

# Hydrogen Potential in the Energy Transition

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### Basic concepts

#### 1. Introduction

In response to the urgency of decarbonisation, policy makers have agreed in 2015 to what is known as the Paris agreement. In order to achieve its targets, the energy sector needs to reduce CO<sub>2</sub> emissions by -80%, -95%. From the 1990 baseline of 5,751MtCO<sub>2</sub>e, a 24% reduction in emissions had been achieved by 2016 across Europe. Limiting the temperature increase to <1.5°C by 2050 will require a reduction of emissions by another three times the amount already achieved.

Many stakeholders have in the past favoured an 'All-Electric' approach of decarbonisation, which includes renewables but also nuclear power, biomass and interconnection. However, due to the lack of security of supply and the needed technological progress, this approach is risky. In 2017 wind and solar power accounted 85% of all new renewable capacity and will continue to increase. Environmentally, important net benefits associated with wind and solar generation are obvious, however, their renewable energy generation is variable and uncertain and its integration into the electrical system is a great challenge. With an increasing demand for flexibility in the electric system around the world, the electricity storage market faces great challenges. Currently, pumped hydro storage

(PHS) represent 96% of current storage electricity capacity (IRENA, 2017), but PHS solutions are quite geographically limited, this opens an opportunity for other storage technologies, such as hydrogen

The EU targets are more likely to be achieved if zero carbon hydrogen from natural gas is included in the solution. In order to achieve a net-zero emissions EU energy system by 2050 all sources of gas consumed in the EU by 2050 must be net-zero emissions gas. The sources of gas can be either renewable gas, i.e. gas produced from renewable sources, or low-carbon gas—natural gas combined with Carbon Capture Storage (CCS) or Carbon Capture Utilization (CCU). Renewable gas includes biomethane, green hydrogen and power to methane. Low-carbon gas is gas that, during production, has small volumes of CO<sub>2</sub> that remain uncaptured. While biomethane and hydrogen are different gases, it can be used similarly in almost all energy sectors. Both biomethane and hydrogen can be transported through existing gas infrastructure and the two can even be mixed.



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