



# Hydrogen The Fuel of Tomorrow?



Join the green hydrogen revolution with Hychor.

[hychor.com](https://hychor.com)

# What is Hydrogen (H<sub>2</sub>)

Hydrogen is the first element on the periodic table and is the most abundant element in the Universe. It is what powers our sun and is typically in its gaseous phase.

## Why Hydrogen?

H<sub>2</sub> is an explosive gas, which is important when considering the future fuel of choice to power our energy system. When reacted with oxygen, the by-products are simply heat and water, making it a suitable CO<sub>2</sub>-free energy source.

This is why UK and many other countries are looking to transition to H<sub>2</sub> to decarbonise many parts of industry including: heavy transport, aviation, maritime, steel, ammonia, and even electricity.

Per kilogram, hydrogen contains near 3x more energy than E10 petrol, however, it is typically in its gaseous phase which has low specific volumetric energy density. To make H<sub>2</sub> competitive to petrol in volume (how big your fuel tank is), it must be compressed and/or cooled to extreme conditions such as pressures equalling near 700x earth's atmosphere or temperatures near absolute zero around -250 oC.





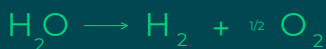
## How is Hydrogen Made?

Currently, most hydrogen is produced through steam reforming of natural gas (methane), stripping the organic molecule of its hydrogen and releasing CO<sub>2</sub> as a by-product. This is called Grey Hydrogen:



Instead of releasing the CO<sub>2</sub>, it can be captured then stored or utilised. This is called Blue Hydrogen.

Alternatively, the most sustainable method of production is through electrolysis: splitting water into hydrogen and oxygen with electricity. This electrochemical method is highly efficient and if powered by renewable energy, it is called Green Hydrogen:



## Batteries vs Fuel Cells

A fuel cell is an electrochemical device that converts chemical energy into electrical energy where, as the name implies, the fuel powers the device. Fundamentally, batteries and hydrogen are very similar! Both efficiently store electrical energy as chemical energy, however, the main difference is batteries store their by-products in a closed cell, whereas, hydrogen systems eject its by-product, water.

Another difference is that batteries can be recharged within its contained system (e.g. car) but hydrogen is produced elsewhere and is dispensed in centralised locations, just like a petrol station.

In terms of energy density, hydrogen storage is roughly 1.5x that of a lithium ion battery per volume and near 100x greater per mass.

# Pros and Cons of Hydrogen



Pros	Cons
High Mass Energy Density Weight efficient	Poor Volumetric Energy Density High Pressures or Low Temperatures
Usage similar to current fossil fuels Facile integration	Lack of infrastructure Significant investment required
Non-Toxic Spills won't react with environment	Can embrittle metals at high pressure May be ill-suited for some pipelines
CO2-Free Energy Carrier Suitable fossil fuel alternative	Currently mostly Grey Hydrogen Still producing CO2
Produced Non-reliant on fossil fuel deposits	Energy Intensive Takes additional energy to generate

## Water

Unlike fossil fuels which is extracted, hydrogen is produced, meaning it requires a precursor. For green hydrogen, this is typically freshwater sourced from domestic supplies. Though green hydrogen is the most water-efficient hydrogen production method, it still may withdraw up to 32.2 kg of freshwater for every kilogram of hydrogen produced.

At the predicted scale of 460 TWh of hydrogen energy by 2050 in the UK, that could equate to 450 MT of freshwater withdrawal, over 10% of UK's yearly domestic supply! Globally, by 2050, 11.5 GT of water may be withdrawn which is equal to over 3x UK's domestic supply.

Alternative sources like seawater are therefore necessary, but current technology can not use it without thorough desalination which incurs additional costs and generates a polluting brine residue.



# Ready to **Revolutionise** Your Hydrogen Production?

At Hychor, we're transforming hydrogen production with our seawater electrolysis technology—eliminating costly desalination and delivering sustainable, scalable solutions for the future.

Let's explore how we can help you reduce costs, simplify operations, and meet your sustainability goals.



[jani.shibuya@hychor.com](mailto:jani.shibuya@hychor.com)

