

The race to solve the sustainable transport problem via carbon-neutral synthetic fuels and battery electric vehicles

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Abstract Carbon-neutral synthetic fuels (CNSFs) could offer sustainable alternatives to petroleum distillates that currently dominate the transportation sector, and address the challenge of decarbonising the fuel mix. CNSFs can be divided into synthetic biofuels and ‘electrofuels’ produced from CO₂ and water with electricity. We provide a framework for comparing CNSFs to battery electric vehicles (BEVs) as alternatives to reduce vehicle emissions. Currently, all three options are significantly more expensive than conventional vehicles using fossil fuels, and would require carbon prices in excess of \$250/tCO₂ or oil prices in excess of \$150/bbl to become competitive. BEVs are emerging as a competitive option for short distances, but their competitiveness quickly deteriorates at higher ranges where synthetic biofuels are a lower-cost option. For electrofuels to be viable, the challenge is not simply technological learning, but access to a low-cost ultra-low-carbon electric power system, or to low-carbon electric generators with high annual availability.

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