Renewable hydrogen: decarbonising solution for the transport and fuel sectors

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Power-to-gas provides a route for channelling substantial amounts of renewable energy to sectors that have been, until now, dependent on fossil energy sources - as required for meeting adopted climate goals. Power-to-gas also introduces a systemic flexibility resource which can significantly improves the operating conditions of needed dispatchable power generation by reducing the magnitude of load variations related to changing weather, while also decreasing curtailment of wind or solar power generation.

Furthermore, Power-to-gas can help maintain local balance between power generation and consumption where distributed power generation is added to the distribution grid, hence allowing to avoid power grid expansion for absorbing excess production.

The main condition for realising this potential is deployment ramp-up and continued scale-up. It is therefore essential to identify particular applications and associated conditions of implementation where this deployment could be market-driven already in the short term, considering also the policy environment.

Green hydrogen in refineries is a promising means to reduce the greenhouse gas emission intensity of established transportation fuels in the short term, and a potential option to meet the requirements of the EU Fuel Quality Directive. Refineries' net hydrogen demand –today typically provided via steam methane reforming of natural gas – is to be supplied from green hydrogen from renewable electricity via water electrolysis by 2025.

With this process, a typical French and German refinery can reduce greenhouse gas emissions 'gate-to-gate' by 14.1% and 7.2% respectively compared to today. In absolute terms, this is equivalent to the reduction of 1.33 and 1.50 million tons of CO2eq per year with just 20 refineries, making this option highly effective. Indeed, this is a significant contribution to the ~10 Mt/yr CO2eq emissions reduction that needs to be achieved in 2020 versus today to comply with the EU Fuel Quality Directive both in France and in Germany.