

A single
partner.
A modular
solution.

All the advantages of



biomethane.



ONE-STOP SHOP





Choosing AB means not only being able to use a wide **range of technologies**  (biogas upgrading, liquefaction of CO₂, liquefaction of biomethane and cogeneration), but above counting on a series of services that cover the entire life of the plant, **from the feasibility study to maintenance**,  to get the best possible benefit from your investment.

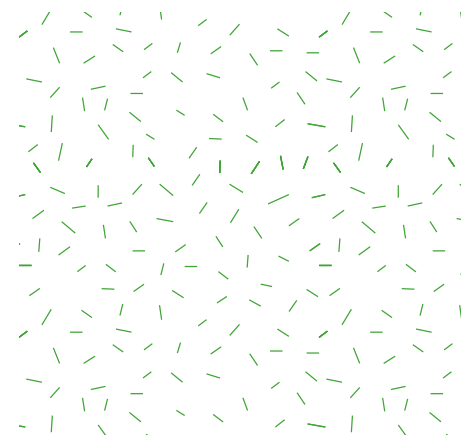
Biomethane is the **fuel** obtained from the purification of biogas produced **thanks to the enhancement of organic waste and sustainable biomass**. After appropriate chemical and physical treatments are carried out (upgrading and eventually liquefaction), it becomes **suitable for the injection of natural gas** into the grid or for transport using cryogenic tankers.

As it is produced from zootechnical waste, agro-industrial waste, organic waste and agricultural biomass, biomethane is in all respects a source of renewable and sustainable energy: in addition to reducing emissions into the atmosphere, it is carbon neutral, in other words it fully compensates for the emissions produced to generate it, returning organic substances to the soil. This is therefore a solution that can significantly contribute to the energy and ecological transition, with important implications both in terms of the circular economy and independence

from foreign energy supplies.

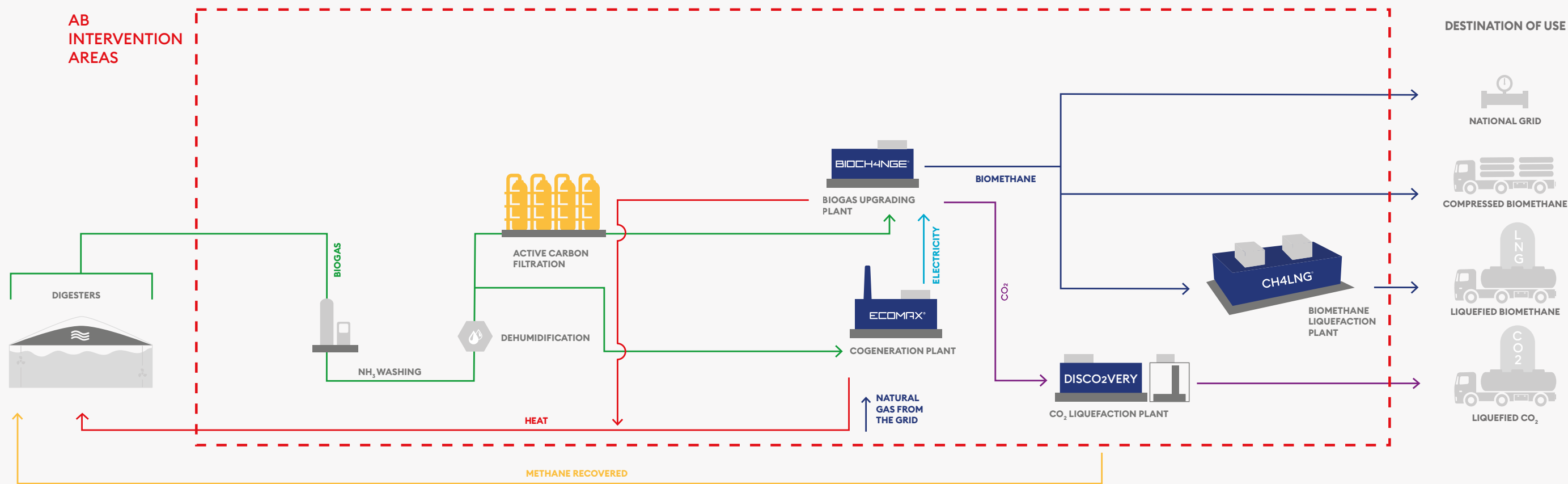
It is also an excellent investment opportunity for many companies in the agricultural and industrial sectors which, in addition to committing to increasing the sustainability of their production companies, have the opportunity to generate profits and increase the level of competitiveness. A new era opens up and the time to decide whether to take part in it with an active role is now. We are at your disposal to accompany you along this path, building on the experience gained over decades in the biogas sector and, in recent years, in the biomethane sector, in Italy and internationally.

**Rely on AB's
ONE-STOP SHOP**
to have
biomethane in a
single solution –
the best solution!



All AB solutions for biomethane

AB is the only provider to guarantee your company all the benefits of biomethane. With **AB**, in fact, you can create a complete and sustainable energy system, combining cogeneration, biogas upgrading technologies, biomethane and CO₂ liquefaction, supported by a complete range of services: from the feasibility study to maintenance.



Biogas upgrading is the treatment aimed at removing CO₂ from raw biogas.

BIOCH4NGE[®], the technology offered by AB, is based on a membrane system, characterised by flexibility, scalability and low energy consumption for a real competitive advantage. The process consists of several phases: a first pre-treatment step, followed by a purification phase, i.e. of removal of pollutants (H₂S, VOCs) from biogas coming from the anaerobic digester and a final phase of methane separation (CH₄) from carbon dioxide. The end result is a renewable energy source, biomethane, which reduces emissions, exploiting existing gas networks and increasing national production, with positive repercussions in terms of circularity in the use of resources in the agri-food sector. Combined with the **CH4LNG liquefier**, **BIOCH4NGE**[®] can produce a quality gas suitable for liquefaction and transport by road as an alternative to feeding into

the grid. In support of the plant, **AB** also makes available **DISCO₂VERY**, the CO₂ liquefier which allows to purify and liquefy gas rich in carbon dioxide coming from the **BIOCH4NGE**[®] system, in order to obtain liquid CO₂ suitable for food and industrial use. To power the entire system, **AB** offers a wide range of **ECOMAX**[®] cogeneration solutions.







Tailor-made services

Every company, whether in the agro-zootechnic or industrial sector, has its own needs, which **AB** knows how to interpret. We provide tailor-made

services to each customer, which guarantee long-term investments and optimal performance over time.

-  Feasibility study and selection of the best solution
-  Consulting on regulations and incentives
-  Assistance in the authorisation phase
-  Plant design and production

-  Installation and start-up of systems
-  24/7 maintenance and assistance service
-  Spare parts always available
-  Financing

The benefits of the **AB** approach, the only partner for biomethane

Integrated solution supplied by a single provider:

- Centralisation → Varied equipment and reduction of different self-consumption producers
- Unique control system, remotely accessible and connected with the Internet of Things (IoT) technology
- Perfect integration of the different subsystems: **ECOMAX**[®] cogenerator, **BIOCH4NGE**[®] biogas upgrading, CO₂ **DISCO₂VERY** liquefaction and **CH4LNG** biomethane liquefaction.

Minimisation of risk due to interfaces between:

- Varied equipment / from different manufacturers
- Technologies not natively compatible
- Different suppliers

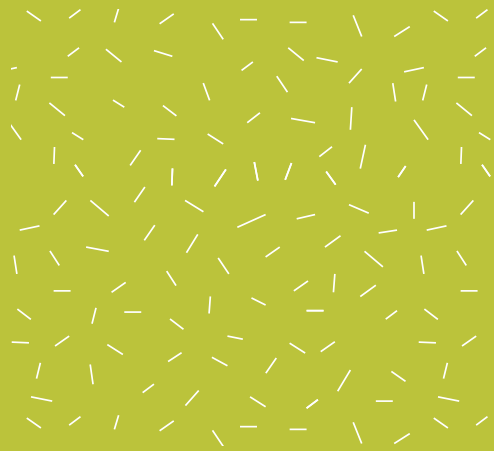
Control of prefabrication, supply, installation and start-up times

BIOMETHANE IN A UNIQUE SOLUTION
THANKS TO **AB'S** ONE-STOP SHOP

 WATCH THE VIDEO ▶



Compressed biomethane for feeding into the grid



Among the various upgrading technologies for biomethane available on the market, **AB** offers the BIOCH4NGE® solution for compressed biomethane, which uses a membrane system, **the most widespread and most commonly used in the world.**

The membranes are made up of special polymeric materials characterised by a selective permeability useful for the separation between CH₄ and CO₂.

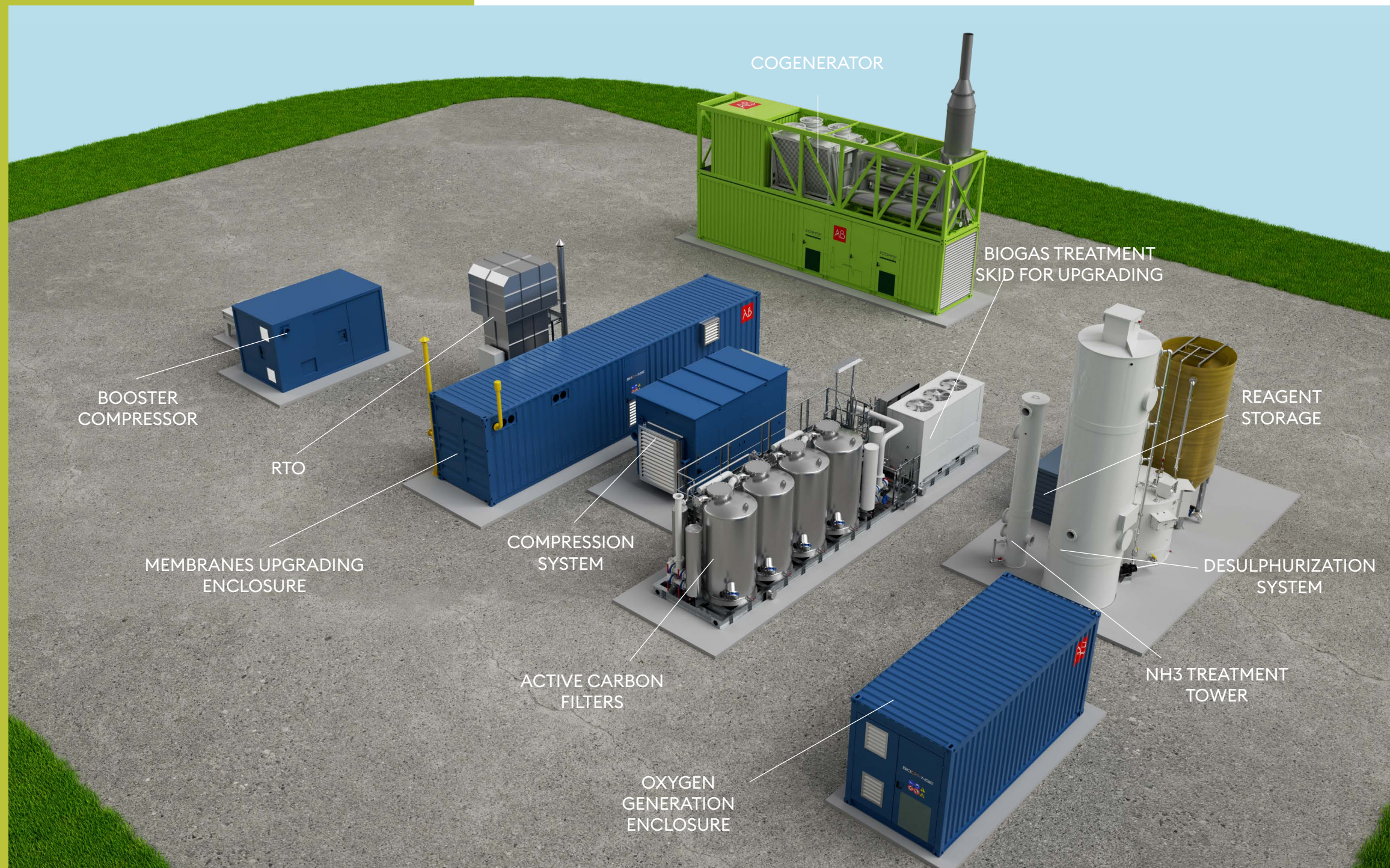
BIOCH4NGE® is a configurable solution for:

Adapting to the quality of the biomethane produced

Minimising methane leaks

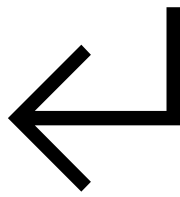
Achieving maximum recovery and reduction in consumption

Meeting the requirements of the so-called Biomethane-Ter Decree in terms of size, self-consumption and sustainability



*example image
Layout and elements to be defined based on the available spaces and the configuration chosen

How the process works



1

In the first phase, a **chilled water heat exchanger**, supplied by a chiller, lowers the biogas temperature from the digester, **while a condensation separator** removes excess water. Downstream of dehumidification, a **blower compresses** the gas at the suitable pressure for subsequent treatments.

2

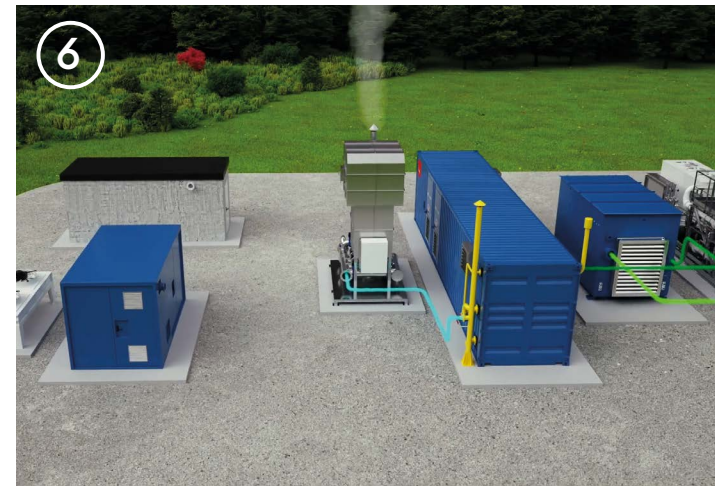
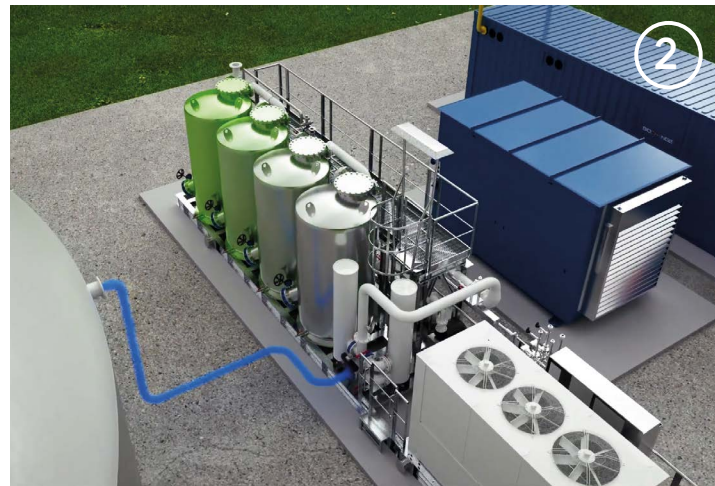
Biogas then passes into the **activated carbon tanks** for the abatement of volatile organic compounds and hydrogen sulphide.

3

Once filtered, the biogas is compressed and enters **the heart of the BIOCH4NGE®** upgrading plant, where methane is separated from carbon dioxide using a multi-stage membrane system. The biomethane that conforms to the required standard is sent to the compression process, if needed, before being injected into the grid.

4

BIOCH4NGE® is completed by a series of preparatory options for feeding into the network and other accessories to support the operation of the system. Upstream of the biogas treatment, the **desulphurisation system is available** to lower the hydrogen sulphide content and the **washing tower to reduce** the ammonia content, if the quality of the gas requires these specific treatments.



5

In the case of a low concentration of oxygen in the biogas, an **oxygen concentration system** from ambient air makes it possible to provide the necessary quantity so that the chemical adsorption reactions of contaminants by activated carbons take place correctly.

6

AB offers a range of **regenerative thermal oxidisers (RTOs)**, to eliminate even the smallest percentages of residual methane in the off-gas.

7

Biomethane is produced at a pressure in a range from 7 to 15 bar to minimise consumption, but also to facilitate injection into distribution networks where necessary.

A **booster compressor** can be supplied to reach the pressure required by the transport networks.

Before being injected into the grid, the **REMI cabin** measures the flow rate and analyses the quality of biomethane in order to establish its compliance with the grid requirements or the need to recirculate the non-compliant gas.

Find out in the video
how the process
works





The benefits of BIOCH4NGE®

Industrial product entirely designed and manufactured by **AB**, pre-assembled and tested in our production plants before shipment.

Outdoor modular solution designed to be installed outside.

Compact and engineered in every aspect to optimise dimensions and simplify maintenance operations.

Plug & play installation to limit construction work and takes place inside contained spaces.

Sustainable as it meets both the requirements of the gas produced and the gas emitted into the atmosphere and in combination with **AB's** secondary abatement systems ensures complete zeroing of CH₄ emissions.

Remote control thanks to a centralised monitoring and supervision system, managed by **AB**.

Membrane system benefits:

Simple upgrading process, without intermediate steps and without the use of chemicals or consumption

High scalability and flexibility that allow operation even at partial load

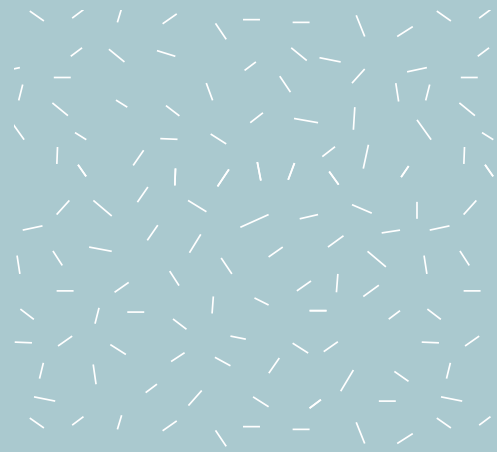
High efficiency and low consumption thanks to the control system that makes it possible to modulate the operating pressures of the separation stages

Affordable cost even for medium-small sizes plants

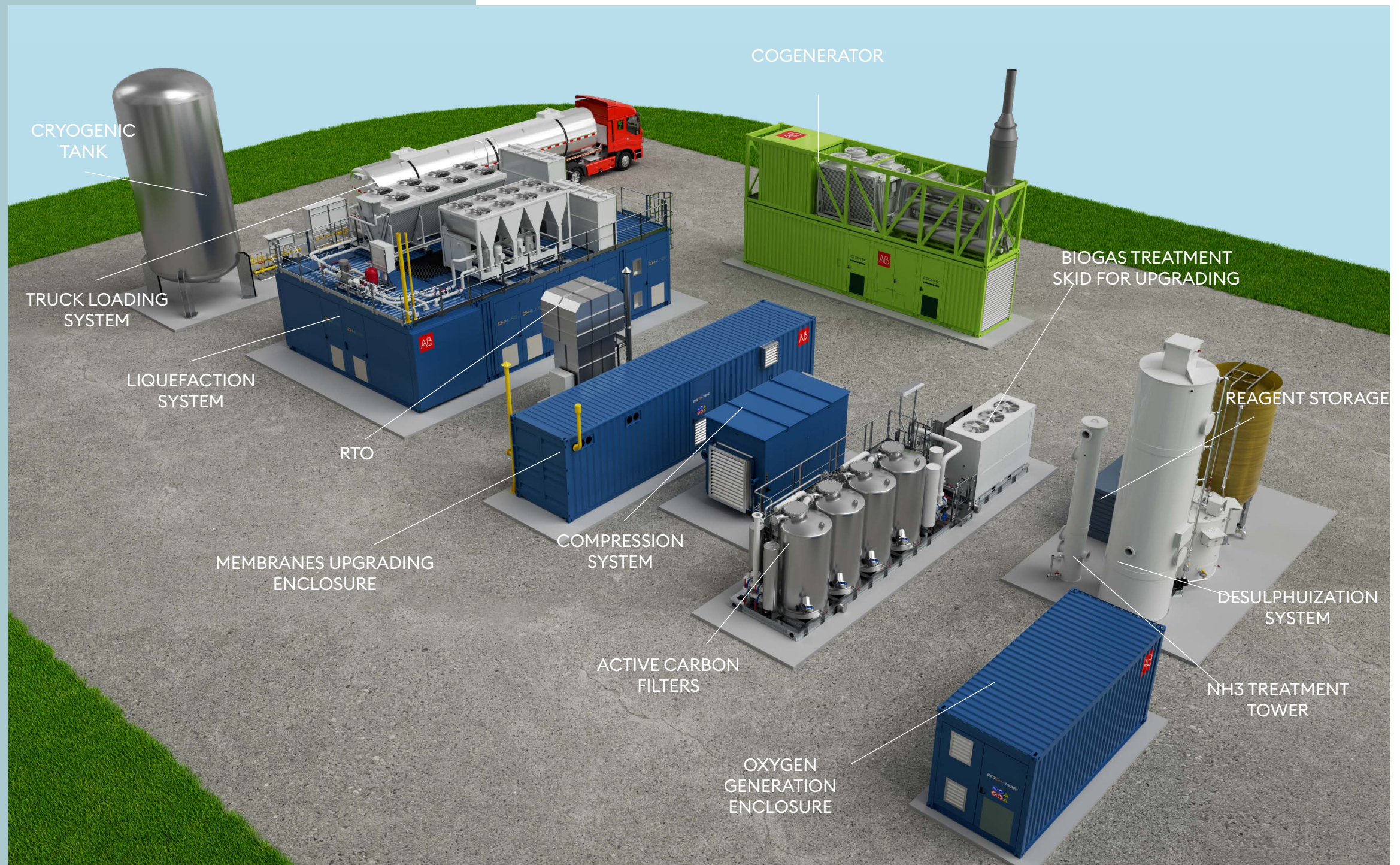
AB's offer for the upgrading of biogas in biomethane

BIOCH4NGE® is available in standardised units from 150 to 2,500 Nm³/h, complete with pre-treatment systems that can be used with existing biogas plants and integrated with possible extensions linked to the liquefaction of gas and the exploitation of CO₂. Solutions of different sizes can be "tailor-made".

Liquid biomethane



If the injection of the biomethane produced into the grid is not possible, the biomethane can be liquefied for transport by road. To this end, **AB** has created CH4LNG, the solution for the liquefaction of biomethane designed to be installed downstream of a BIOCHANGE[®] system, with which it integrates perfectly.



*example image
Layout and elements to be defined based on the available spaces and the configuration chosen

How the process works

CH4LNG is based on an **integrated cryogenic process**, at low operating pressure, divided into 3 phases: treatment, liquefaction and storage.

8

Treatment: in the first part of the process, the TSA (Temperature Swing Adsorption) purification system lowers the moisture and CO₂ content through molecular filters and sieves.

Liquefaction: through several cooling stages, the biomethane under pressure passes to the liquid state and is made available at conditions of < -142 °C and 3 barg and, where necessary, at even lower temperatures and pressures. The heart of the CH4LNG process is the cryo-cooler, based on Stirling Cryogenics technology, which is an alternative refrigeration machine that works by compressing and expanding helium in a closed cycle.



9

Storage: the bio-LNG is conveyed to a transfer tank, where the desired pressure and temperature conditions of the final product are achieved.

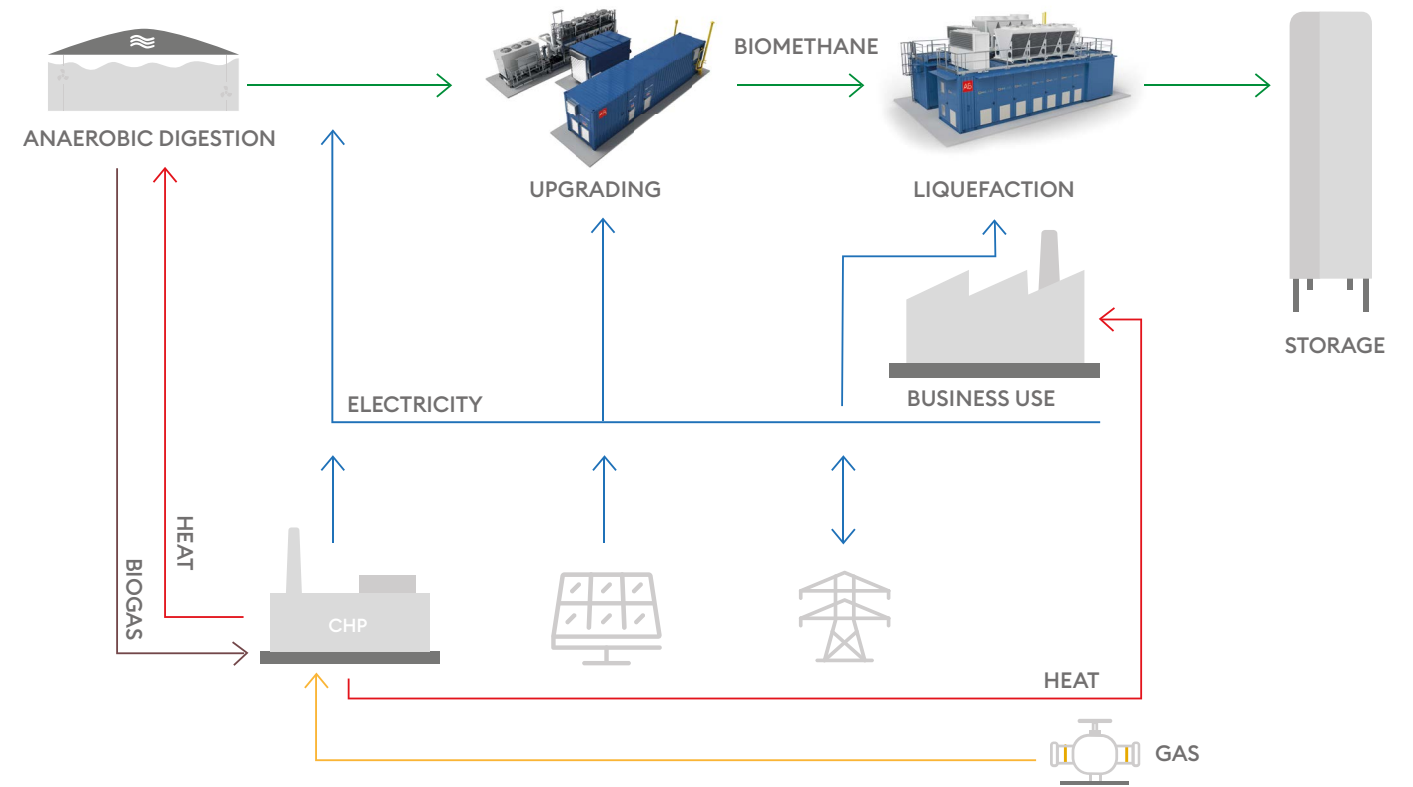
Find out in the video how the process works

WATCH THE VIDEO ►



Production of liquid biomethane

The cryogenic process behind the CH4LNG system uses **only electricity**, for example, avoiding the use of liquid nitrogen. CH4LNG is the highly efficient containerised modular solution, which works without the use of liquefied technical gases, **also available for small plants.**



The advantages of CH4LNG

- Modular and compact
- Simple and very efficient process
- No liquid nitrogen required
- Granularity up to 1 TPD (1 cryogenerator)
- Constant specific consumption
- Scalable up to 11 TPD

Regenerative thermal oxidisers (RTO) for after-treatment of waste gases



During the biogas upgrading process, raw biogas is separated into two gas flows: a flow rich in biomethane and a flow consisting of CO₂, containing residual methane traces, which constitutes the tail off-gas to be treated.

Biogas upgrading technologies never reach 100% efficiency, therefore CO₂ separated as off-gas always contains traces of methane, often in a concentration higher than that permitted.

For the combustion of residual methane contained in the off-gas, regenerative thermal oxidation (RTO) provides a sustainable and economically advantageous solution, suitable for the combustion of streams containing volatile organic compounds (VOC).



Regenerative thermal oxidation is a flexible and energy-efficient process, which combines the thermal oxidation of VOC in the gas phase, in order to remove residual contaminants from the biogas upgrading process, with the exchange of regenerative heat that makes the OPEX of these plants

less impacting given their operation in “auto-thermal” mode. The RTO system can recover up to 96% of the latent heat of the purified gas and reuse it for preheating the inlet gas. This is done using a refractory material with a high heat transfer capacity. Operating temperatures range from 780 to 1,000 °C


RTO_Bio


allows the **treatment of off-gas** from the biogas upgrading process that uses only two stages of membranes for the separation between methane and CO₂ and where the residual methane quantity can reach up to 5-7%. It consists of three thermal recovery chambers and a combustion chamber. The three recovery chambers, filled with structured ceramic material, work cyclically to achieve heating and subsequent cooling with an average energy recovery efficiency of 92%. The combustion chamber is equipped with

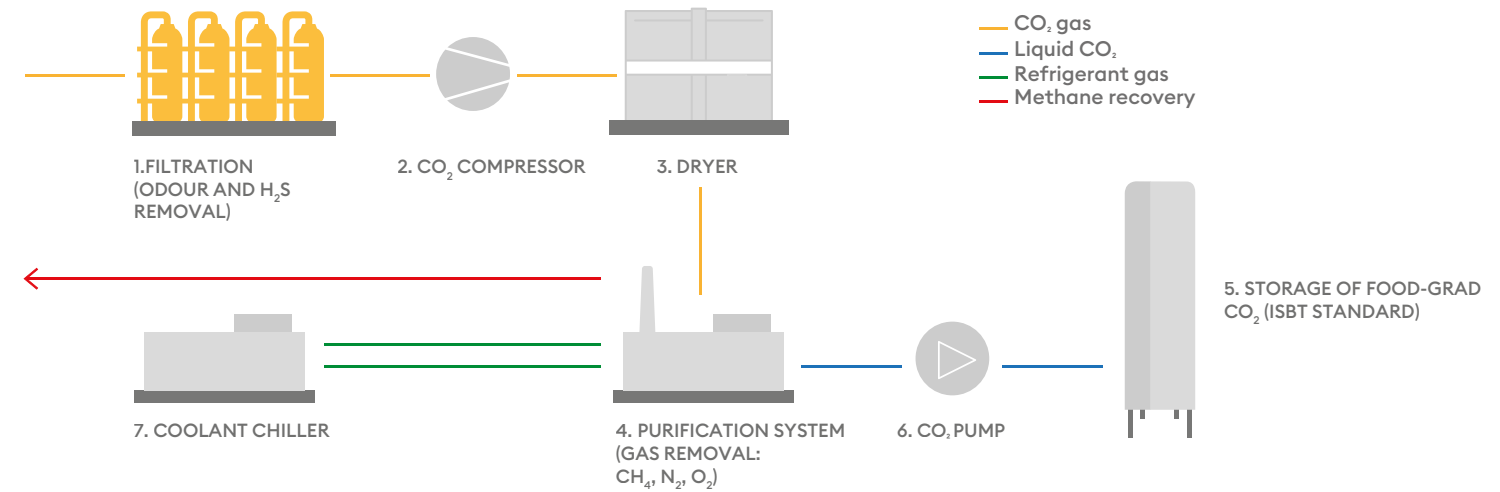
a biogas burner, necessary to quickly reach the oxidation temperature of the methane component (between 850 and 950 °C) during the cold start. Thanks to the intrinsic recovery efficiency of the thermal energy developed in the oxidation process of the methane compounds and the significant energy content of off-gas entering the RTO, the combustor operates in an **auto-thermal mode, without any need for auxiliary fuel** once the oxidation process has been triggered.

Liquefaction of CO₂



The DISCO₂VERY CO₂ liquefaction system makes it possible to purify and liquefy  the carbon dioxide-rich gas coming from the BIOCH4NGE[®] biogas upgrading system, in order to obtain liquid CO₂ suitable for food and industrial use.

In this way, CO₂  is transformed from emissions into a resource, maximising the recovery of the substances that make up the biogas.



The off-gas is purified, by absorption on activated carbons, dried and finally compressed at a pressure between 16-18 bar. Humidity is reduced by condensation and absorption on molecular sieves. Subsequently, the CO₂ is liquefied using the cryogenic distillation technology, a process where the dissolved gases (CH₄, N₂, O₂) are stripped to reach the specifications of the final product. These gases are recovered and, where possible, recirculated to the BIOCH4NGE[®] system, in order to increase the recovery of the latter, used thermo-electrically or simply oxidised. The liquid CO₂, purified until it meets food-grade standards, is finally sent to a storage tank, waiting to be withdrawn.

Properties of liquid CO₂ produced

Pressure	Temperature
from 16 to 18 bar	from -23 °C to -27°C

meets the standards prescribed by the quality guidelines of the **International Society of Beverage Technologists** (ISBT) for liquid carbon dioxide and the quality prescribed by Regulation (EU) No. 231/2012 (additive E290). This makes it suitable for use for most beverage companies.

The quality of liquid CO₂ can be analysed using an appropriate measurement system, in order to certify its compliance with the specific requirements of both E290 and ISBT.

ECOMAX® cogeneration solutions can power the entire system.

At the service of both the BIOCH4NGE® and CH4LNG installations, AB can provide the complete power supply system for electrical utilities, including medium-low voltage transformers, medium voltage switchboards and low voltage power distribution.

ECOMAX® produces electrical and thermal energy starting from a single fuel source (biogas or methane), to power the entire plant efficiently and sustainably.

ECOMAX® cogeneration plants can create, in combination with BIOCH4NGE® and CH4LNG, a complete energy system.



*Indicative image - Layout and elements to be defined based on the available spaces and the configuration

Here are some of the numerous **biomethane production plants** that we have installed around the world 🌐.



ITALY, Vicenza



⚙️ **Biogas flow rate:** 2.200 Nm³/h

+ **Valorisation of agricultural waste** (i.e. livestock effluents such as manure, slurry and pollen provided daily by 120 farms).

💧 **Liquefied biomethane:** 7,000 tons of liquid biomethane per year for heavy transport (200 trucks covering 100 thousand km a year).

With the ECOMAX[®] cogeneration plant, which can be fed both with biogas and natural gas, energy is produced to support other processes, meeting the sustainability requirements and at the same time guaranteeing the best economic performance.

☑️ **Products:**
2 x BIOCH4NGE[®] 10, ECOMAX[®] 12 + ECOMAX[®] 9, 2 x CH4LNG 11

ITALY, Milan



⚙️ **Biogas flow rate:** 1.200 Nm³/h

+ **Valorisation of agricultural waste** (900 hectares and 15,000 pigs)

↔️ **Biomethane produced and fed into the grid:** > 600 Nm³/h

With the ECOMAX[®] cogeneration plant energy is produced to support other processes, meeting the sustainability requirements and at the same time guaranteeing the best economic performance.

☑️ **Products:**
BIOCH4NGE[®] 12, ECOMAX[®] 3

ITALY, Ravenna



⚙️ **Biogas flow rate:** 1.500 Nm³/h

+ **Valorisation of spent pomace and agricultural by-products**

↔️ **Biomethane produced and fed into the grid:** 900 Nm³/h

☑️ **Products:**
BIOCH4NGE[®] 15

ITALY, Lodi



⚙️ **Biogas flow rate:** 500 Nm³/h

+ **Enhancement of agro-food waste**

↔️ **Biomethane produced and fed into the grid:** 300 Nm³/h into the grid

☑️ **Products:**
BIOCH4NGE[®] 5

ITALY, Cremona



- ⚙️ **Biogas flow rate:** 1.000 Nm³/h
- + **Enhancement of livestock slurry and agricultural by-products**
- ↔️ **Biomethane produced and fed into the grid:** 550 Nm³/h
With the ECOMAX[®] cogeneration plant energy is produced to support other processes, meeting the sustainability requirements and at the same time guaranteeing the best economic performance.
- ☑️ **Products:**
BIOCH4NGE[®] 12, ECOMAX[®] 6

FRANCE, Grand-Est



- ⚙️ **Biogas flow rate:** 1.000 Nm³/h
- + **Enhancement of livestock slurry and agricultural by-products**
- ↔️ **Biomethane produced and fed into the grid:** 500 Nm³/h
- ☑️ **Products:**
BIOCH4NGE[®] 10

ITALY, Cremona



- ⚙️ **Biogas flow rate:** 1.200 Nm³/h
- + **Enhancement of organic fraction of municipal solid waste (OFMSW)**
- ↔️ **Biomethane produced and fed into the grid:** >600 Nm³/h
- ☑️ **Products:**
BIOCH4NGE[®] 12,5

SPAIN, Soria



- ⚙️ **Biogas flow rate:** 660 Nm³/h
- + **Enhancement of agro-industrial and urban organic waste, sewage sludge**
- ↔️ **Biomethane produced and fed into the grid:** 418 Nm³/h
- ☑️ **Products:**
BIOCH4NGE[®] 7,5

FRANCE, Pays de la Loire



- ⚙️ **Biogas flow rate:** 500 Nm³/h
- + **Enhancement of organic fraction of municipal solid waste (OFMSW)** (82 tons of waste per day)
- ↔️ **Biomethane produced and fed into the grid:** 250 Nm³/h
(equal to a consumption of approximately 1,900 families), 4,800 tons of CO₂ each year not released into the atmosphere.
- ☑️ **Products:**
BIOCH4NGE[®] 10, ECOMAX[®] 3

CANADA, Ontario



- ⚙️ **Biogas flow rate:** 1.070 Nm³/h
- + **Valorisation of agricultural waste** (manure)
- ↔️ **Biomethane produced and fed into the grid:** 579 Nm³/h
- ☑️ **Products:**
BIOCH4NGE[®] 10, ECOMAX[®] 3

FRANCE, Nouvelle Aquitaine



- ⚙️ **Biogas flow rate:** 250 Nm³/h
- + **Valorisation of agricultural waste** (14,000 tonnes of sewage, cereal waste and energy crops)
- ↔️ **Biomethane produced and fed into the grid:** 150 Nm³/h
(equal to the consumption of 1,200 inhabitants)
- ☑️ **Products:**
BIOCH4NGE[®] 2,5

GERMANY, Bavaria



- ⚙️ **Biogas flow rate:** 600 Nm³/h
- + **Valorisation of agricultural waste** (maize silage and manure)
- ♦️ **Liquefied biomethane:** 5 TPD
- ☑️ **Products:**
BIOCH4NGE[®] 5, CH4LNG 5

FRANCE, Grand-Est



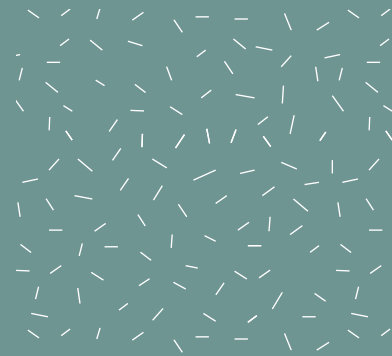
- ⚙️ **Biogas flow rate:** 600 Nm³/h
- + **Valorisation of agricultural waste** (manure) and **agro-industrial waste**
- ↔️ **Biomethane produced and fed into the grid:** 300 Nm³/h
- ☑️ **Products:**
BIOCH4NGE[®] 7,5



USA, New York



- ⚙️ **Biogas flow rate:** 660 Nm³/h
- + **Valorisation of agricultural waste** (bovine manure and slurry)
- ↔️ **Biomethane produced and fed into the grid:** 365 Nm³/h
- ☑️ **Products:**
BIOCH4NGE[®] 7,5

AB Service is the **AB Group** company  dedicated to plant service and maintenance  with over 300 specialists operating all over the world.



The over 40 years of experience and specialisation gained by **AB** are reflected in the excellence of Service, which maintains the constant relationship between the quality of the installations and the maintenance of optimal performance  over time, whether they are cogeneration, biomethane, liquefaction or the treatment of emissions into the atmosphere. Choosing **AB Service** means having access to the most accurate maintenance  of the plants and obtaining their maximum performance in terms of upstream hours of availability.

Whatever the type of plant, **AB Service** safeguards it from failures and outages, thanks to a coordinated and scheduled series of interventions to maximise the plant's usability.

The advantages of an integrated service are evident from the moment the plant is commissioned: **AB** specialists facilitate the commissioning phase, follow and optimise the plant start-up phase.

In addition to the on-site assistance and a prompt turnaround time, **AB Service** monitors all the systems 24 hours a day, 365 days a year, with the activation of the remote diagnostics and assistance service.

AB Service also offers training and continuous updating courses to ensure the best operation of the plant for the customer and a correct management and maintenance.

Plant service and maintenance agreements are created and customised according to the customer's specific needs, to ensure high yields throughout the plant's life and to guarantee a greater predictability of operating costs.

Connection of AB plants

AB plants are equipped with remote control systems accessible via the Internet, which allow the user to choose the best operating structures, check operating conditions and monitor the plant output. The supervision and monitoring system

is a **central control point** for all plant parameters and an interface that is always active to allow the plant to be managed and regulated remotely, ensuring an even **more punctual and timely monitoring and prompt intervention service.**

Strengths of our service

- Continuous monitoring
- 360° maintenance for the entire plant life cycle
- Timeliness
- Digitisation of the entire maintenance cycle and of plant data collection and transmission activities
- Implementation of monitoring and predictive maintenance systems
- Highest quality spare parts and supply chain warehouse
- Reliability
- All AB plants are IoT-enabled and connected to our remote control room and help desk
- Capillarity of AB technicians on the territory
- Warehouses located in strategic positions, and survival kit on site

Relying on AB's Full Service means being able to count on the following services:

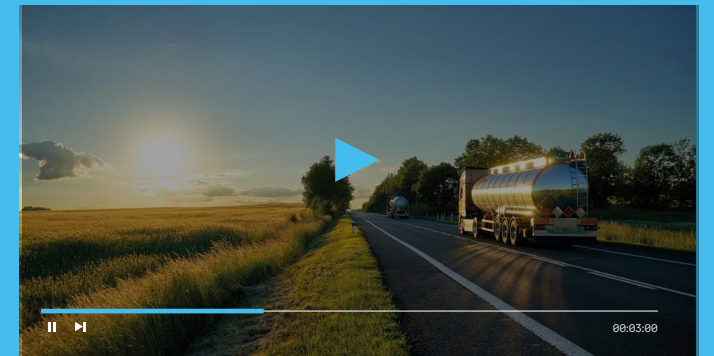
Services included	Full Service	
Preventive maintenance	Spare parts	Included
	Manpower	Included
Corrective maintenance	Spare parts	Unlimited (included)
	Manpower	Unlimited (included)
Assistance and technical support	24 / 7 / 365	
Remote monitoring tools	Included	
Availability guarantee	97% for upgrading	
Additional services and/or plant management	On request	
Training	Included	
On-site intervention	In 24 hours	
Spare parts: prompt delivery	Included	



The Biomethane RNG Channel is the first video channel dedicated to the world of biomethane/RNG, with a 360° view on the role it plays in the ecological transition, in the decarbonisation of transport and in energy safety.

biomethanerngchannel.com

A tool to learn more about this alternative fuel, through the contribution of hundreds of industry experts and the direct experiences of those who have invested in a biomethane/RNG project.



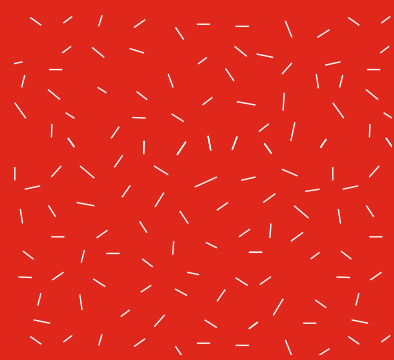
The Biomethane RNG Channel was born from an editorial initiative designed and supported by the AB Group. Together with Biogas Channel and Cogeneration Channel, it is an integral part of NetZero Tube, the first network of thematic channels dedicated to the key technologies necessary to achieve the zero net emissions goal.

NetZero Tube: Since 2013, it has collected thousands of experiences and interviews with industry experts and continues to consult the main authoritative sources on the subject to help disseminate correct and up-to-date knowledge about the world of biogas, biomethane/RNG and energy efficiency.



AB: the experience of the leader in cogeneration at the service of the development of systems in the field of **energy sustainability.** 

A know-how and **production capacity**  that are unparalleled.



There are various ways to do things. AB wants to offer the very best way to do them in the world of energy and sustainability.

Developing innovation at the service of energy has always been our focus. For this reason, **AB's leadership in the cogeneration sector has also expanded to biofuels, with systems for the purification of biogas, the liquefaction of biomethane and CO₂, photovoltaics and the treatment of emissions into the atmosphere.**

Since 1981, we have been working alongside companies who want to improve their competitiveness, saving energy and limiting emissions into the environment. Expertise, production capacity and a high quality service, with the aim of providing our customers with the very best energy sustainability solutions. The **AB Group**, represented by the **AB Holding** parent company, now has over 1,200 employees with a direct presence in 21 countries around the world between Europe, Singapore, North and South America: a widespread network that allows us to dominate every specific market in terms of business activities, support and after-sales service, starting from the **AB Energy** Italian commercial branch. Ours is a "made in Italy" where the main production and engineering

activities are concentrated in the modern industrial centre of Orzinuovi (in the Province of Brescia, in Italy), a 40,000-square-metre facility which houses all the Group companies with the exception of the foreign sales offices.

AB Engineering, with over 140 engineers, is dedicated to planning all activities related to the implementation of customised solutions to meet the needs of the final customer.

In **AB Impianti**, we carry out every single aspect of the construction activity of the plant.

AB Fin-solution is the company that deals with the operating leasing of machinery and offers users in each sector the possibility to rent an **AB** plant.

AB Grade is involved in research and development activities, a true centre of excellence that develops innovative energy transition technologies.

AB Ambiente, an agricultural company based in Orzinuovi, is a privileged area to experiment and directly test the solutions focused on the circular economy, where the pilot plants for the production of biogas and biomethane are in operation.

The Group's organisation is completed with **AB Service**, the company dedicated to the after-sales assistance and maintenance of **AB** plants around the world, thanks to the adoption of the latest Industry 4.0 technologies.

Our daily commitment is aimed at being the “Better Way” for our customers. Because improving our customers’ way of producing and working is our way to contribute to the construction of a better world.