UPEI 2050 VISION

SHORT- AND LONG-TERM RECOMMENDATIONS FOR A CARBON NEUTRAL SOCIETY

UPEI
THE VOICE OF EUROPE'S INDEPENDENT FUEL SUPPLIERS

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EXECUTIVE SUMMARY

The European institutions are facing an unprecedented challenge: providing sound policies responding to the urgent need to address climate change. As part of Europe's commitment to the Paris Climate Agreement, the European Commission presented on 28 November 2018 the long-term vision for a prosperous, modern, competitive and climate neutral economy by 2050, and called upon relevant stakeholders to share their insights, know-how and expertise in order to craft the policies and legislation that will allow to attain this goal.

Answering to this appeal, UPEI, representing Europe's independent fuel suppliers, is in a unique position to offer perspectives to the EU long-term strategy and contribute to the ongoing consultation process. UPEI members are fully aware of the climate impact of the current fuel mix for the transport and the housing sectors and are committed to provide flexible, affordable and clean energy to the consumer, to meet Europe's short- and long-term climate objectives. They can channel the transition, as critical elements of the connecting tissue that keeps the energy and mobility systems in operation.

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The size of the challenge is daunting. To achieve this goal, three significant changes are simultaneously required, while safeguarding economic growth and individual needs, in the behaviour of the consumers, in energy demand, and in carbon intensity.

The carbon neutrality objective embedded in the EU strategy is embraced by UPEI members. We believe that it can only be achieved in an affordable way by facilitating the transition through the deployment of different technologies. It includes the combination of both electricity and fuels, to maximise emission cuts in the transport and housing sectors, at the lowest cost with the best use of our resources.

UPEI 2050 vision promotes the use of alternative fuels and the improvement of energy efficiency to reduce emissions immediately, while developing carbon neutral fuels to suit all needs and applications in the longer term.

These carbon neutral fuels are advanced biofuels and biogases, e-fuels (synthetic fuels) and other solutions such as recycled carbon fuels. They offer many advantages: they feature a significant energy content, and can be moved, stored, and used in the existing distribution infrastructure and appliances. Their production and deployment must be stepped up to deliver their full potential to fight against climate change.

UPEI members have developed an expertise in the supply and distribution of fuels and energies. They are the interface between energy producers and consumers, using their own infrastructure to supply existing demand for conventional and renewable liquid fuels, as well as non-liquid alternatives in a flexible manner. As such, they are an essential link in the supply chain to bring low carbon solutions to consumers, providing a full coverage of the European territory, also reaching less accessible areas outside main conurbations, where reducing emissions from road mobility and heating & cooling has proven to be challenging. Retail stations will also help communicate effectively the energy transition to the consumers.

Significant cost savings will result from using the existing infrastructure to store, move and distribute energy products. The deployment of low and carbon neutral fuels in liquid and gaseous forms can therefore happen immediately, making the most of existing assets. Moreover, independent fuel suppliers are already active and investing into developing the distribution of a greater variety of fuels and energies to satisfy evolving consumer demands.

To make this vision a reality, policy enablers are needed. UPEI calls upon governments to adopt a technology neutral approach to the energy transition; ensure a stable policy framework, favourable to investments; define long-term targets rather than market bans; consider social acceptance and affordability; and support innovation in low carbon fuels.

More about our vision:
upei.org/upei-2050-vision

1. INTRODUCTION AND RATIONALE

1.1 A global and European commitment to fight climate change

By signing the historical Agreement of the 21st United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP), the European Union (EU) assumed the common commitment of "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels".

As part of this commitment, the European Commission, mandated by the European Parliament and the European Council, had initiated the process of crafting a long-term strategy for energy and climate in the EU; the foundations of such a strategy were reflected in the long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050[1], presented on 28 November 2018.

While the EU Strategy does not set specific targets and measures, it crystallises the political ambition to reach a net-zero emission economy by 2050. The Strategy will consider a number of options and technological pathways to be explored, providing a sense of direction to frame the efforts of governments, industry, researchers on one hand and of future EU legislation on the other hand. The energy transition is a long, complex and uncertain process, involving many technological options some of which will be more successful than others, which is difficult to predict.

In this context, EU institutions are calling on all relevant stakeholders to share their insights, know-how and expertise in order to craft the policies and legislation that will help Europe attain the common energy and climate objectives assumed by endorsing the Paris Agreement.

1.2 The relevance of European independent fuel suppliers

Answering to this appeal, UPEI, the voice of Europe's independent fuel suppliers[2], is pleased to put forward this position paper outlining key principles as well as our proposals for effectively and successfully reaching net zero carbon emissions in the European transport and heating sectors.

UPEI is in a unique position to offer perspectives to the EU long-term strategy and contribute to the ongoing consultation process:

- The European Commission vision stresses the need to decarbonise the transport and heating sectors, and to move away from fossil fuels. The carbon neutrality objective is fully embraced by UPEI members.

  As we represent approximately one third of Europe's import and wholesale/retail distribution of energy, our involvement is essential to bring evidence and share our experience to ensure a smooth and effective transition.

- Independent fuel suppliers are the interface between producers and consumers, using their own infrastructure and flexibility to supply existing demand for conventional and renewable liquid fuels, as well as non-liquid alternatives as part of the energy transition.

  As such, UPEI members will be a critical element in the supply chain to bring low carbon solutions to consumers, providing a full coverage of the European territory.

- UPEI members are European, independent and mostly family-owned companies, with a balanced mix of SMEs and larger companies, and therefore a key component of our economy and society at large.

- UPEI acts on behalf of its members, that are fully independent from refiners and major oil companies, in activities that do not involve fuel production.

  They have an unmatched capacity to adapt their product range, as demonstrated when independent suppliers led the way in the distribution of alternative fuels from the 1990's. Independents are already active and investing into developing the distribution infrastructure for most low carbon energies.

  The association takes an unbiased approach to reducing carbon emissions from fuels, in line with the principle of technology neutrality.

2. CONTEXT

According to the European Commission's long-term vision, climate neutrality can be achieved "by investing into realistic technological solutions, empowering citizens, and aligning action in key areas such as industrial policy, finance, or research, while ensuring social fairness for a just transition".

1 2018, European Commission, 2050 Long-term strategy
https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2050-long-term-strategy

2 2019, UPEI – The voice of Europe's independent fuel suppliers
https://www.upei.org

To achieve this goal, three significant changes are simultaneously required, while safeguarding economic growth and individual needs:

- **Changes in consumer behaviour**
- **Reduction in energy demand thanks to energy savings and efficiency improvements**
- **Urgent and sustainable reduction of carbon emissions across all sectors.**

Regarding the latter, in order to halt greenhouse gas emissions (GHG) emissions, the share of renewable and low carbon energy in all sectors of the economy and notably in the transport sector needs to increase significantly.

There is a direct correlation between carbon emission and fuel consumption. In addition, in 2016, the EU transport sector depended for 93,6% on oil[3], and accounted for around a quarter of EU total GHG emissions[4]. Road transport causes over 70% of all GHG emissions from the transport sector[5].

Importantly, the European Commission's long-term vision stresses that the decarbonisation of key sectors such as mobility and heating & cooling can't be based on silver bullets. There is not one solution, only a combination of solutions can address the challenges before us.

Electrification of the transport sector will significantly increase, especially for passenger cars in urban areas. Today, battery-electric vehicles and plug-in hybrids represent a total of 2.4% of new cars sales, and approximately 0.3% of Europe's current vehicle fleet[6]. According to the European Commission strategic long-term vision, it is estimated that battery-electric cars will make up 9% of Europe's car fleet in 2030, and vans 6%, but their deployment must scale up after 2030 to reach carbon neutrality in the European Commission 2050 scenarios, whatever the technology pathway chosen. According to the electricity utilities' association Eurelectric, reaching the most ambitious scenario of the European Commission vision requires a rate of direct electrification of 63% in the (road) transport sector by 2050[7].

However, it is not clear how we can achieve the levels of electrification across the economy in a sustainable and timely manner. Grid capacity will be one of the greatest challenges. Recharging infrastructure investments are significant and require time to reach a network density that is suitable for the mass market. In parallel, the issue of the life-cycle emissions related to batteries needs to be addressed to guarantee their sustainability.

In our view, it is important to pay attention to the following considerations:

THERE IS NO SINGLE SOLUTION.
While battery-vehicles are being introduced, we also need to clean up the existing vehicle stock to achieve climate objectives

The market introduction rate of battery-electric vehicles is not fast enough, given the renewal rate of the European car fleet, to provide the necessary carbon emission reduction[8]. The remaining carbon budget that would help us stay well below 2°C is expected to be depleted within 18 years.

Assuming a linear decrease of the annual CO2-emissions to reach zero in 2050, the carbon budget would be exceeded by 2034, i.e. before carbon neutrality is reached[9].

This calls for deploying options that are currently able to bring carbon emission reduction, making use of the existing infrastructure and even more importantly of the existing vehicle fleet, in parallel of introducing electric mobility to the market as part of a much broader decarbonisation strategy.

As stated above, approximately 40% of the vehicles in 2050 will not be electric, therefore carbon neutral solutions should be developed to power them to achieve climate objectives.

EACH CHALLENGE REQUIRES A DEDICATED RESPONSE,
including carbon neutral solutions for segments or applications which are difficult, or not effective to electrify

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3 2018, Eurostat, Oil and petroleum products - a statistical overview https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview

4 2018, European Environment Agency, Greenhouse gas emissions from transport https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-11

5 2017, European Commission, Transport emissions https://ec.europa.eu/clima/policies/transport_en

6 2019, European Alternative Fuels Observatory https://www.eafo.eu/

7 2018, Eurelectric, Decarbonisation pathways https://cdn.eurelectric.org/media/3457/decarbonisation-pathways-h-5A25D8D1.pdf

8 See information in e.g. https://www.theicct.org/sites/default/files/publications/ICCT_Pocketbook_2017_Web.pdf https://www.eafo.eu/vehicles-and-fleet/m1 https://www.acea.be/statistics/tag/category/report-vehicles-in-use

9 2018, Willner, *Importance of liquid alternative fuels for climate protection – a ProcessNet position paper* (Fuels of the Future, 2018, Berlin)

Energy is needed in different intensities and for different uses. Research shows that liquid fuels will still be needed for aviation, maritime transport, most heavy-duty road transport and passenger cars in certain cases[10].

The main reason is the energy density. Despite important progress in recent years, the energy density of all kinds of battery technologies is still around one tenth of the energy density of liquid fuels[11].

Even if technology improvements would make it possible to power a truck with a fully electric powertrain, one can wonder whether it is an efficient use of our energy, as it would greatly reduce the load capacity of such truck, and whether it is fit for purpose for the different forms and requirements for road haulage.

RENEWABLE ELECTRICITY PRODUCTION IS GROWING.
We need solutions to balance fluctuating generation and store the energy long-term

The increasing share of renewables in electricity production introduces new challenges for the reliable supply of energy for industry and households as it does not provide the necessary supply of base load energy.

Energy storage is needed to address these issues, to avoid wasting renewable electricity, as well as for energy security reasons. These elements are further developed in chapter 4.

In parallel, other low and carbon neutral solutions highlighted in the Renewable Energy Directive (RED[12]) and the Alternative Fuels Infrastructure Directive (DAFI[13]) can help achieve significant emission reductions.

These activities are complementary to the market introduction of battery-fuelled vehicles and can lead to a faster, more effective and cost-efficient reduction of the carbon footprint of the transport sector as we transition to climate neutrality.

3. UPEI VISION

UPEI members are committed to provide flexible, affordable and clean energy to the consumer, to meet Europe's short and long-term climate objectives. Our vision promotes the use of existing technologies and the improvement of energy efficiency to reduce emissions immediately, while developing carbon neutral fuels to suit all needs and applications by 2050.

What is required is not a choice between electricity and fuels, but rather a move from fossil to renewable and low carbon fuels (for electricity, liquid and gaseous fuels). Not only will both be needed, but research also shows that a combination of different technologies can maximise emission cuts[14] at the lower cost[15] and with the best use of our resources[16].

In addition, the battery is only one out of two clear and simultaneous modes of electricity use:

- Direct utilisation, being electricity stored in vehicles' battery.
- Indirect utilisation, in which renewable electricity is used to produce a gaseous or liquid fuel that is then stored in the fuel tank of the vehicle.

3.1 Short-term vision

In the short term (until 2030), the following solutions can immediately bring benefits:

» Focus on energy efficiency first

The fuel consumption of new cars has been decreasing since 2000 and was 1.8 l/100km lower in 2014 at EU level. From 2007, the rate of decrease has accelerated significantly (3.2% per year compared to 1.2% before)[17].

There is still room for improvement, thanks to new engine technologies and the increasing hybridisation of engines. Such energy efficiency improvements require collaboration along the entire fuel supply chain and vehicle manufacturing.

10 2018, Tremel, Siemens & Strombasierte Kraftstoffe (Fuels of the Future, 2018, Berlin)
11 2017, Somers & Tue, *Road towards green Transport* (NL-RVO/PDB seminar, 2017, The Hague)
12 Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources
13 Directive (EU) 2014/94 of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure
14 2017, IEA, *Technology Roadmap – Delivering Sustainable Bioenergy*
15 2019, Kuhlmann, *Technology-openness reduces costs for achieving climate neutrality in transport* (Fuels of the Future, 2019, Berlin)
16 2018, Concawe, *Impact Analysis of Mass EV Adoption and Low Carbon Intensity Fuels Scenarios* https://www.concawe.eu/wp-content/uploads/RD18-001538-4-Q015713-Mass-EV-Adoption-and-Low-Carbon-Fuels-Scenarios.pdf
17 Based on data collected by EEA from car manufacturers and based on test values. They therefore differ from real consumption on road (http://www.odyssee-mure.eu/publications/policy-brief/transport-efficiency-trends.html)

With the progressive introduction of low carbon fuels, it is essential that the original equipment manufacturers (OEMs) keep investing into more efficient engines, while independent fuel suppliers provide the best energy to power such vehicles. In addition, e-fuels have the potential to further increase engine efficiency, since they can be designed with an improved combustion pattern within the engine, higher internal compression, better software control of the engine. Governments' immediate action should be to encourage the renewal of the fleet to reap the benefits of these efficiency improvements.

In addition, the efficiency of the vehicles and the transport system as a whole can be improved thanks to digital technologies, design and aerodynamics, smart and integrated infrastructure etc.

In the heating & cooling sector, governments' immediate actions should be to encourage and incentivise improvements to the infrastructure and efficiency of homes. Alongside technological and design developments, more efficient supply systems will also improve, rendering our energy systems more sustainable.

» Increased use of sustainable biofuels blended into conventional fuels

Sustainable and low carbon biofuels are mature technologies and can be further deployed in an effective manner by being blended into conventional fuels. Currently strict sustainability criteria guarantee their actual GHG benefits, as well as social standards, low indirect land-use change etc.

Several European countries already have blending obligations in place[18]. However, there is a huge potential beyond strict RED II requirements. For example, we would suggest considering to blend higher rates in the near future, commensurate to the availability of sustainable biofuels.

In addition, the use of sustainable biofuels could be developed in applications where they are not yet commonly used e.g. aviation, non-road mobile machineries, maritime transport, heating & cooling etc. Governments should further support and encourage the production of these sustainable biofuels to ensure their widespread availability on the European market.

» Increased deployment of other alternative fuels

Alternative fuels, as defined in Directive 2014/94/EU[19], have clear energy security, climate and air quality benefits. As explained above, electricity will be increasingly used to power the transport sector, and light-duty vehicles in particular.

Other alternative fuels can also bring a significant contribution to reaching climate objectives and should not be neglected. These alternative fuels must be able to compete fairly against each other. For an effective deployment, the development of the distribution infrastructure has a fundamental role to play. The distribution network must be dense enough to encourage drivers to switch to alternative fuels. This requires important investments, that governments should promptly encourage and support.

UPEI calls for a smart use of available low carbon fuels, by choosing the most suitable option for each application. UPEI members can bring the right solution to customers, providing a more effective supply of energy.

3.2 Long-term vision

In the long-term, carbon neutral fuels should be widely deployed to reach net zero carbon emissions in the 2050 horizon, alongside electricity and hydrogen. Early developments would bring a much-needed support to reach the 2030 climate goals in sectors which are difficult to decarbonise, while the technology is scaled up post-2030.

Europe is currently a global leader in e-fuels and advanced biofuels research and development[20]. Further investment would allow Europe to consolidate this position, creating jobs and growth in the EU.

They offer many advantages, in addition to being carbon neutral, when considering future energy needs:

» Significant energy content per mass

This is particularly relevant for applications requiring high amounts for energy such as planes and ocean-going vessels.

» Storage pre-use

These carbon neutral fuels can be stored in liquid or gaseous form, in the long term, without energy losses.

» Portability

Carbon neutral fuels in liquid and gaseous form can be transported virtually anywhere, from the place of production to the place of consumption, thanks to the existing supply infrastructure.

» Optimisation of the existing distribution infrastructure

Thanks to their properties, such carbon neutral fuels can be used in the current distribution infrastructure, making the most of existing assets in Europe.

18 2018, UPEI, Biofuels Matrix https://www.upei.org/library/download/463/381/17?method=view
19 Electricity, hydrogen, biofuels, synthetic and paraffinic fuels, natural gas and LPG
20 2018, European Commission, *2050 Long-term strategy*

» Energy security and reliability

The storability and portability of these fuels allow to stock necessary volumes to be used in case of black out or any other supply issue with other energy carriers.

» Environmental benefits

They have positive side effects on air quality in comparison with conventional fuels, mainly due to favourable combustion characteristics.

4. LOW CARBON AND CARBON NEUTRAL FUELS: TYPES AND USES

There is a wide range of solutions that can together facilitate the transition to net zero emission[21]. The production of renewable and low-carbon fuels starts with feedstocks in which energy is stored as a chemical component or in the form of electricity:

- Biogenic feedstocks, which can further be characterised by being a primary feedstock (crop), a by-product or a waste/residue.
- Renewable electricity (for the production of e-fuels).
- Industrial, fossil-based feedstocks such as waste gases from industrial activities and non-recyclable plastics.

Each of the above feedstock category lead to the production of different types of renewable energy, gathered in the following three categories.

4.1 Advanced biofuels and biogases

Advanced biofuels and biogases are produced from the feedstocks listed in Part A of Annex IX of RED II (whereas waste-based fuels are listed in Part B of IX). These feedstocks are converted into a number of products through bio-chemical, physico-chemical or thermo-chemical conversion processes. Technology readiness is currently being assessed at different levels according to the pathways, with several being already fully mature[22].

4.1.1 Important considerations on advanced biofuels and biogases

» GHG emission savings

The GHG emission savings, taking into account cultivation, processing, transport and distribution, of advanced biofuels and biogases (considering both default and typical values), range from 20% to 210%[23] compared with the fossil fuel comparator[24]. Savings exceed 100% thanks to avoided emissions.

RED II sets limits to certain feedstocks, in particular food/feed crops-based biofuels and used cooking oil and animal fats, indicating that the achievement of the 2030 renewable targets will depend on the joint deployment of biofuels produced from all types of feedstocks. In practice, RED II incentivises the deployment of advanced biofuels and biogases.

In addition to caps, RED II strengthens the GHG requirements. The threshold level of the original RED in 2009 was 35%. This has increased to 50% and 60% and up to 65% for new production plants coming online.

» Production costs

Generally, technology maturity and increasing production volumes allow for efficiency improvement and economies of scale, therefore pushing production costs down. Such evolution has been witnessed for the most commonly available biofuels.

However, most advanced biofuel production pathways are in the innovation phase. The industry has been invested in their development for some time, but is expected to start investing in commercialisation now that RED II objectives are clarified.

An analysis of various advanced biofuel production pathways has concluded that some are nearly closing the gap with conventional fuels, while other options would require support to reach parity[25]. Moving forward, the search for new and sustainable feedstocks will be key, with corresponding innovation on conversion technologies.

» Feedstock availability

In general, advanced bioenergy is produced from cellulosic and lignocellulosic materials, such as agricultural and forestry residues, wastes, energy crops, or aquatic biomass. These technologies are important as they can utilise feedstocks with high availability and limited other uses (e.g. agricultural residues and municipal solid waste).

The International Energy Agency (IEA) concludes, based on recent assessments, that at least 100,000 petajoules of sustainable bioenergy could be available in 2050 or 2060 at global level, and that potentials within the 100,000-300,000 petajoules range may still be considered reasonable. Around 60% of these volumes could come from different types of waste and residues.

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21 An overview of the technology status is available at http://artfuelsforum.eu/wp-content/uploads/2019/04/ART-Fuels-Forum-SGAB-Biofuels-Technology-report-2018-update.pdf

22 2019, DBFZ, *Technology status of various conversion routes*

23 2019, Studio Gear Up calculation for UPEI

24 94 gCO2eq/MJ

25 2019, Studio Gear Up for UPEI

On that basis, the IEA forecasts that feedstocks will be sufficient for a major expansion of the use of bio-energy, moving up to tenfold in 2060, providing 29% of total transport final energy demand worldwide.

4.2 E-fuels – synthetic renewable fuels

E-Fuels, or electrofuels, or power-to-X, are advanced renewable fuels produced from renewable electricity via electrolysis.

As regards to e-fuel production pathways, the following conversion routes are identified[26] for power-to-liquids (Fischer-Tropsch synthesis, methanol synthesis, polyoxymethylene synthesis) and for power-to-gas (electrolysis from water to hydrogen, eventually transformed into methane). In all pathways the outcome is carbon neutral, provided that the electricity used comes from renewable sources.

When it comes to production costs, Prognos estimates that in 2050 the production costs of GHG neutral e-fuels (based on the Fischer-Tropsch production pathway) could be between 0,5 and 0,9 €2015/l, at 2% interest rate and 0,7 and 1,3 €2015/l, at 7% interest rate. These prices would be achieved at locations optimised for low cost production, in Europe and outside Europe, reinventing the map of global energy flows. Like any emerging technology, production costs for e-fuels are currently high.

Economies of scale are expected with the development and deployment of these solutions. Such changes will translate into lower prices for consumers when they become mainstream. The fact that e-fuels can be distributed and used in the existing infrastructure and vehicles compensates for higher production costs.

As the availability of feedstock, i.e. wind or solar, is not limited, potential volumes and market shares are determined by the demand. Several studies[27] have estimated the expected global e-fuels demand for different GHG reduction scenarios. Depending on the share of e-fuels usage in each sector, the total demand in 2040 varies between 10% and 50% of current oil and gas consumption.

The e-fuel production capacity to cover this demand is estimated to range from 4,000 gigawatts to 16,000 gigawatts, confirming that e-fuels are expected to play a crucial role in the future energy system[28].

UPEI therefore sees a need for prompt action to build up the necessary production capacity. The e-fuel technology is versatile. It can be used on very large scale for global production, and also on a more local scale, giving flexibility and balancing the intermittent renewable electricity production.

4.2.1. Important considerations on e-fuels[29]

» Secondary use of renewable electricity

In the case of e-fuels, renewable electricity is not being used directly, but transformed into a gaseous or liquid energy carrier to be used indirectly. Not only does storing renewable electricity as e-fuels brings many benefits (as stated in chapter 3), but we argue that they are a solution to store and use electricity, complementing batteries.

In any case, the introduction of both battery-electric vehicles and e-fuels will require the expansion of production capacity of renewable electricity in Europe. In addition, e-fuels could also be produced at locations where abundant solar and/or wind energy is available, thus taking advantage of economies of scale and low production cost opportunities.

» Energy efficiency

The overall energy efficiency of various power-to-X production pathways is about 50%[30] with current technology, because of the energy used in the course of the synthesis process. As for any emerging technology, energy efficiency improvements are to be expected. Moreover, this relative "energy inefficiency" is based on a too narrow definition (see below). Besides, it is largely compensated by the fact that e-fuels can be used in existing vehicles and appliances, thanks to the existing distribution infrastructure and offer – as an example - the chance to make Australian solar power available for the transport sector in the EU. In addition, this process leads to the production of a high energy liquid useable in virtually any situations and whenever necessary.

Furthermore, the proper consideration of the energy efficiency of both energy carriers, batteries and power-based e-fuels, is essential. Currently, the debate is limited to comparing the ratio of primary energy input to energy available for propulsion at the wheel: battery vehicles are widely seen as cars with an energy efficiency of around 65% whilst cars with an internal combustion engine show 15% to 20% efficiency rate when using renewable energy.

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26 2018, Prognos, SBFZ & Fraunhofer UMSICHT, *Status and perspectives of liquid energy sources in the energy transition*
2018, Frontier Economics, *International aspects of a Power-to-X roadmap: A report prepared for the World Energy Council Germany*

27 2018, Frontier Economics, Ibid.

28 2019, Global Alliance Powerfuels, *Powerfuels: Missing link to a successful energy transition*
https://www.powerfuels.org/discussion-paper/

29 2019, Studio Gear Up for UPEI

30 Tremel, Siemens & Strombasierte Kraftstoffe, Ibid.

The ratio of primary energy input to propulsion energy output is a misleading micro perspective that ignores substantial points: it assumes renewable energy is available when- and wherever demanded. Also, the energy and GHG emissions to produce batteries and related raw materials are not taken into account. Plus, electrification requires infrastructure investments from production, transport, short and long-term storage, which imply carbon emissions. In many cases these grid investments need to be laid out capacity-wise for peak-loads, e.g. on motorways and frequently used roads during holiday season. As a result, the metric needs to be different, e.g. a metric "driving range per installed kW power" could be envisaged. The entire "fuel" chain efficiency needs to be assessed with a well-to-wheel perspective to allow for informed policy decisions. E-fuels offer the chance to use renewable energy from all over the world to bring carbon reduction elsewhere, once in liquid state without energy losses.

» Water consumption and land use

Water is an important element of any e-fuel production pathway, as it is required in the electrolysis process. While the intake of water is important, recycling is a way to reduce that intake, down to 1.3-2.0 litre per litre of e-fuel[31]. Such recycling must be addressed in the sustainability criteria (see Chapter 5) to ensure the most sustainable use of water. In particular, water desalination should be envisaged. Regarding land-use, strong sustainability criteria are already available in RED II and follow up implementing acts. For e-fuels, we could expect that large-scale facilities would be located in areas where wind or solar power production capacity is highest, thus in areas where the competition for land is low (e.g. deserts). Again, strict sustainability criteria should prevent unintended consequence from harming the environment.

4.3 Recycled carbon fuels

RED II provides the option for Member States to account the contribution of recycled carbon fuels, e.g. fuels produced from industrial waste gases or based on non-recyclable plastics, to contribute to the renewable energy target in transport.

UPEI's vision does not develop on the role of this category of fuels, as specific requirements are still to be developed by the European Commission (regarding appropriate minimum thresholds for greenhouse gas emissions savings of recycled carbon fuels through a life-cycle assessment that takes into account the specificities of each fuel).

5. OUR RECOMMENDATIONS TO EUROPEAN AND NATIONAL POLICYMAKERS

5.1 State of the legislative framework

The legislative framework for renewable fuels has been progressively established from the 1990s. In various EU Member States' regional developments, the production of crop-based biofuels took place as one of the options the agricultural sector explored to diversify and to build extra variety in the existing agricultural rotation schemes.

In 2003, the European Commission sought to harmonise the development of biofuels with a proposal for a Directive, which was then regularly complemented and updated.

The recently adopted Directive, RED II (for the period 2021-2030), sets a binding overall Union 2030 target for renewable energy of 32%, and creates a clear framework for more types of renewable fuels, beyond biofuels. It is a proof of the significant potential of e-fuels and recycled carbon fuels. Reaching cost-effectiveness may take a few years, but investment and development must start now.

For all renewable energies, the legislative framework at EU level establishes strict definitions and criteria when it comes to sustainability, indirect land-use change criteria, and GHG emission savings. It provides guarantees and avoids any negative side-effect.

As a comprehensive legislative framework being in place at the European level, it is now time for policymakers to enable the greater deployment of these low and carbon neutral fuels, moving from framing to facilitating.

Indeed, expert analysis[32] shows that the actual physical shares of renewable energy in transport may not increase sufficiently to fulfil its contribution to the overall GHG emissions reduction objectives for the sector, although renewable energy goals would be met on paper; this would result in a CO_2 gap.

In order to close this gap, there is an urgent need to speed up production of renewable energies to ensure their availability and actual market deployment beyond RED II requirements.

5.2 Putting the vision into action

Achieving the vision set out by UPEI requires an enabling policy framework, just like any other pathway allowing to reach the ambitious climate objectives set

31 2018, Shell, *The road to sustainable fuels for zero emissions mobility status of and perspectives for power-to-liquids fuels*
32 2019, Studio Gear Up for UPEI

out at global and European level. Political support is needed to scale up carbon neutral fuels production and deployment in our economy. This should focus on the following key aspects:

» Technology neutrality

EU and national governments should keep promoting both e-mobility and renewable electricity production to quickly and fully decarbonise Europe's electricity mix. That being said, policymakers also need to adopt a neutral approach to different technologies, incentivising the outcome based on climate performances and not on the type of technology.

When it comes to both policy and support measures, there is a need to create a real level-playing field encouraging investment and innovation.

A focus on a single solution does not maximise the chances of reaching climate objectives. In practical terms, this would materialise thanks to the following actions:

- Urgently developing a life-cycle approach to evaluate the carbon footprint and the environmental footprint of all solutions and emissions from all applications, allowing for a thorough comparison, and its swift implementation by amending existing pieces of legislation in a practical manner using for example default values and credit/compensation mechanisms, avoiding regulatory overlaps.

  In particular, car manufacturers should be incentivised to further invest in energy efficiency improvements and vehicles powered by renewable and carbon neutral fuels.
- Developing an EU methodology to harmonise the approach to certificates of origin delivered for putting renewable and carbon neutral fuels on the market.
- Revising the definition of "efficiency" to factor in the cost efficiency of renewable fuels ("drop-in" benefit) versus standalone technologies requiring dedicated infrastructure and appliances.
- Updating the definition of energy efficiency to accurately compare the range per installed kW of vehicles powered by different fuels.

» Favourable framework for innovation and investments

EU and national governments urgently need to establish a framework which is stable and favourable to investments. In practical terms, this would occur thanks to the following actions:

- Ensuring stable and predictable sustainability criteria for fuels from biomaterial origin, beyond 2030, to give the right signal to the market to invest in necessary production facilities.
- Developing robust sustainability criteria for batteries and e-fuels as a complement (including emissions at production, transport, raw material, recycling).
- Launching a Europe-wide e-fuel strategy to boost R&D, investment and commercialisation. At the EU level, e-fuels should be identified as a Key Strategic Value Chain to foster investment and coordinated actions, gathering not only producers but also the supply chain, including distributors and end-users.
- Revising the CO2 emission regulations for light and heavy-duty vehicles to incorporate a crediting system recognising the use of low carbon fuels. This would directly incentivise the development of these fuels.

In both the transport and heating & cooling sectors, investment should not be entirely redirected towards alternative technologies.

EU and national governments should keep focusing on energy efficiency as a priority area for action. More efficient internal combustion engines will be needed to bring down CO^2 emissions of transport in the short term, and ensure the best use of carbon neutral fuels in the longer run. For housing, state-of-art boilers can reduce GHG emissions by 40%, and can easily be adapted to work in combination with renewable energy.

In parallel, fleet and appliances renewal should be encouraged as a short-term measure, to reap the benefits of the latest energy efficiency improvements.

» Long-term targets

Generally, UPEI calls upon the EU and national governments to adopt long-term targets, to avoid politically motivated draconian measures and u-turns in policy which convey negative signals to consumers and investors alike.

UPEI warns against market bans and other drastic restrictions, which go against the principle of technology neutrality.

» Social aspects

In order to ensure acceptance, social implications of the energy transition and its affordability should be fully considered in any future action plan. Increased costs due to the use of low and carbon neutral fuels should be communicated and adequately compensated by public authorities.

In particular, low and carbon neutral fuels should be made attractive to consumers through favourable taxation and other incentives.

EU and national governments should account for market realities and consumers, in order to promote the solution that is most suitable to specific needs.

» Internal market

Member States should implement the EU framework in a consistent way to avoid creating barriers for market players willing to deploy clean solutions across borders. In particular, RED II should be implemented in a consistent manner to promote renewable fuels and enhance the internal market for them.

6. THE INDEPENDENT SECTOR CONTRIBUTION TO CREATING A CARBON NEUTRAL ECONOMY

UPEI embraces the urgent need to address climate change. UPEI members are active in the transport and heating markets and are fully aware of the climate impact of the current fuel mix for these sectors. UPEI and its members are committed to the overall objectives European policy makers have articulated. Independent fuel suppliers have a key role to play for the following reasons:

» Making the most of our expertise

UPEI members are not directly involved in fuel production; however, they have developed a strong expertise in the supply and distribution of fuels and energies. The independent sector was born in the context of the oil shocks and showed a reliance and flexibility which oil majors did not have. They have been and still are able to changes rapidly, using competitive strategies to adapt their product portfolios allowing to bring the best products to the market at the lowest price.

Independent suppliers will have an increased role to play, in a context where renewable energy production will become more decentralised and diversified, to bring this energy to the end users. We anticipate a system where local energy producers would team up with independent suppliers to bring their products to consumers.

Independents are the front runners. They have a strong track record in pioneering the supply of renewable fuels in the EU, and similarly they will bring carbon neutral fuels to European consumers in the shortest delays.

» Repurposing our existing distribution infrastructure and investing further

UPEI members have an extensive infrastructure for storing and moving products across Europe (30,000,000 m^3 storage capacity, 15,000 trucks, 1,000 depots owned). In addition, they own 21,000 retail stations, i.e. more than a fifth of the total retail network in Europe. They are ready to re-purpose this extensive infrastructure to meet evolving consumer demands, by investing in the existing infrastructure and develop new facilities. Meeting climate objective will require the progressive diversification of the fuel mix. As they have started already, UPEI members will develop and operate multi-energy stations, expanding their fuel and energy product portfolio.

As a result, the deployment of low and carbon neutral fuels in liquid and gaseous form can therefore happen immediately, at a limited cost, making the most of existing assets.

» Making the link with consumers

UPEI members are close to consumers, as retailers are the last elements of a long supply chain. They are already transitioning from supplying fuels towards supplying energy solutions, mobility services and other convenient products, reinforcing this link. Indeed, retails stations are increasingly becoming places where people can pick up their deliveries and meet partners for car-sharing and car-pooling. In addition, the growing trend is for retail stations to provide a wider range of products including food, whilst in rural areas in particular it might be the closest shop for many citizens.

An effective energy transition must be explained and endorsed by citizens. Fuel suppliers are the face of this energy transition when it comes to changing behaviour in the mobility area. Retail stations will help communicating the energy transition to the consumers.

» Leaving no one behind

Independent fuel suppliers ensure the affordability of Europe's energy transition for consumers by fostering competition in the market. In addition, they have an extensive geographical reach, especially reaching less accessible areas outside main conurbations, in mountainous and rural areas, where reducing emissions from road mobility, and heating & cooling, has proven to be challenging.

UPEI MEMBERS COMMIT TO:

- Actively contribute to the formulation of the pathways to climate neutrality
- Continue and step up their efforts to bring viable low carbon and carbon neutral products to European consumers in view of the 2050 objective, in cooperation with fuel producers
- Educate and train their staff on the technical aspects of these solutions
- Invest in the infrastructure to ensure the effective supply of carbon neutral fuels
- Communicate the energy transition and low carbon mobility options to consumers.

GLOSSARY

- **Advanced Biofuels:** biofuels produced from biomass (as defined under RED or any amendment to it) other than food/feed crops while meeting the EU sustainability regime under the legislation currently in force.
- **Advanced Renewable Fuels:** advanced biofuels and liquid and gaseous fuels produced from renewable intermediates or renewable process by-products (H2, CO, CO2 etc.).
- **Biomass:** the biodegradable fraction of products, waste and residues from biological origin from agriculture, including vegetal and animal substances, from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin
- **Biogas:** gaseous fuels produced from biomass, such as biomethane or biopropane.
- **Biofuel:** liquid fuel produced from biomass.
- **E-Fuels:** advanced Renewable Fuels produced from renewable electricity via electrolysis. They are named "renewable fuels of non-biological origin" in RED II. It is a category of fuels produced via electrolysis of water using renewable power and synthesis. There is a large number of different pathways, leading to the production of e-hydrogen, e-methane, e-diesel, e-gasoline, e-ammonia, e-DME etc.
- **Low Carbon Fossil Fuels:** liquid and gaseous fuels produced by the conversion of exhaust or waste streams of fossil fuel industrial applications via catalytic, chemical, biological or biochemical processes.

UPEI 2050 VISION

WHO WE ARE

UPEI represents nearly 2,000 European importers and wholesale/retail distributors of energy for the transport and heating sectors, supplying Europe's customers independently of the major energy producers and covering more than a third of Europe's current demand.

UPEI brings together national associations and suppliers across Europe, representing the sector at the European level.

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UPEI
THE VOICE OF EUROPE'S INDEPENDENT FUEL SUPPLIERS