

# About renewable gas

**Renewable gas is made from resources such as agricultural and food waste, wastewater, landfill gas, and renewable electricity.**

Renewable gas can have significantly lower emissions compared to gas derived from fossil fuels. Types of renewable gas include:

- biogas
- biomethane
- renewable hydrogen.

Each of these are explored in this guide.



Anaerobic digesters for biogas.

# About biogas and biomethane

Biomethane – which is derived from biogas – is a direct replacement for fossil gas.

## How biogas is produced

Biogas is produced through a biological process known as anaerobic digestion. Anaerobic digestion takes place within a purpose-built dome that enables microorganisms to break down organic material in an oxygen-free environment.

Biogas can be produced from:

- wastewater sludge
- crop residues
- agricultural waste
- animal manure
- food and garden waste
- landfill sites.

These inputs are commonly referred to as feedstocks.

## Biomethane is derived from biogas

Biogas that is produced from feedstocks during anaerobic digestion is a mixture of methane, CO<sub>2</sub> and minor amounts of other gases.

Once biogas has been produced, it travels through a series of membranes and scrubbing processes to remove carbon dioxide, hydrogen sulphide and other contaminant gases. This process converts biogas to biomethane and is referred to as 'biogas upgrading'.

## Biomethane use

Biomethane is supplied to businesses through:

- gas networks, or
- can be supplied directly to end-users through a dedicated pipeline, or
- for on-site use behind-the-metre (BTM).

It is a direct replacement for fossil gas and is interchangeable with fossil gas. This means biomethane can be used in existing gas networks without modification.

## Benefits of biomethane

Biomethane has many benefits:



**Renewable source of energy** – Biomethane comes from renewable sources and organic materials.



**Circular economy** – Biomethane is produced from organic waste, enhancing resource efficiency and reducing landfill waste. It supports a circular economy by treating waste, providing energy, and producing digestate that can be used as organic nutrient-rich fertiliser.



**Decarbonisation** – Biomethane is a low-emission alternative to fossil fuels, which means it can help reduce greenhouse gas emissions from energy use.



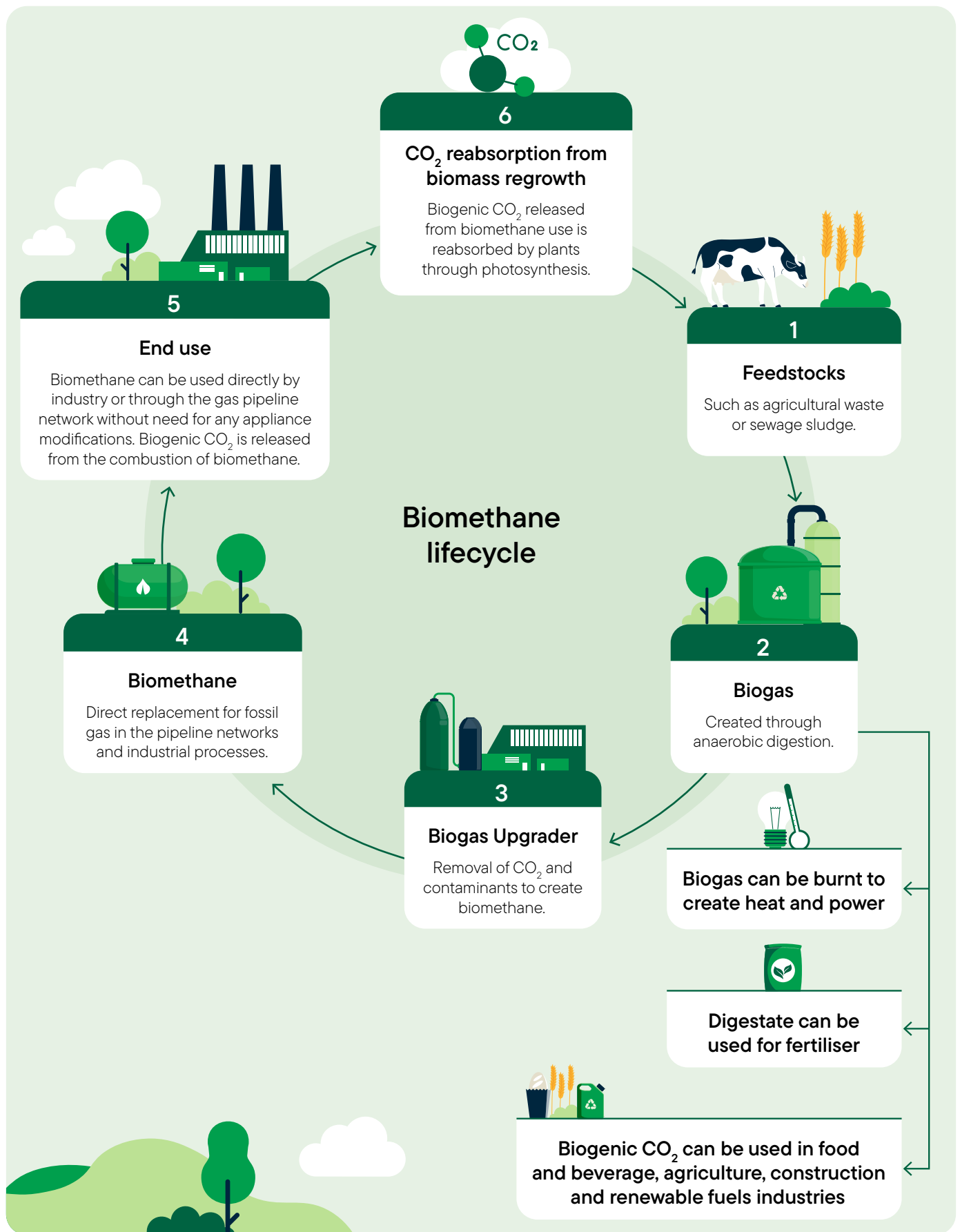
**Energy security** – Biomethane can be used to replace fossil fuels and reduce Australia's reliance on imported fuels.



**Economic growth** – Biomethane projects have the potential to create jobs in regional areas and provide opportunities for economic growth.

# The biomethane lifecycle

The diagram below shows the cycle of biomethane, turning waste into low-emission renewable energy.





# Biomethane vs fossil gas



## Biomethane and carbon emissions

Biomethane is produced from organic materials, such as agricultural residues and animal waste.

Organic materials absorb CO<sub>2</sub> from the air as they grow. When biomethane is used, it releases CO<sub>2</sub> back into the air where it can be reabsorbed by plants through photosynthesis, creating a cycle where no new carbon is added to the atmosphere.



## Fossil gas and carbon emissions

Fossil gas is one of the most significant contributing factor to greenhouse gas emissions.

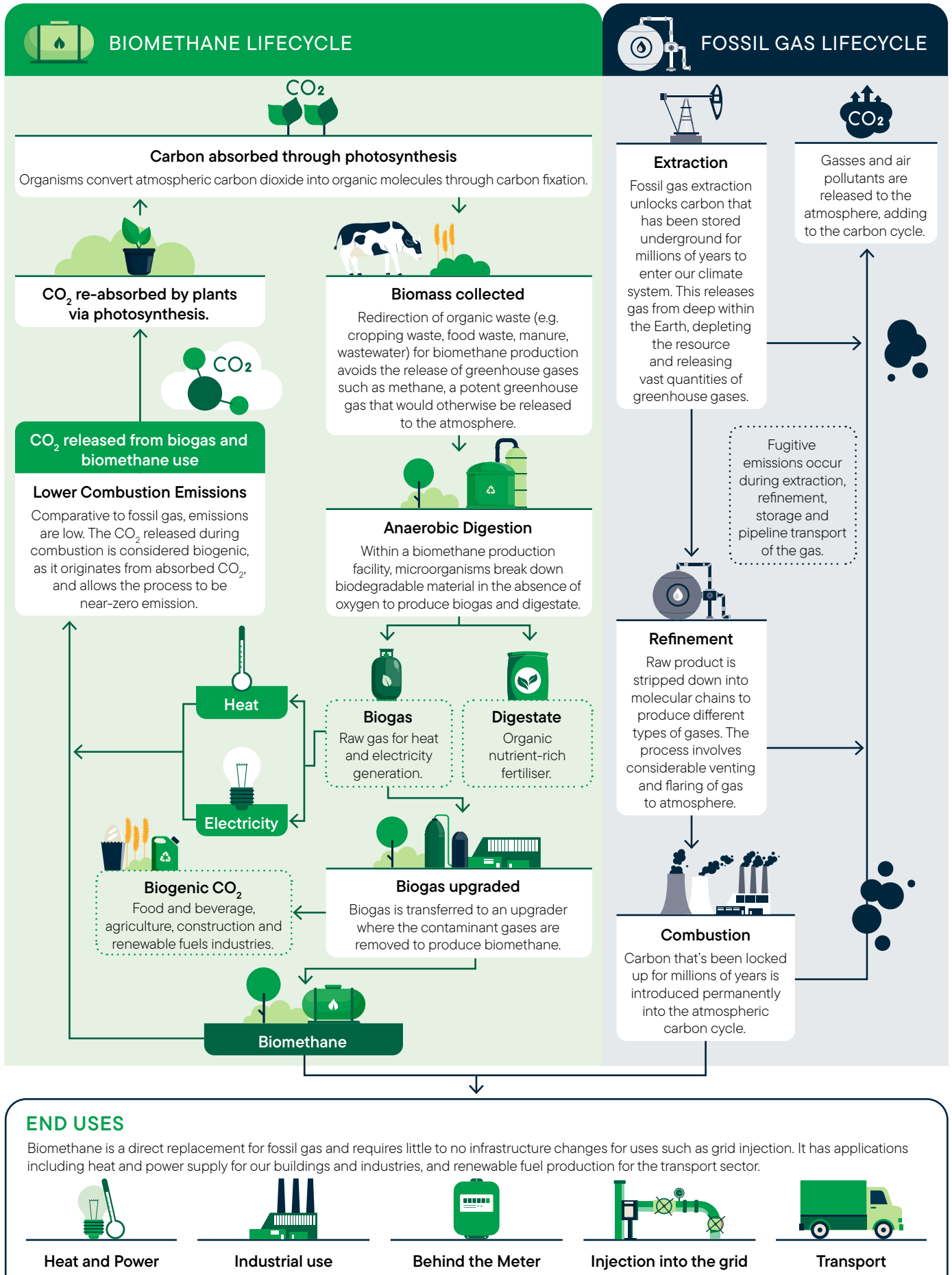
Organic matter buried and preserved for millions of years is released to create fossil gas. When fossil gas is burned this organic matter adds carbon dioxide to the atmosphere that would have otherwise remained locked up beneath the Earth's surface.



Jemena Biomethane Injection Project.

# Biomethane compared to fossil gas emissions

The diagram below shows how biomethane can achieve lower emission gas supply compared to fossil gas.



# Digestate: a valuable biomethane byproduct

## What is digestate?

Digestate is a byproduct of the biogas anaerobic digestion process. It comes from materials like wastewater sludge, crop residues, agricultural waste, animal manure, food waste and garden waste.

## Benefits of digestate

Digestate:

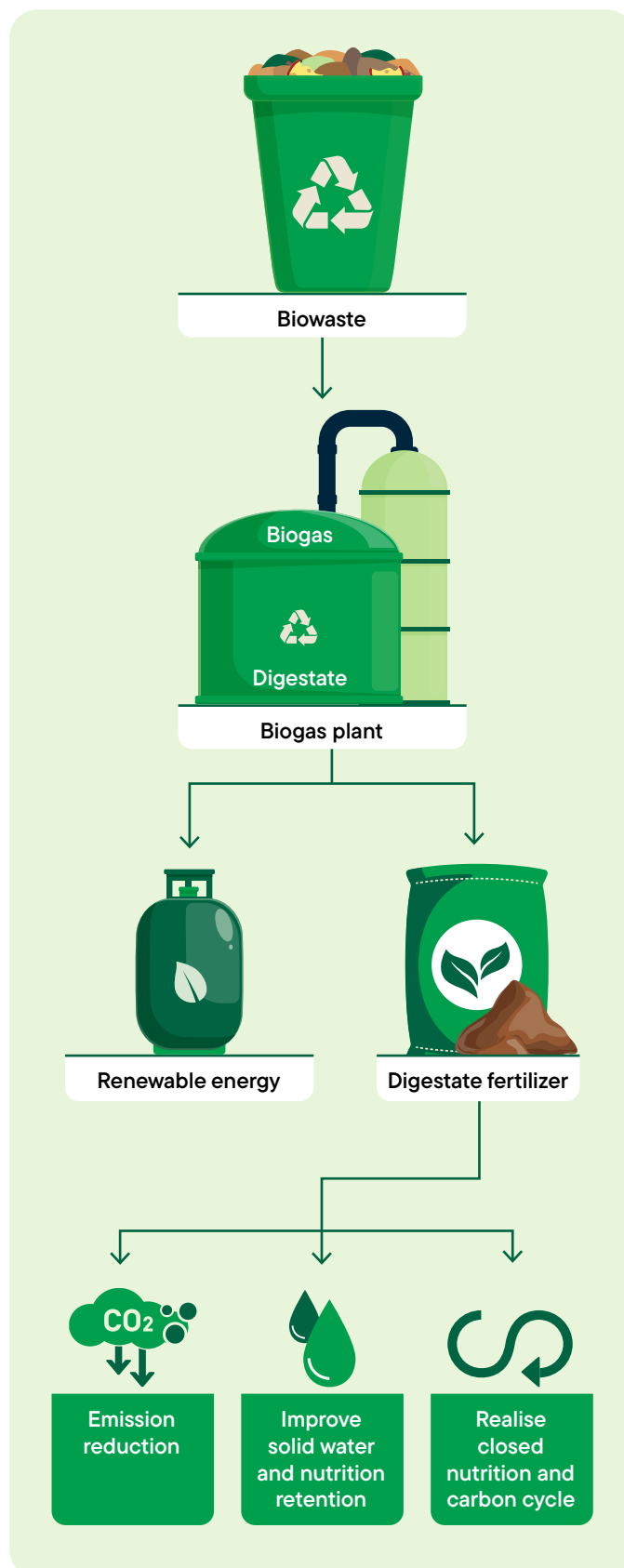
- enhances soil fertility
- reduces greenhouse gas emissions.

Digestate is an organic, nutrient-rich byproduct that contains essential micronutrients for plant growth. It can improve soil structure and moisture retention, enhancing soil fertility. This makes digestate a valuable organic fertiliser for agriculture, landscaping, and horticulture, adding value to the biomethane production process.

Through the biogas production process, greenhouse gas emissions are reduced by preventing biogenic feedstocks to decompose and release emissions. This process prevents unwanted methane emissions. Digestate use also reduces greenhouse gas emissions by replacing chemical fertilisers.

## How digestate reduces greenhouse gas emissions

The diagram to the right shows how digestate is produced, and how it reduces greenhouse gas emissions. It also displaces chemical fertilisers which create emissions and other negative environmental impacts.





# Renewable Hydrogen

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## How is renewable hydrogen produced?

Renewable hydrogen is extracted from water through electrolysis. This process is powered by renewable electricity generated from sources such as wind and solar.

GreenPower accredited hydrogen projects use GreenPower Electricity or onsite renewable electricity to produce renewable hydrogen. This ensures the renewable hydrogen we certify meets strict social and environmental standards.

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## How is renewable hydrogen used?

Renewable hydrogen can be used:

- to generate heat through combustion for industry
  - as a fuel to power fuel cell electric vehicles (FCEVs) and standalone fuel cell systems for electricity generation
  - blending into gas pipelines
  - serve as a chemical feedstock for the production of diverse chemicals, including ammonia, sustainable aviation fuel, methanol and synthetic fuels
  - provide a stored fuel source.
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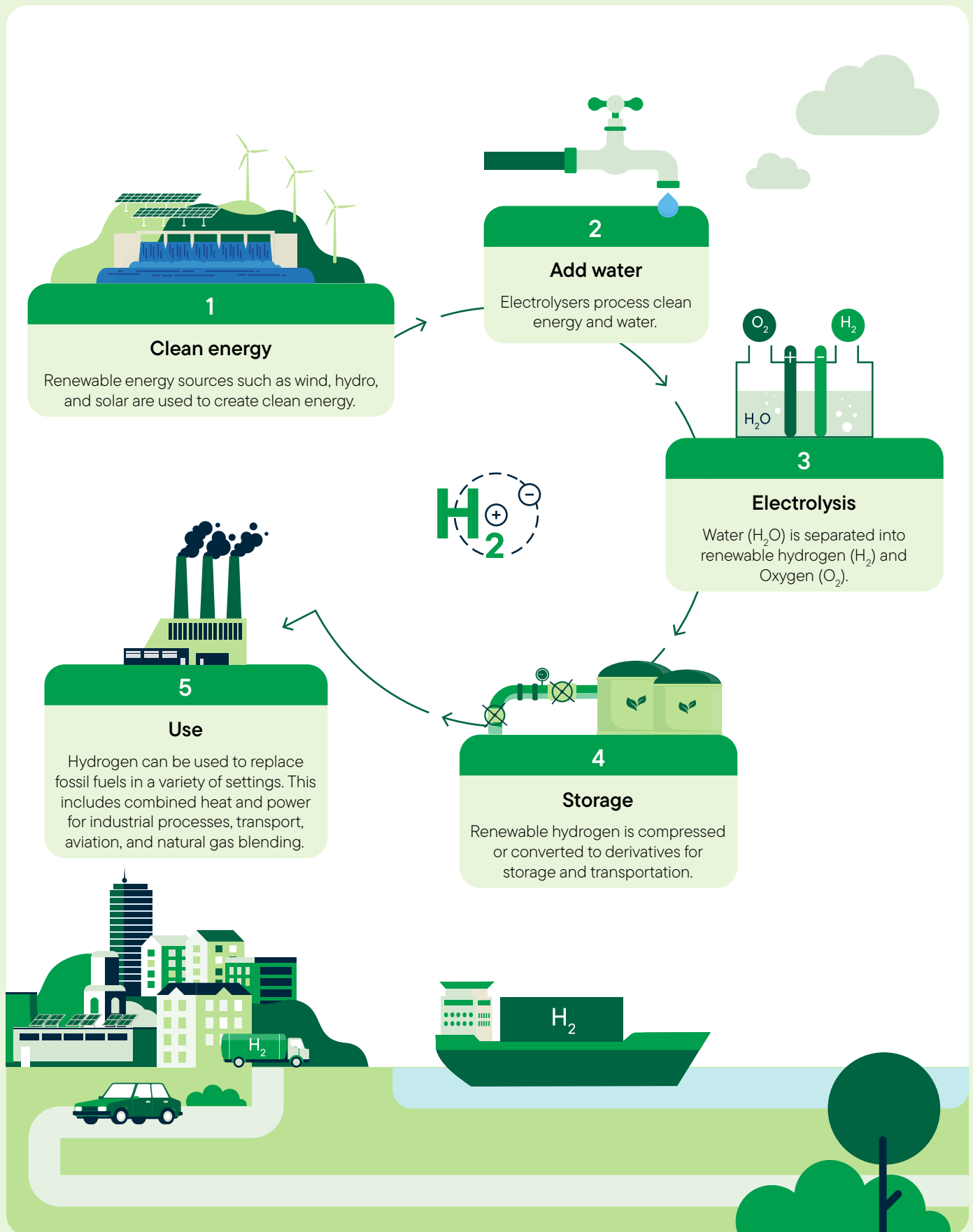
## Benefits of renewable hydrogen

Renewable hydrogen has many benefits:

- zero emission energy, the only byproduct from using renewable hydrogen is water vapour
- hydrogen can be stored as either a gas or a liquid
- renewable hydrogen can help to reduce Australia's emissions through replacing fossil fuels in some energy intensity sectors such as refining, chemical manufacturing, maritime, aviation and heavy transport
- blending into natural gas pipelines instead of fossil gas
- can be used as a vector for export
- hydrogen created through electrolysis also produces oxygen as a byproduct.

# Renewable hydrogen lifecycle

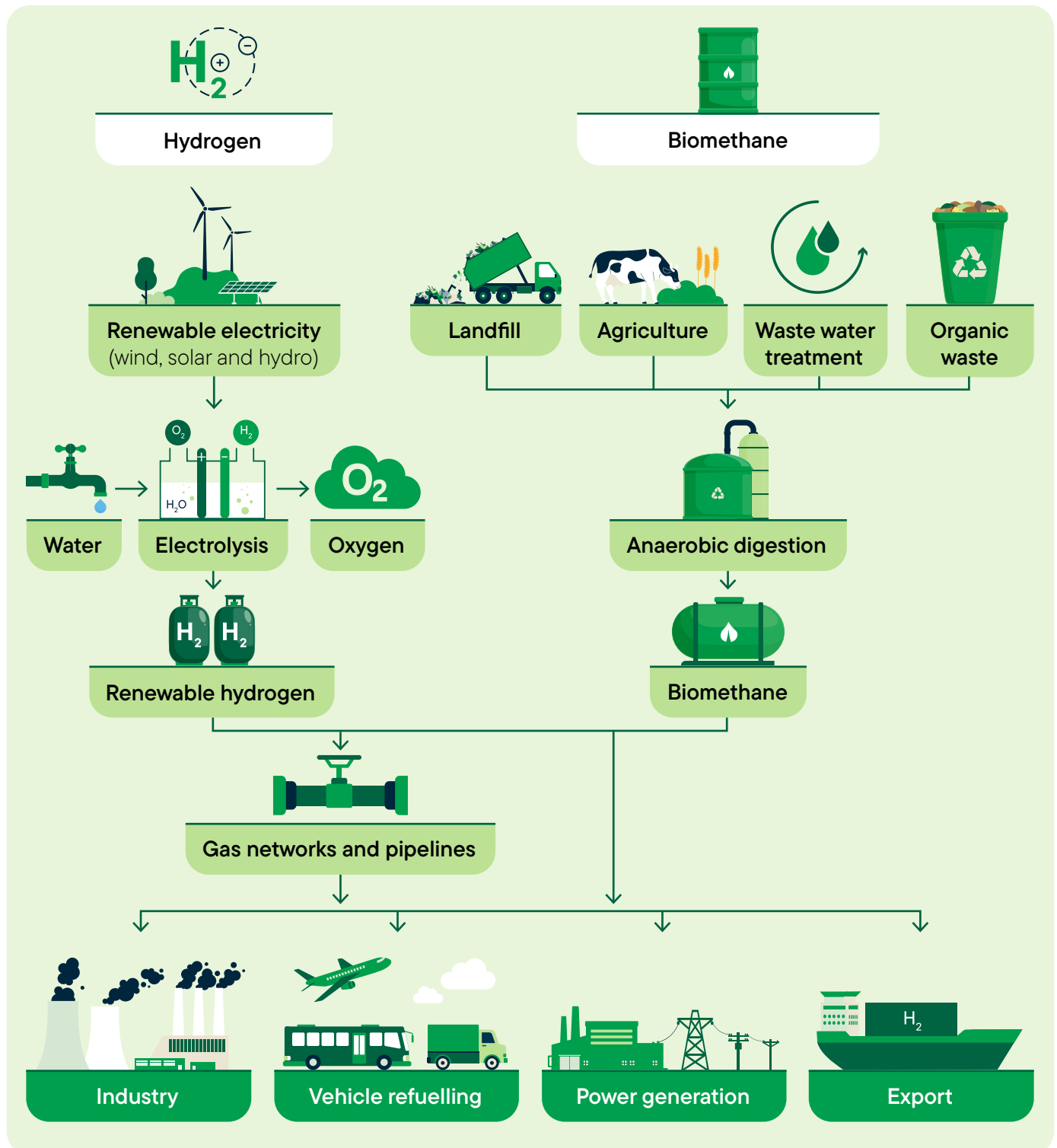
The diagram below shows how renewable hydrogen is produced and used as a renewable energy source.





# How renewable gas supports decarbonisation

Renewable gases like hydrogen and biomethane have the potential to reduce greenhouse gas emissions by replacing conventional fossil gas and other fossil fuels within the energy system. They can play a critical role in decarbonising hard-to-abate sectors such as heavy industry and transportation.



# GreenPower's Renewable Gas Certification

GreenPower's Renewable Gas Certification gives businesses the opportunity to match their fossil gas use with accredited low-emission renewable gas certificates. These are called Renewable Gas Guarantee of Origin (RGGO) certificates.

The sale of RGGOs supports renewable gas projects in Australia, increasing emissions reduction impact transitioning away from fossil fuels.

Our product is ideal for hard-to-abate commercial and industrial businesses that cannot easily decarbonise through electrifying their operations.

If you would like to participate or learn more about the GreenPower Renewable Gas Certification, visit the [GreenPower website](https://www.greenpower.gov.au) or email us at [greenpower.gas@dpie.nsw.gov](mailto:greenpower.gas@dpie.nsw.gov)



Biogas Plant.



## Contact us

Renewable Gas enquiries: [greenpower.gas@dpie.nsw.gov.au](mailto:greenpower.gas@dpie.nsw.gov.au)

[www.greenpower.gov.au/about-greenpower/renewable-gas-certification](https://www.greenpower.gov.au/about-greenpower/renewable-gas-certification)

National GreenPower Accreditation Program  
NSW Department of Climate Change, Energy, the Environment and Water  
Locked Bag 5022, Parramatta NSW 2124

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