

# CO2 Removal & Gases: Hydrogen from Biomass CCS

This lever controls the sub-levers listed in the table, and ambition levels are for the end year shown on the right-hand side.

Gasification is the partial combustion of a material to produce syngas – a mixture of carbon monoxide and hydrogen. Syngas can be used to produce biomethane, hydrogen or liquid biofuels. Hydrogen does not emit CO<sub>2</sub> when it is combusted to produce heat or power. By using biomass gasification in combination with carbon capture and storage (CCS), there is the potential to remove CO<sub>2</sub> from the atmosphere resulting in negative emissions. CCS processes have an energy demand of their own, which will add to the amount of CO<sub>2</sub> that must be stored.

Gasification of biomass has been achieved at small scales, but it has not yet been combined with CCS. Hydrogen can be used to heat buildings via the Hydrogen Gas Grid Share lever. In 2015, the consumption of natural gas for industry and buildings heating (excluding electricity generation) was about 500 TWh (DUKES).

## Key Interaction

The total demand for H<sub>2</sub> is determined by the level of gas grid conversion to H<sub>2</sub>, the demand for gaseous fuels in buildings and industry, and demand from transport. H<sub>2</sub> can be created from waste, and from biomass grown in the UK, but these have limited availability. Any demand not met by UK

biomass is satisfied by imports. However, dependency on large quantities of imported biomass may not be possible in reality and would result in a less robust energy system. UK bioenergy production can be controlled through the Land Use & Biofuels levers. The CCS Capture Rate lever determines how much of the CO<sub>2</sub> from the gasification process can be captured and prevented from entering atmosphere. If electrolysis is needed to supply enough H<sub>2</sub> to meet demand, then sufficient low-carbon electricity is needed to ensure the H<sub>2</sub> conversion results in decarbonisation.

**Level 1**  
There is no hydrogen produced from biomass gasification with CCS.

**Level 2**  
Hydrogen from biomass gasification with CCS rises to a quarter of Level 4 (50 TWh/year).

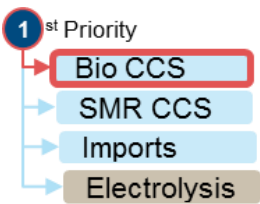
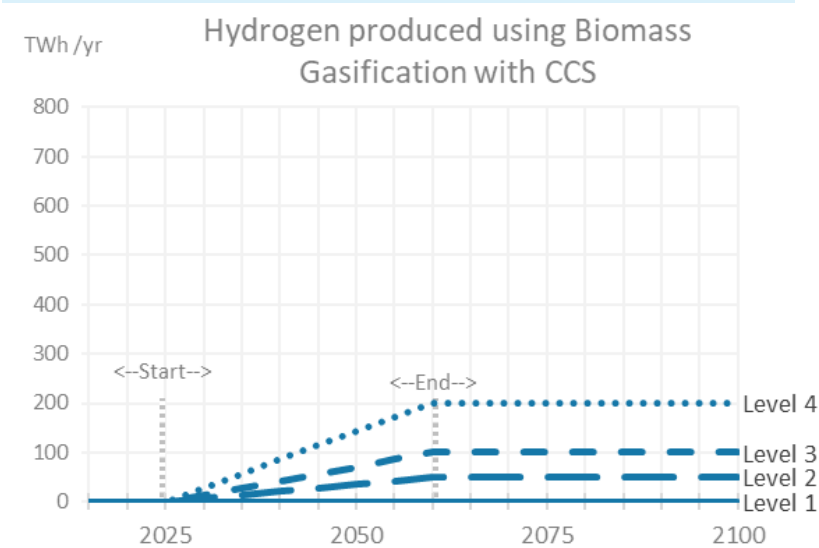
**Level 3**  
Hydrogen from biomass gasification with CCS rises to half of Level 4 (100 TWh/year).

**Level 4**  
Hydrogen from biomass gasification with CCS rises to 200 TWh/year and, in 2050, would require nearly all of the maximum available raw biomass of around 300 TWh/year (CCC ‘Global Governance and Innovation scenario’<sup>1</sup>).

<sup>1</sup><https://www.theccc.org.uk/publication/biomass-in-a-low-carbon-economy/>

**Default Timing** Start year: 2025, End year: 2060  
Hydrogen production

Sub-Lever	Units	2015	Level 1	Level 2	Level 3	Level 4
Biomass with CCS	TWh/yr	0	0	50	100	200



**Lever Priority**  
Biomass with CCS is first in the priority order for producing hydrogen. Where supply would otherwise exceed demand, measures lower in the priority order will be superseded by those above them. Electrolysis will meet any shortfall in demand.