

Advanced biofuels provide solution for today's need to reduce transport emissions

Key takeaways

- Advanced biofuels are an immediately available solution for today's need to reduce transport emissions. Fuel related emissions reduction through renewable fuels, together with engine efficiency improvement and passenger transport electrification, is needed to reach decarbonisation targets.
 - 1) In the short term advanced renewable fuels can reduce internal combustion engine (ICE) emissions significantly - high quality renewable fuels, such as UPM BioVerno, significantly cut both GHG emissions and tailpipe emissions.
 - 2) In the long term other sectors of transport such as aviation, marine and heavy duty can be decarbonized with advanced biofuels – these are sectors that have the highest growth rate and are hardest to electrify.

1. Sustainable biofuels offer a fast lane solution for transport sector decarbonization

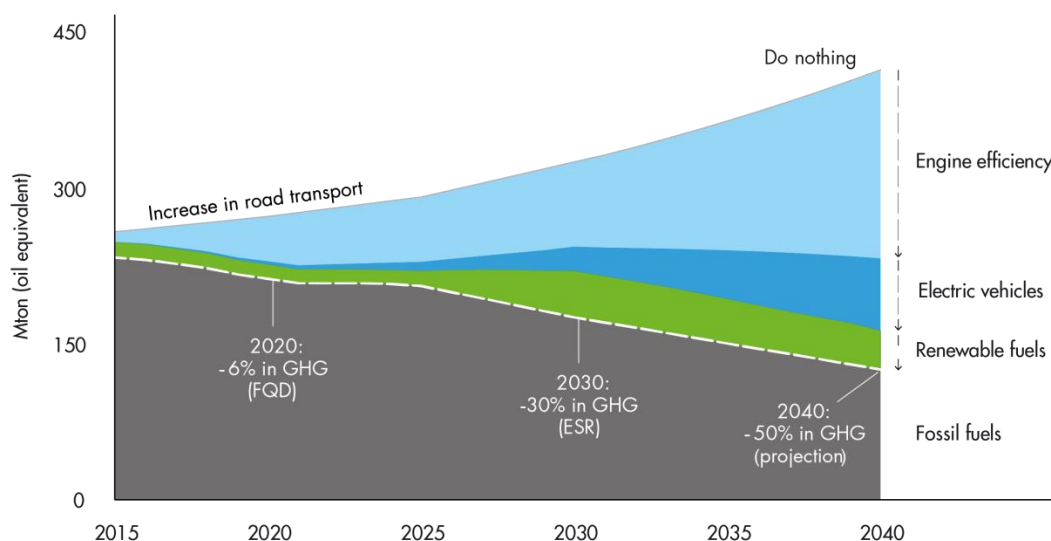
The EU has set ambitious targets for greenhouse gas (GHG) reduction in all sectors. In transport, a 30% reduction is needed by 2030 to step towards a low carbon economy and make a fair and ambitious contribution to the Paris Agreement in order to mitigate climate change. However, despite the fuel economy improvement of ICEs and rapid penetration of electric vehicles (EV), a significant demand for liquid fuels will remain. In the long term, utilization of liquid fuels will concentrate on heavy duty, marine and aviation where electrification is more challenging and high quality fuels are required.

GHG-reduction is by far the most important driver for the use of biofuels in transport. High reduction targets of GHGs are an important driver to develop even more sustainable biofuels. Through the use of sustainable biofuels, a rapid reduction in GHGs can be achieved as no infrastructure or vehicle changes are required. These are solutions at hand today.



UPM Lappeenranta Biorefinery in Finland uses Crude Tall Oil, a residue of pulp production, as a feedstock to produce wood-based renewable diesel and naphtha.

Required fossil oil displacement in road transport to meet EU's GHG-targets – Renewable fuels in important role in the energy mix



GHG-reduction targets calculated vs. reference year 2005
Source: UPM analysis based on BNEF and WoodMackenzie data

Figure. Projection for EU road transport emission reduction. The transport sector is projected to increase significantly in the future as a result of increasing mobility. Therefore, despite the forecast motor efficiency improvement and passenger transport electrification, energy need in transport does not decrease from today. To meet the EU's ambitious GHG emissions reduction targets for the transport sector, a significant deployment of sustainable biofuels is needed.

Sustainability criteria of biofuels are the most stringent set for any sector to date. Other means to reduce transport sector's emissions shall be measured equally. Within the electrification of transport, a full lifecycle emissions assessment is a must to ensure that the system can remain vital in the long run.

2. Sustainable feedstocks are a long term solution

Sustainable feedstocks form the backbone for advanced biofuels. Two specific groups of low indirect emission biofuel feedstocks can clearly be defined:

- 1) Untapped, sustainable potential of wastes and residues
- 2) Low-ILUC feedstocks from sustainable land use.

Sustainable share of wastes and residues

– these are materials that would have further value adding potential in biofuels. The availability of the residual materials is dependent on the demand and production of their respective main products. The availability of these streams could be significantly improved by more efficient collection or separation.

UPM BioVerno is produced from crude tall oil, CTO, a residue of pulp production. CTO is a low ILUC feedstock which does not contribute to direct or indirect land use. The use of UPM BioVerno renewable diesel reduces GHG emissions by up to 80%.

The other group is land using feedstocks based on sustainable cropping systems that do not contribute to land use change. More efficient use of the current biomass production land area would increase the biomass yield. Examples would be new cropping schemes such as sequential cropping where agricultural land is used to produce biomass during periods when the land is not otherwise used for productive cultivation. Another example would be to enhance forest growth rate on existing forest land through sustainable forest management practices. The common theme for both groups is that no additional land is required to produce more. Additionally, perhaps the biggest benefit is that these feedstocks are scalable, as vast areas are currently not fully utilized for example in winter time.

UPM Biofuels is developing a new feedstock concept by growing Brassica Carinata as a sequential crop in South America. The Carinata crop produces non-edible oil suitable for biofuels' feedstock and protein for animal feed.

The sequential cropping concept enables taking the agricultural land into use outside the main cultivation period, in winter time, without compromising existing food production. This does not cause any land use change, prevents erosion and improves soil quality.

Biofuels produced from wastes and residues as well as feedstocks from sustainable land use together create great potential for the advanced biofuel industry. They are biofuels that have low indirect effects and therefore are well suited to mitigate climate change with high, over 70%, GHG emission saving. The deployment of these feedstocks will enable society to make rapid actions to mitigate climate change and to move towards the use of cyclic carbon instead of fossil carbon. Sustainable, non-land use change feedstocks can form the basis for a long term sustainable fuel supply.

3. Advanced renewable fuels bring multiple benefits for society

Biomass feedstock is often produced in rural areas. More efficient production of biomass will therefore promote wellbeing and employment in these areas. However, social and environmental aspects need to be carefully considered to ensure sustainable production of biomass.

Tailpipe emissions are a problem in cities. Electric vehicles are one solution to reduce them, but in the short term other means are also required. Through the use of high quality paraffinic drop-in biofuels one may significantly reduce emissions

such as particulates, carbon monoxide and nitrogen oxides. This will improve air quality in cities without changes in the vehicle fleet.

The use of UPM BioVerno renewable diesel significantly reduces tailpipe emissions compared to fossil diesel and therefore positively contributes to air quality.

Innovation in new technologies to enable the use of new feedstocks in the production of advanced biofuels is important. The forest and bio clusters together with the chemical and petrochemical industries can create a basis for new innovations that combine the production of advanced biofuels and bio based chemical components. Support for an advanced biofuels industry may act as a bridge for the wider bioeconomy bringing new bio based materials into use.

UPM sees great potential in the utilization of sustainable wood-based residue streams and actively develops technologies to convert solid biomass into high quality fuels.

4. Key policy elements for step change in transport decarbonisation



What would need to happen in the transport sector in order to efficiently mitigate climate change and to gain the specific benefits of advanced biofuels?

There are solutions available to reduce transport emissions. This, however, requires policy support to drive change out of a fossil society at all levels – feedstock suppliers, fuel producers and distributors and consumers. Biofuels exist and they are needed today. Biofuels are, in fact, already available today to start the wider change towards bioeconomy - transformation of different industries, such as petrochemicals, into biobased create a basis for broad product spectrum supply and demand.

UPM Lappeenranta Biorefinery produces bio-based products also for the chemical industry.

Sustainable development is all about gradual change towards a cleaner climate. As the changes in infrastructure, production systems and consumer behaviour are slow, policy support needs to have a clear direction and continuity - dramatic changes in the regulatory environment will only hinder innovation and postpone climate benefits.

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