EBA
European Biogas Association

Statistical Report 2024

Tracking biogas and biomethane deployment across Europe

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About the EBA

The EBA fully believes in the future potential of renewable gas in Europe. Founded in February 2009, the association is committed to the deployment of sustainable biogas and biomethane production and use throughout the continent. EBA counts today on a well-established network of nearly 300 national associations and other organisations covering the whole biogas and biomethane value chain across Europe and beyond.

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Preface

Harmen Dekker
CEO

As we navigate the path toward a sustainable future, the EBA Statistical Report serves as a vital reference for understanding the role of the biogas sector in achieving Europe's ambitious climate and energy goals. Together, we can build a more resilient, competitive and sustainable Europe. Ensuring the EU's global leadership in clean technologies will be critical to driving economic growth while addressing pressing environmental challenges.

As we delve into the pages of this report, we are reminded of the extraordinary journey undertaken by the European biogas sector, which has grown from a niche renewable energy to a substantial and scalable competitive resource for Europe, produced with European technology. The significance of renewable gases produced within Europe has never been more pronounced. In 2023, we witnessed an unprecedented increase in biomethane production in Europe (0.8 bcm), with a remarkable growth rate of 21% across the EU. Meanwhile, our dependence on imported gas was again higher than the previous year, underscoring the urgency of strengthening our renewable energy supplies.

Currently, biogases provide 22 bcm of renewable gas to the European market. Private investment of €27 billion will flow into the biomethane sector alone by 2030. Looking ahead to 2040, the potential is staggering: the sector could deliver up to 101 bcm of biomethane to the European Union, effectively covering more than 80% of EU gas consumption at that time.

This report represents the culmination of months of diligent work by EBA technical staff, led by Mieke Decorte, who meticulously collected, analysed and presented these critical insights. The comprehensive data showcased here reflects the invaluable contributions of national associations and other national data providers. We would like to extend our gratitude to all who participated in this collaborative effort—your commitment to knowledge sharing has greatly enriched this report. Additionally, we would like to express our sincere appreciation to our sponsors, whose support has made this publication possible.

The transition to a sustainable economy is not just an opportunity; it is an imperative for the well-being of future generations and the health of our planet. Together, we can forge a sustainable path that positions the EU as a global leader in the clean technology revolution, which includes biogas and biomethane technologies.

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Colour key

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

Feedstock types

- Agricultural
- Agricultural residues
- Monocrops
- Sequential cropping
- Manure
- Sewage sludge
- Landfill
- Organic municipal solid waste
- Industrial solid waste
- Industrial (food and drink)
- Industrial wastewater
- Other

Upgrading technologies

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

Connection to grid

- Distribution grid
- Not connected
- Transmission grid

Other

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

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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**
- **Manure**
- **Sequential crops**
- **Monocrops**

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 solid waste**
- **Industrial wastewater**

Other

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.

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

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.

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.

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Definitions

Other definitions

Biogas production capacity: TThe 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 produced 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.

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.

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

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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
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LV	Latvia
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RS	Serbia
SI	Slovenia
SE	Sweden
SK	Slovakia
UK	United Kingdom
UKR	Ukraine

Other acronyms

AD	Anaerobic Digestion
bcm	Billion cubic metres
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
k–, M–, GW	Kilo–, Mega–, Gigawatt
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
RED III	Renewable Energy Directive III
RES	Renewable Energy Sources
tpd	Tonnes per day

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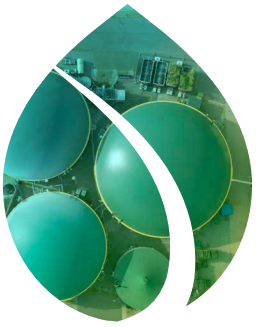
Short overview per chapter

1 Biogases within the EU energy and fertiliser landscape

Chapter 1 gives an introduction and explanation of the role of biogases in the total energy mix of Europe. Topics covered in this chapter are the primary energy production within the EU; final energy consumption by sector; Europe's dependency on gas and fertiliser imports, and fossil fuel subsidies versus subsidies for renewables.

2 The biogases market



This chapter considers three production pathways towards biogases: biogases from anaerobic digestion (AD), syngas from gasification and e-methane from methanation. Whilst the EBA database holds the most detailed information on biogases from AD, figures on syngas from gasification and e-methane from methanation are provided where available. This level of detail reflects the high maturity of the AD segment compared to gasification and methanation technologies.

The chapter analyses the development of the biogases markets in Europe from 2011 to 2023. The growth of the sector is illustrated based on the total amount of renewable energy produced and the number of 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 used upgrading technologies, grid connection types and different national tendencies in feedstock usage are also examined, along with the average biomethane plant size per European country.

3 Growth prospects and biogases potential

This chapter examines the growth prospects and potential of biogases, based on different approaches. It includes industry figures on secured investments for biomethane production, a review on national targets for biomethane and renewable gas in Europe, as well as insights into the progress made in respect of the Biomethane Action Plan in REPowerEU. Furthermore, a description of 2030, 2040 and 2050 biogases potential is included, together with an analysis of novel feedstocks and technologies.

4 End-uses of biogases

This chapters deepens the various uses of biogases. It makes a split between power, buildings, industry, and transport and explores the natural gas consumption, renewables consumptions and share of biogases for those various end uses in Europe. It goes on with relevant case studies and provides the policy context relevant to each end-use sector. The transport section gives additional insights into the current and projected development of bio-LNG production between 2018 and 2027. Estimates as to the number of bio-CNG and bio-LNG filling stations in Europe are included. Finally, insights into the role of biogas and biomethane in supplying biogenic CO_2 are provided.

5 The economics of biogases

This chapter describes the contribution of biogases to the European economy. It highlights the low cost GHG savings biogases offer. It continues with analysing the contribution of biogases to the European economy in terms of jobs and turnover and finally investigates its role in energy system integration and monetizing biomethane whole-system benefits, beyond energy.

6 Country analyses

Chapter 6 comprises country-specific analyses of 28 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 6 are: Austria, Belgium, Switzerland, the Czech Republic, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Sweden, Slovakia, the United Kingdom and Ukraine.

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References and methodology

The European Biogas Association Statistical Report is an extensive examination of the state of the biogases 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 European Biomethane Map 2024, EBA publications, insights from European projects, and scientific publications. Although the EBA database is mainly based on solid 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 2023. In the few cases where 2023 data is not yet available, the 2022 data is reused as 2023 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.

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. Production figures expressed in bcm refer to bcm natural gas equivalents.

Bio-CNG and bio-LNG plants are considered as biomethane plants in the EBA database and thus included in the biomethane statistics.

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Further information

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6 Country analysis

Austria

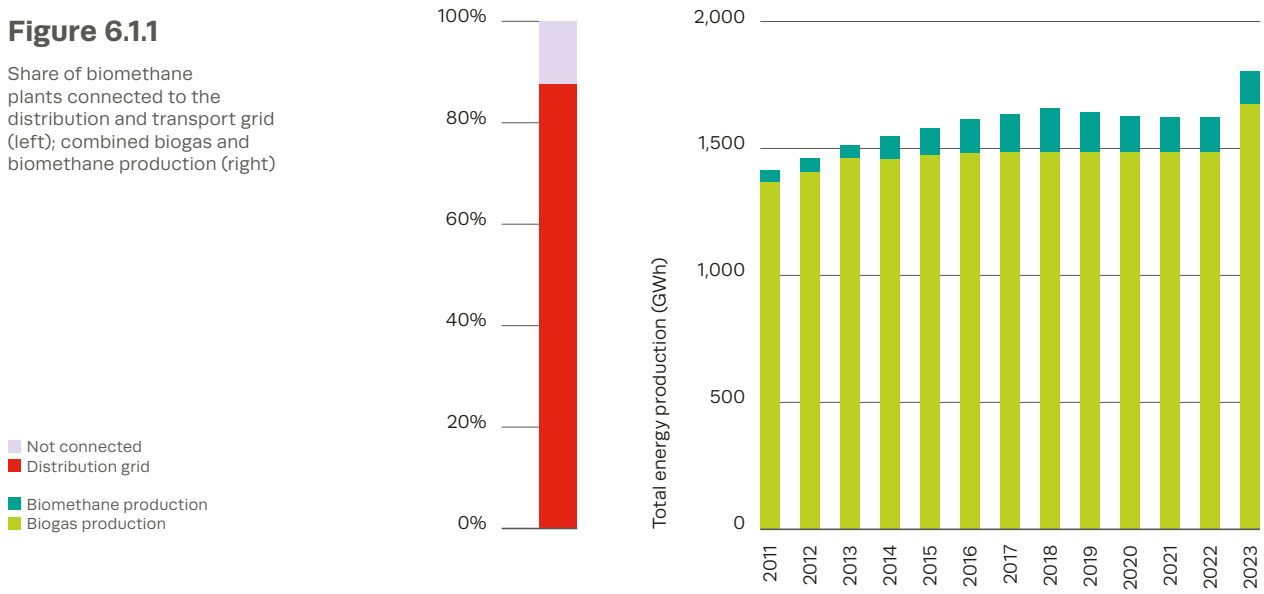
Country highlights

- In 2023, Austria was home to 343 operational biogas plants, with a total reported biogas production of 1,675 GWh.
- 16 biomethane plants were operational in Austria in 2023, of which 14 injected a total of 131 GWh into Austria's gas grid.
- The implementation of the Renewables Expansion Act shifted the country from biogas towards biomethane production. The act provides measures to convert electricity-producing biogas plants to biomethane plants that feed the Austrian gas grid, as well as measures to establish new biomethane plants.

Figure 6.1.1 shows the combined biogas and biomethane production in Austria. Although biomethane production in the country started over 15 years ago, the graph demonstrates that biogas for electricity production is still ahead, thanks to the feed-in tariff (FiT) for renewable power. However, a shift from biogas towards biomethane production in the country is anticipated thanks to the implementation of the Renewables Expansion Act (in force since the beginning of 2022) and the revision of the Transportation Fuels Regulation (January 2023). The Renewables Expansion Act provides investment subsidies for newly constructed biomethane plants and to convert electricity-producing biogas plants to biomethane plants that feed the Austrian gas grid.

Figure 6.1.1

Share of biomethane plants connected to the distribution and transport grid (left); combined biogas and biomethane production (right)



Biogas production

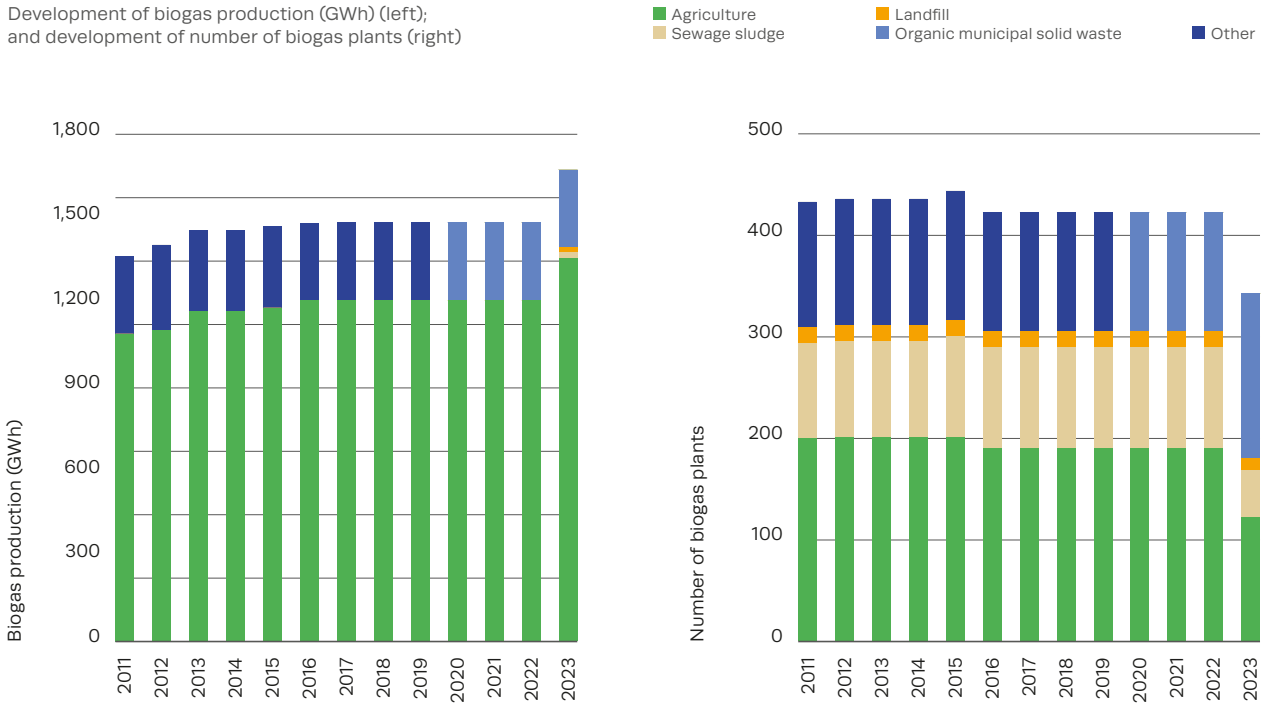
Growth in the Austrian biogas market began in 2011, mainly thanks to the Green Electricity Act (ÖSG, Ökostromgesetz), which came into force in 2003. Many plants started operation between 2003 and 2005, and were granted a subsidy period of 13 years. The Austrian biogas sector successfully negotiated with the government to extend the subsidies and prevent the otherwise likely closure of most biogas plants in operation in Austria by 2019. Nevertheless, certain plants ceased to operate in 2016 directly before the first post FiT came into force (Figure 6.1.2). In 2023, there were 343 operational biogas plants in Austria.

122 of Austria's biogas plants – just under half of the total number in 2023 – 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, accounting for 24% and 28% respectively.

Like the number of biogas plants, Austrian biogas production has grown only slightly in the last decade, reaching a reported biogas production of 1,675 GWh in 2023. The drop in the number of plants is attributed to current data update from the Austrian biogas Association.

Figure 6.1.2

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



Biomethane production

Austria's first biomethane plant started operations in 2005 as a research project, demonstrating the possibilities offered by upgrading and gas grid injection. Additional plants started operating in the years thereafter. The number of biomethane plants has remained flat between 2017 and 2019. By the end of 2023, there were 16 operational biomethane plants in Austria (Figure 6.1.3).

Indirect support for biomethane was paid out for the first time in 2012, thanks to the Renewable Power Act (Ökostromgesetz), on the basis that biomethane is injected into the gas grid and changes 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 consequently can close a long-term contract with the biomethane plant operator.

The Renewables Expansion Act (Erneuerbaren Ausbau Gesetz, EAG 2021) came into force at the beginning of 2022. The prevailing Renewable Power Act has been phased out, and thus, the FiT for renewable power from decentralised biomethane will run out over the next few years. For biogas-based plants injecting renewable power into the power grid, the Act envisages, in specific cases, a follow-up market premium. The Implementation Regulation on the Market Premium Model for Renewable Power came into force in Q4 2022. The possibility to switch from the FiT of the Renewable Electricity Act to the Market Premium of the Renewable Expansion Act was possible only until the end of 2023. However, the "Market Premium Model" for renewable power in Austria remains valid, but from 2024 onwards, market premiums are determined through a tendering process rather than the previous application-based system. The general conditions for funding, such as project requirements and funding volumes, remain the same.

A shift from power-producing biogas plants to biomethane injection plants is anticipated. The Renewable Expansion Act introduced an investment subsidy for the conversion from biogas to biomethane production and for new biomethane plants. The respective implementation regulation for biomethane investment subsidies is however still outstanding.

The Renewable Expansion Act implements a Green Gas Service Agency and hereby acknowledges the complexity of the biomethane market uptake and

Figure 6.1.3

Development of biomethane production (GWh) (left); and development of the number of biomethane plants (right)

the need for administrational support for market participants. After an open tender was launched by the Ministry of Climate Protection, the Austrian Energy Agency took up the new role of the Green Gas Service Agency at the beginning of 2023 and will be operational for five years.

Additionally, the government envisages a green gas quota for gas suppliers, which will be implemented in a separate act. The draft of the so-called Green Gas Act was published in early 2023. It is still undergoing revision and was submitted to the Austrian parliament in early 2024[132]. The Act (including the quota) failed the approval by the necessary two thirds of parliament on the last possible occasion, and remains uncertain if it will be adopted by the next government. With a likelihood that the next government might implement another type of support for green gases apart from a quota. The green gas quota is expected to demand a mandatory share of renewable gases in the total gas supply to end consumers:

- 2024: 0.7% (estimated at 0.6 TWh),
- 2025–2029: annually increasing percentage from 1.05% to 5.95%,
- 2030: 7.7% (at least 7.5 TWh).

If the quota is not met by Austrian gas suppliers, compensation payments will be due with an expected value of €180 / MWh, increasing to €200 / MWh from 2027 onwards.

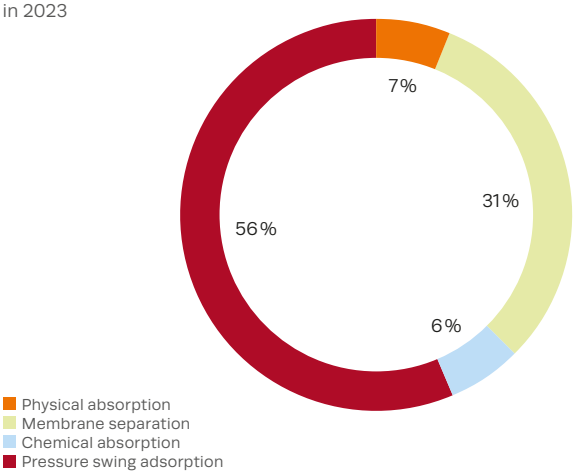
Further measures to pave the way for green gases include the implementation of a Guarantee of Origin System for gas consumer disclosure (implementing Art. 19 of REDII), as well as a new certificate type, "Green Gas Certificates", for off-grid renewable gas volumes and a "Green Gas Seal", which shall ensure the local and sustainable production of renewable gases. Austrian Guarantees of Origin have been issued since 2022.

The main upgrading technique in use in Austria is pressure swing adsorption (PSA), which is used in nine installations, as shown in Figure 6.1.4.

There are only records for biomethane injected into the gas grid in Austria. This means that total biomethane production, including off-grid production, is not documented. The data shown in Figure 6.1.3 thus represent the biomethane injected into the Austrian grid. Production from non-connected plants and off-grid self-consumption are not considered. The highest figure for biomethane injection of approximately 171 GWh was recorded in 2018. In 2023, 131 GWh of biomethane was injected (Figure 6.1.3).

Figure 6.1.4

Relative use of different upgrading technologies in 2023



Biomethane use in transport

In Austria, there are currently 101 CNG fuelling stations on public filling stations, as well as four LNG filling stations (fossil gas, possible to receive biomethane). Five biomethane plants have a bio-CNG filling station directly at the production site; two of these are for internal use only and not accessible to the public. One additional plant has a direct biomethane pipeline to a public filling station. In total, there are thus four public bio-CNG filling stations in the country. Austria does not produce any bio-LNG.

The Austrian Regulation on Transport Fuels has been in place since 2012 and was amended in accordance with the Renewable Energy Directive (recast) at the beginning of 2023. For the compensation amount for the greenhouse gas reduction target, an increase to 600 €/non-saved tonne of CO_2 has been put into place, adjusting to the penalty in Germany.

A complete overview of the biogases support schemes in place in Austria is available on the EBA intranet website and is freely available for EBA members.

National EBA contributor for 2024

AGCS balance group coordinator

132 Renewable Gas Act: the law for the energy transition? | Haslinger / Nagele Rechtsanwälte (haslinger-nagele.com). https://www.haslinger-nagele.com/en/news/renewable-gas-act-the-law-for-the-energy-transition/