

Hydrogen in a low-carbon economy

Report Published: 22 November 2018

Country focus: [UK](#)

Downloads: [Hydrogen in a low-carbon economy \(3.63MB\)](#)

This report by the Committee on Climate Change (CCC) assesses the potential role of hydrogen in the UK's low-carbon economy.

It finds that hydrogen:

- is a credible option to help decarbonise the UK energy system but its role depends on early Government commitment and improved support to develop the UK's industrial capability
- can make an important contribution to long-term decarbonisation if combined with greater energy efficiency, cheap low-carbon power generation, electrified transport and new 'hybrid' heat pump systems, which have been successfully trialled in the UK
- could replace natural gas in parts of the energy system, where electrification is not feasible or is prohibitively expensive, for example in providing heat on colder winter days, industrial heat processes and back-up power generation
- is not a 'silver bullet' solution; the report explores some commonly-held misconceptions, highlighting the need for careful planning

The report's key recommendations are:

- Government must commit to developing a low-carbon heat strategy within the next three years
- Significant volumes of low-carbon hydrogen should be produced in a carbon capture and storage (CCS) 'cluster' by 2030 to help the industry grow
- Government must support the early demonstration of the everyday uses of hydrogen in order to establish the practicality of switching from natural gas to hydrogen
- There is low awareness amongst the general public of reasons to move away from natural gas heating to low-carbon alternatives
- A strategy should be developed for low-carbon heavy goods vehicles (HGVs) which encourages a move away from fossil fuels and biofuels to zero-emission solutions by 2050

The following [infographic](#) shows the key messages from this report:

Hydrogen in a low-carbon economy

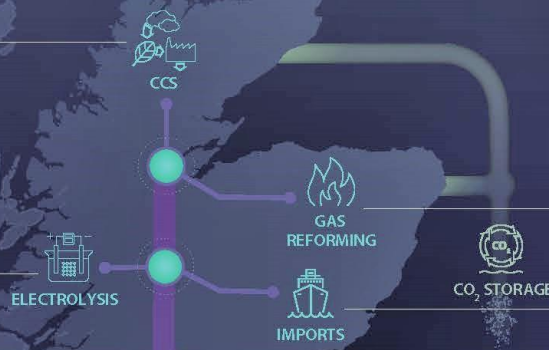
Hydrogen has the potential to help decarbonise the UK's energy system by 2050. There are key decisions for the Government to take in order for hydrogen to become a credible option for the future. Taking decisions soon could see the first deployment in the 2020s.

This graphic is for illustrative purposes only. The examples of hydrogen supply, deployment and use are not intended to be specific to any particular location. Our recommendations apply at a UK-wide level.

Producing hydrogen in the UK

The production of hydrogen from natural gas and potentially bioenergy with carbon capture and storage (CCS), sequestering almost all of the carbon, could be a favoured route if there is demand for this hydrogen.

Producing 'bulk' hydrogen from renewable energy is expensive, but there will be some opportunities to use some 'surplus' electricity for hydrogen.



60-85%
hydrogen's* **relative emissions savings** compared to natural gas used in boilers

Hydrogen from natural gas with CCS is likely to be the main source of production but this is not a zero-carbon process.

International trade in low-carbon hydrogen may develop over time, but this is uncertain and may not be cheaper. The Government should make sensible infrastructure decisions now rather than relying on large-scale imports.

Hydrogen in a low-carbon economy

Used in combination with energy-efficient hybrid heat pumps, hydrogen could displace fossil fuels over the long-term to achieve very low heating emissions. However, near zero-carbon for heating by 2050 is one of the biggest challenges facing the energy system.

However....

The Committee assesses that hydrogen is best used strategically alongside widespread electrification, improvements to energy and resource efficiency, and the use of CCS. It could replace natural gas in parts of the energy system where electrification is not realistic or is too costly.

Hydrogen has a potentially important role in reducing emissions from industrial heat and is well-suited to supplying low-carbon energy for more distributed sources of emissions such as the food and drinks sector.



50-100g/kWh
UK needs to have a very **low-carbon electricity system** by 2030

Hydrogen fuel cells could be used in buses, trains and lorries, and potentially for longer-range journeys in lighter vehicles. However, this needs to be based on plentiful supply of hydrogen from low-carbon sources.

Hydrogen could complement electrification and replace natural gas as a back-up to help reduce emissions from energy use to near-zero emissions by 2050, but gas plants need to be 'hydrogen-ready'.

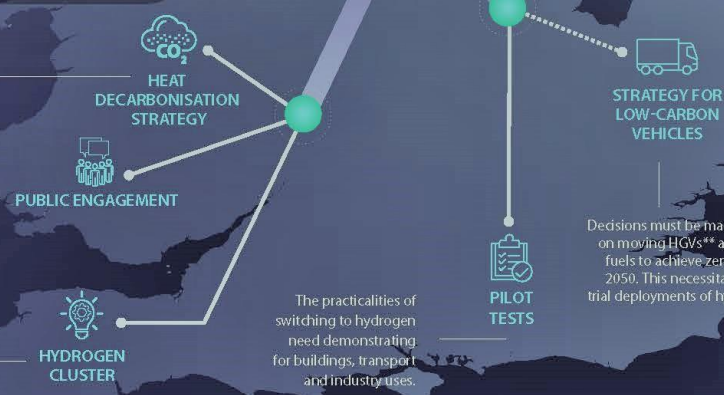
Acting now could see deployment by the 2020s

The following actions by Government are needed now if hydrogen is to help the UK transition to a low-carbon economy.

Government must commit to developing a low-carbon heat strategy within the next three years.

There is limited time to raise public awareness of the need to move away from natural gas heating, but public input is needed on these important choices and as hydrogen deployment could differ across the UK.

Significant volumes of low-carbon hydrogen should be produced in a CCS 'cluster' by 2030 to help the industry grow.



The practicalities of switching to hydrogen need demonstrating for buildings, transport and industrial uses.

Decisions must be made in the 2020s on moving HGVs** away from fossil fuels to achieve zero-emissions by 2050. This necessitates small-scale trial deployments of hydrogen HGVs.

* Produced from natural gas with CCS
** Heavy Goods Vehicles