

# LOW CARBON FUELS STRATEGY – CALL FOR IDEAS

## UKPIA RESPONSE

### **Chapter 1 – Introduction**

i. How can the low carbon fuels strategy best improve certainty about the deployment of low carbon fuels to support the decarbonisation of the transport sector and the growth of this industry in the UK?

- UKPIA’s view is that all suitable Low Carbon Fuels (LCFs) should be considered as available options in the energy transition, not just renewable fuels. Fuels such as RFNBOs, RCFs, liquid and gaseous fuels associated with Carbon Capture, Utilisation and Storage (CCUS) offer significant opportunities for decarbonisation.
- UKPIA suggests that an analysis of supply and demand LCF scenarios will be key to providing a degree of certainty on the pathways to decarbonisation. The trajectories being developed must be based on sound science and achievable, while providing some degree of ambition. The pathways should not rely on “silver bullet” technology and be technology neutral.
- Studies have concluded that Internal Combustion Engine (ICE) powered vehicles will be around for a considerable period, despite announced phase out dates for the sale of new light vehicles (and in fewer cases, HGVs)<sup>1</sup>. Furthermore, ICE vehicles can offer a decarbonisation solution in a technology neutral approach; for example, hydrogen powered ICE engines will offer similar reduction in Carbon Dioxide (CO<sub>2</sub>) emissions to Hydrogen Fuel Cells, with aftertreatment used to bring NOx emissions within acceptable levels.<sup>2</sup>
- The Low Carbon Fuel Strategy (LCFS) Call for Ideas (Cfi) looks to assume that meeting the requirements for electrification of the passenger car parc can be met in the announced time frame. This assumption should be considered in more detail, and an analysis carried out to identify the consequences should vehicle electrification not be achieved as planned. Work being carried out by the Energy Systems Catapult<sup>3</sup> in modelling the transition to Electric Vehicles (EVs) is helping to provide some detail to this issue.
- While providing significant opportunity to decarbonise the transport sector, the move to EVs presents several risks and challenges in terms of the scale and distribution of the charging infrastructure required<sup>4,5,6</sup>. These should be considered in more detail as part of the LCFS and associated modelling work.
- Similarly, the LCFS Cfi assumes that the overall energy demand will not rise significantly. Despite new energy sources and vectors becoming available overall

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<sup>1</sup> <https://www.politico.eu/article/internal-combustion-engine-ice-phaseout-diesel-petrol-cars-ban-europe/>

<sup>2</sup> <https://www.cummins.com/news/2022/01/27/hydrogen-internal-combustion-engines-and-hydrogen-fuel-cells>

<sup>3</sup> <https://es.catapult.org.uk/>

<sup>4</sup> <https://www.forbes.com/sites/prakashdolsak/2021/05/05/the-lack-of-ev-charging-stations-could-limit-ev-growth/>

<sup>5</sup> <https://www.theguardian.com/environment/2022/feb/16/electric-car-charging-points-spread-too-unequally-across-uk> -

<sup>6</sup> <https://inews.co.uk/news/electric-car-uk-climate-change-chargers-crucial-to-britain-going-green-but-lack-of-planning-worrying-1283006>

usage is likely to continue to increase. The impact of future increases needs to be considered in more detail.

- As we describe in more detail in the UKPIA Future of Mobility report<sup>7</sup>, we believe a range of solutions is required both to meet the needs of the energy transition, and to meet these needs efficiently, which will vary depending on the energy vector. For example, a range of options is likely to be required for low carbon aviation including battery, hydrogen, and Sustainable Aviation Fuel (SAF) Technologies; these can also vary depending on the aircraft duty and length of flight.
- Support for low carbon hydrogen production - of all types - is key in the delivery of the LCFS. This includes continued government support for CCUS technologies to increase the supply of low carbon (Blue) hydrogen to meet the rising demand. Green hydrogen from electrolysis using renewable electricity will also be a significant part of the LCFS. Finally, the provision of low carbon hydrogen derived from nuclear energy should also be considered.
- Similarly, the strategy should encourage the continued development of hydrogen supply chains. Several trials (for example at Teesside<sup>8</sup>, Humber<sup>9</sup> and the Northwest<sup>10</sup>) are working to develop and overcome the challenges associated with the supply, distribution, and demand for hydrogen in the future. These should continue and be expanded, and the learnings shared.
- The UK has a significant and robust system already in place for the distribution of liquid fuels from the point of production or import to the end consumer. This national asset should be considered and retained as far as practical through the energy transition, and ideally form part of the LCFS.
- In summary, a clear and achievable policy framework (which doesn't exclude energy pathways which aid decarbonisation) in the short, medium, and long term is needed to provide certainty for investors and consumers at all stages of the fuel supply chain. The strategy should also provide government support to provide technologies that support decarbonisation in production such as CCUS and low carbon hydrogen at the scales needed to support decarbonisation in use on the road to Net Zero.

ii. Are there specific examples or best practices, the government should take into account when drafting the strategy?

- The Renewable Transport Fuels Obligation (RTFO) has been a cornerstone of government policy to deliver Greenhouse Gas (GHG) reductions from the transport sector for over a decade; this legislation successfully delivered 5.5m tonnes of GHG savings in 2019<sup>11</sup>. The best option, a GHG rather than volume, based approach should be actively considered by the government. If such a step change

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<sup>7</sup> <https://online.flippingbook.com/view/609189063/>

<sup>8</sup> <https://www.gov.uk/government/news/uks-first-ever-hydrogen-transport-hub-kick-started-by-3-million-government-investment>

<sup>9</sup> <https://gigastack.co.uk/>

<sup>10</sup> <https://hynet.co.uk/>

<sup>11</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/974822/targetin-g-net-zero-rtfo.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/974822/targetin-g-net-zero-rtfo.pdf)

is not feasible in the short term, then the successful elements of the RTFO which have delivered significant volumes of low carbon fuel and the resulting GHG savings while minimising the levels of buy-out should therefore continue to be supported by government in the LCFS.

- UKPIA recognises the success of the Contracts for Difference (CfD) approach in other sectors such as renewable electricity<sup>12</sup> in managing the investment risks. We have supported Sustainable Aviation in providing a CfD-specialist consultant to support the DfT for development and publication of a consultation on a price support mechanism and business model for SAF implementation in the UK. We look forward to seeing the DfT consultation and will of course respond in due course.
- We would welcome the government considering potential public messaging on renewable fuels. There is very little public knowledge on the successful progress which the UK has made and continues to make. This should be clearly communicated as a key transition pathway for the UK.
- We would encourage the DfT team to look at the potential for similar CfD schemes to manage investment risk where appropriate. In our view two areas that could potentially benefit are Development Fuels and Recycled Carbon Fuels (RCF) where significant investment is likely to be required to meet future LCF targets.
- The Renewable Transport Fuel Obligation (RTFO) trajectory currently rises year-on-year until 2032, after which time there are no further increases<sup>13</sup>. We recognise that 2032 is only 10 years away and would encourage the DfT to consider further increases after that time. An extended trajectory with set reviews to provide certainty for investors may be a beneficial outcome the LCFS. UKPIA also urges the government to consider the UK's renewable transport fuel landscape in more detail – particularly in the context of its northwest European neighbours. If the RTFO is retained in its current form then the government should review the RTFO main obligation in 2023 following the introduction of the 2022 1.5% target increase.
- LCF schemes such as the RTFO, SAF, and potentially Marine schemes, need to be aligned and not provide incompatible conflicts for renewable or low carbon feedstocks. In other words, there should be sufficient available renewable feedstock and LCFs to allow the trajectories of all decarbonisation legislation to be met at the same time. There is a risk that if this is not the case, then obligated companies will have no choice other than to buy-out, meaning that the policy objectives of these schemes are not met and potentially increasing costs to the consumer. One option we would encourage the government to consider, minimising the administrative burden and avoiding cross-scheme conflicts, is to bring together separate obligations such as the RTFO and SAF mandates under one obligation framework in the medium to long term. This would be best served by moving from a volume based to a GHG based system for LCFs.

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<sup>12</sup> <https://www.gov.uk/government/news/government-hits-accelerator-on-low-cost-renewable-power#:~:text=CfDs%20are%20the%20government's%20primary,of%20private%20investment%20by%202030>

<sup>13</sup> <https://www.gov.uk/government/publications/renewable-transport-fuel-obligation-rtfo-compliance-reporting-and-verification>

- Aspects of region-specific transport decarbonisation legislation in California<sup>14</sup> and Germany<sup>15</sup> should be considered as part of the LCFS. We understand that sections of these pieces of legislation particularly encourage the use of hydrogen and may be less onerous on suppliers in achieving the same policy objectives than the RTFO and similar UK legislation. Both California and the EU RED III revision utilise a GHG based approach.
- As previously discussed, modelling of LCF demand and supply in the short, medium, and long term by energy vector would be beneficial for all stakeholders in understanding the road map to decarbonisation. This should be delivered in a technology neutral manner while incentivising the best WTW savings, possibly using a GHG reduction approach.

## Chapter 2 - Demand

iii. Does this chapter accurately capture key trends, opportunities and risks in terms of low carbon fuels demand? If no, please expand on any aspects that you think are missing or inaccurate, or require further exploration.

- UKPIA agrees that this chapter broadly captures the key trends, opportunities, and risks for LCF demand. However as outlined in our response to question i, it is assumed that electrification of the vehicle parc will happen as planned and the possibility that this may not be achieved - due to the dependencies and supply chain risks noted later - should be considered.
- Demand for a range of LCFs including suitable power to liquid fuels, not just renewable fuels, should be encouraged by the LCFS.
- The LCFS should consider the affordability of transport fuels in the energy transition. Mobility, including the cost of fuels, needs to continue to be affordable for society as a whole. If costs become prohibitively expensive, then this risks leaving large sections of society behind with potentially only wealthy members of society able to travel.
- As we previously mentioned, the demand for LCF used in aviation may vary depending on the range type being used. Current thinking<sup>16</sup> suggests that batteries, hydrogen and SAFs are all options being considered for aviation. Therefore, the split in hydrogen and SAF use for low carbon aviation may be challenging to model and understand in more detail and requires further exploration. The aviation industry is also working on the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)<sup>17</sup> which may offer another potential route to aid decarbonisation in the short and medium term (in the long term all SAF should be low carbon allowing fuel decarbonisation with off-setting, maximising global GHG savings). Due to its international nature, engagement with ICAO and the EU on this topic should be encouraged to ensure a global coordinated approach.

<sup>14</sup> <https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program>

<sup>15</sup> <https://biofuels-news.com/news/germany-to-increase-share-of-renewables-in-transport-to-28-by-2030/>

<sup>16</sup> <https://www.sustainableaviation.co.uk/news/uk-aviation-industry-strengthens-commitment-to-achieving-net-zero-and-launches-first-interim-decarbonisation-targets/>

<sup>17</sup> <https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx>

- Maritime is a global sector and is therefore likely to require a coordinated approach from other countries out with the UK. We would encourage for example engagement with the European Union as the UK develops its policies for this sector. As with aviation, several options for decarbonisation exist such as battery for short journeys, and hydrogen or ammonia for longer journeys<sup>18</sup>. Therefore, the split in LCF use may be challenging to model and requires further exploration.
- The Impact of the COVID-19 pandemic on short, medium, and long term fuel demand trends is uncertain and continues to evolve<sup>19</sup>. In the short term for example during the pandemic the UK saw more home working for office-based staff and lower demand for transport fuels<sup>20</sup>. The widespread adoption of new technologies such as virtual meetings has led to a reduction in business travel, potentially reducing the demand of aviation fuels. There has also been a potential increase in home deliveries (such as those from the supermarket sector) which may increase the demand for fuel for light vehicle duties<sup>21</sup>. It is uncertain at present how these will evolve into the medium and long term as the country learns to live with COVID-19 and will be challenging to model in more detail.
- The Call for Ideas suggests hydrogen can only be used in fuel cells; other fuels may be developed such as methane<sup>22</sup> or ammonia<sup>23</sup>. The options including the potential benefits and disadvantages for these fuels should be explored further to ensure that the correct technology approach is being incentivised.
- The UK strategy for freight should be expanded and included in the LCF strategy. For example, modal shift has been discussed<sup>24</sup> and is possible including movement by electrified rail from import hubs such as Freeports to inland depots then LCF powered short haulage thereafter.

iv. In your view, what are the key challenges relating to demand in the future transition of the sector?

- The development of the LCFS needs to consider the pathways for each transport sector to produce a roadmap for the energy transition. This will be a significant challenge to deliver.
- It is important that consumer confidence in fuels of all types, including LCFs is maintained by ensuring they remain fit for purpose in the applications for which they are used. This includes higher blends of LCFs such as FAME, which have

<sup>18</sup> <https://www.dnv.com/maritime/hub/decarbonize-shipping/fuels/index.html>

<sup>19</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/920566/Supply\\_and\\_demand\\_of\\_transport\\_fuels\\_during\\_COVID-19.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/920566/Supply_and_demand_of_transport_fuels_during_COVID-19.pdf)

<sup>20</sup> <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/busin-essandindividualattitudestowardsthefutureofhomeworkinguk/apriltomay2021#:~:text=On%20average%20in%202019%2C%2027,work%20from%20home%20where%20possible.>

<sup>21</sup> <https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic>

<sup>22</sup> [https://cen.acs.org/articles/93/i43/Best-Effort-Yet-Make-](https://cen.acs.org/articles/93/i43/Best-Effort-Yet-Make-Direct.html#:~:text=A%20new%20device%20uses%20a,energy%20for%20homes%20and%20businesses.)

[Direct.html#:~:text=A%20new%20device%20uses%20a,energy%20for%20homes%20and%20businesses.](https://cen.acs.org/articles/93/i43/Best-Effort-Yet-Make-Direct.html#:~:text=A%20new%20device%20uses%20a,energy%20for%20homes%20and%20businesses.)

<sup>23</sup> <https://pubs.rsc.org/en/content/articlelanding/2021/ta/d0ta08810b>

<sup>24</sup> <https://www.railfreight.com/policy/2021/07/08/modal-shift-now-rail-freight-industry-tells-uk-government/?gdpr=accept>

caused concerns over vehicle filter blocking<sup>25</sup>. UKPIA is supporting the work being carried out in BSI to understand the mechanisms by which this occurs and include the necessary mitigations in the appropriate fuel standards. Failure to maintain consumer confidence is likely to reduce demand for LCFs in the future and make the transition more challenging. In addition to the concerns with diesel and gas oil, there have been recent concerns over the mileage performance of E10 fuel and the additional cost burden that this places on motorists.<sup>26</sup>

- We have seen that consumer demand for Hydrotreated Vegetable Oil (HVO) is increasing significantly, with several suppliers offering it as a low carbon fuel alternative<sup>27</sup>. Furthermore, the medium-term uptake of HVO may then allow a further transition to SAF in the long-term, allowing UK LCF plants to manage the transition.
- The Call for Ideas is primarily looking at the supply of Low Carbon Fuels. However additional factors such as the supply of materials such as lithium and graphite for batteries or platinum for Fuel Cells will continue to be a factor in the transition as well as the capability of the UK electrical supply infrastructure. The availability of these may be affected by factors out with the UK's control and may make the transition more challenging<sup>28</sup>.
- UKPIA notes the comment in point 33 of the Call for Ideas that levels of FAME and Ethanol are currently below those set in the appropriate fuel standards. However, we would like to take the opportunity to explain that the blend wall is an absolute maximum so suppliers will blend slightly below that to ensure that the product complies with the required specifications and so remains fit for purpose (including the requirements of the workmanship clauses in these standards)<sup>29</sup>.

v. Apart from developing demand scenarios, are there any other actions the government should consider as part of the strategy development to address uncertainties and identify opportunities on the demand side?

- As outlined in our response to question ii, UKPIA suggests that the RTFO is now a well-established piece of legislation and has achieved significant greenhouse gas reductions in the transport sector. We would therefore encourage the DfT to look to build on this, with any increases in obligation being made in an achievable manner based on sound science. We would encourage the DfT to keep targets under review to ensure that the policy remains fit for purpose and that there are no unintended consequences in the same way as is being carried out in the 2022 RTFO Post Implementation Review. One option for the government to consider is merging legislation such as the RTFO and SAF schemes under one GHG

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<sup>25</sup> <https://www.fwi.co.uk/machinery/farm-maintenance/machinery-maintenance/farmers-report-more-problems-with-blocked-tractor-fuel-filters>

<sup>26</sup> <https://www.autocar.co.uk/car-news/new-cars/new-e10-fuel-could-reduce-cars-economy-10-cent>

<sup>27</sup> <https://www.crownoil.co.uk/products/hvo-fuel-hydrotreated-vegetable-oil/>

<sup>28</sup> <https://www.theguardian.com/australia-news/2022/feb/09/gone-ballistic-lithium-price-rockets-nearly-500-in-a-year-amid-electric-vehicle-rush>

<sup>29</sup> <https://www.acea.auto/publication/position-paper-revision-of-the-fuel-quality-directive-fqd/>

reduction-based obligation scheme to avoid cross-transport conflicts for low carbon fuels in the medium to long term.

- The 2019 and 2020 Greenhouse Gas (GHG) mandates were brought in response to requirements in the European Fuels Quality Directive. Following the UK's withdrawal from the European Union, we recognise that the legal requirement for this mandate is no longer required. However, it was successful in targeting the LCFs that offer the best GHG reductions, rather than simply using a volume-based approach. In order to minimise the administrative burden on obligated suppliers, UKPIA would not advocate the reintroduction of a GHG mandate at the same time as the volume based RTFO mandate; however, some thought should be given to whether it is appropriate to move onto a GHG based scheme subject to the usual government consultation process. This approach would mirror that used in the EU under the RED II and III requirements for their renewable fuel mandates and allow flexibility in the scope of what is mandated.
- The EU is encouraging member states to use different tax rates for different fuels; for example, taxing Low Carbon or Renewable fuels at a lower rate than their fossil equivalents<sup>30</sup>. This is a similar approach to that taken in the early years of the RTFO. It would also provide a mechanism for low carbon fuels to continue to generate an income stream for government through the energy transition.
- As we mention in Section iv, UKPIA support the BSI testing on the potential causes of vehicle filter blocking and implementation of technically justified requirements in the relevant fuel standards to protect the consumer and ensure consumer confidence. We would encourage the DfT to continue to support this work.
- The government may consider a reform of fuel taxation based on carbon intensity. Zero or very low carbon fuels should have a significantly lower taxation rate to facilitate fuel pricing that is socially acceptable and supports business cases for investment.
- UKPIA believes that mandates for specific LCF blends such as B20 or B30 specifically for captive fleets should not be imposed. These mandates potentially restrict options for fuel supply and may penalise operators who wish to use higher blends such as B50 or B100. The mandates often have unintended consequences such as stranded assets in the event of low demand because of low consumer confidence, or the diversion of available FAME supplies from the base retail diesel grade. A more technology neutral approach would be to increase say the RTFO targets (preferably on a GHG basis) above the levels that can be met with B7 and E10 and allow the market to determine the most cost-effective way of meeting them.

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<sup>30</sup> [https://ec.europa.eu/commission/presscorner/detail/en/qanda\\_21\\_3662](https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3662)

vi. For the development of the demand scenarios, are there any key sources of information or data the government should consider?

- UKPIA has been a member of Zemo<sup>31</sup> for many years and is an active contributor to Zemo's work that has been vital in transport decarbonisation for over 20 years. We would therefore encourage the government to look at the significant information available from this organisation. Recent work has focused on the successful roll-out of E10 in the UK, and the incentivisation for higher LCF blends in the HGV fleet (which includes the results of modelling work on diesel demand by sector to 2045).
- UKPIA has also produced several publications which may be of use to government. These include the Future of Mobility report (2021)<sup>2</sup>, the Transition, Transformation, and Innovation Report (2020)<sup>32</sup> and the UKPIA Future Vision (2019)<sup>33</sup>.
- The International Energy Agency (IEA) have published a report "Net Zero by 2050"<sup>34</sup> which should be considered as part of the LCFS development.
- Concawe and Fuels Europe have produced several reports and presentations on the Transition to Net Zero, particularly at a European level.<sup>35,36</sup>

vii. For the development of the demand scenarios, are there any specific aspects that government should consider (e.g., niche uses of low carbon fuels, competing demand from other sectors or technology development) and if so, do you have a view on how best to incorporate them?

- We would encourage the DfT to identify and develop the number of options for heavy goods fleet. For example, low carbon hydrogen, LCFs, and Battery Electric Vehicles (BEVs) are all potential options and may be used in different roles (for example BEVs in short-range and LCFs for HDV in long-range applications)<sup>37</sup>. Electric roads may be also an alternative for some operations.
- Similarly, as mentioned in our response to question iii), the demand for LCF by mode for the aviation and maritime sectors needs to be developed and understood in more detail.
- One option that the government could consider is how to manage the transition from FAME in the short term to HVO in the medium-term to SAF in the long-term. This allows LCF suppliers to manage the transition while ensuring that there are no stranded assets such as production plants or supply infrastructure.

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<sup>31</sup> <https://www.zemo.org.uk/>

<sup>32</sup> <https://online.flippingbook.com/view/111037/>

<sup>33</sup> <https://www.ukpia.com/media/2230/ukpia-vision-july-2019.pdf>

<sup>34</sup> <https://www.iea.org/reports/net-zero-by-2050>

<sup>35</sup> <https://www.concawe.eu/publications/concawe-reports/>

<sup>36</sup> <https://www.fuelseurope.eu/clean-fuels-for-all/>

<sup>37</sup> <https://brc.org.uk/climate-roadmap/section-6-pathway-3-moving-to-low-carbon-logistics/611-heavy-goods-vehicles-hgvs/>

## Chapter 3 - Supply

viii. Does this chapter capture key trends, opportunities, and risks in terms of low carbon fuels supply? If no, please expand on any aspects that you think are missing or require further exploration.

- UKPIA agrees that this chapter broadly captures the key trends, opportunities, and risks for LCF supply.
- UKPIA recognises that large percentage of renewable material is imported<sup>38</sup>. Following the normal economic rules of supply and demand, this imported material will go to highest bidder at an international level. Therefore, government will need to continually review policies from other countries to ensure that the UK continues to attract the renewable material. However, the government should also have a concern regarding the premiums that this may occur for UK fuel users, the affordability of fuel for consumers, and the impact that this has on the UK's competitiveness.
- The UK has less stringent cold operability requirements for FAME than its European neighbours; apart from issues with vehicle filter blocking leading to a loss in consumer confidence this can also lead to physical UCOME molecules entering the UK market, but the GHG certificates associated with such molecules sold to the highest bidder and not necessarily coming to the UK.
- The Call for Ideas recognises that there are Investment risks for LCF plants such as SAF and Development facilities, particularly those that are First of a Kind (FOAK). As previously discussed, we support the CfD model for SAF production and would encourage this to be extended to Development Fuel and RCF production plants as well<sup>39</sup>. SAF production is being developed within the UK at a low scale by companies such as Phillips 66<sup>40</sup>, Fulcrum Bioenergy<sup>41</sup> and Velocys<sup>42</sup>. We recognise the efforts being made by government with the advanced fuel competitions and look forward to seeing details of the £168m competition to be announced in the spring; however, the costs of plants such as those producing SAF can be greatly more than those announced so there will still be a significant risk to investors. These competitions should be technologically neutral to ensure that the UK decarbonises at the lowest cost.
- It should be recognised that UK transport equipment such as cars, HGVs and aeroplanes are not produced in isolation from those found internationally. For example, cars are designed for a European market (e.g., Ford, BMW, and Peugeot), and aeroplanes for a global market (e.g., Boeing and Airbus). Therefore, while we understand that some degree of challenge is needed, the LCFS needs to be aligned with the capability of vehicles available in the UK transport market<sup>27</sup>.
- It has been recognised that the traditional method of supplying Aviation Fuel in the UK may change in the long term, with a move from a small number of producers

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<sup>38</sup> <https://www.gov.uk/government/statistics/renewable-fuel-statistics-2020-final-report>

<sup>39</sup> <https://cerulogy.com/2021/fuelling-development/>

<sup>40</sup> <https://mediacentre.britishairways.com/news/28032022/british-airways-to-power-a-number-of-flights-with-sustainable-aviation-fuel-as-it-marks-the-delivery-of-its-first-supply-from-phillips-66-limited?ref=Home>

<sup>41</sup> <https://fulcrum-bioenergy.com/wp-content/uploads/2021/02/2021-02-15-Fulcrum-Essar-Joint-News-Release-FINAL.pdf>

<sup>42</sup> <https://www.velocys.com/>

to many small SAF plants, as well as continued production at existing refineries. This offers the potential for continued supply resilience for aviation fuel. However, the quality management of aviation fuel is critical and will be a challenge for the industry to address, for example the batching of fuel and the identification of quality issues to a specific source.

ix. In your view, what are the key challenges and opportunities as relates to supply in the future transition of the sector?

- There are several technical challenges associated with RCFs production that still need to be overcome<sup>43</sup>. For example, the high level of residual chlorides in waste plastic can significantly affect the hydrotreatment catalysts used in clean fuel manufacture and may even cause equipment integrity failures. This means that catalysts must be more regularly changed out, increasing costs, and potentially leading to additional waste requirements. Trace levels of contaminants in these fuels may also lead to fuel quality issue (such as silicon in gasoline in England in 2007<sup>44</sup>. Careful attention will need to be paid to these challenges, and development work carried out to mitigate them in the future.
- As mentioned above, appropriate no harms testing for new fuels including LCFs will be required to prevent issues for consumers resulting in a lack of confidence in their use. UKPIA has been working with an external consultant to develop guidance on these which we will share with BSI and the EI shortly with a view to making them more widely available.
- The interaction of LCFs with CCUS including the BEIS clusters should be encouraged to maximise the available GHG savings. Government support for low carbon hydrogen when used in the manufacture of fuels (this would incentivise reducing the carbon intensity of diesel and petrol which will remain at a high percentage in the current fleet for some years). A significant opportunity is Biomass with Carbon Capture, Utilisation and Storage (BECCS) which offers the potential for carbon negative fuel supplies<sup>45</sup>. Other carbon capture technology may become available in the future which should be considered as part of the LCFS; however, these may also have feedstock availability issues when deployed at a large scale.
- eFuels or synthetic fuels may be considered but require significant power supplies for manufacture. The use of these is promising, but also needs to be considered in the context of capacity of the electrical supply grid and the demand for other users such as domestic users and those charging vehicle batteries<sup>46</sup>.
- As the vehicle fleet moves towards BEV technology, and in order to meet increasing targets through the transition there will be a need for ever increasing levels of renewable fuels in blends. The impact of these on vehicle operation,

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<sup>43</sup> <https://www.reuters.com/investigates/special-report/environment-plastic-oil-recycling/>

<sup>44</sup> <https://www.autocar.co.uk/car-news/motoring/tainted-fuel-contains-silicon>

<sup>45</sup> <https://psci.princeton.edu/tips/2020/11/15/preventing-climate-change-with-beccs-bioenergy-with-carbon-capture-and-storage>

<sup>46</sup> [https://www.dena.de/fileadmin/dena/Dokumente/Pdf/9219\\_E-FUELS-STUDY\\_The\\_potential\\_of\\_electricity\\_based\\_fuels\\_for\\_low\\_emission\\_transport\\_in\\_the\\_EU.pdf](https://www.dena.de/fileadmin/dena/Dokumente/Pdf/9219_E-FUELS-STUDY_The_potential_of_electricity_based_fuels_for_low_emission_transport_in_the_EU.pdf)

including compliance with applicable fuel standards needs to be carefully considered.

x. Are there any other actions the government should consider as part of the strategy development to address uncertainties and identify opportunities on the supply side?

- Currently some sources of low carbon hydrogen are not rewarded under the RTFO; for example, Blue Hydrogen and Hydrogen produced from Nuclear Power. The inclusion of other sources of low carbon hydrogen with the appropriate assurance on production technology should be considered as an update to the RTFO legislation (recognising that this requires amendments to the primary legislation).
- There should be alignment between the DfT and BEIS policies on low carbon hydrogen. Recognition of blue hydrogen in transport policy could facilitate overall increased hydrogen demand and kick start hydrogen infrastructure / sales for hydrogen HDVs in the transition to green hydrogen.
- We would encourage the government to recognise that hydrogen ICE powered vehicles with appropriate aftertreatment may also be an option to deliver significant GHG savings, not just hydrogen fuel cells.
- We would ask the government to continue to review the structure of the RTFO including associated buy-out penalties to ensure that appropriate renewable fuels are attracted to the UK without burdening fuel users with excessive cost pressure and undermining the UK's competitiveness.
- There are several Health, Safety and Environmental (HSE) issues associated with the production, transport and distribution of hydrogen that need to be addressed. UKPIA and its members are active participants in panels working on identifying these gaps in HSE and planning legislation<sup>47</sup>. The relevant competent authorities need to be engaged and closely aligned with delivering the LCF strategy for it to be successfully implemented.

xi. Are there particular actions the government should prioritise as part of the strategy development?

- UKPIA encourages the DfT to clarify the requirements for RCFs (recognising that these require an amendment to the relevant primary legislation) as soon as possible to encourage their development and uptake into the wider fuels pool<sup>48</sup>. The rules for these need to be carefully considered to ensure that there are no unintended consequences. For example, carbon may be successfully sequestered by burying plastic rather than burning it as an RCF. This means that the counterfactual needs to be carefully considered.
- We welcome the response to the 2021 Consultation on the SAF mandate in the UK<sup>49</sup>. The publication of a clear SAF mandate trajectory and the basis on which it

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<sup>47</sup> <https://www.igem.org.uk/technical-services/hydrogen-committee/>

<sup>48</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1020709/targeting-net-zero-next-steps-for-the-renewable-transport-fuels-obligation-government-response.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1020709/targeting-net-zero-next-steps-for-the-renewable-transport-fuels-obligation-government-response.pdf)

<sup>49</sup> <https://www.gov.uk/government/consultations/mandating-the-use-of-sustainable-aviation-fuels-in-the-uk>

operates, together with a meaningful timeline in the same way as for the RTFO will create certainty for both investors, and obligated suppliers alike.

- As technology develops, it will be important to carry out periodic reviews of the counterfactuals in the LCFS. These need to be appropriate to provide the correct incentives for investment and LCF deployment. To ensure a technology neutral approach, analysis (or reviews) should be carried out on a Well to Wheels (WTW) basis.

**xii. Do you have any views on how to best capture interdependencies with the global supply chain?**

- The development of the LCF strategy should review the relative attractiveness of renewable fuel obligations and support schemes for the major world economies. We would suggest that the scope could be limited to capture major economies with the highest demand for renewable fuel in the first instance. This would allow conclusions to be drawn within the DfT indicative timeline for 2022 while capturing most of the international demand.
- The government should also review what international legislation changes could potentially be put in place which may limit exports of renewable material and the impact that this may have for UK supply. For example, as the highest volume supplier of renewable fuel to the UK market in 2020, if China develops its own internal legislation for LCFs including renewable fuels, what impact would this have for the UK? The LCFS should also consider how to incentivise UK domestic production to minimise imports, assuming there is sufficient biomass available domestically.
- As we have previously noted, Marine fuels are a global industry with the biggest ships able to potentially choose where to bunker at the lowest cost. The impact of various national obligations for marine needs to be considered, and ideally agreed internationally to create a level playing field.
- The international impacts of potentially different energy vectors for aviation and marine also need to be considered. For example, aviation may be able to use a combination of battery power, hydrogen and SAF and these energy vector can depend on the length of flight. Global organisations such as IATA may be able to provide more clarity in this regard<sup>50</sup>.
- Interdependencies on the global EV market also need to be considered. For example, the development and supply of these is likely to be on a global, rather than a UK scale. As with LCFs, careful attention needs to be paid to whether these can be provided to UK consumers in the scale and price required to ensure mobility for society, rather than wealthier citizens.

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<sup>50</sup> <https://www.iata.org/>

## Chapter 4 - Industry

xiii. Does this chapter capture key trends, opportunities, and risks in terms of UK industry? If no, please expand on any aspects that you think are missing or require further exploration.

- UKPIA agrees that this chapter broadly captures the key trends, opportunities, and risks for UK Industry.
- One trend we would encourage the DfT to consider is the transition in use of oil and tallow type biomass in the short to medium to long term. One possible approach may be for FAME in the short term, moving to HVO in the medium term and then SAF in the longer term.
- We would also ask the government to clarify their strategy with regard to the medium and long term use of bioethanol as a LCF given that petrol demand is likely to decline significantly as the car parc moves to BEVs.
- The production of SAFs creates other potential transport fuels such as renewable gasoline and diesel.<sup>51</sup> A total ban on ICE engines risks there being no market for these in these fully renewable LCFs in the long term and the LCF strategy needs to consider how these can be used. A failure to take these into account risks these LCFs potentially being treated as waste, increasing costs to the SAF consumer.
- There is a significant opportunity to learn from several UK Hydrogen clusters, such as Teesside, Humber and the North West. For example, how will the best practices be scaled up on a national scale? We would encourage the government to share the outcomes from this trial as far as possible.
- The deployment of liquid LCFs at scale would use the existing fuel supply systems, rather than requiring significant investment in infrastructure for EV charging facilities. This should be considered when considering the options for decarbonisation at the lowest risk and cost.

xiv. In your view, what are the key challenges and opportunities for the UK industry in the lead up to 2050?

- There is a lack of established technology for novel or cutting edge LCF production in the UK and risk for FOAK plants. We recognise the efforts being made by government with the advanced fuel competitions and look forward to seeing details of the £168m competition to be announced in the spring; however, the costs of plants such as those producing SAF can be greatly in excess of those announced so there will still be a significant risk to investors. These competitions should be technologically neutral to ensure that the UK decarbonises at the lowest cost.
- As we have mentioned, the traditional method of supplying Aviation Fuel in the UK will change in the long-term, with a move from a small number of producers to many small SAF plants, as well as continued production at existing refineries. The quality management of aviation fuel is critical and will be a challenge for the

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<sup>51</sup> <https://biofuels-news.com/news/johnson-matthey-launches-new-saf-production-technology/>

industry to address, for example the batching of fuel and the identification of quality issues to a specific source.

- We would like to take the opportunity to encourage continued government support for CCUS technology and low carbon hydrogen to ensure they provide a suitable option through the energy transition.

xv. What are key actions the government should consider as part of the strategy development to address uncertainties and identify opportunities for UK industry?

- The government should consider support in R&D and FOAK plants for renewable fuels. As a minimum this should include the development of appropriate CfD and business model support but should also go further. These allow government to work in partnership with industry in delivering the transition to Net Zero. We recognise the efforts that the government have made with the Advanced Fuel Competitions but significant investment over and above that is required to bring production up to the scale required.
- The use of hydrocarbons other than graphite will be key to the delivery of EVs. For example, these will be used in plastics, synthetic rubbers, and lubricants amongst others. Government support for these industries also needs to be considered and supported as part of the LCFS.
- The government should consider the optimal place for renewable fuel plants to be located in order to minimise transport requirements as far as possible. For example, the sources of feedstock for SAF may be found in different places than the sources of demand, such as the large London airports.

xvi. Are there any production pathways or adaptations to production pathways and infrastructure that are most likely to benefit the UK economy?

- We would encourage to government to define their strategy with regards to the UK overall fuel supply industry, including refineries, terminals and supply infrastructure through the energy transition including the LCFS.
- We would encourage the government to explore means of sourcing resources for the transition as close as possible to, and ideally within the UK. The old paradigms of energy resilience being purely about fuel infrastructure now need to be expanded for the energy transition. For example, supporting Lithium in Cornwall would be very useful in supporting both domestic jobs and the UK's resilience<sup>52</sup>.
- Similarly, we welcome incentives for UK battery plants such as those announced recently at Blyth<sup>53</sup>
- As we have previously indicated, the UK economy will benefit from access to affordable low carbon fuels in the short, medium, and long term to ensure that it remains competitive at a global level.

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<sup>52</sup> <https://cornishlithium.com/>

<sup>53</sup> <https://www.blythbattery.org.uk/>

xvii. If applicable, how does your organisation plan to adapt to the expected changes in low carbon fuel demand and supply?

- UKPIA welcomes the forthcoming energy transition, and its members are active in key aspects enabling this at scale<sup>54</sup>. This includes adding additional resource in this area to develop and contribute to understanding of the energy transition.

## Chapter 5 – Policy framework

xviii. Does this chapter capture key trends, opportunities, and risks in terms of policy framework? If no, please expand on any aspects that you think are missing or require further exploration.

- UKPIA agrees that this chapter broadly captures the key trends, opportunities, and risks in terms of the policy framework.
- One option for government to consider is the introduction of a single GHG based reduction mandate across all sectors of the economy in the long-term. This could bring together the policy goals of the RTFO, SAF and UK ETS schemes amongst others. While technically difficult to achieve, it would incentivise the use of CCUS technology in all its forms, as well as other new technologies that offer at scale decarbonisation and allow transparency in achieving GHG reductions across the whole economy.
- The Call for Ideas doesn't include any mention of how to link fuel and vehicle policies. One route to consider is mechanisms where fuel suppliers that exceed carbon intensity reductions from other legislative packages can sell extra credits to vehicle manufacturers for them to use to decrease their vehicle emission targets. Frontier Economics has published a proposal for such a crediting mechanism<sup>55</sup>, and several proposals in the ongoing legislative process on CO<sub>2</sub> standards for cars and vans in the EU refer to such a kind of crediting mechanism<sup>56</sup>.
- UKPIA requests that there should be no divergence between UK and EU recognition of voluntary schemes as this risk reducing potential supply of renewable fuels to the UK market, increasing cost to the consumer, unless there is compelling evidence that the EU voluntary schemes are deficient.
- Reflecting on point 118, there should continue to be recognition that fuel standards developed by industry and government in partnership with BSI (as a member of CEN) are a means to protect the consumer. While the ambition of higher blends such as B10 replacing B7 should be considered as part of the transition, this process needs to fully engage all stakeholders including vehicle manufacturers to ensure that fuels remain fit for purpose. ACEA recently published a position paper on the revision of the FQD and are not supportive of B10 and prefer HVO as a pathway to increase the percentage of renewable fuel<sup>27</sup>. This includes higher blends of gasoline above E10 which are not permitted in the European Union (recognising that although the UK has withdrawn from the European Union it is still

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<sup>54</sup> <https://www.ukpia.com/future-vision/the-global-challenge/>

<sup>55</sup> <https://www.frontier-economics.com/uk/en/news-and-articles/news/news-article-i7325-accounting-for-renewable-fuels-in-eu-fleet-targets-path-to-lower-co2-emissions/>

<sup>56</sup> [https://ec.europa.eu/clima/eu-action/european-green-deal/delivering-european-green-deal\\_en](https://ec.europa.eu/clima/eu-action/european-green-deal/delivering-european-green-deal_en)

part of a European based car parc). BSI is also a member of CEN and therefore has to adopt CEN Fuel standards.

xix. In your view, how should the government best deliver its aims of using LCFs to maximise environmental and economic benefits and are there specific measures the government should take to support the sector's transition?

- UKPIA recognises that the E10 transition was required to ensure that consumers were aware of the changes and could select the appropriate “protection grade” if required<sup>57</sup>. The leadership of the DfT was very welcome in this regard. We would encourage the DfT to work with fuel suppliers to develop practical solutions to rollouts of a similar nature in the future.
- We would ask for clear support from the government in the role of fuel standards in protecting consumers as well as assisting with their development in the future. This includes, for example, the inclusion of technically justified measures to protect vehicles against vehicle filter blocking.
- These aims are best delivered by a direct GHG reduction policy.
- Transport Policy should be developed on an integrated basis addressing three pillars: fuels, vehicles and infrastructure.
- A market-based mechanism, rather than the current preference for mandates should be used. This should create a market for low carbon transport fuels, with a price signal used to stimulate investment. Either a dedicated cap and trade mechanism or an LCF standard could be considered.
- The policy should consider amending vehicle standards to recognise WTW the CO<sub>2</sub> footprint of fuels. It could also consider a link between vehicle and fuel policies as previously outlined by Frontier Economics<sup>55</sup>.
- A reform of tax policies could be considered based on carbon intensity with zero or low-carbon fuels being taxed at a lower rate to facilitate fuel pricing that is socially acceptable and supportive of the business case for investment.
- LCFs should be able to demonstrate their WTW GHG reductions using an agreed and common Life Cycle Analysis (LCA) to demonstrate their environmental benefits in a transparent manner.

xx. In view of the different challenges and opportunities, are there specific policy measures the government should prioritise and why?

- We would ask that the government look carefully at the UK ETS scheme<sup>58</sup> as a significant additional burden on the UK refining industry against European competitors. This disincentivises investment in the UK fuel supply industry and risk the closure of UK refineries. This has the effect of reducing the business cases for UK CCUS schemes by removing a large source of CO<sub>2</sub> and has the potential to simply off-shore UK emissions.
- The current UK economic climate, including high costs of electrical power and other utilities, can act as a disincentive for investment by global companies. This

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<sup>57</sup> <https://www.gov.uk/government/news/fuelling-a-greener-future-e10-petrol-set-for-september-2021-launch>

<sup>58</sup> <https://www.gov.uk/government/publications/participating-in-the-uk-ets/participating-in-the-uk-ets>

may discourage new entrants into the LCF supply market. Therefore, the government should consider the relative competitiveness of the UK vs its international competitors as a place in which to invest.

- More stringent UK policies may also discourage new entrants into the LCF market. For example, if the UK SAF mandate has too high a GHG threshold (vs CORSIA) or there are restrictions on the type of hydrogen used then this can deter investment in the UK.

xxi. Are there any key actions the Government should consider as part of the strategy development to identify policy gaps and opportunities?

- Following the modelling work on renewable fuel supply and demand balance scenarios, we would encourage the government to identify how any imbalances can be addressed in the short, medium, and long term considering the sensitivities of the availability of imported material.
- The government modelling work also needs to consider the wider challenges associated with non-fuel related resources used in the transition. For example, how supply and demand balances for raw materials such as lithium, graphite and platinum develop at a UK, and an international level.
- The government should consider doing a consistency review across HMG and international policies, especially those of the EU, to ensure that UK policies don't create a disincentive to invest in the UK vs other countries. The review should also ensure different LCFs are used in the best place to maximise GHG reductions. For example, the use of LCH as a vehicle fuel (DfT) vs heat generation (BEIS).
- The government should also consider the impacts of societal changes in recent years because of the COVID-19 pandemic and how these translate into short, medium and long term demand for fuels. Support for other measures such as cycle lanes, encouraging walking for short journeys and public transport should not be forgotten as a key part of reducing overall GHG emissions<sup>59</sup>.

## Chapter 6 - Interdependencies

xxii. Does this chapter capture key interdependencies and interactions with other policy areas or markets? If no, please expand on any aspects that you think are missing or require further exploration.

- UKPIA agrees that this chapter broadly captures the key trends, opportunities, and risks of the interdependencies.
- Other interdependencies we would urge the government to consider are:
  - The electrical infrastructure including the supply grid and the availability of charging points for BEVs
  - Global renewable fuel policies which may affect the supply and availability of imports to the UK.
  - Global supply and demand of other resources for example lithium, platinum, and graphite.

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<sup>59</sup> <https://www.oecd-ilibrary.org/sites/55d4f157-en/index.html?itemId=/content/component/55d4f157-en>

- The interaction with vehicle standards as these have a significant impact on efficiency and energy vector
- The encouragement of other transport solutions such as the provision of cycle lanes and the use of public transport as other measures of decarbonisation
- The opportunities and attractiveness for investment in renewable fuels in other countries and regions by global companies
- The interaction with fuel standards which are set at an ISO and CEN<sup>60</sup> level and transposed into national standards in the UK by BSI and be used in pan-European vehicle models.
- The attractiveness of the UK as a place in which global companies can invest relative to other countries will be vital to ensure that suitable supplies of LCFs are available. Industrial policies such as the UK ETS heavily influence the relative competitiveness of the UK in this regard.

xxiii. In your view, are there any specific actions the government needs to take as part of the strategy development to address these interactions? If yes, what would those be?

- We would encourage the government to recognise that UK renewable fuel supply is strongly dependent on international factors, given the degree of imports into the country at present.
- We would therefore consider potential impacts of reductions in renewable fuel imports caused by change in the policies of external governments in any modelling of supply and demand balances to ensure the country remains resilient through the transition.
- We would encourage the continued government support and investment in grid infrastructure and charging points to enable the move to BEVs.
- We would ask the government to encourage domestic development production of materials for transition as far as possible, for example in lithium, graphite, and battery technology.
- We would ask that the government assists in the publication of vehicle and fuel standards to ensure that consumers can continue to have confidence that they remain fit for purpose throughout the transition.
- The government needs to consider a wide range of applicable policy to ensure that fuels remain affordable for society as a whole, rather than for a wealthy section of society.
- Recognising that the UK has withdrawn from the European Union, the government should continue to engage with the European Union on areas with international implications, such as the marine sector, aviation, and harmonisation of Carbon Emission credits. More stringent UK policies may also discourage new entrants into the LCF market. For example, if the UK SAF mandate has too high a GHG threshold (vs CORSIA) or there are restrictions on the type of hydrogen used then this can deter investment in the UK.

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<sup>60</sup> [https://boss.cen.eu/media/BOSS%20CENELEC/ref/ir1\\_e.pdf](https://boss.cen.eu/media/BOSS%20CENELEC/ref/ir1_e.pdf)

## Glossary

BECCS	Biomass with Carbon Capture, Utilisation and Storage
BEIS	Department for Business, Energy and Industrial Strategy
BEV	Battery Electric Vehicle
BSI	British Standards Institute
BX	Diesel containing up to X v/v % FAME
CCUS	Carbon Capture, Utilisation and Storage
CEN	Comité Européen de Normalisation
CfD	Contracts for Difference
Cfi	Call for Ideas
CO <sub>2</sub>	Carbon Dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
DfT	Department for Transport
E10	Petrol containing up to 10 v/v % ethanol
ETS	Emissions Trading Scheme
EU	European Union
EV	Electric Vehicle
FAME	Fatty Acid Methyl Ester
FOAK	First of a Kind
FQD	Fuels Quality Directive
GHG	Greenhouse Gas
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
HSE	Health and Safety Executive
HVO	Hydrogenated Vegetable Oil
ICAO	International Civil Aviation Organization
ICE	Internal Combustion Engine
IEA	International Energy Agency
LCA	Life Cycle Analysis
LCF	Low Carbon Fuel
LCFS	Low Carbon Fuel Strategy
RCF	Recycled Carbon Fuel
RED	Renewable Energy Directive
RFNBO	Renewable Fuels of Non-Biological Origin
RTFO	Renewable Transport Fuels Obligation
SAF	Sustainable Aviation Fuel
UKPIA	UK Petroleum Industries Association
WTW	Well to Wheels