EBA STATISTICAL REPORT 2021

EBA
European Biogas Association

SPONSORED BY:

About the EBA

The EBA is the voice of renewable gas in Europe. Founded in February 2009, the association is committed to the active promotion of the deployment of sustainable biogas and biomethane production and use throughout the continent. EBA counts today on a well established network of 41 national organisations and over 150 scientific institutes and companies from Europe and beyond.

2021
EBA STATISTICAL REPORT
FOREWORD

Harmen Dekker, EBA Director— In 2021, the price of fossil natural gas has risen to a previously unimaginable height. The availability of renewable gas is now becoming critical. Today, the EU is 90% dependent on imported fossil gas and offers no significant support to ensure the fast deployment of renewable gases. Security of gas supply should be based on increasing the role of green gas and maintaining affordable prices for consumers.

Biogas and its upgraded form, biomethane, are being increasingly recognised, not only as a scalable and flexible source of renewable gas, but also as an enabler of local and sustainable development. The environmental performance of these green gases is very promising, as they can reduce CO_2 emissions below zero levels and contribute to lower methane emissions.

Biogas and biomethane are important enablers of the EU Green deal, but they also form the cornerstone of a circular bio-economy. They are produced from organic residues, which helps to reduce industrial and municipal waste. In addition, they support the development of the agroecology by using sustainable farming feedstocks, restoring our soils with organic carbon or prompting the use of digestate as organic fertiliser.

The 11th edition of the Statistical Report sets out the state of play of European biogas and biomethane. The report has become a reference publication, engaging with policymakers, market developers, investors and consumers across Europe. This year, we have expanded the report to include new and more detailed country insights and forecasts for the years to come, as well as specific chapters on transport and job creation.

We have been able to consolidate our data earlier than in previous editions with the support of the EBA national associations. Special thanks go to the EBA secretariat and in particular to Mieke Decorte, who has put together the most comprehensive edition of the EBA Statistical Report so far. We are also grateful to all our sponsors who have supported the design of this publication through their contributions.

Mieke Decorte, EBA Technical & Project Manager — Welcome to the 2021 edition of the EBA Statistical Report. The report is the result of a decade long collaboration between the EBA and its national associations, and contains the combined knowledge of the EBA's extensive network of members active in the European biogas and biomethane markets.

The huge potential of the renewable gas sector becomes more evident year after year. According to a range of studies, European biomethane production has the potential to reach 95 bcm by 2050. This is equal to 24% of the natural gas consumption in the EU in 2020. Assuming that total gas consumption reduces over the coming years, it is estimated that biomethane will be able to meet 30 – 40% of the total EU gas demand by 2050. More and more countries are putting forward ambitious mid- and long-term targets for renewable gas production and use.

The rapid increase in European biomethane production in recent years, as well as the high proportion of renewable gas anticipated in the future energy mix, makes it increasingly important to have a solid and trustworthy knowledge base on which decisions for the future can be made. With the EBA Statistical Report, the EBA and its members want to contribute to this knowledge base as much as possible and provide information for both market participants and policy makers.

The EBA Statistical Report serves as a reference document and is the most comprehensive report covering the European biogas and biomethane market, both on a European level and at a national level in the specific county analyses. We are proud to present to you this 11th edition and wish you an interesting read.

COLOUR KEY

The following colour coding is used in the graphics contained in this report.

Feedstock types

- Agricultural
- Agricultural residues
- Sequential cropping
- Energy cops
- Sewage
- Landfill
- Organic municipal solid waste
- Industrial (food and drink)
- Industrial excl. sludges
- Industrial sludges
- Other

Upgrading technologies

- Pressure swing adsorption
- Membrane separation
- Water scrubbing
- Physical absorption
- Chemical absorption
- Cryogenic separation

Connection to grid

- Distribution grid
- % use in transport
- Transport grid
- Not connected

Other

- Biogas
- Biomethane
- Bio-LNG / Bio-CNG
- Unknown

DEFINITIONS

Feedstock types

Agricultural: All substrates related to agricultural production. This includes manure and other residues, such as straw, husks and cobs stripped of kernels of corn; sequential crops that are grown before or after the main crop, such as cover crops or catch crops (which reduce the chemical input into the soil and restore soil health); and other fresh crops, or primary crops. A further distinction is made as follows:

- Agricultural residues
- Sequential crops
- Energy crops

Sewage: Sewage sludge produced at municipal wastewater treatment plants.

Landfill: Organic waste on a landfill site. As the waste breaks down it produces biogas, which can be collected on-site and is also referred to as 'landfill gas'.

Organic municipal solid waste: Municipal waste and organic household waste.

Industrial (food and drink): Industrial organic waste, for example from the food and beverage industry. A further distinction is made as follows:

- Industrial waste excluding sludges
- Industrial sludges

Other: Various types of organic waste such as bio- and municipal waste, household waste and industrial waste, for example from the food and beverage industry.

Upgrading technologies

Pressure swing adsorption separates carbon dioxide and methane molecules by using differences in their degree of attraction to a surface under elevated pressures.

Water scrubbing dissolves the carbon dioxide molecules in water and thus separates them from the methane molecules.

Chemical absorption dissolves the carbon dioxide molecules in a chemical solvent and thus separates them from the methane molecules.

DEFINITIONS

Upgrading technologies

Membrane separation uses a permeable membrane to separate carbon dioxide and methane molecules based on their different physical characteristics.

Physical absorption dissolves the carbon dioxide molecules in a liquid under pressure and thus separates them from the methane molecules.

Cryogenic separation cools the raw biogas to the condensation point of carbon dioxide. The methane molecules remain in their gaseous form, meaning that the liquid carbon dioxide stream can be easily separated.

Grid types

Distribution grid: In this report, the distribution grid refers to the gas distribution grid. The gas distribution grid delivers natural and renewable gas to individual homes and business. It is mostly operated at low pressure.

Transport grid: In this report, the transport grid refers to the gas transport grid. The gas transport grid transports gas over long distances nationally and internationally. It is mostly operated at high pressure.

Other definitions

Biogas production capacity: The maximum amount of biogas which can be produced by the facility in question at any one point in time. E.g., a biogas plant with a biogas production capacity of 1 MW can produce a maximum of 1 MWh of biogas each hour (1 MWh being the consistent production of 1 MW over the course of an hour).

Biogas production: The actual amount of biogas produced within a certain time interval. E.g., the biogas plant actually produces 0.8 MWh of biogas in the past hour.

Flexible electricity generation: Where an electricity-producing facility can adjust its electricity generation according to demand. E.g., the production facility can produce more electricity when demand is high and less when demand for electricity is low.

ABBREVIATIONS

COUNTRIES

AT	Austria
BE	Belgium
CH	Switzerland
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
IE	Ireland
IT	Italy
LT	Lithuania
LV	Latvia
NL	The Netherlands
NO	Norway
PL	Poland
RS	Serbia
SE	Sweden
UK	United Kingdom
UKR	Ukraine

OTHER ACRONYMS

AD	Anaerobic Digestion
bcm	Billion cubic meters
Bio-CNG	Biological Compressed Natural Gas
Bio-LNG	Biological Liquified Natural Gas
CHP	Combined Heat and Power
CNG	Compressed Natural Gas
DG	Directorate General
EC	European Commission
EU	European Union
FiP	Feed in Premium
FiT	Feed in Tarif
GHG	Green House Gas(es)
GO	Guarantee of Origin
kW	Kilowatt
LNG	Liquified Natural Gas
Mio	Million
M-, G-, TWh	Mega-, Giga-, Terawatt hour
NGV	Natural Gas Vehicle
NREAP	National Renewable Energy Action Plan
RED	Renewable Energy Directive
RED II	Renewable Energy Directive II
RES	Renewable Energy Sources
tpd	Tonnes per day

SHORT OVERVIEW PER CHAPTER

1. A BIOECONOMY WITH RENEWABLE GAS

Chapter 1 gives a textual introduction and explanation of the uses of renewable gas in Europe's bioeconomy.

2. THE BIOMETHANE AND BIOGAS MARKETS

This chapter analyses the development of the biogas and biomethane markets in Europe from 2009 to 2020. Where available, provisional figures for 2021 are included as well. The growth of both sectors is illustrated based on the total amount of renewable energy produced and the number of anaerobic digestion plants active in Europe.

Particular attention is paid to biomethane, with analysis of new plant installations in each year identifying growth trends in specific countries. The most commonly used upgrading technologies and different national tendencies in feedstock usage are also examined, along with trends in biomethane plant size ranges.

Biogas and biomethane plants are divided into different types in this report: agriculture-based plants; sewage-based plants; plants at landfills; plants processing organic municipal solid waste; plants processing industrial waste; and biogas and biomethane plants classified as "other".

Lastly, the chapter looks at the share of biomethane plants connected to the distribution or transport grids and portion of plants without a grid connection.

3. GROWTH PROSPECTS AND SOLUTIONS FOR THE FUTURE

This chapter illustrates the growth potential of the biogas and biomethane sectors according to different studies; it also calculates the average potential biogas and biomethane production per feedstock type using figures given for different feedstocks in the studies involved. Next, solutions for the future are described in terms of gas infrastructure and the biogas business model. Lastly, this chapter highlights the cost-effectiveness of making GHG emissions savings by producing biogas and biomethane.

4. POLICY TRENDS IN THE BIOGAS AND BIOMETHANE SECTORS IN EUROPE

Chapter 4 includes an analysis of the impact of key EU policies on the development of the biogas and biomethane sectors. Amongst others, the Fit-for-55 package, proposals for renewable heating, transport policies, the common agricultural policy, regulation of methane emissions and sustainable finance are discussed.

5. BIOMETHANE USE IN TRANSPORT

This chapter explores the development of Bio-LNG production between 2018 and 2024. The on-site production of Bio-CNG is also examined. The confirmed per-country Bio-LNG production capacity by 2024 is visualised. Additionally, estimates are included as to the number of Bio-CNG and Bio-LNG filling stations in Europe.

6. CURRENT AND FUTURE JOB CREATION THROUGH BIOGAS AND BIOMETHANE PRODUCTION

In this chapter, the number of direct and indirect jobs created by the biogas and biomethane sectors in Europe is calculated using both existing studies and estimates provided by national biogas associations. Furthermore, projections are made of the number of jobs likely to be created by 2030 and 2050.

7. COUNTRY ANALYSES

Chapter 7 comprises country-specific analyses of 22 countries. The development of the national biogas and biomethane markets in each country is examined, including the impact of specific schemes and policies. Country-specific topics and trends are discussed and, where available, data on feedstock usage and digestate production and use are included. The countries included in chapter 7 are: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Ireland, Italy, Lithuania, Latvia, the Netherlands, Norway, Poland, Serbia, Sweden, the United Kingdom and Ukraine.

TABLE OF CONTENTS

METHODOLOGY

The European Biogas Association Statistical Report is an extensive examination of the state of the biogas and biomethane industries in Europe. The report covers the EU-27 Member States as well as Iceland, Norway, Serbia, Switzerland, Ukraine, and the United Kingdom.

The data shown in this report originates mainly from national biogas associations, national statistical reports and industries present in the respective countries. This data is supplemented with data from the EBA-GIE biomethane map 2020 and REGATRACE report D6.1, "Mapping the state of play of renewable gases in Europe". Although the EBA database is mainly based on official facts and figures, in some specific cases, qualified estimates, such as extrapolation from survey data, are made by national stakeholders and by the EBA.

Graphs in this report generally include figures for the period to the end of 2020. Where provisional figures for 2021 are already available, they are coloured in a different shade to indicate that they are not yet consolidated. In contrast, in the few cases where 2020 data is not yet available, the 2019 data is reused as 2020 data and will be updated in next year's report. Data from all years are continuously updated according to newly available information and new insights. Therefore, differences between this and previous EBA statistical reports may exist. To deliver the comprehensive statistical report presented here, data from different sources is combined (the EBA database, the EBA-GIE biomethane map 2020 and REGATRACE D6.1). However, this sometimes leads to small inconsistencies between figures.

For countries where national data on biogas production is not available, the figures are calculated based on the electricity generated from biogas, assuming a CHP electrical efficiency of 38%. In some cases, to convert data on biogas or biomethane production capacity to actual production figures, biogas and biomethane plants are assumed to have 8,000 yearly productive hours. A conversion factor of 10.61 kWh/m³ was used to calculate from bcm to TWh and vice versa.

Although every effort is made to make the EBA database as accurate as possible, some countries do not produce separate statistics for biogas and biomethane, instead including the number of biomethane plants in their figures for biogas, which makes it impossible to draw a clear distinction between biogas and biomethane. This may lead to a small overestimation of the number of biogas plants in few countries and in Europe as a whole. Bio-CNG and Bio-LNG plants are also considered as biomethane plants and thus included in the biomethane statistics. Gasification plants and biomethane production from gasification are not considered in this report.

7
COUNTRY ANALYSIS

7.1 AUSTRIA

Country highlights:

- In 2020, Austria was home to 423 operational biogas plants, with a total reported biogas production of 1,487 GWh.
- 15 biomethane plants were operational in Austria in 2020, injecting a total of 138 GWh into Austria's gas grid. One further biomethane plant began operation in 2021.
- The new "Renewables Expansion Act (Erneuerbaren Ausbau Gesetz or EAG) which was passed in July 2021, is promising for the uptake of renewable gas (biomethane and hydrogen) in Austria. The measures under consideration include an investment subsidy for the conversion of electricity generating plants to biomethane injection plants, as well as an investment subsidy for newly constructed biomethane plants which will feed the biomethane into the gas grid.
- 5 biomethane plants have an on-site Bio-CNG fuelling station; one plant has a direct biomethane pipeline to a public Bio-CNG fuelling station.

Figure 7.1:
Percentage of biomethane plants connected to the distribution and transport grids (left); combined biogas and biomethane production (GWh) (right)

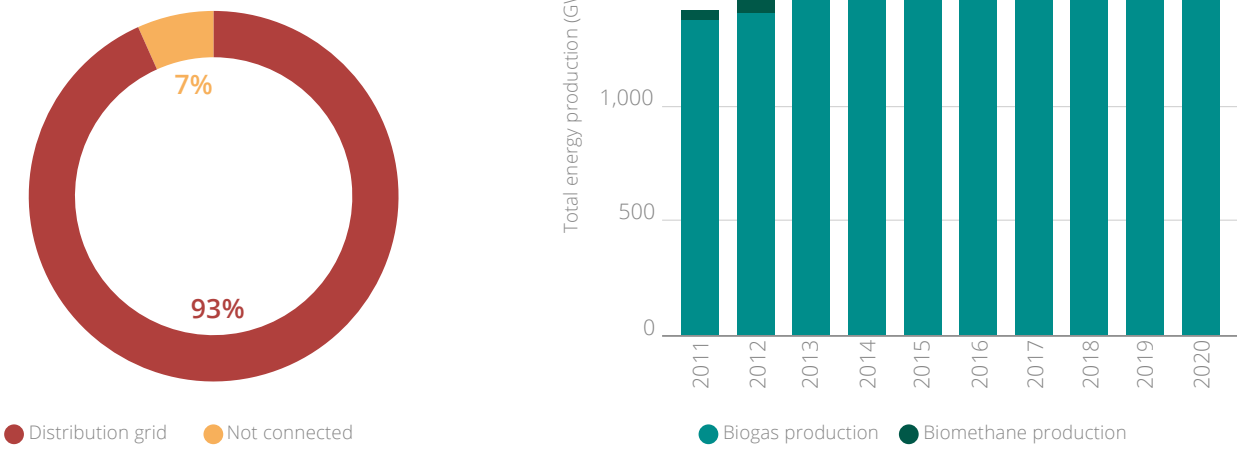

Figure 7.1 shows the combined biogas and biomethane production in Austria from 2011 to 2020. Although biomethane production in the country started over 15 years ago, the graph demonstrates that biogas for electricity production is still predominant, thanks to the Feed-in Tariff (FiT) for renewable power. The implementation of the Renewables Expansion Act (expected in 2022) may, however, set in motion a shift in Austria from biogas to biomethane production. The Act includes measures to support the conversion of electricity-producing biogas plants into biomethane plants injecting into the Austrian gas grid.

BIOGAS PRODUCTION

By the year 2011 – the first year of data in the EBA database – growth in the Austrian biogas market had already begun, mainly thanks to the Green Electricity

Act (Ökostromgesetz or ÖSG), which came into force in 2003. Many plants began operation between 2003 and 2005 and were granted a subsidy period of 13 years. The Austrian biogas sector negotiated successfully with the government to prolong the subsidies and prevent the otherwise likely closure of most operating biogas plants in Austria by 2019. Nevertheless, a few plants ceased operation in 2016, just before first post-FiT subsidy came into force (Figure 7.2). In 2020, there were 423 operational biogas plants in Austria.

190 of Austria's biogas plants – just under half of the total number in 2020 – belong to the country's agricultural sector. Plants treating sewage and plants using organic municipal solid waste also make up a considerable portion of the total number, constituting 24% and 28% respectively.

Like the number of biogas plants, Austrian biogas production has grown only slightly in the last decade, with Austria reaching a reported biogas production of 1,487 GWh in 2020. The reported biogas production capacity in Austria amounts to 222 MW. The electricity generated from the available biogas in 2020 was 565 GWh. In Austria, data on biogas and electricity production are only available for agricultural plants and plants using organic municipal solid waste as a feedstock, so the data given above exclude production from landfill and sewage-based plants.

Figure 7.2:
Development of biogas production (GWh) (left); and development of number of biogas plants (right)

BIOMETHANE PRODUCTION

Austria's first biomethane plant began operation in 2005 as a research project demonstrating the possibility of upgrading biogas and injecting the resulting biomethane into the gas grid. Additional plants followed in subsequent years and by the end of 2020, there were 15 operational biomethane plants in Austria (Figure 7.3). One further biomethane plant began operation in 2021.

In July 2021, the new "Renewables Expansion Act was passed, promising to encourage biomethane uptake in Austria. The Act is yet to be implemented, but this could be done by early 2022 if there are no complications – for example, it is not yet known whether the Directorate-General for Competition will find the implementation of the Act permissible under the EU guidelines for state aid. The measures under consideration to support growth in Austria's biomethane sector include an investment subsidy for the conversion of electricity generating plants into biomethane injection plants, as well as an investment subsidy for newly constructed biomethane plants which will feed the biomethane into the gas grid. The use of energy crops will be capped and the upper limit will be reduced on a yearly basis.

The Act also envisages a follow-up premium for biogas plants whose current business case is based on the FiT for renewable electricity from biogas. The premium will be available until the 30th year of operation for plants with a capacity ≤ 250 kWe, and for 24 months for plants with a capacity above 250 kWe that are located within 10 kilometres of the next gas grid injection point. The aim is that the latter, larger plants should be converted to biomethane injection plants. Existing CHP plants which convert to biomethane production for grid injection are eligible for an investment subsidy covering 45% of the costs incurred, while new biomethane injection plants are eligible to receive 30%. Additionally, the gas grid owner is required to meet the cost of installing the gas grid connection – this includes measurement, quantification, odorisation, pressure boosting and the necessary gas pipe (up to 60 metres per m³/h installed biomethane capacity with a maximum length of 10 km for existing plants and 3 km for new biomethane injection plants).

Investment grants for the conversion of electricity into hydrogen or synthetic gas are also provided for in the Act. Further anticipated measures paving way for green gas include the implementation of a Guarantee of Origin System for gas consumer disclosure (as per Article 19 of REDII), as well as new "Green Gas Certificates" for off-grid renewable gas volumes and a "Green Gas Seal", which will confirm both the Austrian origin and the sustainable production credentials of renewable gases.

At the end of 2020, before the approval of the new Act, there was still no direct subsidy scheme available for Austrian biomethane producers. Indirect support for biomethane was paid out for the first time in 2012, on the basis that biomethane was injected into the gas grid and changed ownership by means of biomethane certificate title transfer from the biomethane plant operator to an electrification plant operator providing renewable electricity from biomethane. The subsidy is then paid by the Renewable Power Settlement Agent (OeMAG Abwicklungsstelle für Ökostrom AG) to the electrification plant operator, who in turn is able to sign a long-term contract with the biomethane plant operator.

Such financial subsidies must be closely monitored, which is only possible by tracking the movement and change of ownership of the renewable gas. With this as a primary objective, the AGCS Biomethane Registry Austria, operated by AGCS Gas Clearing

Figure 7.3:
Development of biomethane production (GWh) (left); and development of number of biomethane plants (right)

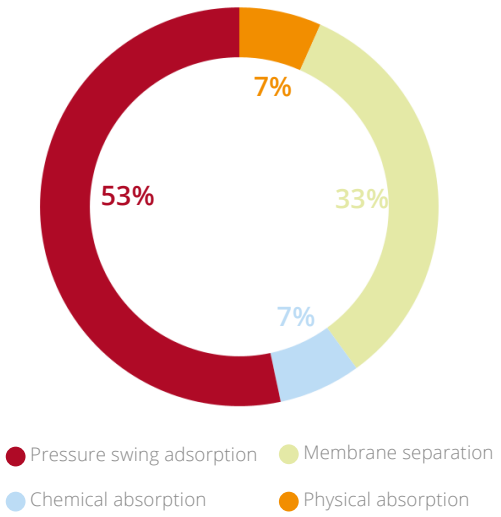

Figure 7.4:
Relative use of different upgrading technologies in 2020

and Settlement AG, was established in July 2012. The AGCS Biomethane Registry Austria is also working beyond the country's borders to establish a European biomethane market. In 2016, AGCS entered into cooperation with the German Biogas Registry, operated by the German Energy Agency (DENA), to enable cross-border trade in renewable gas certificates; in 2021, AGCS has worked on establishing its interface with the ERGaR Certificate of Origin scheme. Austrian stakeholders are therefore already able to sell their renewable gases on the German market and will be connected to a broader market via the ERGaR scheme by the end of 2021.

The highest number of biomethane plants in Austria was reached between 2017 and 2019, when there were 16 plants in total (Figure 7.3). In 2020, one sewage-based plant was de-activated; this left 15 operational plants by the end of 2020, one of which not connected to the gas grid. In 2021, an existing biogas plant was expanded to incorporate a biogas upgrading unit and inject biomethane into the gas grid, bringing the number of biomethane plants back up to 16.

Austria only records biomethane injected into the gas grid – actual biomethane production is not documented. The data shown in Figure 7.3 thus represents the biomethane injected into the Austrian grid. The production from the unconnected plant and any off-grid production for self-consumption are not included.

The highest level of biomethane injection – approximately 170 GWh – was achieved in 2018 (Figure 7.3). In 2019, injection volumes decreased to a level similar to that reached in 2017, at around 150 GWh. In 2020, 138 GWh of biomethane was injected into the Austrian gas grid.

5 Austrian biomethane plants have a Bio-CNG fuelling station directly on the production site; two of these are for internal use only and not accessible to the public. One further plant has a direct biomethane pipeline to a public fuelling station. There are thus 4 public Bio-CNG fuelling stations in Austria in total. Currently, the Bio-CNG amounts produced and consumed on site are not centrally documented. No Bio-LNG production takes place in Austria.

The main upgrading technique in use in Austria is pressure swing adsorption (PSA), which in 2020 was used in 8 of the country's 15 biomethane installations, as shown in Figure 7.4.

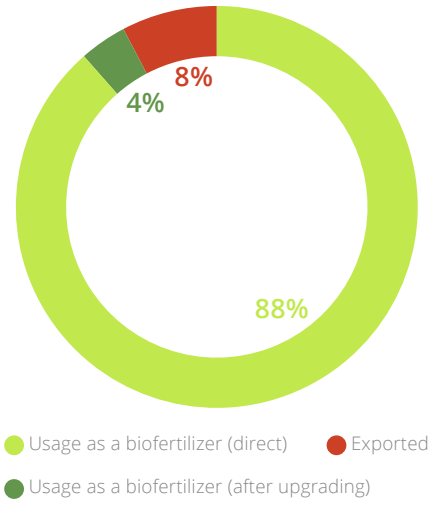

Figure 7.5:
Percentage of different types of digestate usage in Austria in 2020

DIGESTATE PRODUCTION AND USE

The total, non-separated digestate production in Austria was estimated at 130,000 tons of dry matter in 2020. There is however no record of the separation of the digestate into liquid and solid fractions. Austria uses its digestate mainly as a biofertiliser, of which it is estimated that, in 2020, 115,000 tonnes dry weight were used directly as biofertiliser and another 5,000 tonnes after upgrading. The remaining 10,000 tonnes of digestate were exported.

A complete overview of the biogas and biomethane support schemes in place in Austria is planned to become available on the EBA intranet website, freely available for EBA members.

National EBA contributor for 2021

kompost & biogas verband

AGCS balance group coordinator