AMMONGAS
EUROPEAN ENERGY

# Clean $CH_4$
# Clean $CO_2$

Ammongas contributes as a driving force to achieving Goal 7 of the United Nations Sustainable Development Goals: The universal access to affordable, reliable, and modern energy services.

Ammongas separation is able to supply a variety of different environmental plants, including $CO_2$-separation systems for biogas upgrading to biomethane, turning waste and sustainable resources into green fuels.

Moreover, an increased focus on global warming and the removal of greenhouse gases will in the coming years lead to increased demand for Carbon Capture (CC). CC from flue gas at an incineration plant or other combustion is available through the Ammongas-tailored $CO_2$-separation solution.

With Ammongas technology you are ready for tomorrow, today.

# Ammongas 4 pillars

Ammongas has four pillars underpinning the contribution to the overall mission of helping the community towards a green development.

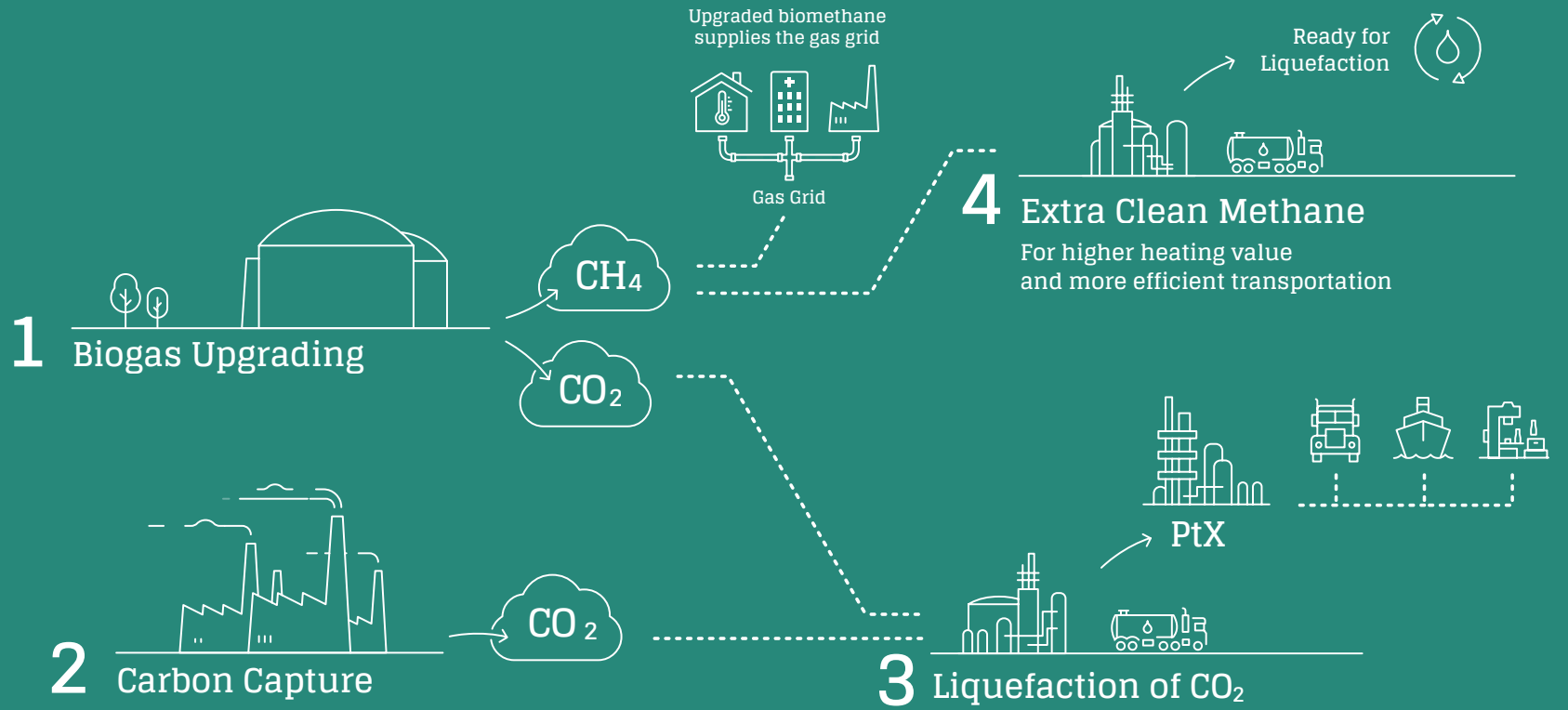
**Pillar 1. Biogas Upgrading**
Transforming raw biogas into biomethane, a renewable source of energy.

**Pillar 2. Carbon Capture**
Utilizing technology to capture and store carbon dioxide emissions, helping to combat climate change.

**Pillar 3. $CO_2$ Liquefaction**
Converting gaseous $CO_2$ into a liquid for easy transportation and storage.

**Pillar 4. Extra Clean Methane**
Producing high-purity methane that can be used for Bio-LNG.

Scan the QR code and take a look at the detail in the video about our 4 pillars.



# Principle of $CO_2$ separation

Ammongas uses the well-known absorber-stripper system with amines for upgrading of biogas and for Carbon Capture. The process has been used for many years in the oil and gas industry for removal of $CO_2$, $H_2S$ among other acidic gases, and is known for being a robust and reliable system.

The central principle of an Ammongas plant is a $CO_2$-separation that uses an alkaline amine solution to absorb sour gases. Heat is added to the system to regenerate the amine which circulates in a loop to reduce the consumption of solvent. Recuperating the heat is an integral part of the Ammongas value proposition and it is possible to achieve up to 90% heat recuperation from the process.

Upgrading of biogas in a class of its own with Ammongas.

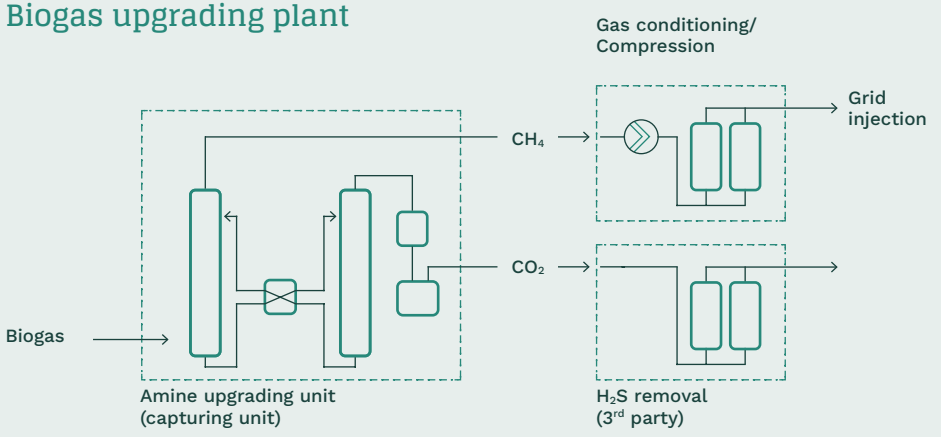
Ammongas has built **30+ biogas upgrading** plants ranging from 150 to 10,000 $m^3/h$.

# Pillar 1: Biogas upgrading

Ammongas is an expert in $CO_2$-separation for biogas upgrading to biomethane. Ammongas' absorption process is so efficient that the methane slip to the atmosphere is less than 0.09%. This means that the amount of methane recovered is more than 99.9%.

Due to the efficient process, $CO_2$ is removed efficiently leading to a higher purity of $CH_4$ in the upgraded gas. Furthermore, the robust technology of the upgrading process results in low operational expense with an average up-time of 99% including service.

## Biogas upgrading plant



# Advantages of Ammongas $CO_2$ separation from biogas

## Designed to meet your needs

In collaboration with our clients, we choose the best options for your specific project.

## Robust system

The $CO_2$ separation process accepts high concentration of $H_2S$.

## Low electricity consumption

Only the $CH_4$ is compressed, resulting in a lower electricity consumption than other technologies.

## Long life

The plant is build in stainless steel using top-tier components, with expected lifetime of 15+ years.


## Large savings

Due to a high degree of heat recuperation and solvent regeneration, the Ammongas $CO_2$ separation plant offers low operational expenditures.


## High separation of $CO_2$

Below 2% $CO_2$ in the $CH_4$ but can be engineered to below 50 ppm for liquefaction purposes.

## Methane slippage < 0.09%

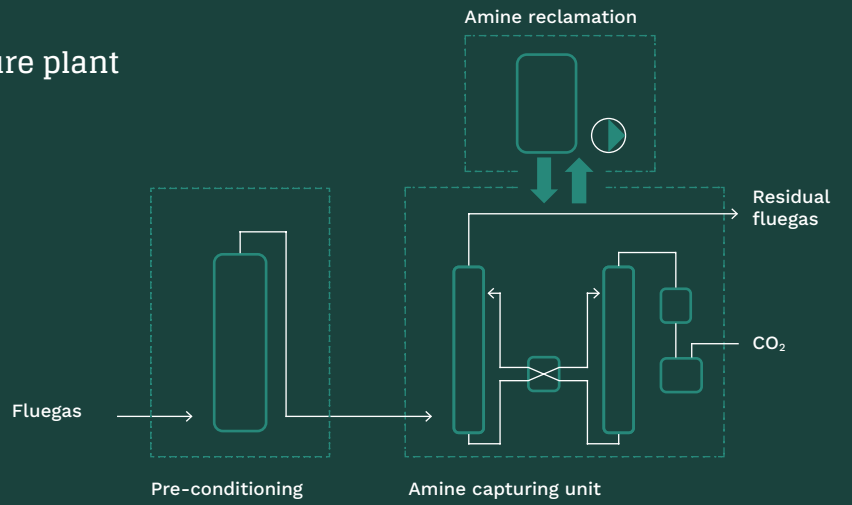
Low methane slippage and high methane recovery leads to optimal profit-generation.

Lower $CO_2$-taxes by reducing $CO_2$-emissions with Carbon Capture

# Pillar 2: Carbon Capture

With the recent addition of Carbon Capture to the project portfolio, Ammongas can process and condition $CO_2$ from flue gas or tail gas. Carbon Capture through Ammongas-tailored $CO_2$-separation is a fairly similar process to Ammongas' biogas upgrading, with high capture-rates to below 1% $CO_2$ in the treated off-gas. This could be further enhanced by incorporating pre- and post-treatment procedures for potential sulfur ($SO_x$) and nitrogen oxides ($NO_x$) present in the gas composition.

## Carbon Capture plant



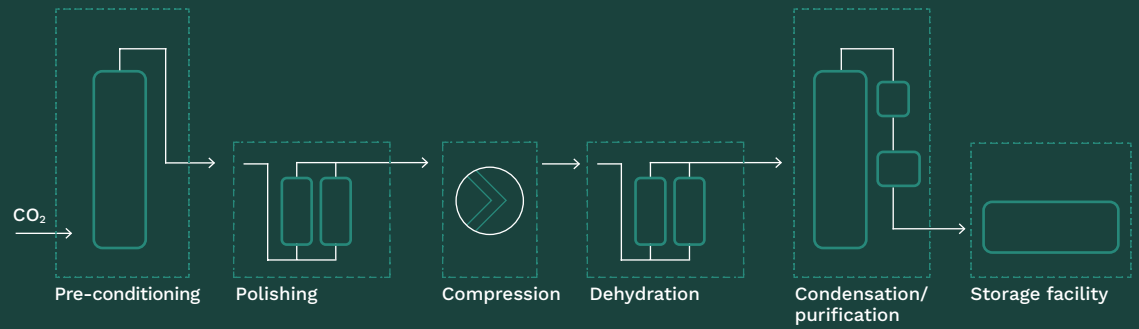
Added biogas value by $LCO_2$ for food industry or Power-to-X

# Pillar 3: Liquefied $CO_2$

Ammongas offers a solution for $CO_2$ liquefaction. The inlet raw $CO_2$ entering the liquefaction plant is pre-conditioned and polished prior to compression, dehydration, and condensation before final storage.

Depending on the end-use, the $CO_2$ can through the Ammongas $LCO_2$-plant be delivered with a quality of +99% $CO_2$ for sequestration and up to food-grade or Power-to-X quality.

## $CO_2$ Liquefaction plant

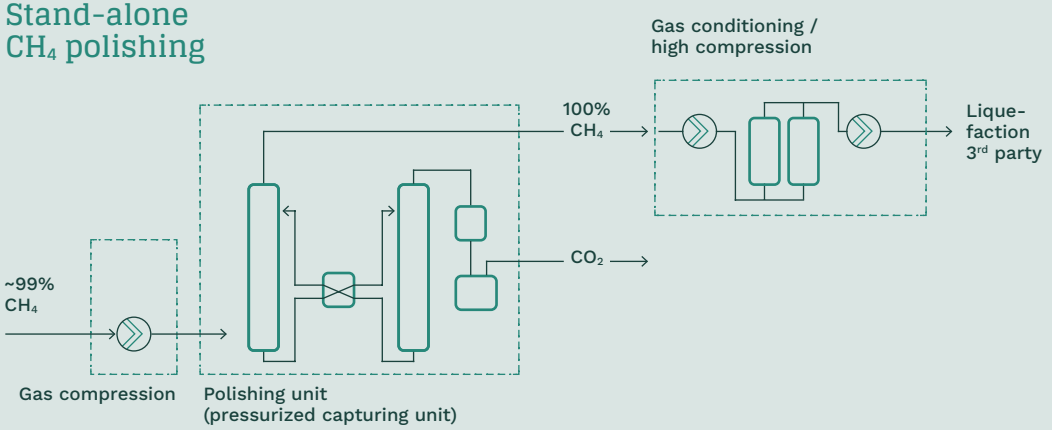


# Pillar 4: Stand-alone or integrated $CH_4$ polishing

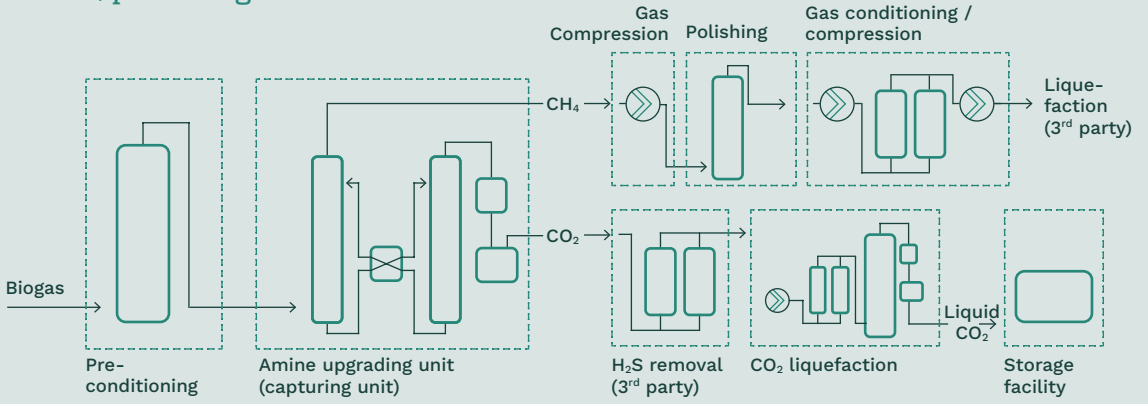
Ammongas' $CO_2$-separation process can remove down to less than 50 ppm of $CO_2$ in the biomethane, which is necessary to prepare the gas for liquefaction (bio-LNG).

$CH_4$ polishing can be offered as a stand-alone add-on to an existing upgrading plant or offered as an integrated amine upgrading and polishing plant.

## Stand-alone $CH_4$ polishing




## System integrated $CH_4$ polishing



# The right partner for a greener project

Whether you are looking for biogas upgrading, polishing of $CO_2$, carbon capture, $CO_2$ liquefaction, Ammongas has made $CO_2$ separation its key business for over a decade.

In close collaboration with clients and through strong engineering capabilities half of the biomethane on the Danish national gas grid is being processed through an Ammongas plant.

Ammongas has existed since 2002 and consists of approx. 35 dedicated employees.

The Ammongas team is eager to help you achieve your ambitious goals and contribute together to helping the community towards a green development.


Better carbon balance for optimal revenues through Ammongas' solutions

Upgrading plants in Brande, Denmark
1500 m³/h and 3000 m³/h raw biogas

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