



**MURCHISON  
GREEN  
HYDROGEN**

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## Green Hydrogen and Green Ammonia

Murchison Green Hydrogen (MGH) will be producing green hydrogen and exporting it in the form of green ammonia to markets in Asia.

But what exactly is green hydrogen and green ammonia?  
And how will its production help combat climate change?

### The World is Going Green

The world is undergoing an energy transition. Also referred to as the renewable energy transition, this process refers to the global movement towards achieving net-zero carbon emissions by shifting from fossil fuel-based energy production to clean energy production.

While electrification is one way in which we can achieve global decarbonisation, there are hard-to-abate sectors—such as refining and chemicals, fertilisers, marine fuels, steel and iron production—that account for [approximately 20-to-30% of global CO<sub>2</sub> emissions](#) and require an alternative source of clean energy.

Green hydrogen has been identified as a clean energy source suitable for decarbonising these sectors.

### Australia's National Hydrogen Strategy


The Commonwealth Government released the [2024 National Hydrogen Strategy](#) to provide a framework for governments and industry to collaborate on building the nation's hydrogen industry and achieving our net zero carbon targets.

[Find out more by visiting the Department of Climate Change, Energy, the Environment and Water's website.](#)

### Western Australia's Renewable Hydrogen Strategy

The State Government updated their [Western Australia's Renewable Hydrogen Strategy](#) in 2021 to align with the National Strategy. It focuses on positioning WA as a leading exporter of hydrogen, integrating hydrogen into the state's energy network, and developing hydrogen hubs to stimulate the industry.

[Find out more by visiting the Western Australian Government's renewable hydrogen industry website.](#)



Around 40% of global hydrogen projects, with a potential total investment of up to \$300 billion, are located in Australia due in part to the excellent natural resources and stable political climate.

Source: [DCCEE](#)

# What is Green Hydrogen and Green Ammonia?

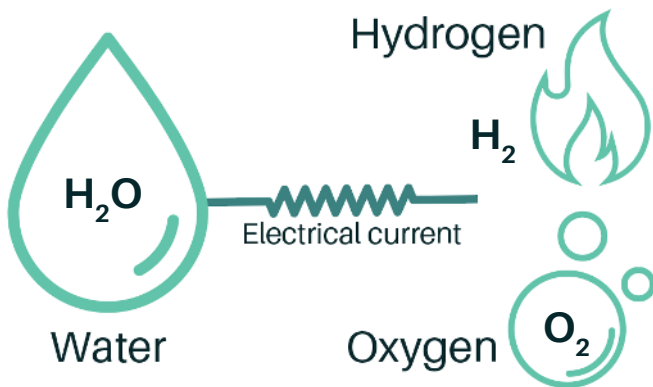
## Breaking Down Green Hydrogen

Hydrogen is a colourless, odourless and tasteless gas with the chemical symbol  $H_2$ . It is the most abundant element in the universe.

## How to Produce Hydrogen

Hydrogen can be produced from water through a process called electrolysis. Electrolysis of water was first used commercially in 1890. Using this process, an electrical current is passed through water ( $H_2O$ ) to split it into hydrogen ( $H_2$ ) and oxygen ( $O_2$ ) molecules.

MGH will be producing green hydrogen through the electrolysis of desalinated sea water.



## What Makes it 'Green'?

The term 'green hydrogen' refers to hydrogen produced through electrolysis using only renewable energy, i.e., energy generated from wind turbines and solar panels. MGH will construct dedicated wind and solar farms ensuring that the hydrogen is produced using only renewable energy.

Green hydrogen is a clean fuel alternative which produces only water vapour when it burns and can displace fossil fuels such as coal, oil, and natural gas.

## What is Green Hydrogen Used For?

Energy storage



Industry (including steel production)



Hydrogen produced using natural gas and with the carbon emissions then captured and stored is called blue hydrogen. Green hydrogen, on the other hand, is produced using renewable energy only and has a lower emissions intensity.

## What is Ammonia?

Ammonia is a colourless gas. Its chemical formula is  $NH_3$ . This means it has one atom of nitrogen and three atoms of hydrogen.

Ammonia is currently used mostly for fertiliser production. However, it can also be used for energy storage or as fuel. It is naturally occurring and is essential for life as it is required in the formation of amino acids and nucleic acids, the building blocks of proteins and DNA.

## Why are we Producing and Exporting Green Ammonia?

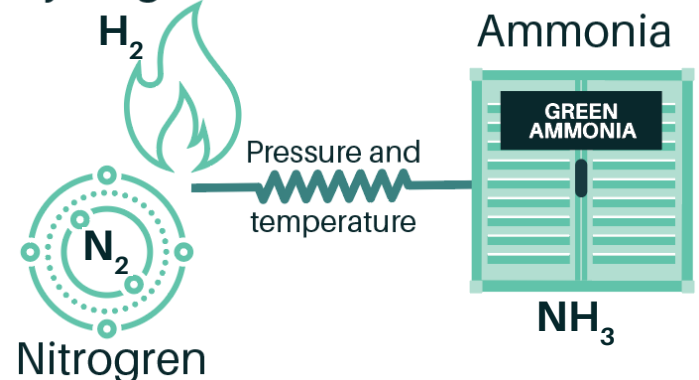
Whilst hydrogen gas can readily be transported by pipeline, it cannot efficiently be exported internationally in large quantities. For this reason, MGH needs to turn its green hydrogen into a liquid form to store and transport overseas.

The process of liquefying green hydrogen requires temperatures of minus  $-253^{\circ}C$ . This process is energy-intensive and not economically viable. Instead, MGH intends to convert its green hydrogen into liquid green ammonia, which liquifies at just  $-33^{\circ}C$ , requiring significantly less energy.

## How to Produce Green Ammonia

Green Hydrogen can be turned into green ammonia through the Haber-Bosch process. This process, developed in 1913, combines nitrogen ( $N_2$ )—which occurs naturally in the air—with hydrogen and, over a catalyst at high pressure and temperature, converts to ammonia.

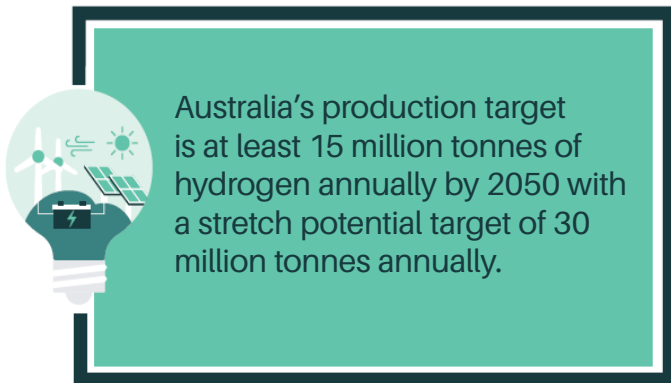
## Hydrogen



The ammonia can be liquified at  $-35^{\circ}\text{C}$  similar to Liquefied Petroleum Gas (LPG), which is already widely transported by marine tankers.

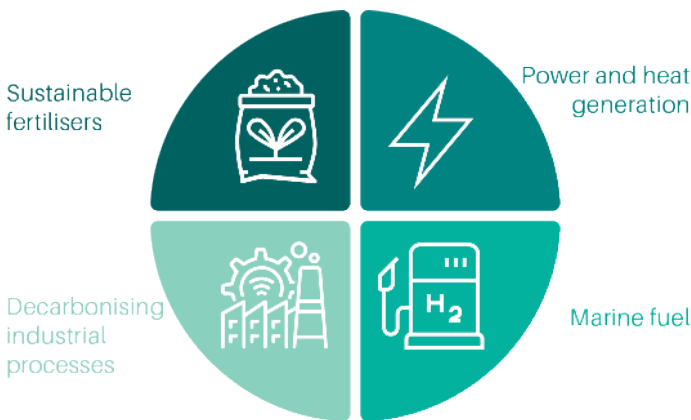
As with hydrogen, the energy used to produce this ammonia comes from renewable energy sources, making it 'green'.

Green ammonia can be used directly as an alternative clean energy source or cracked back to green hydrogen (by removing the nitrogen) depending on the end use.



Source: [Australia's National Hydrogen Strategy, 2024](#)

### What is Green Ammonia used for?



### The Future is Green (Hydrogen)!

Green hydrogen will play a big role in the fight against climate change as electrification alone cannot meet the world's net zero targets. Large scale production of green hydrogen and its derivatives will be required to meet carbon reduction aspirations.

The Commonwealth and State Governments' policies and incentives are promoting the adoption of green hydrogen and stimulating the development of the hydrogen industry in Australia.

As our global communities transition to a zero-carbon emissions future, the domestic and international market for green hydrogen and ammonia is expected to grow

significantly.

### Has Green Hydrogen been produced in the past?

Green hydrogen has not been produced until now due to the lack of demand.

Fossil fuels were previously the cheaper and easier source of fuel, if one disregards the climate change impact.

While the technologies existed, continuous technological improvements and scientific advancements in renewable energy is lowering the cost and increasing the efficiency of producing green hydrogen.

Transportation of hydrogen has also been a barrier to the development of the industry. However, with improvements in the safe and efficient transportation of ammonia, this is now possible.

The willingness for countries to pay the premium price of green hydrogen and ammonia is also only recently developing as countries start to understand the significant social, environmental and economic cost of not transitioning away from fossil fuels to cleaner energy alternatives.

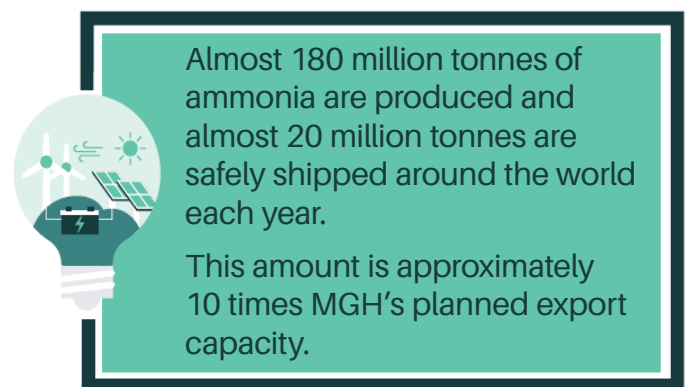
### MGH is leading the development of large-scale green hydrogen production in Western Australia

MGH will provide a clean source of fuel by using renewable energy to produce green hydrogen and green ammonia, and is currently the most advanced project of its kind in Australia.

The wind turbines and solar farm on MGH will produce reliable renewable energy to power electrolysis. This renewable energy will also be used to transform the green hydrogen into green ammonia.

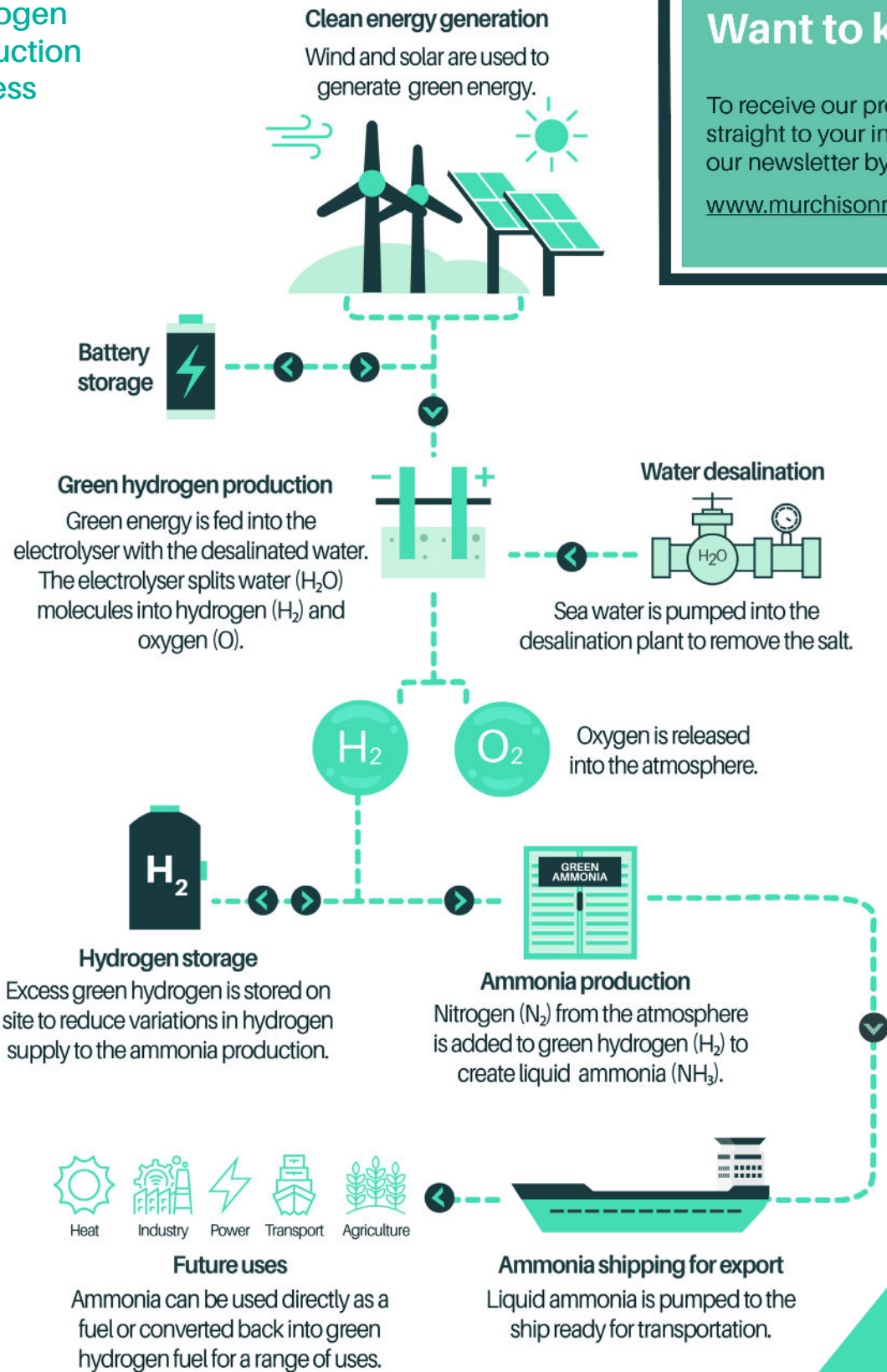
The liquid ammonia produced will be loaded onto ships, through a marine export facility, and transported to offtake markets. It will then be converted back into green hydrogen or used in its ammonia form as a replacement for fossil fuels.

The infographic on the next page depicts the entire production process on the Murchison Green Hydrogen project.



Source: [International Energy Agency](#)

# Hydrogen Production Process



## Want to know more?

To receive our project updates straight to your inbox, subscribe to our newsletter by visiting:

[www.murchisonrenewables.com.au](http://www.murchisonrenewables.com.au)