

7 AFFORDABLE AND CLEAN ENERGY



Industrial biotechnology – providing sustainable energy for all

The seventh UN Sustainable Development Goal – *Ensure access to affordable, reliable, sustainable and modern energy for all* – addresses the need to meet rising global demand for energy, in the context of the global emissions reductions agreed in the Paris Climate Accord.ⁱ The International Energy Agency predicts global energy needs will expand by 30 percent by 2040.¹

In the energy sector, industrial biotechnology uses the power of naturally occurring microbes and enzymes to create biofuels and biogas. These innovative bio-based solutions are able to convert plant matter, agricultural residues and biowaste into biofuels, helping to reduce the dependency of Europe's transport infrastructure on fossil raw materials.

USING BIO-BASED SOLUTIONS TO CREATE SUSTAINABLE BIOFUELS

Biofuels are liquids that have been produced by using innovative microbes and enzymes to convert the sugars and starches in plant matter – often from crops like wheat, corn, and sugarcane – into fuel. More recently, alternative feedstocks like agricultural residues and biowaste from industry (e.g. from Scotland's iconic Whisky distilleries²) have become a source of feedstock for biofuels. Innovative biotechnology enables the use of new low-cost, sustainable feedstock sources, which have so far been underutilised or not been used at all. All these processes yield valuable coproducts such as animal feed, lignin for energy or materials production and fertilisers.

Innovative microbes and enzymes have been developed to increase fuel yields. They are used as part of a biochemical process to extract and ferment plant sugars, which are then distilled and processed to become bio-ethanol, or bio-butanol and bio-isobutanol. Blending these biofuels into existing petrol infrastructure provides a cost-effective fuel solution that significantly mitigates against the growing emissions of our existing transport fleet and are also important in view of improving air quality in cities.³

USING MICROBES AND ENZYMES TO CREATE BIOGAS

Biogas is methane produced by the process of anaerobic digestion of organic material by anaerobes (micro-organisms that live in the absence of oxygen). It is produced by putting feedstocks – such as biomass, manure, sewage, municipal waste, green waste, plant material, and crops into anaerobic digesters and biorefineries.

Biogas can help reduce emissions by collecting and reusing greenhouse gases like methane, nitrous dioxide and carbon dioxide that are usually released into the atmosphere when manure and waste decompose. Biogas can be used for renewable electricity production, heat production and (when compressed) as a transport fuel.



DID YOU KNOW?

- The transport sector alone accounts for around 25% of total EU GHG emissions.
- The global car fleet is expected to double by 2040.⁴
- European biorefineries produced 5.84 billion litres of renewable ethanol in 2017, more than three-quarters of which was utilised for transport⁵
- This resulted in a 70% saving in GHG emissions compared to petrol.⁶
- In 2014, 14.9 mtoe (million tonnes of oil equivalent) of biogas was produced in the EU: this represented about 7.6% of all primary renewable energy production in the EU.⁷
- If all residues and wastes that are sustainably available in Europe would be turned into advanced biofuels, as much as 16% of energy needed in road transport could come from advanced biofuels.⁸

¹ Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change.

¹ See [International Energy Agency's 'World Energy Outlook 2017' webpage](#)

² See e.g. [Celtic-Renewables webpage](#)

³ See [European Commission \(2017\), 'Impact of higher levels of bio components in transport fuels'](#)

⁴ See [International Energy Agency's 'World Energy Outlook 2017' webpage](#)

⁵ See [ePURE 'European renewable ethanol – key figures 2017' factsheet](#)

⁶ Ibid

⁷ See [European Commission 'Energy' webpage](#)

⁸ See ['Wasted: Europe's untapped resources. An advanced Assessment of Biofuels from Waste and Residues' \(2014\)](#)



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