

Hydrogen BC | Hydrogen Production Pathways

Hydrogen can be produced from a variety of resources. British Columbia (BC) has renewable electricity, natural gas, and geological storage that can be leveraged to produce low-carbon hydrogen.

Different methods of hydrogen production vary in their climate impacts. To meet emissions reduction targets, BC must focus on advancing and supporting low-carbon hydrogen production methods.

HOW IS HYDROGEN MADE?



Electricity



Natural Gas



Industrial Processes

Electricity

Electricity is a feedstock that can be used to produce hydrogen. Electrolysis is a process that uses electricity to split water into hydrogen and oxygen. When electrolysis uses renewable electricity as a feedstock, the hydrogen produced has a lower **carbon intensity**¹.

Natural Gas

There are different methods to produce hydrogen from natural gas:

Natural Gas Reforming: Natural gas reforming uses heat to break down natural gas into hydrogen and carbon dioxide (CO₂). The CO₂ emissions can be captured, transported, and either utilized or stored deep underground through carbon capture, utilization, and storage (CCUS)².

Two common methods of natural gas reforming include steam methane reforming (SMR) and auto thermal reforming (ATR). The main difference is that SMR uses external heat to produce hydrogen, while ATR generates its own heat during the process, making it more efficient.

Methane Pyrolysis: Methane pyrolysis also uses heat to break down natural gas, but this process creates hydrogen and solid carbon and does not create CO₂ emissions. The solid carbon is a valuable product and can be used in products like tires and asphalt.

Hydrogen as By-product of Industrial Processes

Different industrial and chemical processes, such as the production of chlorine, generate hydrogen as a by-product. Instead of releasing hydrogen into atmosphere, it can be captured and utilized, creating a new value stream.



HYDROGEN COLOURS

Colours are often associated with different types of hydrogen, depending on the feedstock used to produce it.



Hydrogen produced using renewable electricity as the feedstock is often referred to as **green hydrogen**.



Hydrogen produced from natural gas reforming with CCUS is commonly known as **blue hydrogen**.



Hydrogen produced from methane pyrolysis is commonly known as **turquoise hydrogen**.

¹ Carbon intensity is the amount of carbon dioxide released for every unit of energy or fuel produced. The lower the carbon intensity, the cleaner the energy or fuel.

² CCUS is a series of processes where CO₂ is captured from industrial processes, transported, and either utilized or stored safely underground.

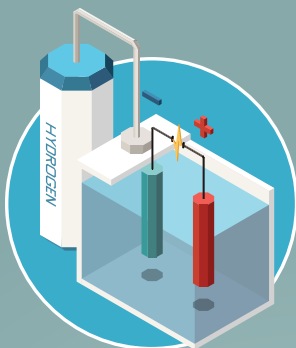
Common Hydrogen Production Pathways

Feedstock

Production Method

Product

Electricity

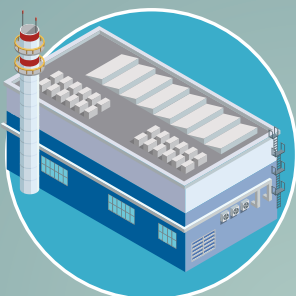


Electrolysis

Uses electricity to split water into hydrogen and oxygen.

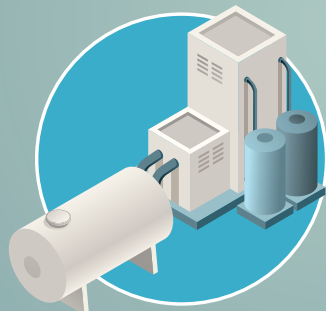


Natural Gas



Natural Gas Reforming

Uses heat to breakdown natural gas into hydrogen and carbon dioxide (CO₂), which can be captured, transported, and either utilized or stored underground.



Methane Pyrolysis

Uses high temperature heat to breakdown natural gas into hydrogen and solid carbon. The solid carbon can be sold for use as a value-add product (such as tires or asphalt).



Industrial Processes



Industrial By-product

Hydrogen is captured as a by-product from different industrial and chemical processes, such as the production of chlorine.



H₂

Hydrogen