ePURE
european renewable ethanol

Position Paper

ePURE's contribution to the public consultation on the
Green Paper on a 2030 framework for climate and energy policies

ePURE believes that a high level of consistency with related policy areas is a precondition for creating a successful future policy framework for renewable energies, particularly in transport. Such a holistic approach would need to include relevant changes to agriculture, trade, taxation and R&D policies. European companies are world leaders in developing innovative technologies to produce renewable ethanol. However, due to an insufficient support scheme, the investments in commercial scale plants are made elsewhere. This "technology leakage" has severe consequences for Europe's competitiveness, energy supply and economic growth potential. By setting out a renewable energy vision for 2030 Europe has the chance to enable green growths and jobs while significantly improving its carbon footprint and energy security.

Continue successful renewable energy policy

The key drivers of current renewable energy use in transport are binding targets. In its Energy Roadmap 2050 the European Commission recognises the importance of binding targets for the deployment of renewable energy technologies. Without binding targets the growth rate of renewable energy is projected to slump from the current 6% per year to just 1%.[1] At a time when fossil fuel subsidies in the EU are 4 times as high as support for renewable energies[2], binding targets will achieve what a greenhouse gas reduction target alone cannot achieve: Providing the energy sector with the necessary stability and predictability that allow renewable energies to grow successfully. Recent scientific evidence proves that supporting renewable fuels pays off and results in a net gain for the Member State Treasuries[3].

Set clear and binding target for renewables in transport up to 2030

The EU transport sector is highly dependent on imported fossil fuels, which puts the EU's energy security at risk. At the same time the transport sector will remain highly dependent on liquid fuels until at least 2030.[4] The combined effort of more fuel-efficient engines and use of biofuels with at least 50% GHG emission saving will make the strongest contribution to driving emissions further down. Renewable and sustainable fuels such as EU-produced ethanol are therefore crucial to any responsible energy framework. Furthermore, transport is cross-border by nature. It is therefore important to have the same fuels available in the different member states. If one country would opt only for renewable electricity whilst another opts for a high share of biofuels, the internal market would suffer. A volume-based target combined with a minimum GHG emission saving requirement is the right way forward to ensure that future growth in the biofuels market should come from the best performing biofuels in terms of GHG performance irrespective of whether these biofuels are conventional or advanced. To create long-term visibility the EU should set itself a binding target of 20% in energy of renewable ethanol in the petrol market by 2030. Due to its increased octane, mid-blend ethanol fuel is a key enabler to achieve additional GHG emission reductions through efficiency gains.

Special attention to advanced biofuels

Advanced biofuels such as ligno-cellulosic ethanol are made from a variety of new feedstock sources such as straw, residues or waste. Processing these feedstocks requires high tech facilities, pioneering enzyme and yeast technologies as well as highly skilled people. European companies are world leaders in advanced biofuels technology but investment in commercial scale production plants are happening elsewhere in the world where more targeted support is given, instead of in the EU. To avoid this innovation leakage and to create a new dependency on imported advanced biofuels, the EU needs to make the move from development to deployment. Considerable investment is required to set up such commercial scale state of the art production facilities.[5] Double Counting has not helped to spur deployment of innovative ethanol technologies.[6] It reduces the actual volume of biofuels needed and decreases the associated GHG emission reductions and benefits for energy security. **To be set therefore** a dedicated sub-target for cellulosic ethanol in petrol increasing gradually from 2%

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[1] *European Commission, Energy Roadmap 2050, 2011.*
[2] *European Commission, Renewable Energy: Progressing towards the 2020 target, 2011.*
[3] *Les impacts socio-économique de la filière bioéthanol en 2010, PriceWaterhouseCoopers (PwC), Avril 2013.*
[4] *Globally, oil will remain the dominant fuel in transport, although its share falls from 94% in 2011 to 89% in 2030. BP Energy Outlook (January 2013), page 29.*
[5] *As a rule of thumb investments in advanced ethanol plants are double that of conventional ethanol plants.*
[6] *ePURE (March 2013) Double counting, half measures: Study on the effectiveness of double counting as a support for advanced biofuels. http://www.epure.org/sites/default/files/130327_102_Double_Counting_Half_Measures_Study.pdf*

in 2020 to at least 10% in energy by 2030. This target must be supported by meaningful measures by the European Union, taken to overcome existing concerns by financial institutions that their support for advanced biofuels will be undermined by future changes in law, for without such longer-term support there cannot be commercialisation of advanced biofuels within Europe.

Apply fair energy taxation rules

The price of fossil fuels does not reflect true costs, moreover, existing taxation rules distort competition. In addition, a big (and growing) part of the passenger fleet runs on diesel like the entire fleet of HDV, shipping and aviation. To make optimum use of biofuels for transport, a shift towards petrol engines is needed. A fair fuel taxation policy is needed to achieve this, one that would tax fuels based on their energy content and carbon impact, letting the market prize the most efficient fuels. Today's fuel taxation practices in the EU, however, distort efficiencies and are disconnected from decarbonisation goals, with large effective subsidies for diesel at the expense of petrol and ethanol (one reason why the EU is a net exporter of petrol).[7] A fairer, and less costly, fuel taxation regime would open the EU market to sales of small, highly efficient petrol engines and new fuels such as E20-25 or E85 for passenger cars and ED95 for heavy-duty vehicles would become an attractive and viable option to further decarbonise the transport sector.

Trade to support renewable fuels

Consistency of policy is key. The EU trade policy must support the development of renewable ethanol in Europe rather than hindering it by treating ethanol as a bargaining chip in trade agreement negotiations. Moreover, persisting loopholes with regards to import tariffs and a reluctant application of trade defence instruments has deteriorated the prospects of domestically produced renewable fuels over the past years. While a fair and healthy trade is desirable, the EU has to ensure that trade partners are on equal footing: a level-playing field needs to be created with particular attention paid to local support schemes, energy prices and market realities.

[7] *In the EU Ethanol is the highest taxed motor fuel.*

Annex: Facts and figures underpinning ePURE's contribution to post 2020 energy policy reflection

1. GHG emissions savings

Ethanol in petrol can significantly support the achievement of climate and energy targets set in the EU. This is especially true of higher ethanol blends with an increased octane number, such as E20, which contributes twofold to CO_2 emission reductions: it both lowers CO_2 emissions directly through the replacement of fossil petrol, and improves engine efficiency thanks to its higher octane rating. In the short and medium term, the CO_2 reduction potential stemming from an enhanced use of alternative fuels, such as ethanol is higher than from electric vehicles.

Direct replacement

Since 1990, transport has been the only sector in Europe to not have reduced GHG emissions. Since then emissions from EU transport have risen by 36%[8]. Without the EU biofuels policy this rise in emissions would have been even greater. With the introduction of the EU biofuels policy in 2003, the consumption of EU-produced ethanol has generated 22 million tonnes of CO2 emission savings in EU transport during a period in which energy demand in transport reached record levels. These emissions savings could rise to 55.7 million tones of CO_2 emissions in 2020, based on projected EU ethanol consumption.

10+MToe of ethanol can be produced with zero indirect land use change (ILUC) consequences by agricultural yield increases alone.[9] There is mounting evidence that these yield increases won't happen without a vibrant ethanol industry that provides EU farmers with a reliable market for their products. The production of animal feed co-products from EU ethanol also generates substantial GHG savings from ILUC due to the displacement of soya meal imports[10]. This means that EU ethanol is generating emissions savings, while assisting rural and regional development, plus creating jobs and growth in Europe, as well as improving EU energy security, all at the same time and with no competition with food[11] or ILUC.

The GHG savings of ethanol, compared to fossil fuel, can be increased to 80% (as high as advanced biofuel) with (i) a move away from using natural gas in individual plants, (ii) better fertiliser use in agriculture, and (iii) an expansion of the biorefinery concept. No technological breakthroughs or improvements are needed, only a favorable investment climate.

Ethanol facilities built today are very different from those built as recently as a decade ago: A) Technically: energy consumption is much lower, ethanol yields are higher, and production costs are lower, all leading to dramatically better GHG savings today than just a decade ago; B) Operationally: in the past DDGS used to be disposed of as a waste material, but now it is processed into a valuable, GMO-free, high-protein animal feed that helps ease Europe's 70% dependency on animal feed imports.[12] Now ethanol production facilities are increasingly in the form of biorefineries, which produce a wide range of products for the wider market and generate zero waste. The pace of innovation and change in the ethanol industry continues to be rapid and today's ethanol plants currently use 40% less energy per litre of biofuel than their ten year-old predecessors.

Efficiency gains through improved fuel properties

Several scientific studies, recently published, corroborate the finding that engine efficiency is increased thanks to higher octane rating of E20-25 ethanol blends. A summary of the most relevant studies and their main conclusions are provided in the following.

- Incorporating ethanol enables an increase in the minimum octane rating for regular-grade fuel. Large increases (4–7 points) in the RON of fuel are possible by blending in an additional 10–20% v/v ethanol above the 10% v/v already present in fuels.[13]
- Ethanol as splash blend component (E20) in gasoline can provide a significant extra contribution to the

[8] *DG CLIMA, European Commission*
[9] *Own calculations.*
[10] *UN Food and Agriculture Organisation, Biofuels Co-Products as Animal Feed (2013), Page 14*
[11] *European Commission, Renewable Energy Progress Report, Page 12*
[12] *AGRI Committee of the EP: The EU protein deficit: what solution for a long-standing problem? (2010/2111(INI)), http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A7-2011-0026&language=EN*
[13] *Anderson, DiCicco, Ginder, Kramer, Leone, Raney-Pablo, Wallington (Ford motor company), High octane number ethanol–gasoline blends: Quantifying the potential benefits in the United States*

CO_2 emission savings of up to 6 % in conventional gasoline engines. The CO_2 reduction potential is significantly higher if the engine is adapted to the changed fuels properties of the splash blend (namely the higher RON).[14]

- The E20 efficiency gain has a 'leveraging' effect, which increases CO_2eq savings allocated to ethanol from 50 % to 69 % or from 60 % to 78 %.[15]
- Intermediate blends near E20 can provide the majority of the performance benefit of E85 and enable strategies that offset their lower energy penalty.[16]
- US studies found that the effects of 20% ethanol blended fuels did not present materials compatibility problems for current automotive or fuel dispensing equipment.[17]

2. Security of supply

The importance of ethanol as a here-and-now solution in the fuel mix is clear. EU transport is currently 94% dependent on oil, 84% of which is imported from countries outside of the EU, many of which are politically unstable. In 2012 the EU oil import bill was nearly EUR 1 billion per day, totaling EUR 315 billion, nearly the size of the entire debt of Greece. Since the introduction of the EU biofuels policy in 2003, EU ethanol producers have generated 31,5 billion litres of domestically-produced green transport fuel, **replacing the need for 113 million barrels of oil** and saving the EU oil bill EUR 6,6 billion.

We predict that up to 2020, EU produced ethanol could **displace an additional 286 million barrels of oil** and save EUR 23.5 billion to the EU oil bill (n.b. based on a cumulative EU ethanol production of 79.8 billion litres up to 2020).[18]

3. Agriculture

If the EU's current renewable energy target in transport is not renewed after 2020 it would most likely limit the blending of (conventional) biofuels by fuel suppliers. This would have wider negative consequences for agriculture and rural regional development in the EU[19]:

- Vegetable oil produced from the crushing of rapeseed and sunflower grown in the EU would have to find an outlet in third countries, provided they can be competitive as an export;
- The protein deficit in the EU would increase in the livestock sector and thus there is a huge risk that this activity would be outsourced to third countries generating ILUC;
- More land outside the EU would be needed for agriculture. Since the yields of biofuel crops grown in the EU are substantially higher than those of soybean in South America, the production of co-products of EU biofuels results in a net reduction in required global land area of about 3 milion hectare. Removing EU support for conventional biofuels will impact on domestic animal feed production and increase the amount of agricultural land needed outside of the EU to meet EU feed demand.[20]
- Substituting the production of oil cakes, currently produced as a result of the demand for biodiesel, by additional protein crops is not realistic because of the agronomic conditions: growing conditions in most parts of the EU are unsuitable for these crops and the absence of the authorization of GMO crops such as soybeans in the EU;
- The instability of agricultural markets, where biofuels demand plays a stabilising role, would increase, together with commodity price volatility leading to greater uncertainty for consumers as well as for farmers;

[14] *Schwaderlapp, Adomeit, Kolbeck, Thewes, (FEV and RWTH Aachen University), Ethanol and its Potential for Downsized Engine Concepts*
[15] *Bernard (Südzucker): Bioethanol – Biofuels strategy (presentation)*
[16] *Moore, Foster, Hoyer (Delphi Powertrain Systems), Engine Efficiency Improvements Enabled by Ethanol Fuel Blends in a GDi VVA Flex Fuel Engine*
[17] *State of Minnesota and the Renewable Fuels Association, E20: The Feasibility of 20 Percent Ethanol Blends by Volume as a Motor Fuel*
[18] *Based on 14/10/13 oil price of 111 USD per/barrel and exchange rate (1 USD = 0,74 EUR)*
[19] *Copa-Cogeca*
[20] *UN Food and Agriculture Organisation, Biofuels Co-Products as Animal Feed (2013), Page 14*

- The sustainability of some agricultural systems in some countries the EU would be put in question;
- The lack reliable outlets for conventional biofuels would restrict the possibilities of decentralized processing of agricultural raw materials in rural areas;
- The loss of alternative markets for agricultural commodities will lead to job losses and therefore a decline of rural areas.

4. Economic benefits

Based on the current RED policy framework, the ethanol industry alone has invested EUR 8 billion and sustained 70.000 direct and indirect jobs in the EU. The establishment of a long term, stable policy framework up to 2030 would help protect these investments made and secure the jobs created so far.

A recent report by PriceWaterhouseCoopers (PwC) has estimated that in 2010, the French renewable ethanol industry generated EUR 815 million of added-value to the French economy. The French renewable ethanol industry, that simultaneously provide fuel and high protein animal feed, sustained 8900 jobs and is a large net contributor to the Budget of France, providing more than EUR 300 million in fiscal revenues to the French government. Furthermore, with a direct added-value of EUR 345 million, the sector contributed significantly to the country's trade balance.

An independent study by WifOR research institute found that a single ethanol plant in Germany alone sustained 2500 jobs, with salaries higher than in other sectors, such as manufacturing; and created EUR 51 million of direct added-value to the economy plus an additional EUR 96 million was generated indirectly for other industries, such as farming. The project created EUR 92 million tax revenues for the Government in the past 4 years.

Another recent economic impact study revealed that their two ethanol projects in Hungary will create up to 3150 new jobs; generate EUR 7,4-8,4 million tax revenues per annum for the Hungarian Government between 2014-2020, reaching EUR 19,5 million by 2021; and expect to generate additional GDP growth of EUR 500 million.

Extrapolated to 2020 and the EU (assuming 10% e/e of ethanol in petrol = 14 bln litres) the ethanol industry predicts that it could generate EUR 10.9 billion of added value to the EU economy, EUR 4 billion of net gains to the EU economy by 2020, and reduce the EU oil bill by EUR 15.4 billion

5. Technological innovation – cellulosic ethanol

Some critics of advanced ethanol suggest that it is inefficient to turn biomass into ethanol, that it would be better to turn that biomass into electricity for EV. This is an intriguing argument, with no grounding in reality. The large cellulosic bioethanol plants currently coming into commercial operation in the United States and Europe produce both ethanol and power. Due to the unique synergies of such plants, they exhibit roughly 55% efficiency, whereas a biomass power plant might be lucky to achieve 35% efficiency.

In other words, the economics and energy balance of these cellulosic ethanol plants are amazing. The only downside of these assets is their huge cost, several times more expensive than their biomass power counterparts. Accordingly, a suitable investment climate is needed to encourage their development. Even more exciting is the potential to combine first and second generation ethanol facilities, creating even more synergies. The efficiency of such facilities should reach 65%-70%.

Production Capacities. For renewables to cover 2% of the transport needs by 2020, 6Mtoe would be required. Assuming a typical advanced biofuels facility has a capacity of 200 ktoe/y, 30 units would need to be up and running by 2020 (with 4 times counting, only 7.5 units would be required by 2020).[21] 4% in 2025 would require 12Mtoe and an additional 30 units.

Biomass Required. For a 200 ktoe/y output plant, 500,000 tonnes of straw would be required per year. That is, for 30 plants, 15 million tonnes/year.

Biomass Availability. DBFZ-Oeko Institute review estimate 50 to 110 million tonnes of straw dry matter/year; Biomass Futures project: 127 million tonnes / year; BNEF **lower** case: 106 million tonnes/ year.

Sustainability is taken into account. On average, between 20 and 40% of agricultural residues might be

[21] *Source: Draft EIBI implementation Plan.*

extracted in Europe according to WWF's literature review.[22]

6. Electric vehicles

The biofuel industry does not compete with electric vehicles, except when policymakers create such competition. Situations in which biofuels and EV appear to compete against each other are easily avoidable. They should not crowd each other out; the goal of climate policy is for both to crowd out oil. That said, EV is not a better climate solution than ethanol, despite widespread belief to the contrary. In fact, with today's technology, **EVs are more expensive and have higher emissions than ethanol**.

Based on the current knowledge of electric vehicles

- EU Electricity mix at 0.4kV – 548 gCO2/kWh
- 85% charging efficiency
- 0.13 kWh per km

EV today results in 83.8 gCO2/km. Conventional ethanol (in E5) delivers 67 gCO2 per km in the average 2010 vehicle and 53 gCO2 per km in a hybrid vehicle. By 2020 that numbers will go to 58 gCO2/km and 46 gCO2/km respectively. The introduction of ILUC factors would still not make EV better than ethanol. In the description of EV above, those EV would not be powered only by renewable electricity, an impossible assumption, but rather by whatever mix of fossil and renewable energy is on the grid. If biomass is turned into electricity used in vehicles the same or equivalent sustainability criteria as for biofuels would have to be applied in order to create a level playing field.

Accordingly, to round out the explanation of why EV are not a better use of biomass, we provide the chart below showing that ethanol is just as efficient a means of power vehicles as EV from biomass power.

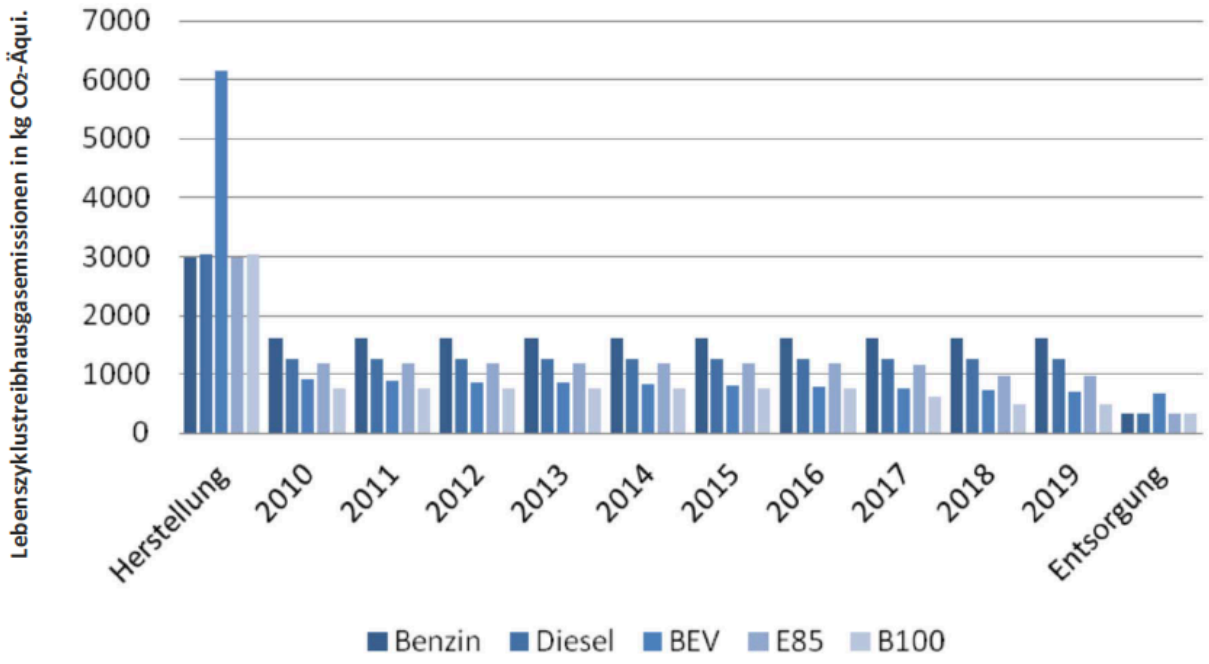
	EV	Ethanol
Biomass efficiency	30-35%	55-70%
Grid loss	13%	1%
Charging efficiency	85%	None
Fuel Energy per km	0.47 MJ/km	1.3 MJ/km
Ultimate biomass per km	1.82 -2.1 MJ/km	1.88-2.4 MJ/km

This by no means suggests that the biofuels industry is against EV, only that the assumption that biofuels are inefficient is incorrect. Ideally, EV and biofuels each claim market share from fossil fuels; policymakers should avoid situations in which they compete against each other.

These numbers do not yet take into consideration the GHG emissions associated with the manufacture and disposal of the EV, which is highly GHG intensive. In order to get a fair comparison between EV and biofuel powered ICE more work is needed in the area of life cycle assessment (LCA).[23] Comparing tailpipe emissions only is not sufficient (see graph), and there needs to be a full cradle to grave life cycle analysis to correctly compare the different power train types that are being introduced.

[22] *WWF (May 2012) Smart use of residues – Exploring the factors affecting the sustainable extraction rate of agricultural residues for advanced biofuels. http://awsassets.panda.org/downloads/wwf_smart_use_finale_version.pdf*

[23] *LCA works (June 2012): Electric Vehicles: A synthesis of the currentl literature with a focus on Economic and environmental viability.*



Source: DBFZ/DA Marcus Holland