CO_2 Removal & Gases: Hydrogen from Methane 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.

Fossil fuels such as methane contain carbon and hydrogen atoms. In methane, four hydrogen atoms are bonded to a single carbon atom (CH_4). Steam methane reformation (SMR) breaks apart these bonds and allows the hydrogen to be separated. High temperature steam is reacted with methane in the presence of a catalyst to produce hydrogen and carbon monoxide. The carbon monoxide can be reacted further using the water gas shift process to produce more hydrogen and CO_2. If CCS (carbon capture and storage) is applied to the process, this CO_2 can be captured and stored and the hydrogen produced can be considered to be low carbon.

SMR is the most common method of producing bulk hydrogen in the world today. However, 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 500TWh (DUKES).

Key Interaction

The total demand for H_2 is determined by the level of gas grid conversion to H_2, the demand for gaseous fuels in buildings and industry, and demand from transport.

The CCS Capture Rate lever determines how much of the CO_2 from the SMR process can be captured and prevented from entering atmosphere.

If electrolysis is needed to supply enough H_2 to meet demand, then sufficient low-carbon electricity is needed to ensure the H_2 conversion results in decarbonisation.

Level 1

There is no hydrogen produced from SMR with CCS.

Level 2

Hydrogen from SMR with CCS rises to 190 TWh/year (a quarter of Level 4).

Level 3

Hydrogen from SMR with CCS rises to 375 TWh/year (half of Level 4).

Level 4

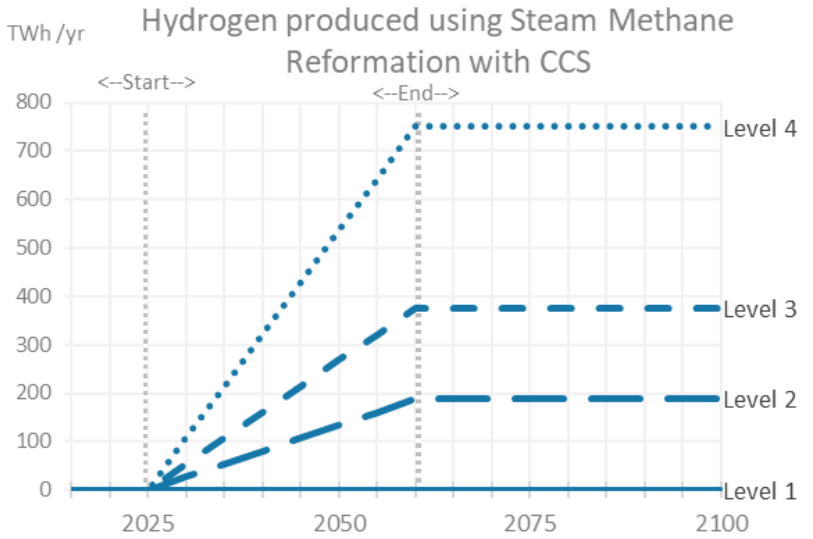
Hydrogen from SMR with CCS rises to 750 TWh/year. This represents a quantity of energy approximately sufficient to meet all heating and light transport demand assuming full conversion to hydrogen in the future.

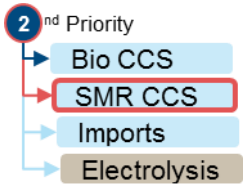
Default Timing

Start year: 2025, End year: 2060

Hydrogen production

Sub-Lever	Units	2015	Level 1	Level 2	Level 3	Level 4
SMR with CCS	TWh/yr	0	0	190	375	750





Lever Priority

Methane CCS is second 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.