

SIAPARTNERS

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European Biomethane Benchmark.

1000+ biomethane plants in operation and a sector facing major regulatory changes

Climate
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Executive Summary



Current situation

More than **1000 biomethane facilities** were operating in Europe by the end of 2021, with a total **production capacity of 3.6 billion cubic meters**. Of these units, 90% inject the biomethane they produce into the gas transmission network, representing **30 TWh in 2021**. European biomethane producers have now reached **10% of the 2030 REPowerEU plan target of 35 bcm** announced by the European Commission. There is huge scope to expand biomethane production, as **only 5% of biogas plants in the EU have registered a biogas upgrading unit, which is required to produce biomethane**. The majority of biomethane plants are supplied by **agricultural residues** including manure, crop residues and sequential crops. Biomethane production is currently fueled by 38% agricultural residues, 31% dedicated energy crops and 28% organic waste.



Trends

The sector has grown steadily in recent years with total **biogas upgrading capacity increasing by 21% in just two years**. This mainly results from dynamic growth in major producing countries like France or the Netherlands. Smaller players like Italy are following that same dynamic trend. **In France alone, 241 new biomethane units have been commissioned in the past two years**. Regarding feedstocks, the proportion of energy crops has decreased substantially over the past decade while the use of **agricultural residues has increased**, improving the **sector's sustainability**.



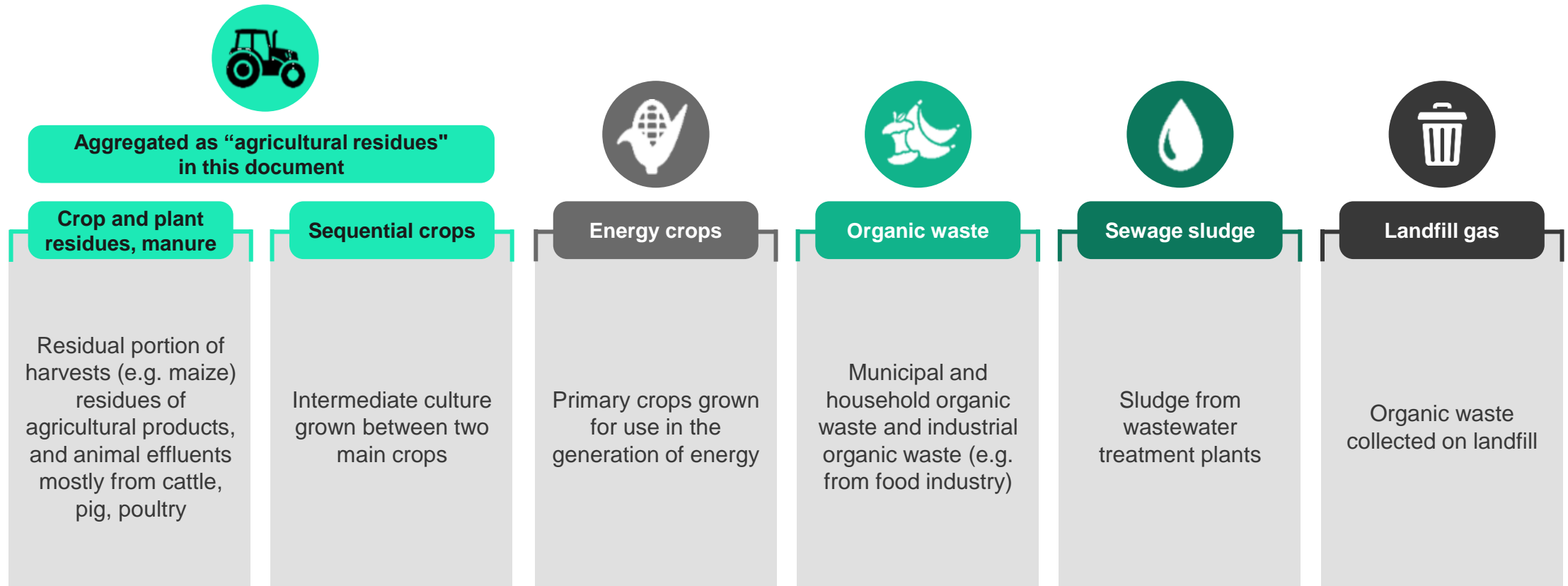
Regulatory Outlook

Countries with developed biomethane industries are transitioning from investment subsidies and feed-in tariffs to tendering systems that encourage the industry **to reduce its costs and be less dependent on support mechanisms**. Some countries are also stimulating demand for biomethane used as fuel through **consumption and carbon tax exemptions**, as well as **increasing quotas for renewable fuels** as required by the Renewable Energy Directive (RED II). Meanwhile, an increasing number of national registers tracking biomethane production are enabling the development of **Guarantees of Origin (GOs) and Renewable Transport Fuel Certificates**. In addition, **the possibility to use GOs in the EU ETS** as introduced in the Monitoring and Reporting Regulation (MRR) Directive and **the potential implementation of the Union Database in 2023** as quoted in RED II, could boost respectively the development of the two types of certificates.

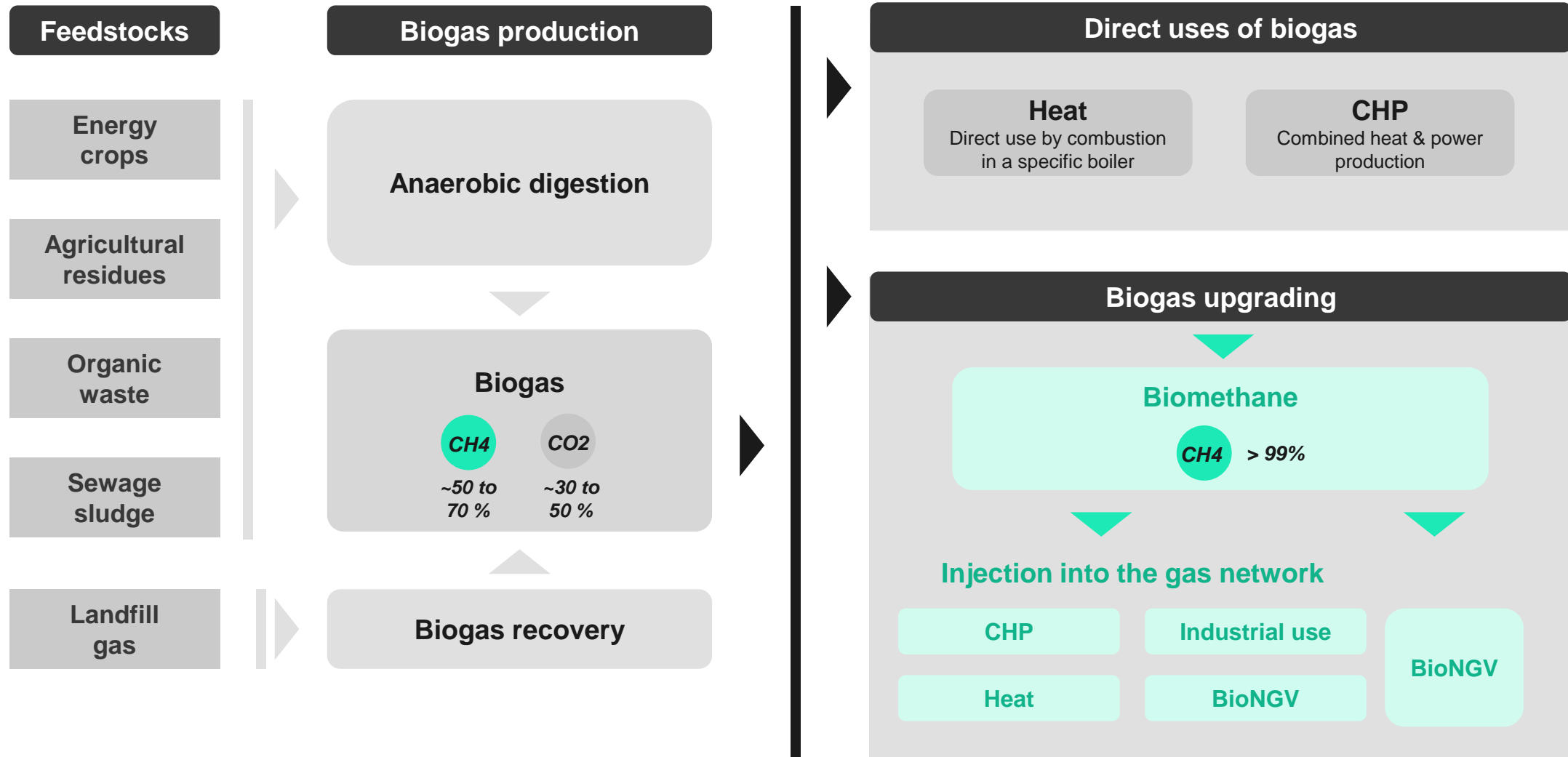


1. Definitions

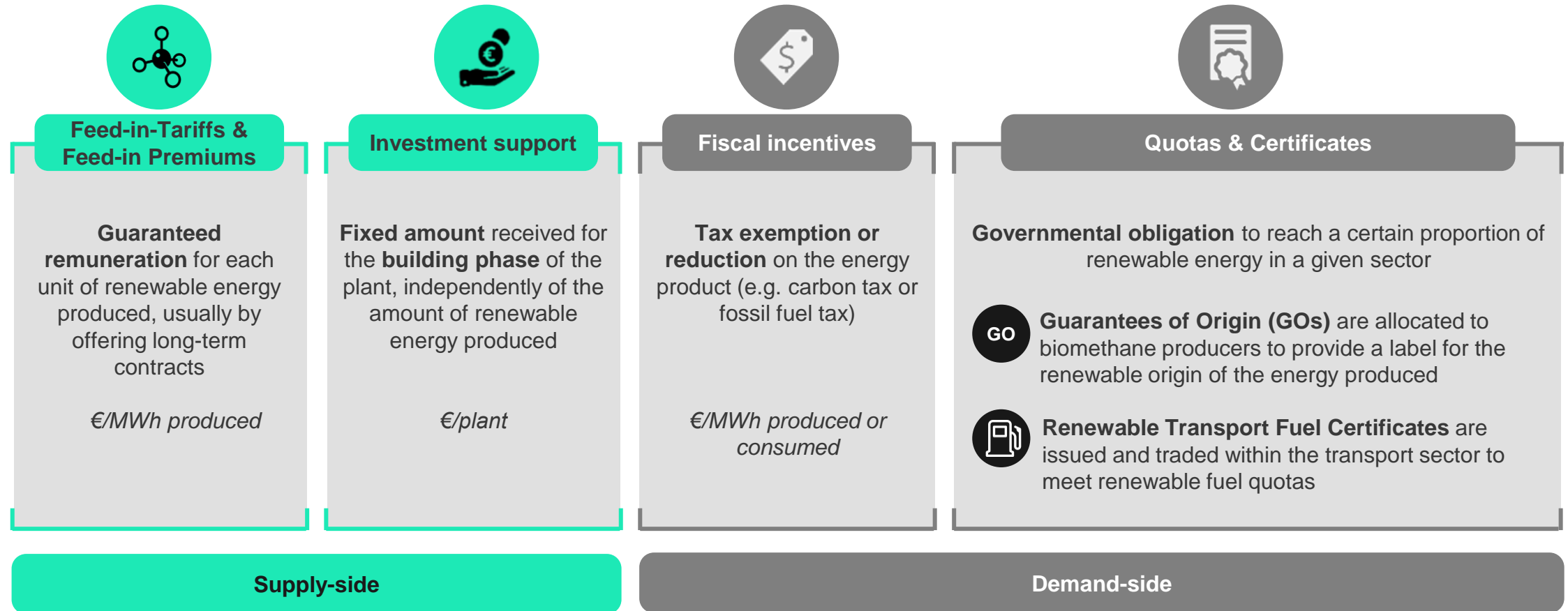
Definitions | Feedstock types for biogas production



Definitions | Biogas and biomethane production and valorisation



Definitions | Main support schemes¹



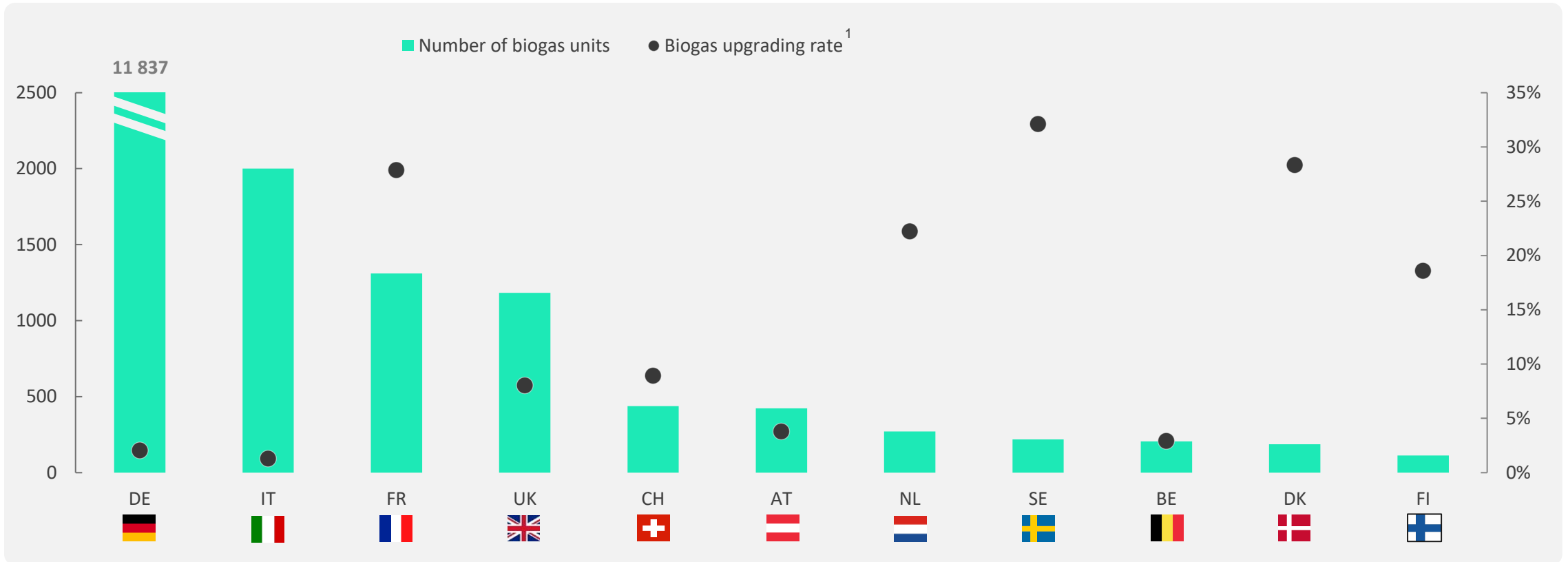
¹ Other support mechanisms can complete the list such as vehicle incentives, etc.



2. Country comparisons

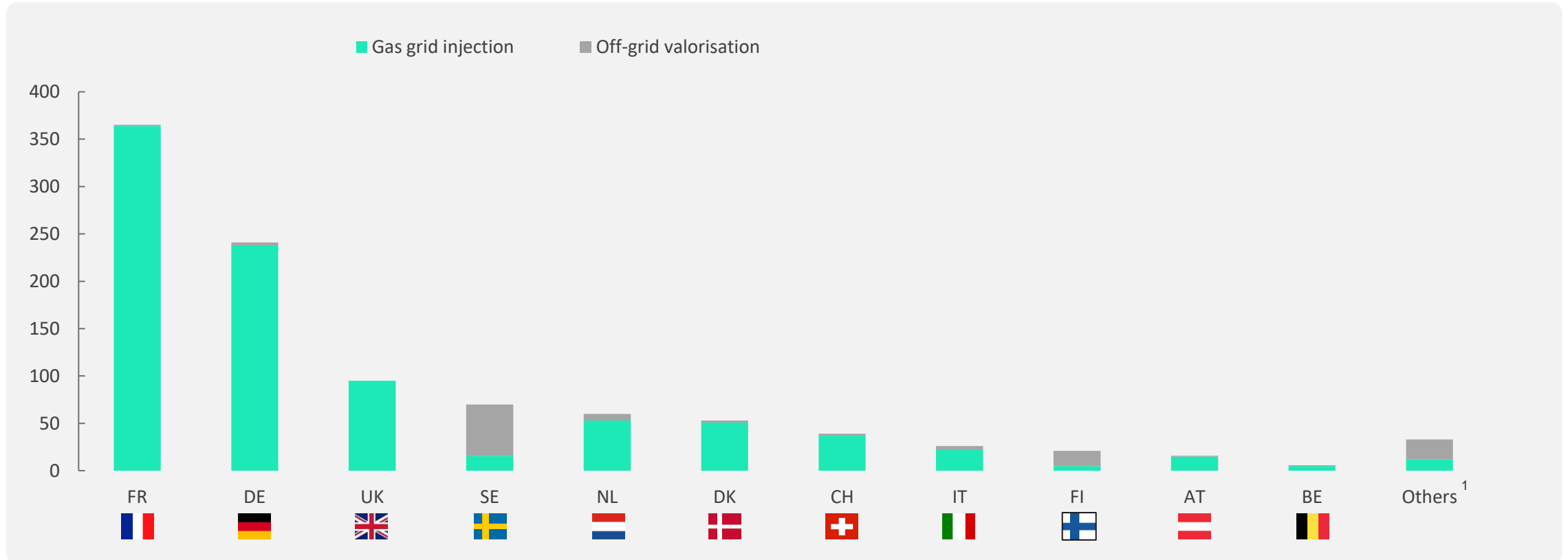
For more details regarding the scope and methodology used for this section, see the corresponding appendix

Country comparisons | Number of biogas plants and biogas upgrading rate



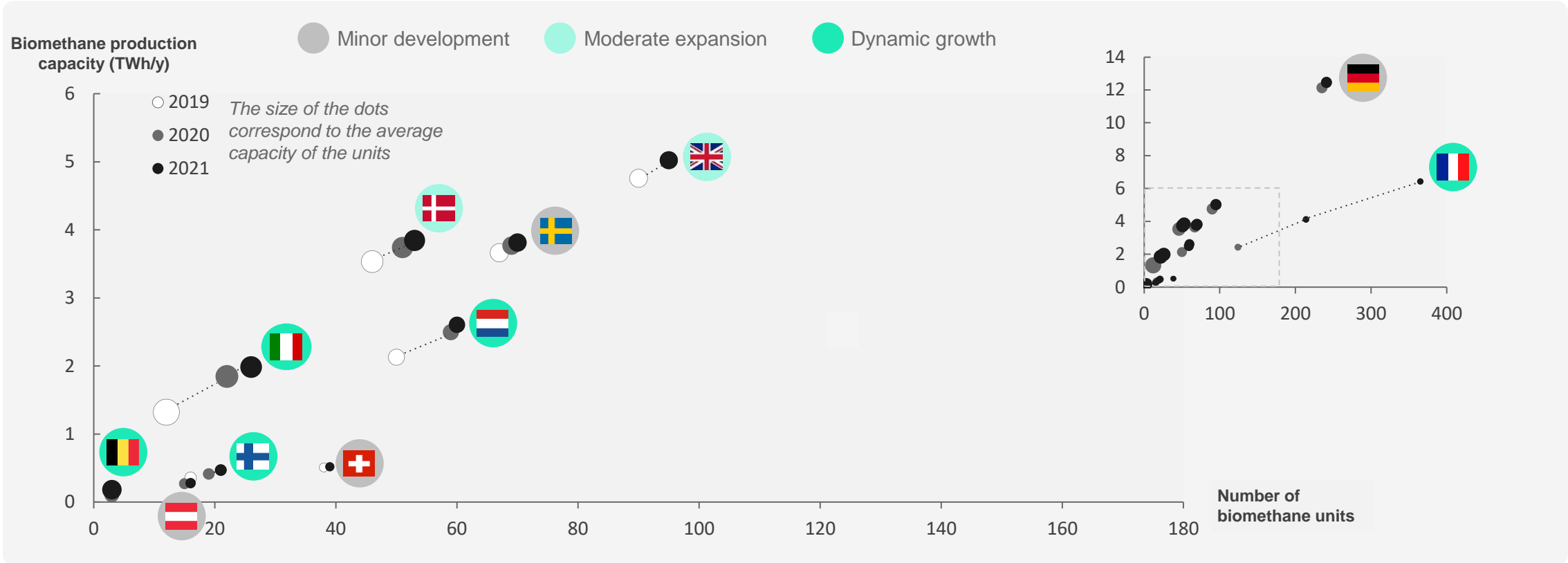
The development of biogas and its upgrading into biomethane varies greatly across Europe. Three groups of countries stand out: Germany and Italy with highly developed biogas sectors and a low biogas upgrading rate, the other Western European countries, including France, Switzerland, and the United Kingdom, which present dynamic sectors and promote the upgrading of biogas into biomethane, and the Nordic countries with few biogas production units. In all countries, the biomethane sector is experiencing faster growth than other biogas valorisation processes (heat and/or electricity).

Country comparisons | Number of biomethane plants per country



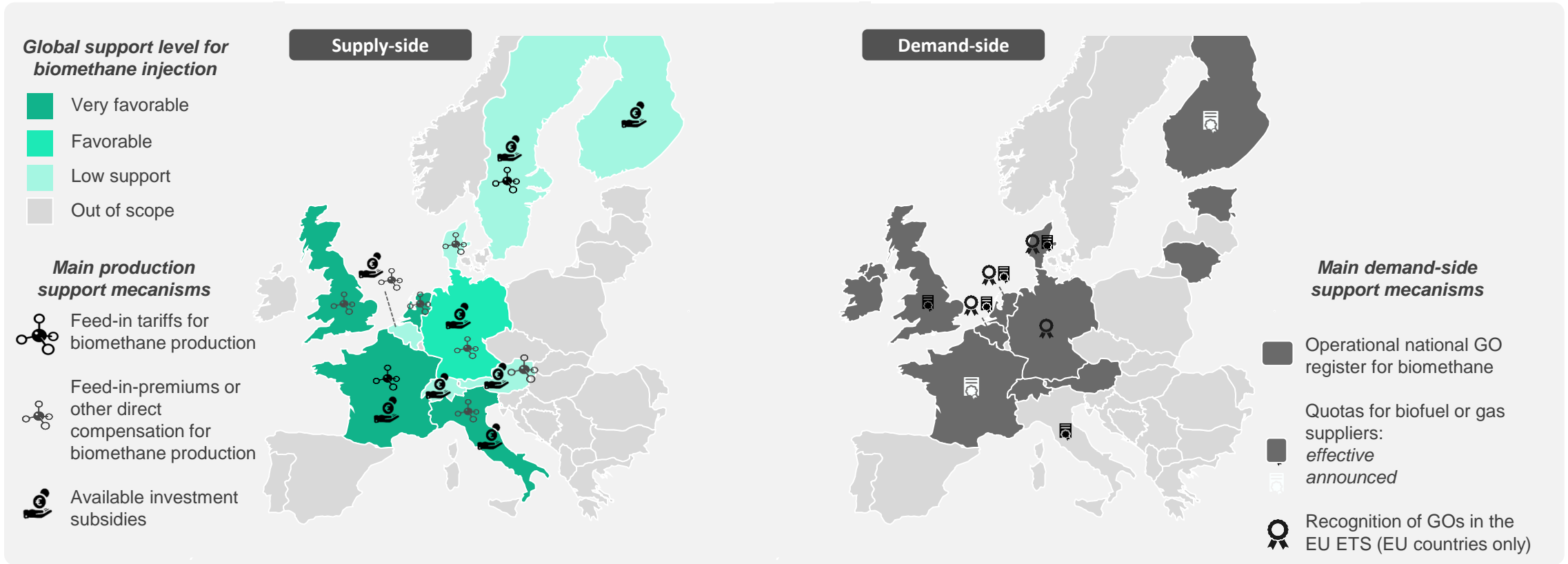
In 2021, Germany still holds the largest upgrading capacity of biogas. However, France hosts from now on the largest number of biomethane plants. The biomethane sector is also taking off in Italy, which has doubled its number of units in less than two years. Most producing countries choose to inject biomethane into the gas network, with Sweden, Finland and Norway being notable exceptions. This feature of the Nordic countries can be explained by a lower coverage of the territory by the gas transport and distribution networks.

Country comparisons | Evolution of biomethane plants number and capacity over 3 years



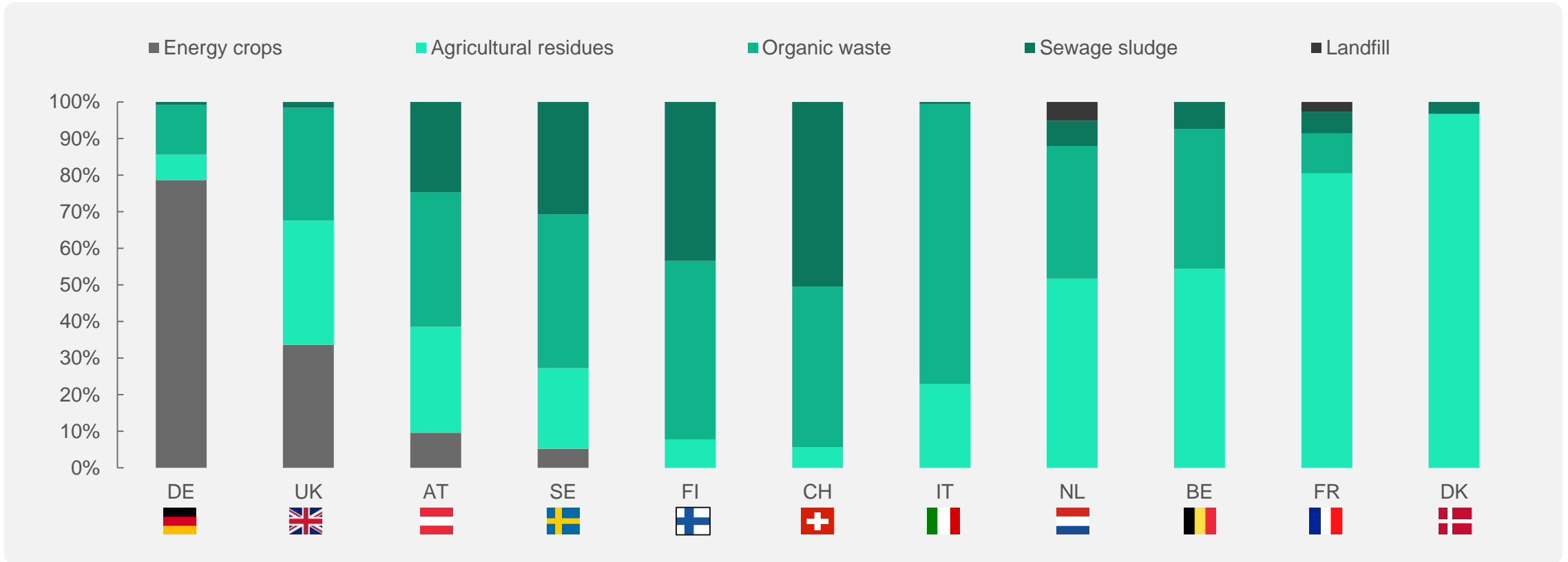
Not all countries are experiencing the same dynamic in the development of biomethane production: the sector is stabilizing in Germany, Austria, Switzerland and Sweden, where minor developments are observed. In contrast, France, the Netherlands, Italy, and Finland are experiencing strong growth, followed in a lesser degree by the United Kingdom and Denmark.

Country comparisons | Regulatory support schemes



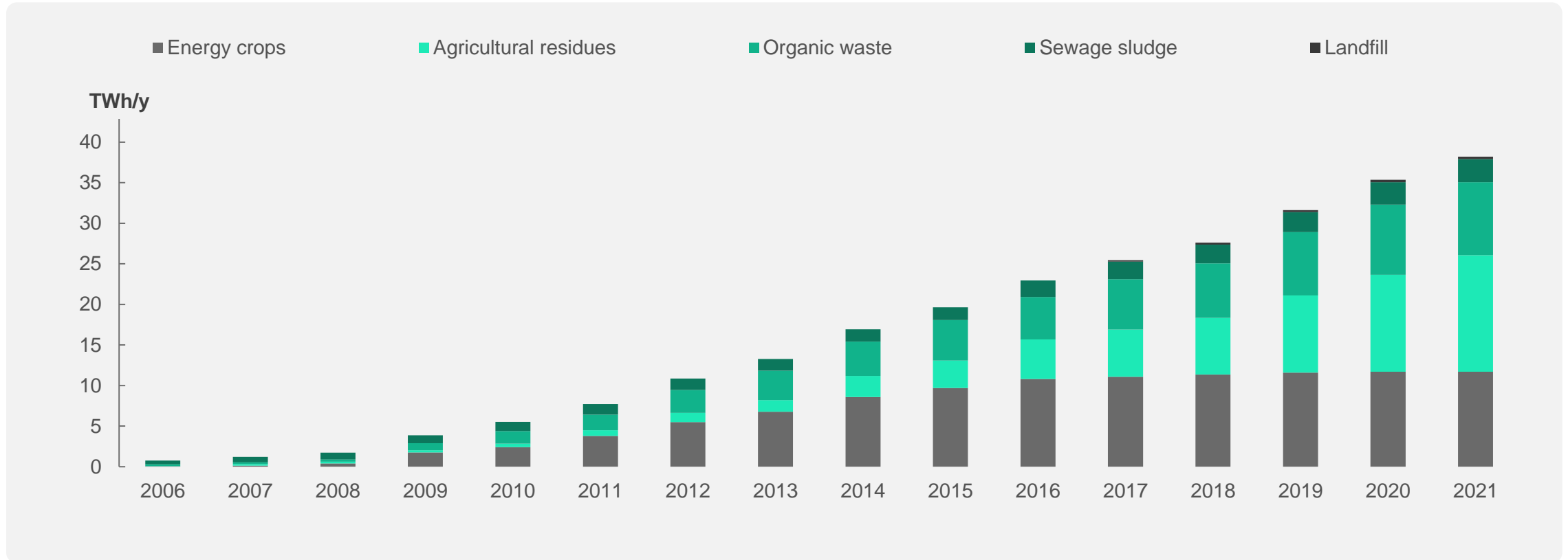
European countries have implemented different strategies to support the development of the biomethane sector. Some countries focus on supporting supply by setting up feed-in tariffs or investment subsidies. However, more countries are moving to a generalization of demand-side incentives, notably through quotas and/or by organizing the GO market. The recent record gas prices and the ambitions of the European Commission to produce 35 bcm by 2030 have accelerated the debate on the development of various mechanisms to stimulate the biomethane sector while keeping the overall bill under control.

Country comparisons | Share of main feedstocks used by country



France, the Netherlands, Denmark, and Belgium mainly rely on agricultural residues. These feedstocks, accounting for 38% of the total mix used in 2021, represent a promising way to reduce methane emissions from agriculture, causing today more than half of the EU's methane emissions. Dedicated energy crops, mainly in Germany and the UK, still account for 31% of the feedstocks over all. Municipal and industrial organic waste represents a growing supply in most countries, while on a smaller scale, Sweden, Switzerland, Finland, and Austria produce part of their biomethane from wastewater treatment plants.

Country comparisons | Evolution of biogas upgrading capacity and feedstock mix



The role of dedicated energy crops is decreasing over time as the use of these controversial feedstocks is limited in countries favoring the use of land for food production over energy production only: the share of agricultural residues has increased by 27% while it has decreased by 20% for energy crops over the last 10 years. The increasing use of agricultural waste, including manure, is driven mainly by France and Denmark. The growth of the organic waste sector has been steady since 2017, accounting for 24% of the feedstock mix, while the share of wastewater treatment plants is decreasing slightly.

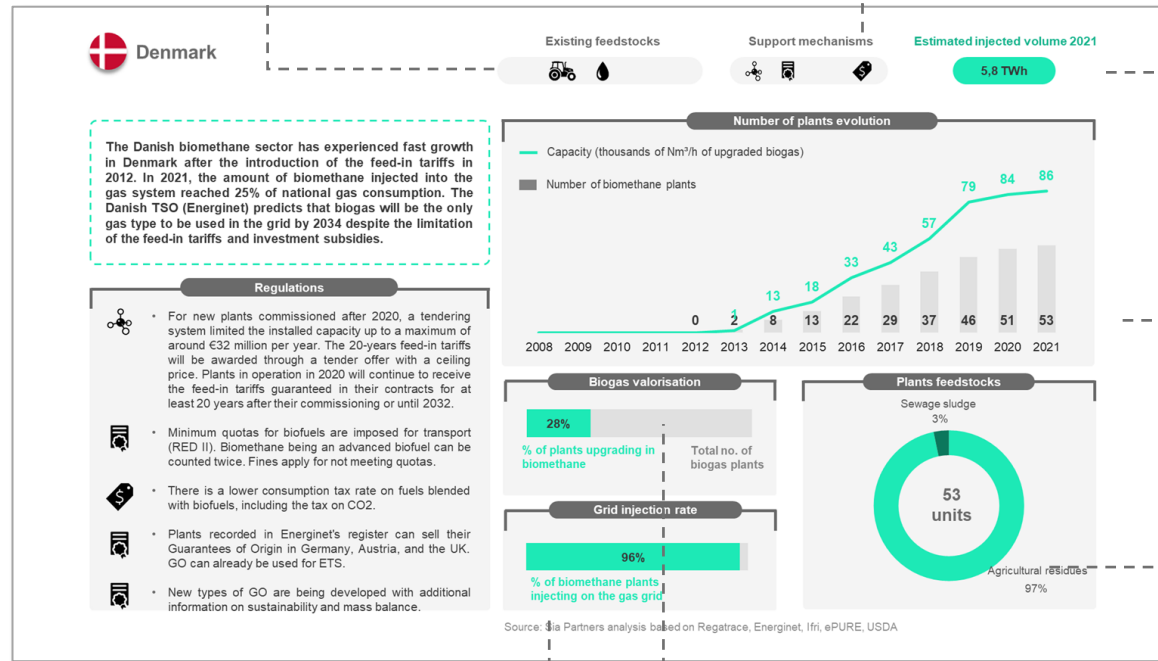
3. Country factsheets

Country factsheets: how to read



Synopsis of the current situation of biomethane sector in the country

Description of the regulatory system and support mechanisms helping biomethane production and demand



Biomethane volume injected into the gas network

Number of plants and capacity evolution over the past 10 years (upgrading biogas capacity in thousands of Nm³/h)

Production capacity breakdown (in Nm³/h of upgrading biogas capacity) of biomethane units based on the type of feedstock

Grid injection rate (Number of plants injecting into the gas network / Total number of biomethane plants)

Biogas upgrading rate (Number of biomethane plants / Number of biogas plants)



0,1 TWh

The number of biomethane plants is slowly growing. However, the Renewable Energy Expansion Act (EAG) came in to force in July 2021. This text needs to be specified due to the approval of the EU Commission and national procedures. EAG will be an accelerator for the industry providing support schemes for biomethane injection.

Regulations



- Austria has had a feed-in-tariff scheme in place since 2012 for electricity producers who use biogas to produce electricity. With the EAG, for the first time, direct incentive schemes will be introduced for biomethane injection into the gas grid.



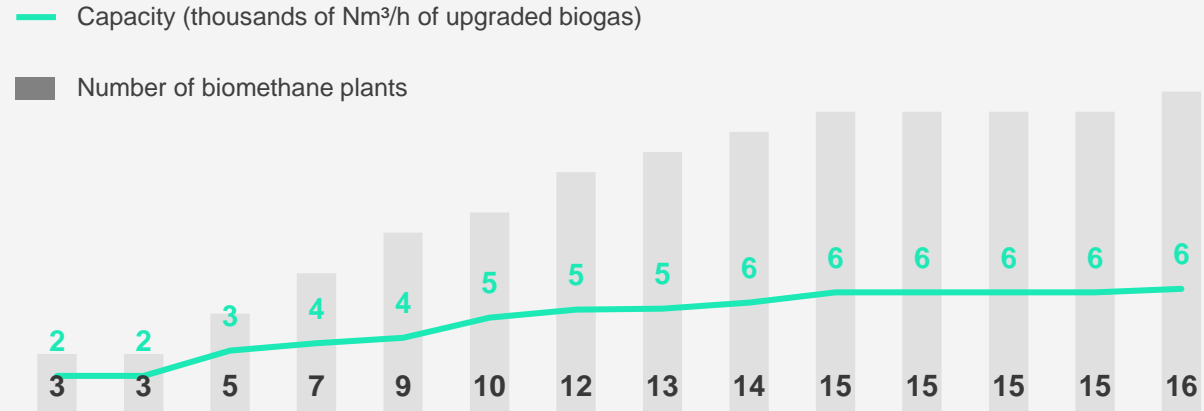
- For the plants whose the business model is based on the previous FiTs, an investment support scheme is scheduled to convert large plants into biomethane injecting plants. A follow-up premium will be introduced for 30 years for plants with a capacity $\leq 250\text{KWe}$. For plants $\geq 250\text{KWe}$ located around a gas grid ($\leq 10\text{km}$), the premium will be granted for 24 months.



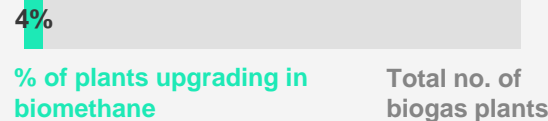
- Guarantees of Origin are monitored by the AGCS (Austrian Biogas Register). There are some international agreements for the trading of GOs with Denmark, Germany and the UK.

- Energy crops proportion will be limited each year to ensure sustainability.

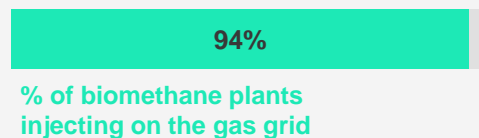
Number of plants



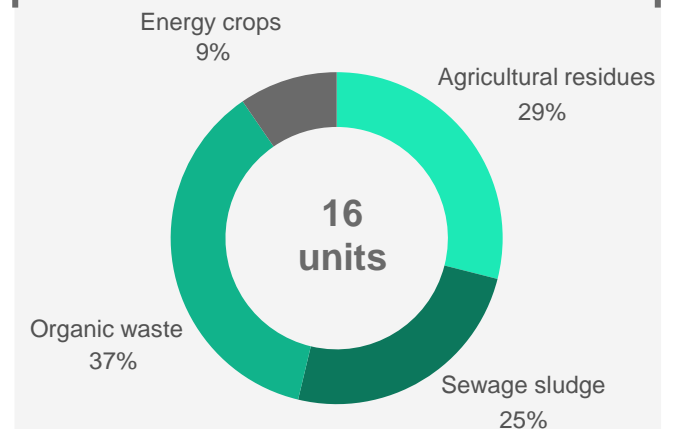
Biogas valorisation



Grid injection rate



Feedstocks





< 0,1 TWh

The Belgian biomethane sector is growing despite being at an early stage of development due to limited support mechanisms in certain regions. The implementation of the Guarantees of Origin in Flanders, and the possibility to use them in the EU ETS framework, could boost the sector.

Regulations



- A system of Guarantees of Origin (GOs) has been introduced by the Flemish regulator (VREG), but the import of foreign GOs and the export of Flemish GOs is not possible yet.



For use in CHP only

- The 'Guarantees of Origin Labels' (LGOs) handled by the Walloon administration (SPW) currently supports local CHP installations: biomethane producers receive LGOs worth €70-75/MWh and trade them with CHP owners which in turn valorize them as electricity certificates.



- In Wallonia and Flanders, investment support schemes exist but remains fairly limited¹.

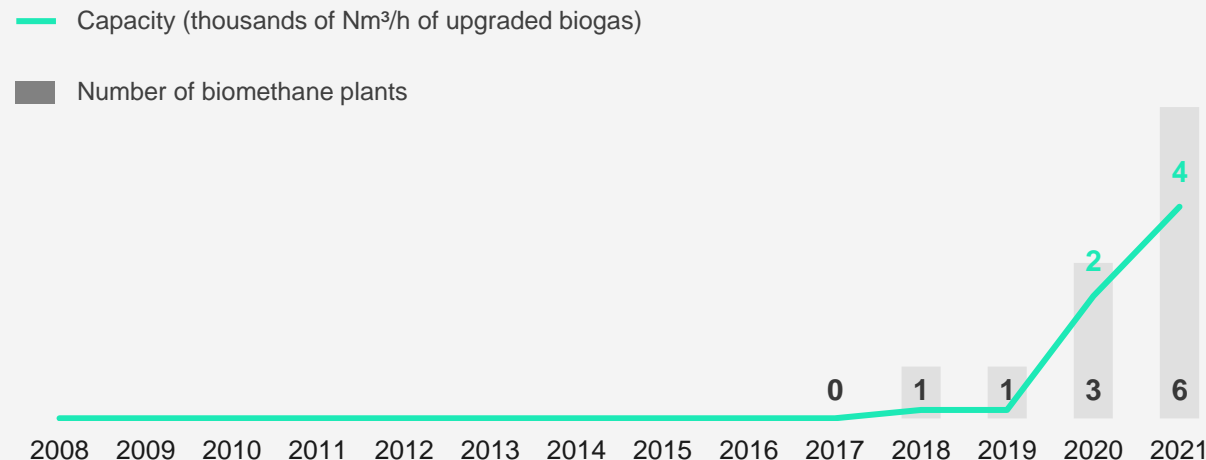


- Minimum quotas for biofuels are imposed for transport (RED II). Biomethane being an advanced biofuel² can be counted twice. Fines apply for not meeting quotas.

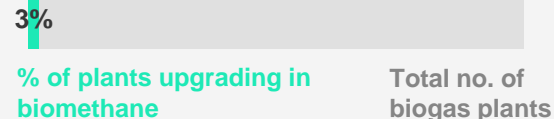


- Following the EU MRR directive, biomethane can be used to reduce EU ETS allowances. A process, using GOs, can be used in Flanders but not yet in Wallonia.

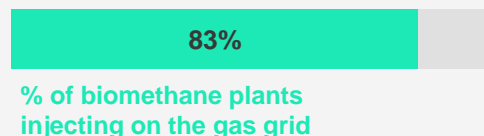
Number of plants



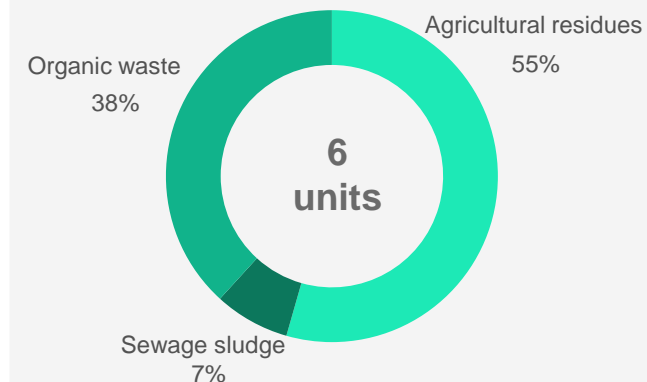
Biogas valorisation



Grid injection rate



Feedstocks





5,8 TWh

The Danish biomethane sector has experienced fast growth since the introduction of feed-in-tariffs in 2012. In 2021, the amount of biomethane injected into the gas system reached 25% of national gas consumption. The Danish TSO (Energinet) predicts that biogas will be the only gas type to be used in the grid by 2034, despite the limitations of the feed-in tariffs and investment subsidies.

Regulations



- For new plants commissioned after 2020, a tendering system limited the installed capacity up to a maximum of around €32 million per year. The 20-years feed-in tariffs will be awarded through a tender offer with a ceiling price. Plants in operation in 2020 will continue to receive the feed-in tariffs guaranteed in their contracts for at least 20 years after their commissioning or until 2032.



- Minimum quotas for biofuels are imposed for transport (RED II). Biomethane being an advanced biofuel can be counted twice. Fines apply for not meeting quotas.



- There is a lower consumption tax rate on fuels blended with biofuels, including the tax on CO2.

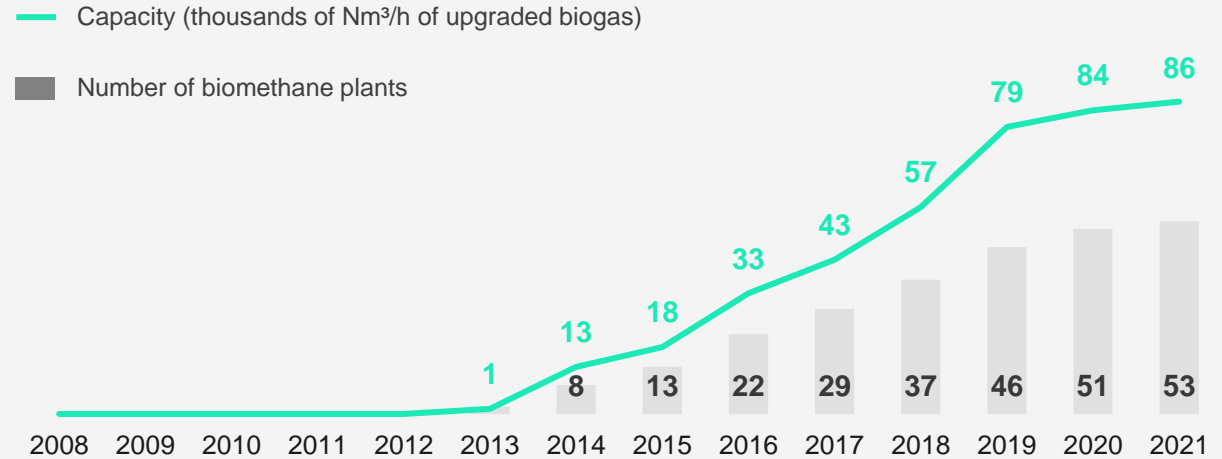


- Plants recorded in Energinet's register can sell their Guarantees of Origin in Germany, Austria, and the UK. GOs can already be used for ETS.

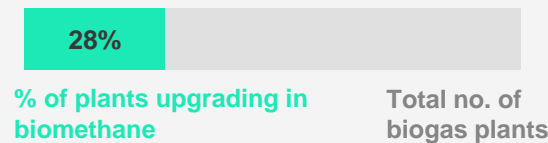


- New types of GOs are being developed with additional information on sustainability and mass balance.

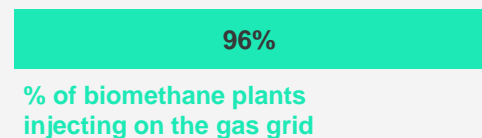
Number of plants



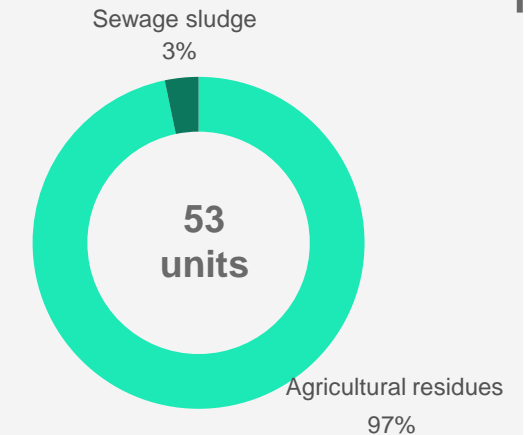
Biogas valorisation



Grid injection rate



Feedstocks





< 0,1 TWh

The development of the biogas sector is considered key to the decarbonization of the transport and industry sectors. New support mechanisms are taking shape and should make it possible to direct the use of biogas towards these sectors and to encourage the conversion of biogas into biomethane. The Finnish government has set the goal of producing 4TWh of biogas per year by 2030, with most of the biogas upgraded to biomethane.

Regulations



- Investment subsidies are provided to biogas production plants up to a maximum of 30% of the overall project costs (40% for projects using new technologies).



- Biomethane and biogas are tax-exempt.



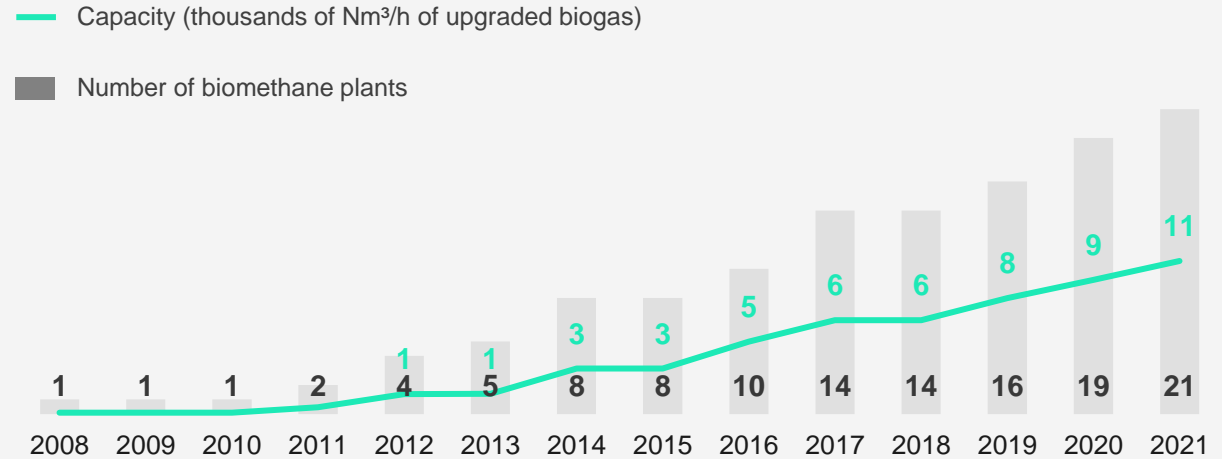
- On 17 March 2022, the Government issued a decree on infrastructure support for the use of electricity, biogas and hydrogen in transport between 2022 and 2025.

New measures are currently under discussion :

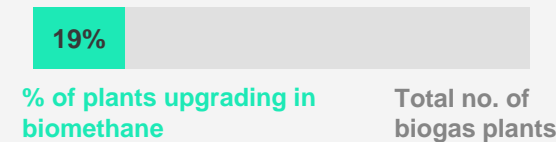


- Raising biofuel target : sustainable biomethane could be part of suppliers' distribution quotas,
- If biomethane is included in the distribution obligation, the current tax exemption should be removed,
- Implementation of a GO mechanism for green gas on July 1, 2022.

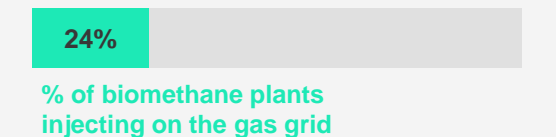
Number of plants



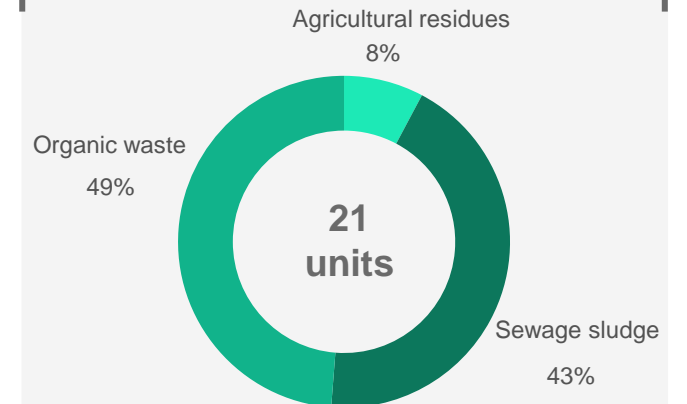
Biogas valorisation



Grid injection rate



Feedstocks





4,3 TWh

The French biomethane sector has developed considerably in three years, placing the country first in terms of number of units, and the dynamic should continue based on a pool of projects under development. The regulatory framework has undergone major changes, and it is now preparing for the transition to a sector less dependent on state aid. The sector is on track to reach the 10% renewable gas target by 2030.

Regulations



- DSOs and TSOs contribute up to 60% of the costs of connection to the distribution and transmission networks.



- FiTs have been reformed: only projects below 25 GWh/y have access without limitation. Larger projects will be eligible through tenders. In addition, sustainability criteria have been strengthened in line with RED II.



- The government has unveiled a new scheme (Biogas Production Certificates): a minimum incorporation rate will be set for all natural gas suppliers, to pursue the development of the sector without additional public aid.



- Since Nov. 2021, GOs of new projects are auctioned by the State, ending the over-the-counter system.

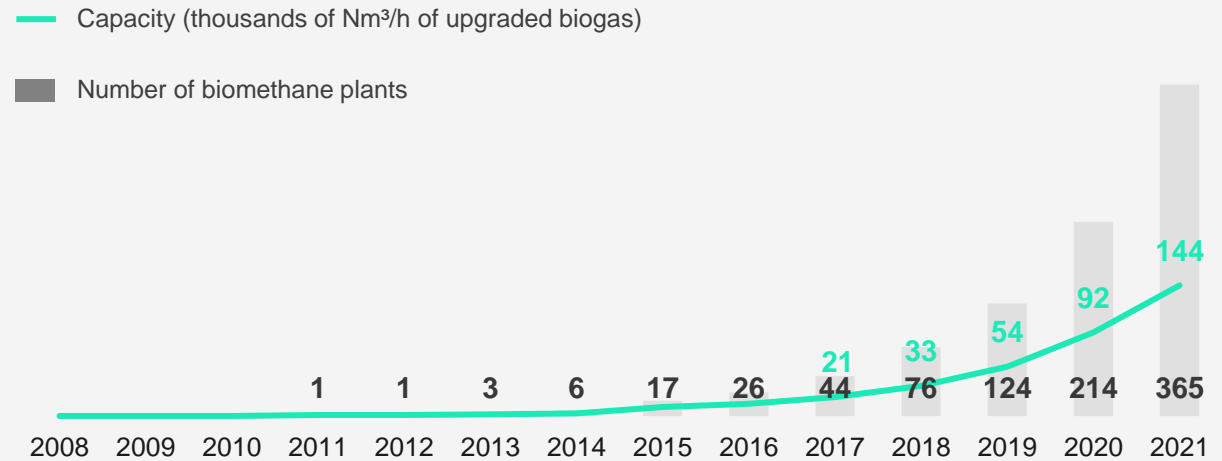


- Local grants and subsidies are available to help funding biogas/biomethane projects.

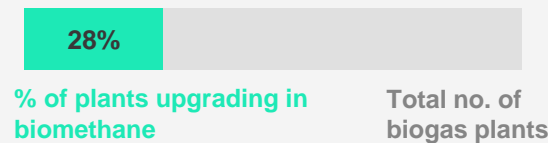


- There is no longer an exemption from the domestic consumption tax on natural gas (TICGN).

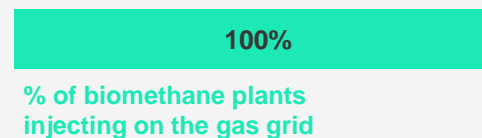
Number of plants



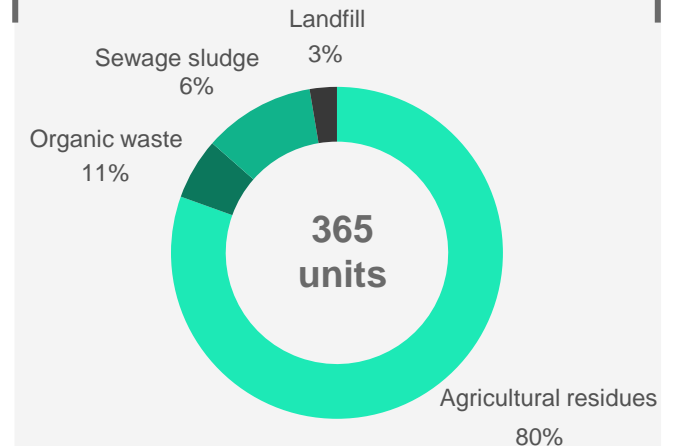
Biogas valorisation



Grid injection rate



Feedstocks





Germany

Existing feedstocks



Support mechanisms



Estimated injected volume 2021

10,7 TWh

Germany still has the largest upgrading capacity for biogas in Europe. The tendering system set up by EEG in 2017 slowed growth. However, with EEG 2021 (German Renewable Energy Sources Act), bigger volumes are expected for electricity production with biogas and biomethane and could give a rebound to the German industry. Attempts to improve the sustainability of biogas production are progressing with the limitation of the proportion of energy crops in feedstocks.

Regulations



For use in CHP only

- With EEG 2021, the tendering system set up by EEG 2017 is evolving. Larger volumes (200MW/y to 600MW/y) are expected for the traditional tender for biogas included biomethane. A new specific tender (150 MW/y) is in place for new plants with high flexibility located in the south of Germany whose biomethane is used for CHP. A flexibility bonus for CHP plant using biomethane is set at 65€ by kW_{el} additional.



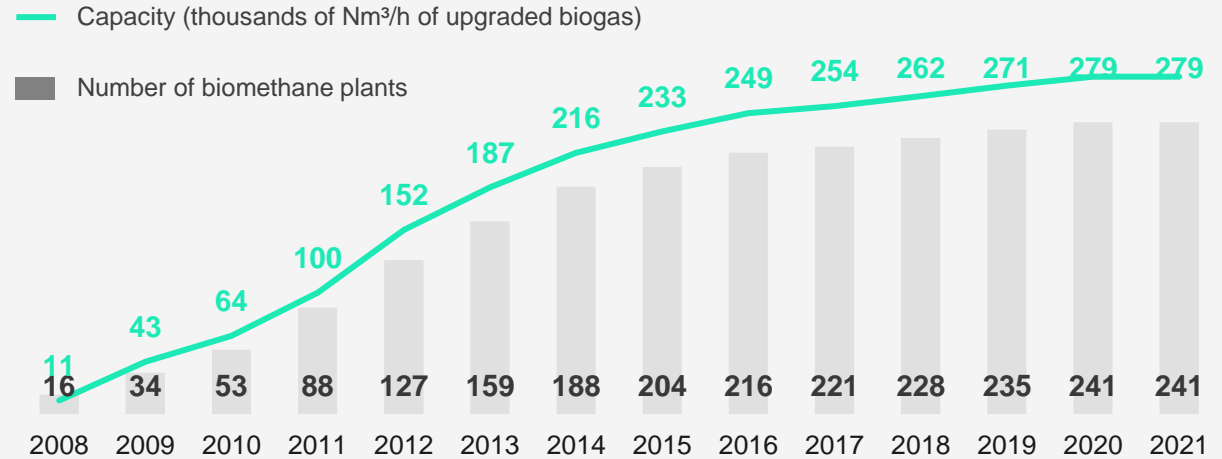
- To benefit from support schemes, biomethane must be injected into the gas grid and be integrated into the system of Guarantees of Origin provided by the DENA (German Energy Agency).



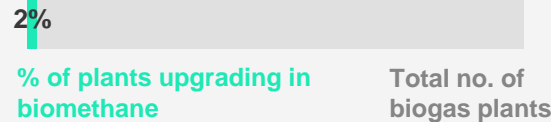
- TSOs/DSOs bear 75% of the grid connection cost in most cases.

Note : feedstocks are now more constrained: for example corn and cereal grains are limited by 40% for biomethane plants.

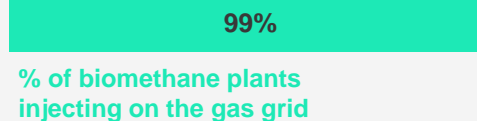
Number of plants



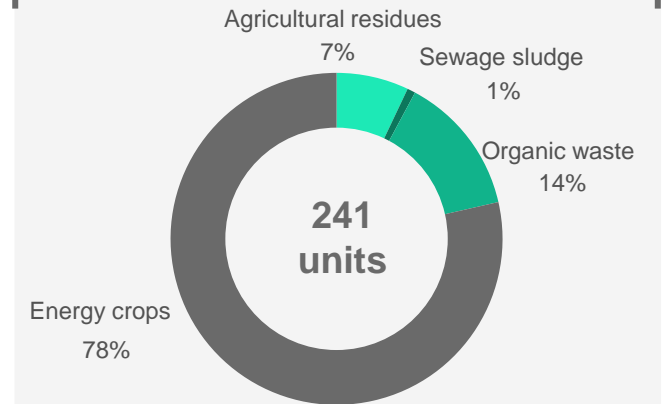
Biogas valorisation

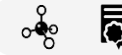


Grid injection rate



Feedstocks





1,2 TWh

In 2021, the Italian government set up the National Recovery and Resilience Plan (NRRP) to respond to the Covid19 crisis. Two billion euros was committed to the development of biomethane, with the objective of maximising the conversion of biogas into biomethane and its subsequent injection into the gas network. This should maximize its use in the industrial and residential / tertiary heating and transport sectors and thus contribute to achieving the GHG emission reduction targets set for 2030.

Regulations


- A system of quotas sets a biofuels integration rate for fuel suppliers of 10% in 2022, including 2% biomethane. The purchase of CICs (certificates of supply for consumption) ensures that these targets are met.



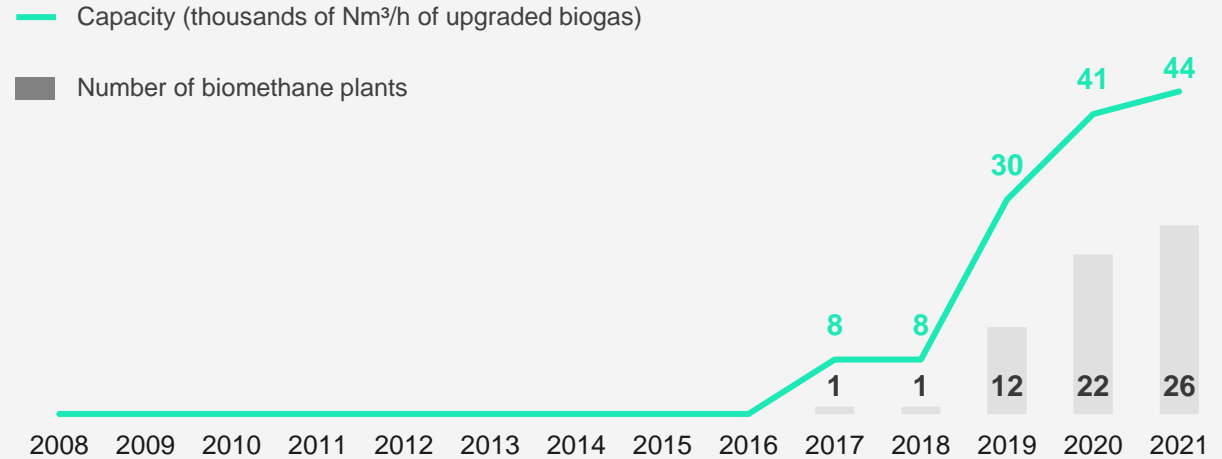
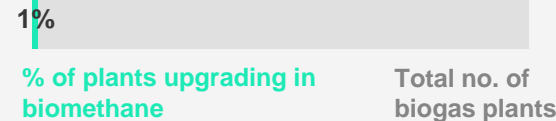
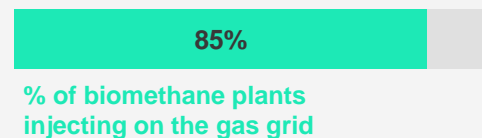
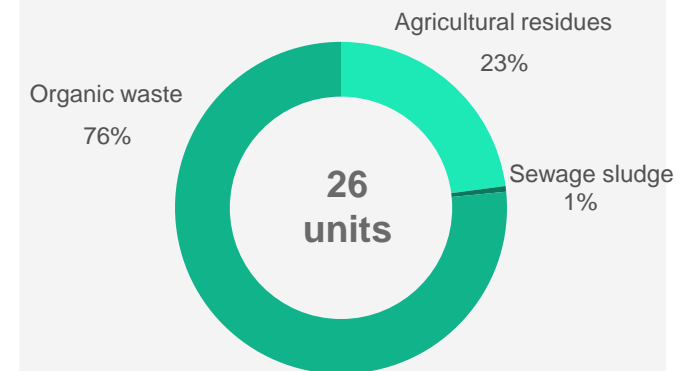
- Installations receive CICs depending on their production. For advanced biomethane, the CIC's value doubles. A 20% bonus to the CICs is also granted for compression or liquefaction infrastructures.

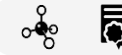


- Biomethane producers can obtain Guarantees of Origin, if they do not already received CIC. These GOs can be sold to an obliged subject.

Specific measures will be added to achieve the NRRP:

- Reconverting and improving the efficiency of existing biogas plants towards the production of biomethane
- Supporting the construction of new biomethane plants by contributing to 40% of the investment
- Promoting the replacement of obsolete and low-efficiency vehicles with biomethane fueled-vehicles

Number of plants

Biogas valorisation

Grid injection rate

Feedstocks




2,2 TWh

The Dutch biogas sector is experiencing steady growth as a result of federal ambitions to produce 2 bcm (billion m3) of biomethane by 2030. On the one hand, biomethane producers benefit from increasing quotas in the Renewable Fuel Units (HBE) trading system. On the other hand, a feed-in tariff provides the adequate support to stimulate biogas development.

Regulations



- The SDE++ scheme (stimulation of sustainable energy production and climate transition) stimulates biogas development with a feed-in tariff that covers the non-profitable portion of production costs for 12 to 15 years via a tendering system. This feed-in tariff compensates the difference between the production costs and the market prices of the competing non-renewable energy.

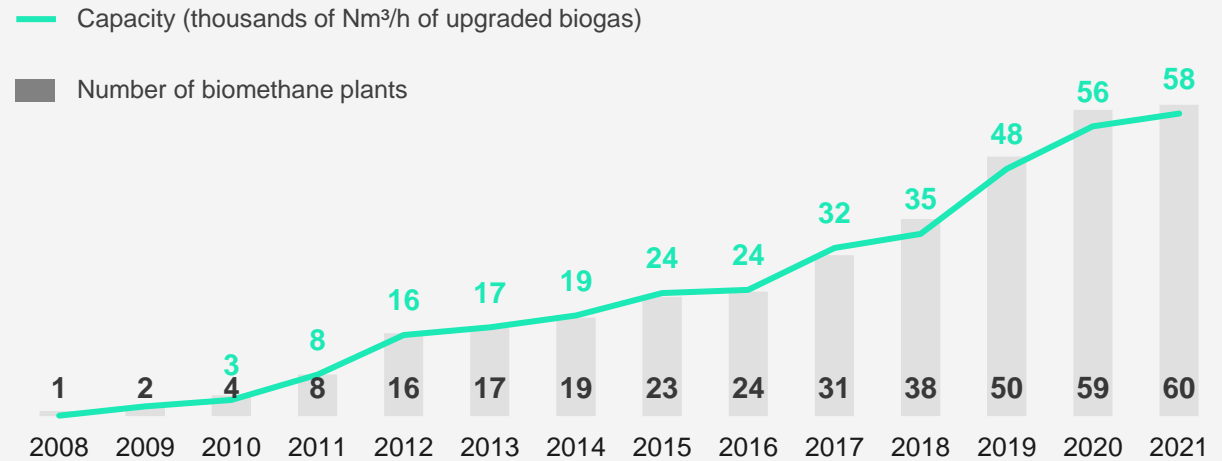


- A Renewable Fuel Units (HBE) trading system (1 unit = 1GJ) forces fuel producers to increase the share of green fuel from 17.9% in 2022 to 28% in 2030. Plant owners can choose to either benefit from the HBE or the SDE++ scheme but not both at the same time.

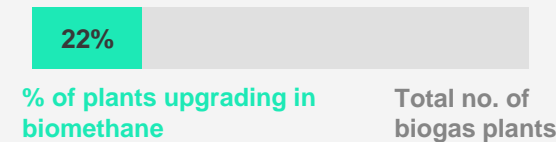


- As of January 1st 2022, Guarantees of Origin (GOs) can be used within the EU ETS. However, these benefits are taken into account before granting SDE++ support.

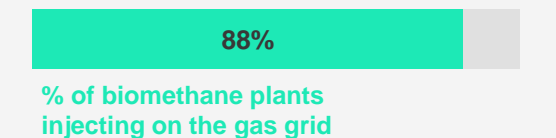
Number of plants



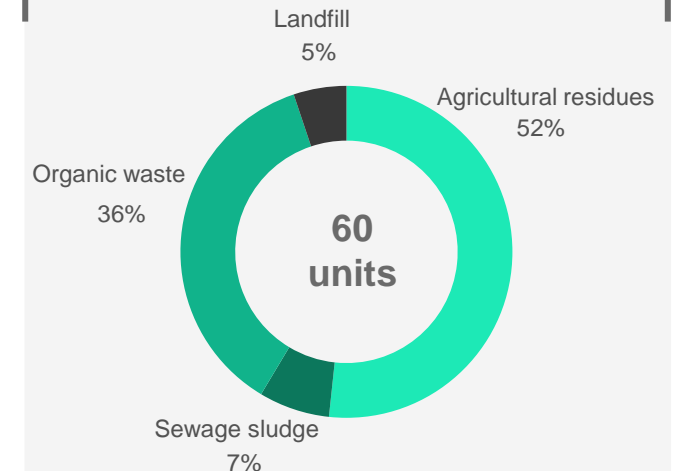
Biogas valorisation



Grid injection rate



Feedstocks





0,5 TWh

As one of the pioneers of biomethane in Europe, Sweden is now growing at a fairly slow pace. Although industrial companies are starting to turn to biomethane, it is currently mostly consumed for transport. The historical support mechanisms have been extended, but it is expected that the Swedish government will propose a new long-term support strategy to reach the target of 10TWh of biomethane in 2030.

Regulations



- Exemption from CO2 and energy tax for biogas or biomethane used for heating, CHP plants and transport.



- The Local Climate Investment Program (2015-2026) provides investment support of up to 45% for all types of GHG reduction measures, including support for biomethane plants.

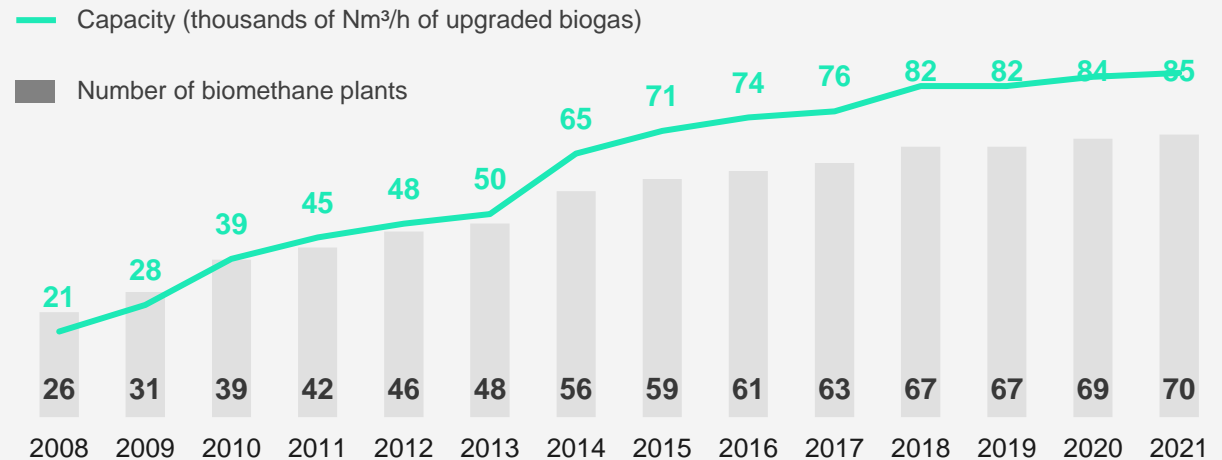


- New production premium scheme for biomethane since 2021. The premium, between 10 and 40€/MWh, is given to the biogas producer for up to 10 years.

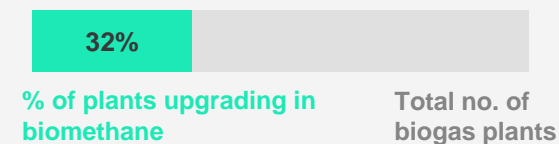


- A national biogas Guarantee of Origin system operated by the Swedish Energy Agency is being prepared.

Number of plants



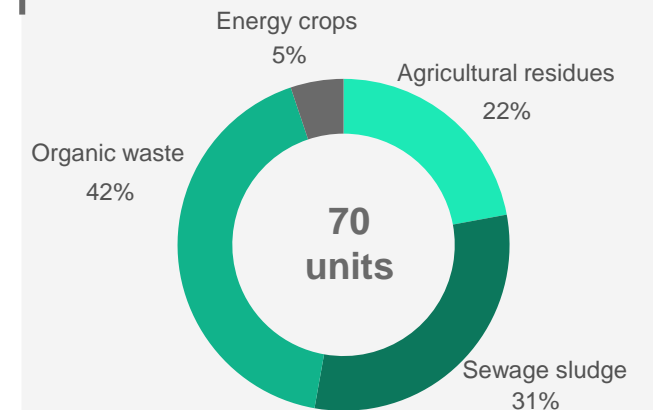
Biogas valorisation



Grid injection rate



Feedstocks





0,4 TWh

The Swiss biomethane sector is still developing slowly. Despite being supported by the Swiss Association of Gas Industry (VSG), the absence of subsidy schemes at the federal level does not encourage large-scale development of the industry.

Regulations



- A federal subsidy scheme exists for biogas used to produce electricity. Biomethane plants that inject into the gas grid are not eligible.

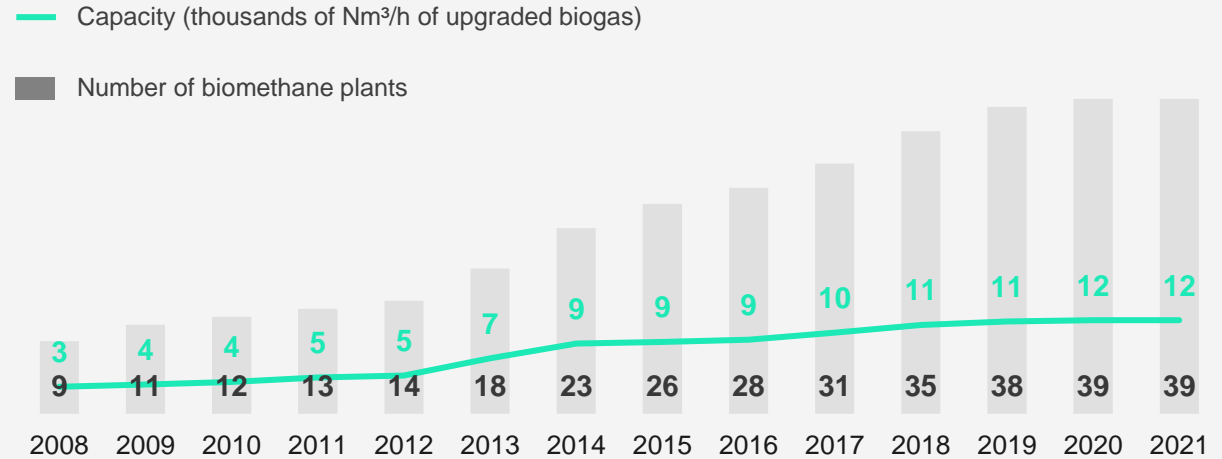


- VSG has created a fund to support new or expanded biomethane plants through:
 - an investment grant per Nm³/h,
 - A support per kWh for the first 36 months of injection,
 - An additional support per kWh from the grid operator for the first 36 months of injection.

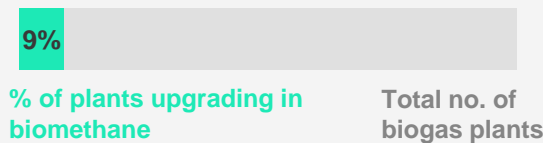


- There is a CO₂ tax exemption for biomethane consumption as a combustible or as a vehicle fuel.

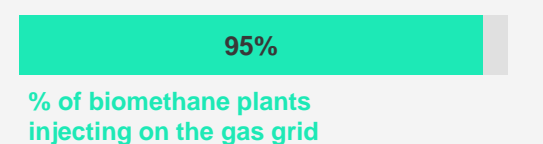
Number of plants



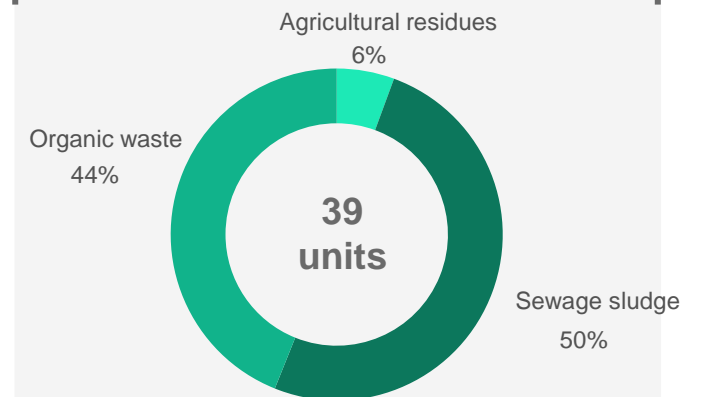
Biogas valorisation



Grid injection rate



Feedstocks



Existing feedstocks



Support mechanisms



Estimated injected volume 2021

4,5 TWh

The UK wishes to decarbonize heating in the residential, industrial and tertiary sectors, as heating is currently responsible for one third of the country's greenhouse gas emissions. To this end, a new support mechanism for the injection of biomethane into the gas network has been put in place. The budgetary cap on this mechanism should allow for sufficient biomethane production to meet the national target of 20 TWh per year by 2030.

Regulations



- Open from 30/11/2021 to autumn 2025, the Green Gas Support Scheme (GGSS) will support the injection of biomethane produced by anaerobic digestion into the gas network through a guaranteed tariff over 15 years, determined by the level of production (1.56 - 5.51 p/kWh). It is financed by the Green Gas Levy, a new levy on licensed fossil fuel gas suppliers (from April 2022).



- The former support mechanism for biomethane injection, the Non-Domestic Renewable Heat Incentive (NDRHI), closed in March 2021.

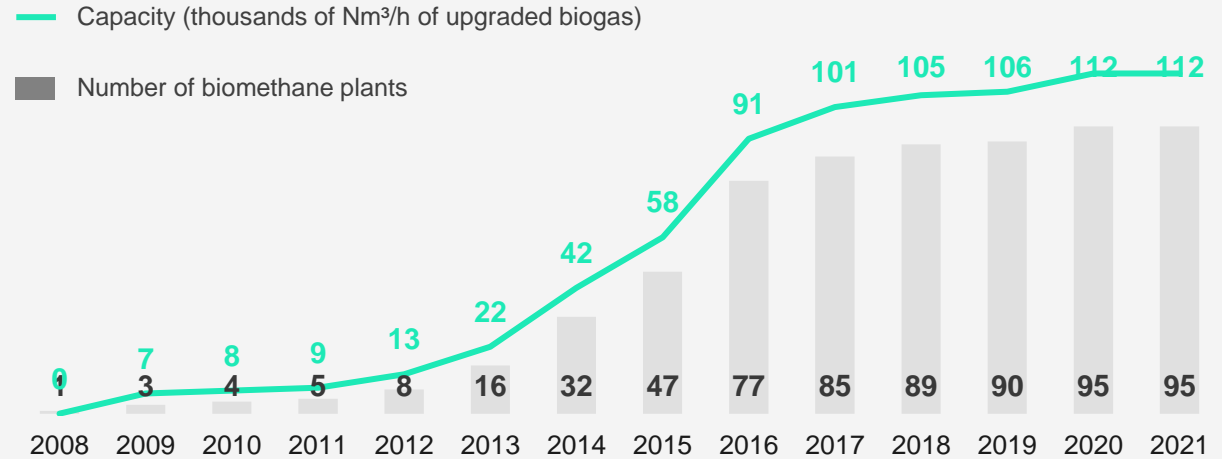


- Green Gas Certification Scheme (GGCS) : Valuable Certificates of Origin certify the origin of the injected biomethane.

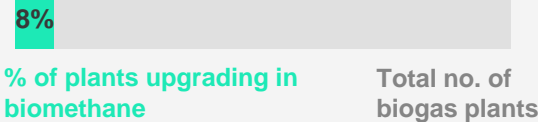


- Renewable Transport Fuel Obligation (RTFC) : requirements for fuel suppliers to incorporate a share of renewable fuel (including biomethane).

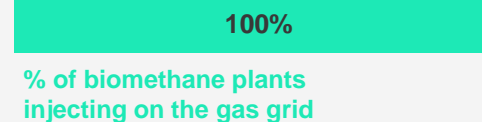
Number of plants



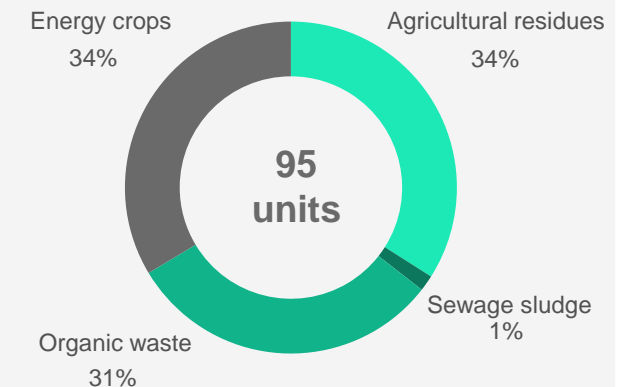
Biogas valorisation



Grid injection rate



Feedstocks



Appendices

Appendix | Glossary

Acronyms & units	Signification
bcm	billion cubic meters (1 billion of m ³ = 1 km ³). 1 bcm ≈ 10TWh of biomethane
EU ETS	European Union Emission Trading Scheme
GOs	Guarantees of Origin
FiP	Feed-in Premium
FiT	Feed-in Tariff
MRR	Monitoring and Reporting Regulation
Nm ³ /h	Normal cubic meters per hour
RED II	Renewable Energy Directive II

Appendix | Scope, sources and methodology

Scope

This benchmark covers the 11 main biomethane-producing countries on the European continent at the end of 2021: **Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Sweden, Switzerland and the United Kingdom**. These countries have at least 15 biomethane production units in operation, except for Belgium which is however experiencing a phase of strong growth. The other producing countries have only a limited number of biomethane production units: Norway, Czech Republic, Ireland, Latvia, Iceland, Hungary, Luxembourg, and Estonia. They are included in the aggregate figures not in the detailed country factsheets. There is no biomethane production plant registered in the other countries at the moment.

Sources

The data and information provided by **Sia Partners are the results of internal analyses based on open public information**. Sia Partners provides this material for informational purposes only, and cannot be held responsible for the accuracy of the data. The sources used are listed on the relevant slides. In the following order of priority, the sources used are: state or official sources (government agencies, regulatory texts, regulators, etc.), sources from associations related to the biogas/biomethane sector and stakeholder organizations (in particular EBA and Regatrace), as well as TSO/DSO data, and finally, all open-access public data sources.

Methodology

Sia Partners regularly updates its internal database of production units in Europe and their characteristics (inputs, capacity, etc.). The data sources are verified to secure a reliable consolidation of the data and to ensure that the most up-to-date version of the data is available regarding the countries' production facilities.

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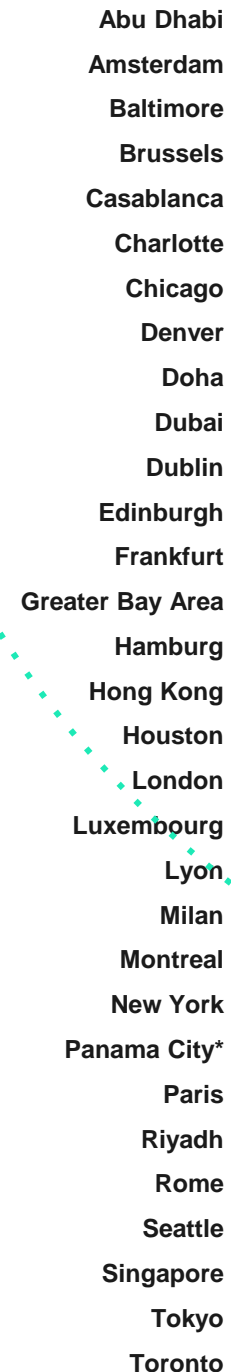
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