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An assessment of feasibility and challenges for methane to be used as a feedstock for a sustainable bioeconomy

Methane (CH₄) is one of the lowest cost carbon sources available in the abundance required to produce bio-based commodity chemicals and fuels on a scale that could replace existing chemical manufacturing processes. Methane is also the second most important greenhouse gas (GHG), and is generated by the oil and gas sector, at coal mines, landfills and manure management facilities. Mitigation of methane emissions not only has environmental benefits by reducing the impact of climate change - methane having about a 30 times higher impact than carbon dioxide - but also considerable economic interest for a number of sectors.

Methanotrophic bacteria possess a unique molecular pathway to oxidise methane and assimilate the major biological intermediate and chemical building block formaldehyde via methanol. Formaldehyde can further be metabolized into commodities of industrial interest e.g. butanol as a higher value alcohol for transportation, polyhydroxybutyrate as a precursor of bioplastics, lipids for biodiesel production, lactic acid as a precursor of bioplastics or biomass with nutritional value.

We want to commission a report outlining the current status of biological methane transformations and the challenges to be overcome for methane biotransformation to be industrial viable. The report will be written by an independent, unbiased researcher of the University of Nottingham using the available library resources as well as national and international databases for their investigation. Furthermore, existing key players in the UK natural gas industry shall be consulted for more information (e.g. European Gas Conference 2017, Progress in Biogas IV, Lignofuels 2016, Innovate UK, Directing Biosynthesis V).