

# Hydrogen - what is it?

## Briefing Paper



### What is hydrogen?

Hydrogen (H<sub>2</sub>) is the smallest of all molecules, it forms a colourless, odourless gas. H<sub>2</sub> is the most common element, but appears almost exclusively locked in other compounds, such as water (H<sub>2</sub>O) or hydrocarbons (eg. Methane, CH<sub>4</sub>). Therefore, energy has to be applied to crack these compounds and “free” the hydrogen, which can then be used as an energy carrier that can be stored and transported and potentially used for mobile and stationary power applications. It is thus comparably to electricity, our most common energy carrier.

### The production of hydrogen determines the environmental attributes of the technology.

Hydrogen can be produced from a variety of sources. Water can serve as a feedstock via a process called electrolysis, which applies electricity to split water into hydrogen and oxygen. Natural gas can be “reformed” with steam to be split into hydrogen and CO/CO<sub>2</sub>. Other fossil fuels like oil and coal can also be made to yield their hydrogen content, again leaving CO<sub>2</sub>. Similar processes can be applied to biomass.

### What are the drivers for hydrogen?

**Climate Change** concerns are often named as a major driver for a future need for hydrogen. As hydrogen can be produced from renewable energy sources and converted to electricity in fuel cells, which produce no greenhouse gas emissions, significant climate benefits could potentially be reaped with hydrogen technology. Hydrogen is one of the few promising energy carriers that will allow renewable energy to be used in transport. The use of hydrogen in fuel cells could also bring **improvements in air quality**.

Fuel cells, essentially energy conversion devices for hydrogen which use an inverted electrolysis to produce electric power, heat and water, create essentially no particulate emissions. Hydrogen combustion also produces much less atmospheric pollutants than conventional fuels. Especially in big cities with a high traffic density, the substitution of today’s vehicles with hydrogen-powered cars could bring about significant improvements.

Another reason often cited in support of hydrogen technology lies in the potential improvement of the **security of energy supply**, in terms of alleviating the dependency on energy imports. This could be achieved by making use of domestically available resources and by broadening the variety of energy sources. A key benefit is its ability to replace oil as a transport fuel. Global oil resources, by definition a finite resource, will be depleted in the long-run. This makes alternatives necessary, especially in transport, where no large-scale alternatives to oil currently exist.

More information on hydrogen and fuel cells can be found in CAN Europe’s technology sheets