Fuel’s gold – but for how much longer?...

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GALLONS
2/3d gallon
Sorry Sold Out

Seen in St. Mawes, Cornwall, March 2022. 2/3d per gallon… those were the days! (Photograph copyright Kim Henson).

A detailed look at alternative synthetic ‘e-fuels’, what they are and how they may (or may not) fit into the future of transport, classic and otherwise. By Dave Moss.

Kim says:

“Here is Dave’s very comprehensive article, in its entirety and as written by him and representing his own views following his in-depth ‘free rein’ analysis of the subject.

I should mention that this was written before the invasion of Ukraine by Russia, the shock wave implications of which, in terms of fuel and so many other aspects of life of course, are still unfolding.

At the end of the feature I have added a few additional thoughts.

I should like to thank Dave personally for the huge amounts of time and trouble that I know he has spent on researching this feature; Thanks Dave, very much appreciated.”

1. Some background

Since the Department for Transport document “Decarbonising Transport, A Better, Greener Britain” and the European Commission’s “Fit for 55” proposals were published during 2021, Britain and Europe are committed to work towards a “net zero” carbon future. In December they were joined by the US, when a Presidential order was issued requiring net zero emissions by 2050 – adding to a previously announced 50% electric vehicle target by 2030.

Both the British and European phase-out policies are predicated on post-2030 new cars being EV-based, with no private cars using internal combustion engines (ICE) being sold

after 2035. Light vans will also be affected, though the timings are slightly different, while all new HGVs sold in Britain are required to be zero emission by 2040. The UK has recently become the first country committed to phasing out new, non-zero emission goods vehicles up to 26 tonnes by 2035, which in total means that all new vehicles arriving on UK roads must be zero emission within 20 years.

These are hugely ambitious targets, which will redefine the future of roadgoing transport. While everyone will have a view on the benefits or otherwise of such moves, one easily anticipated side effect of such over-arching policies is that most remaining ICE powered cars seem likely to depreciate quite rapidly after 2030, hastening their disappearance from the roads sooner rather than later.

By 2050, internal combustion engines will be little more than idiosyncratic curiosities, found only in lovingly-preserved vehicles, built in times long gone… but these declarations carry particularly worrying implications for classic vehicle enthusiasts everywhere.

2. ## The classic problem: Not many, using not much fuel – and time marches on…

Classic Ford Anglias refuelling en masse. (Photograph copyright Auboné Braddon).

Latest available Federation of British Historic Vehicle Clubs (FBHVC) research suggests there are around 1.54 million officially designated “historic” vehicles over 30 years old, and 1.47 million “classics” aged between 15 and 30, on British roads today. Together they amount to under 1% of UK licensed vehicles – averaging, according to the FBHVC, just 1,200 miles a year. Hopefully, by 2050 more survivors will have joined this total, some, perhaps, not yet regarded as classics, others still awaiting discovery, and yet more joining licensing databases as restorations are completed.

As the drive towards net zero gathers speed, the growing numbers of low and zero-emission vehicles as drivers embrace the future will inevitably result in declining demand for long-familiar petrol and diesel fuels. Yet the fact is, there will only ever be modest numbers of thinly spread older vehicles around still reliant on supplies of "traditional" fuels – and their demand alone will never support continued year-round viability of almost 8,000 currently operational British filling stations. This network has evolved to operate successfully based on mileages covered by vast numbers of vehicles on our roads today, which, according to DfT/DVLA figures, in March 2021 totalled around 31.7 million cars, 4.7 million commercial vehicles, and 1.3 million motorcycles.

For those immersed in preserving, restoring, repairing and enjoying classic vehicles, continued access to suitable fuels is clearly a key requirement. Devotees today thus face big questions: First, how rapidly might declining fossil fuel demand precipitate shrinkage of today's nationwide filling station network – and second, whether any workable fossil fuel alternatives night become available.

3. The decline and fall of fossil fuel supplies…

Declining demand is a top reason for the disappearance of fuel stations, but demand in coming years won't disappear overnight on the basis of latest figures from OICA, the International Organisation of Motor Vehicle Manufacturers. Their calculations suggest that, worldwide, over 1.4 billion vehicles currently have internal combustion engines. Data from European manufacturers Association ACEA indicates that in 2020 there were almost 304 million cars on European roads – and just 0.5% of them were battery powered.

A 2035 combustion-engined new car sales end-date suggests such vehicles could theoretically be in showrooms for another 13 years. Some estimates suggest up to 100 million new ICE cars could be sold in Europe alone before 2035 – adding to continuing worldwide sales – and millions of older vehicles still in regular use. All of these will naturally require liquid fuel.

This said, electric vehicle sales are now growing strongly, with clear signs that

manufacturers are moving swiftly towards mainstream BEV production, anticipating buyers will increasingly turn against “yesterday’s polluting technology”. Electric vehicle uptake will surely accelerate as list prices fall, and technical and battery improvements offset present perceived public disadvantages.

Manufacturers certainly think so: Volkswagen has recently announced its Zwickau plant has become a dedicated electric vehicle production facility – a first step towards building 1.2 million all-electric vehicles worldwide in 2022. The Renault-Nissan- Mitsubishi alliance has announced its future is focussed on pure electric vehicles and connected mobility, with €23 billion being invested supporting a strategy to deliver 35 new EV cars globally by 2030…

There is however a significant Wild Card in this vast equation: The impossibility of predicting what mechanisms future Governments might dream up to accelerate “switchover”, and encourage compliance with chosen net-zero timetables. Measures ranging from incentivising EV purchases to offering generous ICE vehicle scrappage schemes, selectively targeted road pricing – and steeply increasing fossil fuel taxes – must be possibilities… There is also an ultimate solution to transport pollution: One day, could fossil-fuelled vehicles be barred from general use altogether?

4. Any net zero alternatives to petrol and diesel which might suit classic vehicles?

For most classic vehicle enthusiasts this question really has only one answer, though two other approaches are just possible, depending on the size of your bank account., and – especially – on your point of view.

One outside possibility is hydrogen – in use today powering vehicle fuel-cells as a zero-emission alternative to ICE engines. This is the only “obvious” zero emission road vehicle alternative to batteries – though internal combustion engines can run directly on hydrogen. However, wholesale replacement of original ICE powertrains and fitment of a large storage tank will be anathema for owners seeking to maintain originality. Similar issues affect the other alternative, battery electrification. This is certainly possible, and various

professionally converted ICE classics – ranging from Minis, to Land Rovers and Aston Martins – are already on sale.

The most convenient alternative is also the least well known. Synthetic fuel – also known today as electrofuel, e-fuel, synfuel or power-to-liquid – can closely replicate petrol or diesel performance in ICE engines, where, in general terms, it can be used with few modifications. It has been around for a hundred years, with the first volume production achieved via a "coal hydrogenation" process, developed by a specialist industry established in Nazi Germany to power its World War II campaign. Its effectiveness can be judged by US Dept of Energy estimates suggesting that over 92% of wartime Germany's aviation fuel, and 50% of its petrol, came from synthetic petrol.

Emissions-heavy coal could never underpin synthetic fuel production in a net zero future. Nowadays, however, although the technology is in its infancy, and the process has some pretty significant eco-strings attached, other production methods are possible. Various synthesised fuels can be derived from methane made from electrolysis-generated hydrogen, combined with CO2 from several possible sources. Using so-called "direct air capture" of CO2, a "closed loop" results, where CO2 emissions resulting from burning the fuel in an ICE engine can closely match the amount removed from the atmosphere in its production.

The process thus appears almost carbon neutral – which is not the same as carbon zero… though if supplies were readily available, e-fuels appear suitable to keep ICE vehicles running into a low carbon future. Several pressure groups have been pursuing that ambition. However, amongst academics, politicians, environmentalists and other pressure groups vocally opposing that approach, there's a clear preference for eliminating internal combustion engine use entirely.

5. Focus on a zero carbon future?

There are complex, wide ranging – and perfectly valid – reasons for that preference. Production of liquid e-fuel and hydrogen raise broadly similar carbon efficiency issues, and. both demand big background investments, and significant energy supplies for manufacture.

Practical realisation of environmental advantages over fossil fuels rest largely on using only sustainable electricity for production – and afterwards, how efficiently that "fuel" is converted into vehicle movement. Both also require post-production transportation and storage, carrying further environmental implications. Hydrogen's big advantage in all this is the reduction of gaseous vehicle exhaust emissions to zero, while e-fuels recycle existing atmospheric CO2.

A 2018 Frontier Economics research report starkly illustrated the fundamental differences between low carbon "fuel" sources, showing that battery electric vehicles can reach total overall carbon efficiency from power generation to use of around 69%. This makes them clear minimum carbon leaders – when recharged by wind- or solar- sourced electricity.

The energy used in Hydrogen production, plus the separate carbon and other emissions "costs" of transportation and specially controlled storage, contrasts strongly with simply recharging an electric vehicle from electricity grids which are getting greener by the day. Even leaving aside the ecological irony of using electricity to make hydrogen – and later converting it back into electricity to move a vehicle, the Frontier Economics work demonstrated that the compromises involved leave fuel cell vehicles well behind BEVs, at 26 – 35% efficient. This still easily betters the notorious inefficiency of internal combustion engines at turning fuel into movement: conventional cars using e-fuel were found to be just 13 – 15% efficient.

The simplistic efficiency of turning electricity – delivered via networks which already exist far and wide – into movement is the core attraction on the road towards net zero vehicles, and the primary reason why battery electric has become firmly established as the "official" default private transport preference in Britain and Europe. It presently seems unlikely that the complex, energy inefficient processes involved in producing and distributing e-fuel – or indeed hydrogen – will ever compete on eco-friendly, zero carbon, minimal pollutant terms with using sustainably sourced electricity to directly recharge BEVs.

The independently funded International Council for Clean Transport (ICCT) aims to reduce

and eventually eliminate transport sector climate and health impacts by promoting and supporting measures developed through its own rigorous and impartial research. The organisation's Deputy Director, Rachel Muncrief, summarising what the ICCT sees as electric vehicles' supremacy, says "The energy efficiency of battery electric vehicles is 4 – 7 times higher than for e-fuels, so using renewable energy to fuel those vehicles goes a lot farther than using it to produce e-fuels…"

However, the complexity of the political versus technical arguments was underlined in a recent controversial interview for several European newspapers. There, Stellantis's Chief Executive Officer, Carlos Tavares, who heads up Peugeot, Citroen, Fiat/Chrysler, Vauxhall/Opel and some other marques, was reported as saying: "What is clear is that electrification is a technology chosen by politicians, not by industry. Given the current European energy mix, an electric car needs to drive 70,000 kilometres to compensate for the carbon footprint of manufacturing the battery, and to start catching up with a light hybrid vehicle – which costs half as much as an EV." The Stellantis group is presently midway through a major, multi-billion Euro vehicle electrification plan…

6. Could e-fuel rather than fossil fuel power classic vehicles in future?

An Austin A30 refuelling on a continental tour. The Austin and more modern vehicles could run happily on carbon-neutral liquid e-fuels. (Photograph copyright Anthony Henson).

Quite possibly – though bear in mind that worldwide, liquid fuel seems unlikely to disappear soon. It's far from certain that nations where suitable electric vehicles, and charging points, may never materialise in sufficient numbers will enthusiastically join the headlong flight of the world's advanced economies towards "net zero". In remote parts of the world, where roads are poor, distances great and existing powered transport – and other machinery – often ancient, abused and thinly spread, liquid fuel is likely to remain vital. Aside from classics, there are specialist vehicles – and sectors including agriculture, forestry, mining and heavy construction – where it seems inevitable that liquid fuel demand will linger – as pragmatism overrules ideology.

Continuing demand will not come only from wheeled vehicles. The International Energy Agency says that transportation currently accounts for 24% of all direct CO2 emissions

resulting from burning fuel – with road vehicles responsible for almost three-quarters of that. Within the remainder, it says, rising aviation emissions highlight a need for greater focus on reducing emissions – in a sector widely acknowledged as difficult to decarbonise.

A similar conclusion was reached in a recent Ricardo Energy and Environment study for campaign group Transport & Environment. It recommended prioritising electrofuels for aircraft and ships, where full battery-powered decarbonisation could take many years. A recent report entitled "Why the future is electric", authored by international research and insight consultancy McKinsey, supported this viewpoint, stating: "The majority of bio- and e-fuels supply will be required to decarbonise marine, aviation and commercial road transport, for which only limited zero-emissions alternatives exist today".

IATA, the International Air Transport Association, representing almost 300 airlines worldwide, has resolved to follow EU proposals to halve carbon emissions by 2030, and reach net zero by 2050. A key requirement in the bloc's proposed ReFuelEU aviation regulations is for all aircraft refuelling at EU airports to upload a 5% sustainable proportion from 2030, rising to 63% in 2050, with the synthetic element growing from 0.7% to 28% in that time. However, there are already calls for greater ambition in these targets, with a proposed amendment suggesting the sustainable fuel requirement should be 100% by 2050 – with a 65% e-fuel proportion. The proposals must go before the European Council and Parliament before coming into force.

7. A collection of swings and roundabouts – and more questions than answers…

All in all, given how moves towards net zero are unfolding, it's already easier to imagine officialdom favouring e-fuel supplies to limited numbers of valuable, low mileage older vehicles as a spin-off from other, non-car uses… than it is to see such fuel widely available for mass-market ICE cars. It seems a promising avenue, though the crystal ball reveals a collection of swings and roundabouts – which don't immediately look like an easy ride. Here are some reasons why:

Independent research and real-world experience have confirmed that e-fuel production involves high up-front costs – and is particularly energy-inefficient. With up to 50% of the input energy consumed during manufacture, high-volume production will require lots of sustainable electricity.

Minimal demand so far means very limited manufacturing facilities currently exist, raising some key questions. To what extent will legislators assist commercial market development by requiring specific sectors to "use synthetic"? Would large-scale investors risk cash building high-volume production plants without such a guaranteed marketplace? What about product pricing to ensure adequate return on major investments – while not holding entire transport sectors to ransom? And… anticipated target sectors like aviation, marine and HGVs don't use petrol – the fuel most classic vehicles actually need…

Supposing these and other hurdles were overcome, and suitable e-fuels became available in Britain. How might classic vehicle owners access it? Today's filling station and distribution infrastructure would be hopelessly underused given the modest volumes involved, necessitating smaller, less numerous outlets… but how might they be sited so that classic vehicle owners were within sensible distances of refuelling points – and who would pay for their installation and maintenance?.

8. Is anything happening to make e-fuel available?

Coryton Advanced Fuels' 'Sustain' fuel under development. (Photogarph, Prodrive).

Yes – and, as often happens with automotive innovation, motorsport currently leads the way.

British motorsport specialist Prodrive competed in the 2021 FIA World Cup for Cross Country Rallies, and is continuing in 2022 – using sustainable fuel combining agricultural waste biofuel with carbon-capture produced e-fuel. It's claimed to reduce greenhouse gas emissions by 80% compared to equivalent fossil petrol.

Prodrive ECOpower developed in conjunction with Coryton Advanved Fuels. (Photograph, Prodrive).

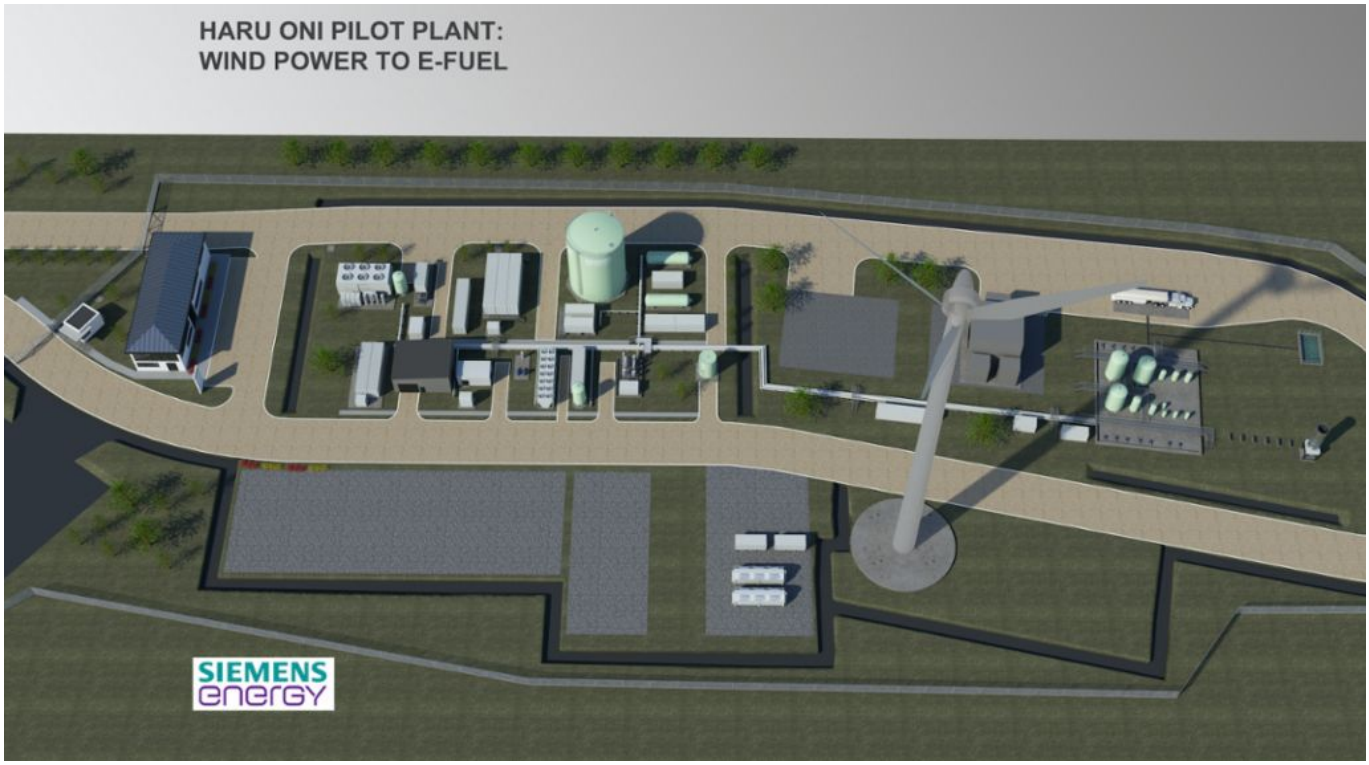
Prodrive Hunter T1. (Photograph, Prodrive).

Top tier cars in the World Rally Championship's 2022 season have moved to hybrid power units, running on blended synthetic and bio-derived fuel. Formula 1 has announced it will move to 100% sustainable e-fuels from 2025, laboratory created to match the energy density of current E10 fossil petrol – while delivering claimed greenhouse gas savings of at least 65%. It's anticipated that production will later be scaled up "for wider social use."

Porsche has invested around 20 million Euros in a high volume South American e-fuel production project, the brainchild of a big-name international consortium. Continuous access to a sustainable, high capacity electricity supply is the venture's costliest and most eco-controversial challenge, so the facility, known as Haru Oni and covering around 3.7 hectares, is being built alongside a new, dedicated 2 hectare wind farm… It's sited on the Magellan Straits, 100 km (62 miles) north of Cape Horn in southern Chile, where the deserted landscape and weather patterns are near-ideal for wind farms..

Several other groups, in places as diverse as Canada, Switzerland, Norway, Spain and Scotland are already planning significant e-fuel production increases, or establishing new facilities. As yet, however, there are few clues about where their products might be marketed – though Porsche is already confirmed as the biggest initial customer for Haru Oni. It sees e-fuel application primarily in motorsport – but interestingly, also as a way of ensuring that its older cars can continue running in a low carbon future.

Haru Oni Pilot Plant site, Patagonia, Chile. (Photograph, Porsche).



Haru Oni Pilot Plant plan, Patagonia, Chile. (Photograph, Porsche).

Not all performance marques share Porsche's e-fuel conviction. McLaren, for example, is reportedly planning an e-fuel test car project, but Lotus, despite its combustion engine pedigree, has announced a move away from ICE, and into BEV sports car production.

If the EU's "Fit for 55" proposals are approved, there is already speculation that European makers building under 1,000 vehicles annually might be exempted from the proposed new rules, which, from 2030, will end an existing derogation from emissions targets for manufacturers building between 1,000 and 10,000 cars annually. Rumours also persist that Ferrari and Lamborghini, which together sold over 16,000 cars in 2020, may be lobbying for post-2035 ICE exemptions. Nothing has been officially confirmed, though any exempted ICE-engined vehicles would inevitably need liquid fuel….

9. What's the situation with e-fuels right now?

With motor industry manufacturing decisions taken years ahead, ever tightening emissions

legislation started the trend towards BEV production amongst major car makers well over ten years ago. Hybrids and zero emission battery electric vehicles soon emerged as the most convenient, least controversial way of driving down emissions figures.

E-fuels, then, as now, lacking volume production, retail availability and real-world experience, have hardly been considered as manufacturer attention has focussed on practical and efficient ways of minimising fleet average CO2 emissions – simply to continue selling vehicles in major markets. Today, hardening political attitudes, net zero targets, increasingly determined environmental campaigning and no track record has left e-fuels lacking mainstream support. This is especially true outside Europe, though in 2021 Mazda, with its long history of engine innovation, became the first car maker to join Europe's e-Fuel Alliance, which links organisations supporting use and promotion of e-fuels – and hydrogen. Many of Mazda's electrified models due on sale by 2030 will retain internal combustion engines.

In Europe…

Germany has been a particular epicentre of recent lobbying activity to improve availability of e-fuels for road transport use. Pressure has come from several high profile groups, including VDA, the German motor manufacturer federation, UNITI, the country's federal association of SME mineral oil companies, and FuelsEurope, representing almost all EU petroleum refining capacity, supplying over 75% of the bloc's retail motor fuel.

'E-fuels for future'. Photograph from 'UNITI' in Germany – a trade association there campaigning for e-fuels to be incorporated into the overall drive, alongside electric power, to eliminate damaging emissions created by burning fossil fuels.

Wider industry support for e-fuels varies dramatically however: Automotive systems and component behemoth Bosch is a long-standing convert to the cause.

This slideshow requires JavaScript.

Meanwhile German press reports have suggested that Volkswagen has clashed with the VDA, reportedly claiming that the "…so-called potential of alternatives for liquid fuels is… massively overestimated."

VW is heavily committed to rapid EV development, targeting at least 70% of its European sales being all-electric by 2030. It hasn't clarified what will fuel the remainder, but, despite that pledge, it says its combustion engines will be developed to further reduce CO2

emissions, and increase efficiency. It's also claiming to seek complete climate-neutrality by 2050…

Ford's declared ambition is for BEV's to represent 40 to 50% of its global volume by 2030, though again, quite what will fuel the rest is unclear. Neither Ford, Volkswagen or Germany signed a (non-binding) COP26 summit declaration, committing to "work towards sales of new cars and vans being zero emission globally by 2040, and by no later than 2035 in leading markets".

The effectiveness of Germany's well-connected pro-synthetic fuels lobby was demonstrated soon after COP26, when then Transport minister Andreas Scheuer tweeted that German reluctance sprang from a belief that ICE engines can be part of the climate solution – if powered by green e-fuel rather than fossil fuels… That lobbying may also have prompted a minor uplift in the EU's Renewables Energy Directive, which, in the "Fit for 55" proposals, would allow "Renewable fuels of non-biological origin," covering e-fuels and hydrogen, to account for 2.6% of energy supplied to transport by 2030. This figure includes HGV, maritime and aviation uses, so automatically limiting e-fuel distribution for European private cars.

Effective maybe – but this lobbying may yet prove unsuccessful. Germany's new Transport Minister, Volker Wissing, of the liberal FDP party – which before the country's 2021 elections issued a manifesto interpreted as endorsing e-fuels – is now apparently back-pedalling on future policy. He reportedly said recently that European regulatory decisions favouring full-electric cars "…were made a long time ago…" and that "…there will be insufficient e-fuel to power currently registered ICE-engined passenger cars for the foreseeable future – what is available will primarily be needed for aviation."

Many experts, researchers and some legislators agree, seeing e-fuels as a way of easing the notoriously difficult task of decarbonising commercial airliners. It's certainly logical, since today's heavy batteries, and large tanks of highly flammable hydrogen, aren't easily rationalised against the range, loadspace or safety demands of big, passenger aircraft.

Despite this, Airbus has already revealed hydrogen-fuelled commercial aircraft concept studies, suggesting they could be flying by 2035.

In the UK…

The recent DfT paper "Decarbonising Transport – A Better, Greener Britain" outlined a less detailed future government strategy than "Fit for 55." It includes a general policy to identify measures during the 2020s to maximise Greenhouse gas savings through low carbon fuel use – and encourage and prioritise uptake in sectors with few liquid fuel alternatives – but an identified long term need.

It also notes that the limited air quality benefits of low carbon fuels when used in internal combustion engines "will need to be considered." A medium term shift towards their use in long-haul HGVs is anticipated, with increasing demand from aviation and maritime, which – as in Europe – is where the highest long term requirement for low carbon liquid fuels is anticipated. Measures to promote such fuels in these sectors are being considered, since the DfT believes there is likely to be a market for as much low carbon fuel as the UK can produce until well beyond 2050.

The Government expects to publish a more detailed low carbon fuel strategy in 2022, saying this will "set a clear signal about the vision for the transport sector", and consider "how carbon savings could be sustainably maximised."

10. Should classic vehicle owners be worried about fossil fuels disappearing?

For anyone interested in using historic, fossil fuel-powered vehicles, contemplating increasingly restricted fossil fuel availability will probably be slightly un-nerving. However, two research reports released to coincide with the COP26 summit suggest a quite prolonged timescale to its disappearance.

Bloomberg New Energy Finance found that just 19% of new passenger vehicle sales in 2020

were in countries with an existing ICE phase-out target, and only 31% of the world's passenger car markets were committed to end fossil fuel-powered vehicle sales entirely. International Energy Agency research anticipated fossil-based products would still account for 80-90% of transport fuel consumption in 2030. Bloomberg also forecast that zero emission vehicles will represent 70% of global new car sales in 2040, implying that in some markets, up to 30% of new vehicles might still be ICE-powered almost 20 years hence, joining unknown numbers of older ICE vehicles still in use. It all suggests that – unpredictable government interventions apart – fossil fuel is unlikely to disappear any time soon.

Looking to the future…

In 2022, e-fuel production is being ramped up, and, extrapolating announcements already made, before this decade is out, significant volumes should be available. For the mass-market, it has inescapable disadvantages as a direct, fossil fuel replacement: It is carbon neutral not carbon zero, production is energy-inefficient, manufacturing facilities are cost-intensive – both pointing to likely high prices – and liquids require distribution, adding more carbon and cost penalties. These are some key reasons why e-fuels are already being viewed as expedient for sectors where effective decarbonisation by other means is presently difficult or impossible.

All this said, one day e-fuels may well prove to be the only practical way of keeping classic ICE vehicles original and running. The hope must therefore be that some modest future availability might be possible, alongside supplies which already seem destined for aircraft, ships, HGVs – and motorsport.

Hope, though, will not be enough – and quite apart from communicating the importance of fuel being needed for classic vehicles at all, two big practical questions follow closely behind. First, can modest classic vehicle demand justify legislation to secure e-fuel supplies in perpetuity..? Second: if motorsport eventually became the only significant source of e-petrol, how might distribution and availability be arranged and funded for classic vehicle owners nationwide?

Conclusion – Liquid Fuels Still Needed…

In this big picture, survivors from the last 130 years stand as working testament to the importance of motor vehicles in British technical, industrial, social and employment history. It will be down to the classic vehicle movement itself – not traditionally known for its loud voice in corridors of power – to start punching above its weight in the fight to secure e-fuel availability before fossil fuel stops flowing. The real task will be to deliver and continually reinforce the message – to the right people in the right places – that liquid fuel must remain available and accessible for classic vehicles. It's a message that cannot be allowed to fall by the wayside during the decades-long haul towards net zero which has only just begun.

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Kim adds:

"Food For Thought – A few additional points to consider…

First, regardless of the details, it should always be noted that it is the type of fuel that causes emissions and environmental damage, rather than the engine/power unit. Internal combustion engines can easily be operated on carbon-neutral liquid synthetic fuels – i.e. other than fossil-based types.

E-fuels can be used in a wide variety of internal combustion engines, powering cars, commercial road transport, railway locomotives, boats, ships and aircraft. As liquid fuels, they can also be delivered via existing infrastructure, including storage facilities, transporter pipework and wagons, and fuel supply stations.

Importantly, in many parts of the world there is no existing infrastructure available for the large scale operation of electric vehicles, and it is likely to be many years/decades before this situation could be changed. In such situations, e-fuels could offer continued mobility for people and goods, for many years.

It is interesting that major manufacturers including Volkswagen, Mazda and Porsche are continuing to develop internal combustion engines. The acknowledgement that e-fuels can be useful alongside electric vehicle propulsion development, for future transport needs, is important. This report on Wheels-Alive last December explains Volkswagen's approach…
VW alternative fuels

Here's another feature on this Wheels-Alive website, looking at the 'big picture': Consider all options

Although Dave's feature deliberately concentrates on synthetic or e-fuels, an important part of the future fuels/transport equation is 'whole life' environmental cost, for vehicles with internal combustion engines and those that are electrically-powered. Of course this is a huge and complex separate subject, but crucially important are challenges relating to the batteries required to store the electrical energy needed to power electric vehicles. (Note too that the batteries store the power, they don't produce it). Typically these require precious materials (including, for example, lithium, copper, aluminium, manganese and cobalt) for their construction, and these materials have to be mined/reclaimed from the earth's existing resources. In addition, at the end of each battery's useful life, it has to be recycled.

Overall, the environmental costs in terms of battery production and end-of-life disposal can be very considerable. This needs to be taken into account when considering whole-life vehicle emissions/environmental damage; often this aspect is ignored or downplayed.

Last but not least.. Many prudent players in the vehicle and transport industries advise that the whole range of future propulsion requirements and possibilities needs to be considered and all possible alternatives carefully considered. In particular, rather than advocating a headlong rush to electrification as the ONLY way to reach 'net zero', and to the exclusion of all other potential answers, they advise that the inclusion of e-fuels as part of the plan would in fact result in a faster route to achieve the desired result."

STOP PRESS… THERE'S MORE…

Kim explains: In a press release issued on 24th March in Germany by UNITI (Federal Association of Medium-Sized Mineral Oil Companies e.V.), in which the organisation responds positively to the German government's coalistion committee decision to lower fuel duty by 24 cents per litre for three months, they add:

'UNITI also welcomes the fact that the package of measures emphasises the importance of importing green energy. In the paper, for example, the traffic light coalition members state, "We shall accelerate the ramp-up of the hydrogen economy and press ahead with international supply partnerships. In addition, we shall ensure the diversification of energy sources, including through the import of climate-neutral hydrogen and its derivatives." UNITI Chief Executive Elmar Kühn: "Importing renewables in the form of hydrogen and its derivatives, such as liquid, CO2-neutral e-fuels, will help reduce the heavy dependence on a few countries for fossil fuel supplies." This represents an indispensable contribution to the secure supply of affordable energy and supports the achievement of ambitious climate targets.'

Dave's References

The Wikipedia entry on electrofuel is at: wiki/Electrofuel

Everything you need to know about use of road fuel in Britain since 1990, updated quarterly, can be found here: gov.uk/oil-and-oil-products-energy-trends

The background to synthetic fuel production during World War II, and what happened afterwards, is here: energy.gov/fe/early-days-coal-research

See also:

A synopsis of an interesting story here; full access requires a subscription payment.

Synthetic fuel production in prewar and world war II Japan: A case study in technological failure. By Anthony N. Stranges Pages 229-265 https://www.tandfonline

The Formula 1 announcement about using synthetic fuels is here:

formula-1-plans-sustainably-fuelled-hybrid-engine/

Information about the Chilean “Haru Oni” synthetic fuel project is at:

www.siemens-energy.com/haru-oni

The UK’s Net zero strategy is here:

https://www.gov.uk/net-zero-strategy

The UK Net Zero Strategy: Build Back Greener full document is ISBN reference 978-1-5286-2938-6. Available for viewing/downloading as a 368 page PDF (36.3 MB) here:

Build back greener

The Department for Transport paper “Decarbonising Transport A Better, Greener Britain” full 216 page PDF is at:

gov.uk. greener-britain.pdf

The European Fit for 55 strategy is here

Europe 55

More information on the eFuels Alliance can be found at:

www.efuel-alliance.eu

The FuelsEurope view on e-fuels is summarised here:

Fuels Europe

A Bosch press release, outlining what it sees as e-fuel advantages, is here:

Bosch approach

An opposing view from the ICCT::

ICCT

The DfT Transport decarbonisation plan “for cleaner air, healthier communities and tens of thousands of new green jobs.” is at

DfT Decarbonisation plan