

Synthetic fuels could shrink carbon footprint

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Synthetic fuels, made using carbon captured from the air, farm waste or biomass, could help the transport sector reduce its reliance on fossil fuels and meet "net-zero" greenhouse gas emission goals.

[A policy briefing](#)

[by the Royal Society, published on 16 September, set out the potential for](#)

[synthetic fuels](#) to help transition to more [sustainable fuels](#) over the next 20 years, at a time when transport demand is set to rise.

The report was produced by a panel of scientists including Professor Matthew Davidson, Director of the Centre for Sustainable Chemical Technologies at the University of Bath.

While domestic travel and other parts of the energy sector are moving to [electric power](#), batteries lack the energy output required in sectors like shipping, aviation or freight haulage where large loads need to be transported long distances.

Synthetic fuels could offer an alternative as they can be manufactured with similar energy density to conventional fossil fuels. They can also be used as a "drop-in" replacement for jet fuel or diesel, without the need for major modification of engines or fuel supply infrastructure. The report considers two types of sustainable synthetic fuels: electrofuels (efuels) and synthetic biofuels.

Efuels are made by combining hydrogen, produced using sustainable electricity to power the electrolysis of water, with [carbon dioxide](#), from direct air capture or from industrial exhausts.

Synthetic biofuels can be made from [biological material](#), such as waste from forestry or farming, or from processing existing biofuels, such as ethanol.

High production costs—between two to five times as expensive as wholesale fossil fuel prices—and inefficiencies in the [manufacturing process](#) have so far limited use of synthetic fuels.

However, where renewable electricity is cheap and plentiful—such as [solar power](#) in North Africa—the manufacture and export of bulk efuels might make economic sense.

Longer term these fuels could be a way to help the UK meet its net-zero carbon emissions targets, by using electricity from nuclear power to generate hydrogen or ammonia fuels.

Key research challenges identified in the report include improving our understanding of the techniques and materials used in catalysis; producing cheap low-carbon hydrogen at scale; and developing sources of competitively priced low carbon energy.

Professor Matthew Davidson was the Deputy Chair of the Synthetic fuels steering group that produced the report. He said: "Synthetic fuels could offer an interim solution to reducing greenhouse gas emissions by 'defossilizing' difficult to address transport modes such as aviation.

"These fuels have the advantage of using known technologies and existing infrastructure.

"Further research will be required to bring down costs and increase efficiencies of synthetic fuel production—they are currently more expensive than fossil fuels and will require large amounts of cheap sustainable electricity."

Chair of the report's steering group, Professor Graham Hutchings CBE FRS from Cardiff University, said: "While there is no silver bullet for meeting the government's net-zero ambitions, investing in technologies now which can reduce our reliance on [fossil fuels](#) will be vital to realizing those goals.

"The UK has the research skills and capacity to improve many of these

process steps such as in catalysis and biotechnology, and to provide a further area of UK leadership in low-carbon energy."

More information: Sustainable synthetic carbon based fuels for transport, Issued: September 2019 DES6164. ISBN: 978-1-78252-422-9
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