applications we are likely to see more diversity in transport end uses in the late 2020s and early 2030s.

By 2030, we envisage hydrogen to be in use across a range of transport modes, including HGVs, buses and rail, along with early stage uses in commercial shipping and aviation. Beyond this we expect to see an increased role for



hydrogen in aviation and shipping decarbonisation which could become a large component of the overall hydrogen demand in the long term.

We recognise that the longer-term role for hydrogen in transport decarbonisation is not yet clear, but it is likely to be most effective in the areas where energy density requirements or duty cycles and refuelling times make it the most suitable low carbon energy source. Key challenges in this area include technology uncertainty, lack of existing hydrogen infrastructure, cost differentials and low numbers of hydrogen powered vehicles.

Continued investment in research and innovation by government and industry will help to overcome these. As we learn more about ways in which hydrogen can be used in transport, we will need to put policy in place to support this technology rollout.

What are we doing to deliver?

Throughout the 2020s, government is taking forward a programme of development and demonstration of hydrogen technologies across different transport modes.

PUBLIC TRANSPORT

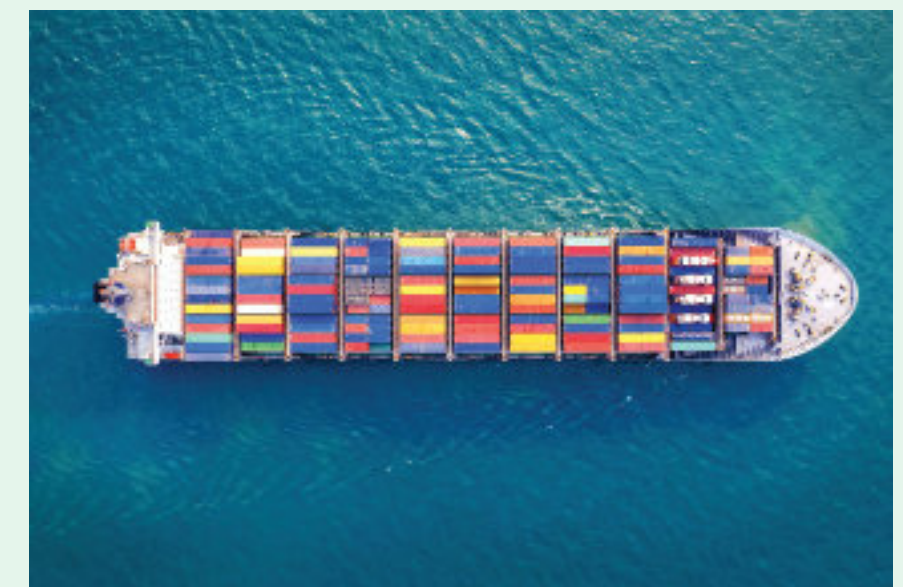
Approximately two per cent of England’s local operator bus fleet is now zero emission (either battery electric or hydrogen fuel cell). We will deliver the ‘National bus strategy’ and its vision of a green bus revolution, including setting an end date for the sale of new diesel buses and the Zero Emission Bus Regional Areas (ZEBRA) scheme. ZEBRA will provide up to £120 million in 2021/22 to begin delivery of 4,000 new zero emission buses, either hydrogen or battery electric, and the infrastructure needed to support them.

RAIL

Rail is already one of the greenest ways of moving people and goods, and government is committed to making it even greener, in line with our net zero target by 2050. To decarbonise currently unelectrified parts of the network, electrification will likely be the best solution because electrified trains are faster, quicker to accelerate, more reliable and cheaper. There will also be a role for new traction technologies, like battery and hydrogen trains, on some lines where they make economic and operational sense.

HEAVY GOODS VEHICLES

Large long-haul HGVs are the most challenging segment of the road sector for developing zero emission options, due to their long journey distances and heavy payload requirements. Some vehicles are in constant use and therefore require fast refuelling to meet operational requirements.



We are investing up to £20 million this financial year in designing trials for electric road system and hydrogen fuel cell HGVs and to run a battery electric trial to establish the feasibility, deliverability, costs and benefits of these technologies in the UK. To further support the shift away from fossil fuels, government is also consulting on the phase out date for the sale of new non-zero emission HGVs.

SHIPPING AND AVIATION

Shipping and aviation are responsible for approximately five per cent of global emissions and are some of the most difficult areas of transport to decarbonise.

HYDROGEN IN SHIPPING

Low carbon hydrogen and hydrogen derived fuels, such as ammonia and methanol, are likely to play a crucial role in the decarbonisation of the maritime sector. Analysis commissioned by the Department for Transport (DfT) estimated that by 2050 there could be massive demand for hydrogen based fuels (principally in the form of ammonia) from UK domestic and international shipping.

Coupled with decarbonisation of road and rail freight, hydrogen use in shipping could help create an end-to-end low carbon freight system from port to door. The potential for adopting battery electric technology in the maritime sector is mostly constrained to domestic navigation: the size and weight required for battery powered ships means that their range is limited and they are not a compatible option with larger ship types.

Hydrogen could be used to decarbonise ships directly, through combustion or in fuel cells, or as feedstock for methanol or ammonia. Liquid ammonia is more energy dense than hydrogen meaning less storage volume is required on vessels, which may represent an effective option for larger ships on long-distance routes. Ammonia is also already internationally transported on ships so some infrastructure and supporting regulations are in place (although this ammonia is currently not low carbon).

Additionally, as set out in DfT's 'Clean maritime plan', research has estimated that the global market for the elements of alternative fuel production technologies in which the UK has a particular competitive advantage (for example, upfront design) could rise to around \$11–15 billion per year (£8–£11 billion per year) by the middle of the century. If the UK were able to maintain its current export market share (estimated to be around 5 per cent of relevant global markets), this could result in economic benefits to the UK of around \$490–690 (£360–£510) million per year by the middle of the century.

This research also found that, while there are significant opportunities for the UK across all abatement options considered, the UK has the strongest competitive advantage in hydrogen and ammonia production technologies, alongside onboard batteries and electric engines.

Government launched the £20 million 'Clean maritime demonstration

competition' in March this year, which aims to accelerate the design and development of zero emission vessels in the UK and will lay the foundations for a network of technology demonstrations, fast-tracking maritime decarbonisation.

Government is also exploring the establishment of a UK Shipping Office for Reducing Emissions (UK-SHORE). This is a dedicated unit within the Department for Transport focused on decarbonising the maritime sector. UKSHORE will build on the success of the Clean maritime demonstration competition, delivering a suite of interventions inspired by our experience with decarbonising other transport modes, looking at programmes such as the Office for Zero Emission Vehicles and the 'Future fuels for flight and freight competition'.

UK-SHORE aims to transform the UK into a global leader in the design and manufacturing of clean maritime technologies and fuels such as hydrogen and ammonia. Government will continue to engage with industry to consider how the establishment of this programme in cooperation with UKRI and Innovate UK could unlock the necessary industry investment in clean maritime technologies.

HYDROGEN IN AVIATION

The proportion of UK GHG emissions from aviation is expected to increase in the future as other sectors decarbonise. We need to tackle these emissions and are keen to do so in a way that capitalises on UK strengths in the aerospace and aviation sectors. To realise this, government has established

the Jet Zero Council, a partnership between industry and government, to focus efforts on accelerating decarbonisation, including with an aim to deliver zero emission transatlantic flight within a generation.

More recently, in July 2021 we published our 'Jet Zero Consultation' which seeks view on our proposed approach to reaching net zero aviation. While there are technological challenges to overcome before hydrogen is used in aviation, interest from the aviation industry is significant. Airbus have announced their ambition to develop and launch a zero-emission large commercial aircraft, powered by hydrogen propulsion, by 2035. Alongside this, through the Aerospace Technology Institute (ATI) programme, government is supporting a number of projects in this area.

SUSTAINABLE AVIATION FUELS

Additionally, hydrogen can be used to refine and produce Sustainable Aviation Fuels (SAF). SAF could play a key role in emissions reduction in the short and medium term, and the development of a SAF industry in the UK could see thousands of new jobs across the country.

In March this year, we launched the £15 million 'Green Fuels, Green Skies' competition to support the production of first-of-a-kind SAF plants in the UK. Government has set out its proposed ambition for SAF uptake in its SAF blending mandate consultation, which was recently published.

MULTI-MODAL PLACE-BASED APPROACH

Areas with particularly strong hydrogen potential could help to improve our understanding of the role of hydrogen in transport, drive local industrial strategies and jump start green recovery. The UK's first 'Hydrogen Transport Hub' in Tees Valley will bring together government, industry and academia to focus on future hydrogen research and development, real world testing and demonstrations.

The Hub, supported by £3 million of initial government development funding this year, will bring a number of hydrogen vehicles to public roads and waterways, alongside the associated refuelling infrastructure.

In March this year we also announced that we will provide £4.8 million (subject to business case) to support the development of a hydrogen hub in Holyhead, Wales. This will pilot the creation of hydrogen from renewable energy and its use as a zero-emission fuel in HGVs

THE RENEWABLE TRANSPORT FUEL OBLIGATION (RTFO)

The RTFO aims to increase the use of renewable transport fuels. Hydrogen produced by electrolysis using renewable electricity, as well as biohydrogen, for example produced through methane reformation of biomethane, are supported through the scheme. In March 2021, government published a consultation on the amendments to the scheme which sought views on a number

of issues related to hydrogen support, including expanding the scope of the RTFO to make renewable fuels from non-biological origin used in maritime, rail and non-road vehicles eligible for support. Government's response to the consultation was recently published, with changes intended to come into effect from January 2022.

Hydrogen is a key alternative to the use of fossil fuels in transport – as well as in industry, power and heat – and will be essential to meeting our CB6 and net zero targets. We will continue to build on our strengths in research and innovation and expertise along the hydrogen value chain to fully realise the potential of hydrogen to support decarbonisation across end use sectors over the coming decade and beyond.

Hydrogen – the flipside

In the Green Pages we try and provide you with all angles in the discussions around new fuels. Here is a summary of a recently published article.

If only there was into a vast, previously unknown source of naturally-occurring free hydrogen in the North sea. Then we really could have a hydrogen strategy. Unfortunately, the chances are next to nil.

What is almost certain is that the hydrogen strategy announced by the government recently will lead to consumers paying much higher prices for energy, possibly even increase greenhouse gas emissions.

It is easy to see why the government is very keen on hydrogen. Potentially, it offers a solution to some of the key parts of the economy: HGV's, aviation, steel-production and home heating. If we could exchange gas boilers for hydrogen-powered ones it would replace the need for heat pumps, costing £10,000 (plus another £10k to insulate older properties to make them suitable). With net zero target of 2050 approaching, the government wants to make all new domestic boilers hydrogen compatible by 2026.

GREEN AND BLUE HYDROGEN

However, while burning hydrogen produces no greenhouse gas emissions, hydrogen first needs to be manufactured. This is where the problems lie. At the moment, all but a small percentage of hydrogen produced worldwide (mainly used in industrial processes) is produced from fossil fuels, which produce large clouds of CO₂; which defeats the object of trying to deliver green energy.

This is why the government wants to underwrite £4 billion worth of private sector development, into alternative methods of manufacturing hydrogen, either:

'Green' hydrogen

Produced via electrolysis of water, or

'Blue' hydrogen

produced from natural gas; but with carbon capture and storage used to try to grab carbon emissions and pump them underground, hopefully for ever.

While green hydrogen would obviously be preferable, it is also far more expensive.

The cost of green hydrogen should come down as technology improves and increases, yet the government's hydrogen strategy is still working on the assumption that it will remain at current prices, even in 2050.

That is why the strategy is also looking at blue hydrogen, which unfortunately is always going to be more expensive than natural gas (manufacturing a fuel from a fuel). Add in the energy consumption of the carbon capture process itself, and we consume significantly extra gas to produce the same energy.



CUTTING GREENHOUSE GASES?

Secondly, this process might not cut greenhouse gas emissions. A study by Cornell University calculated that greenhouse gas emissions from blue hydrogen could be 20% higher than from simply burning gas (fugitive methane emissions and increased gas consumption).

Also, can we be confident that captured carbon dioxide can be relied upon to remain underground for eternity?

Technology will undoubtedly advance, but does the government's hydrogen strategy give us confidence that it will help reach net zero emissions in just 29 years time, without imposing punitive costs on the economy?



Prince Charles visits hydrogen car maker Riversimple

HRH test-drove the zero-emission, hydrogen-powered Rasa and toured the car company's Llandrindod Wells HQ



Recently, HRH the Prince of Wales spent the morning at Riversimple's HQ in Llandrindod Wells, Powys. Riversimple are producing hydrogen electric cars that emit nothing from the tailpipe - but a drop of water. They have plans for two manufacturing plants in Wales, with aims to create high-skilled jobs in the region.

He test-drove a hydrogen electric Rasa, and it's stability and quick acceleration impressed greatly. Hugo Spowers, MD and founder of the company, said;

"It was great fun being the Prince of Wales' passenger in the Rasa and it was wonderful to have the opportunity to share our plans for creating a new, sustainable manufacturing business in mid-Wales."

The Rasa is an ultra-lightweight and super-efficient two-seater; with a 300 mile range and refuelling with hydrogen takes just a few minutes. Riversimple are currently beta-testing their vehicles with the general public in Abergavenny, where they have also installed a hydrogen refueller.

Riversimple is researching potential sites for two manufacturing plants in Powys, with each creating over 200 skilled jobs, plus an around 600 in the supply chain.

USING GREEN HYDROGEN

Riversimple are also partners in the Milford Haven: Energy Kingdom in the Port of Milford Haven, which is exploring the use of green hydrogen in local energy systems.

A number of organisations keen to support the company in its ambitions include the Development Bank of Wales, Barclays, DHL, Siemens and Oil 4 Wales (who have 30 fuel stations across Wales and is committed to transitioning to green fuels on their forecourts).

MORE INFORMATION ON RIVERSIMPLE

Riversimple's purpose is:

"To pursue, systematically, the elimination of the environmental impact of personal transport"

The company is designed to make sustainability profitable, in the design of the product, the business model and the governance.

The Rasa is a lightweight, super-efficient, two-seat electric car powered by hydrogen and is the first of a range of vehicles that Riversimple plans to offer customers. It will be followed by a light commercial van for last mile delivery and a family vehicle.

The Rasa emits nothing but pure water vapour. It is designed to minimise the particulates from tyres and brakes with its low weight, skinny tyres and highly regenerative braking. The Rasa's performance:

- 0-60mph in under 9.7 seconds
- Cruises at 60mph
- Has a range of c.300 miles
- Takes 3 minutes to fill
- Weighs just 655kg
- It achieves the equivalent of c.250mpg

Riversimple are currently building Rasas for trials with the general public, both in Monmouthshire where they have installed a refueller in the town centre of Abergavenny, and in Milford Haven, Pembrokeshire, as part of the Milford Haven: Energy Kingdom demonstration of a local green energy system.

These trials are being supported with grants from OLEV and Innovate UK respectively and the unanimous response from testers so far is that the cars are fun to drive.

The company is also crowdfunding through the Seedrs platform.

www.riversimple.com

