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Biomethane in Europe

Plants – Projects – Developments

Cologne, May 2023

Extract

ecoprolog GmbH

Biomethane in Europe

With the attack of Russia on Ukraine and the disruptions in the European energy markets, energy independence has gained priority in many countries quickly. Biomethane as a direct, renewable replacement for natural gas has therefore increasingly moved into focus in Europe. According to the Biomethane Action Plan proposed by the European Commission, biomethane production in the EU shall increase by more than 10 times until 2030.

In the future, the biomethane development is especially driven by the demand in the heating and transport sectors, both sectors which are hard to decarbonise. With the latest amendment to the Renewable Energy Directive, the renewable energy targets in these sectors have been further tightened. Biomethane can play a vital role in reaching these targets.

However, as of the beginning of 2023, the level of biogas and biomethane exploitation in Europe varies considerably. The study gives an overview over the current state of biomethane production in Europe and which markets can be expected to have a dynamic development in the next years.

For this study, ecoprolog has examined the European market for biomethane production in more detail, analysing more than 800 existing biomethane plants and almost 500 projects.

The study "Biomethane in Europe" contains on more than 170 pages:

- The description of biogas production and upgrading technologies as well as gas infrastructure.
- The description of costs and revenues of a biomethane plant as well as a comparison with the costs of natural gas.
- An analysis of the most important market factors and drivers for the future biomethane production development.
- The analysis of major competitors in this market at the level of technology providers and operators/projectors.
- An analysis of 12 of the most important biomethane markets at country level.
- Additionally, **buyers of this study will receive access to ecoprolog's waste & bio Biogas module for 12 months**, which holds data on more than 10,000 biogas and biomethane plants and projects worldwide.

The study is available in English language **starting from 2,900.- €*.**

ecoprolog's waste & bio Infrastructure Monitor is an excellent complement to the study if you wish to stay up to date on all developments in the bioenergy sector. Chapter 3 of the Monitor contains all relevant news regarding new plants and projects, company and policy news in the biogas market. **Readers of our waste & bio Infrastructure Monitor will receive a discount for the study starting from 600.- €.**

Detailed information can be found at the end of this extract.

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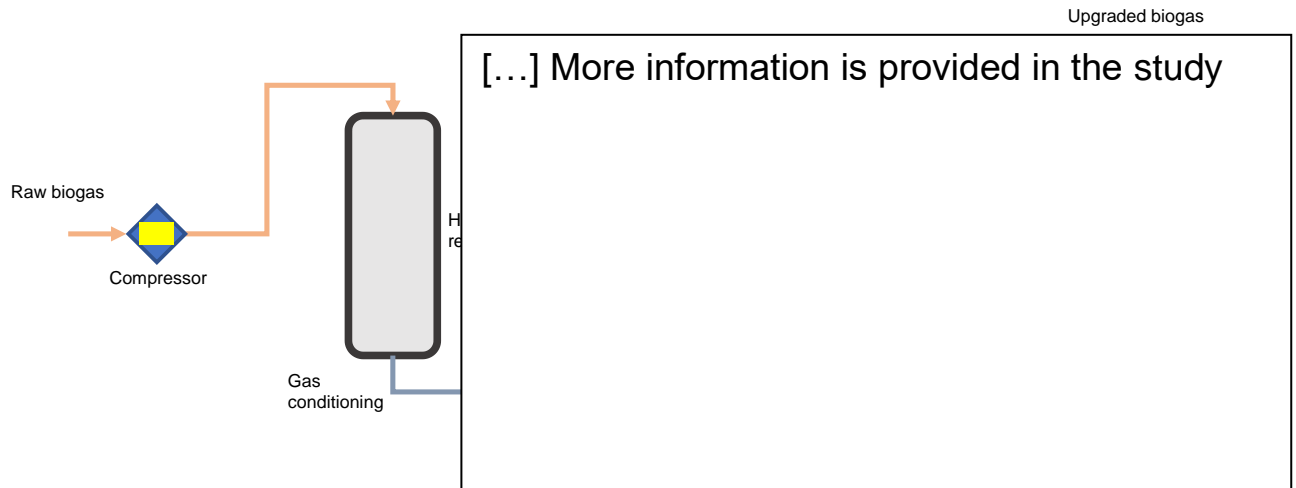
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If hydrogen sulphide is present in the biogas, the adsorbent is irreversibly adsorbed. The presence of moisture also affects the structure of the adsorbent material. Therefore, pre-treatment methods are required before the biogas enters the carbon dioxide removal column.

Figure 1 Process diagram of pressure swing adsorption



Source: ecoprolog

For larger biogas upgrading applications, multi-column plants are built for a continuous process. For small plants, single or double columns with storage facilities are used. PSA is one of the few upgrading technologies that can adapt to hot or cold weather conditions. PSA plants typically produce upgraded gas with a methane concentration of 95-98 %.

The choice of adsorption material for the PSA system determines the operating conditions and other properties of the entire cycle. The material is usually chosen according to its selectivity towards CO₂ and its pore size flexibility.

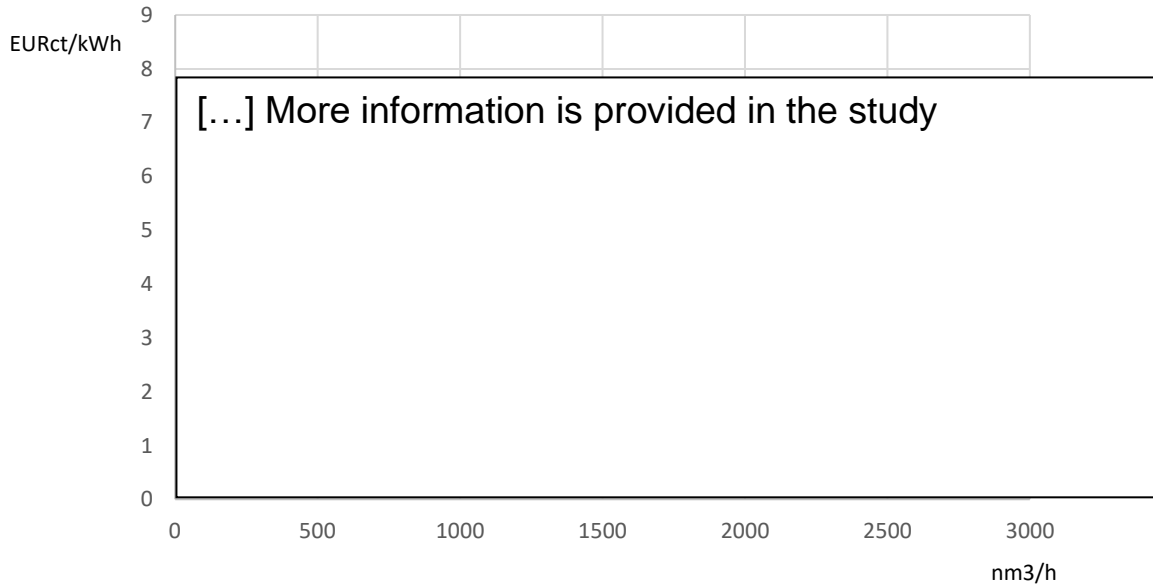
Water scrubbing

[...] More information is provided in the study

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Although the specific costs have increased in the last years compared to the values depicted, the economies of scale for the biogas upgrading become clear. The study determines a capacity of at least 250 nm³/h to be suitable for the installation of a biogas upgrading plant.

Figure 2 Specific costs for biogas upgrading



Source: Beil et al., 2019, DBFZ, ecoprolog

In Austria and Italy, investment grants specifically for the retrofit of biogas upgrading plants at existing AD plants are available.

While the investment decision for the installation of a biogas upgrading plant at an existing AD plant is an individual one, the potential for the retrofit is generally increasing with higher capacities and higher age of the existing AD asset. In the graph below, the existing AD asset as well as its average age and capacity for the countries assessed are summarized (see also the individual country chapters).

Country	Number of plants	Average Capacity (kWel)	Average Age
[...] More information is provided in the study			

Source: ecoprolog



Extract

8 Country chapters

8.1 Central Europe

Germany

Update: 02-2023

Key Facts			
Inhabitants 2019 [UN est. in million]	83.0	Number of biomethane production plants	[...]
Goal: biomethane production	[...]	Installed upgrading capacity (nm ³ /h)	[...]
Market size		Market dynamics	 [...]

Management summary

The development of the German biomethane market has slowed down significantly with the downward adjustment of the support for electricity generation from raw biogas and biomethane from 2014 on. In recent years, the market has gathered momentum again, [...]

Background and support scheme

Germany traditionally supports the electricity generation from biomethane. Electricity generation from biogas or biomethane has been supported since 2000. Through generous feed-in tariffs, biogas and biomethane plants especially boomed between 2009-2014, while subsequent cuts in the tariffs led to a slowdown of the market. Since 2017, market premiums have been awarded through auctions. Under the current version of the

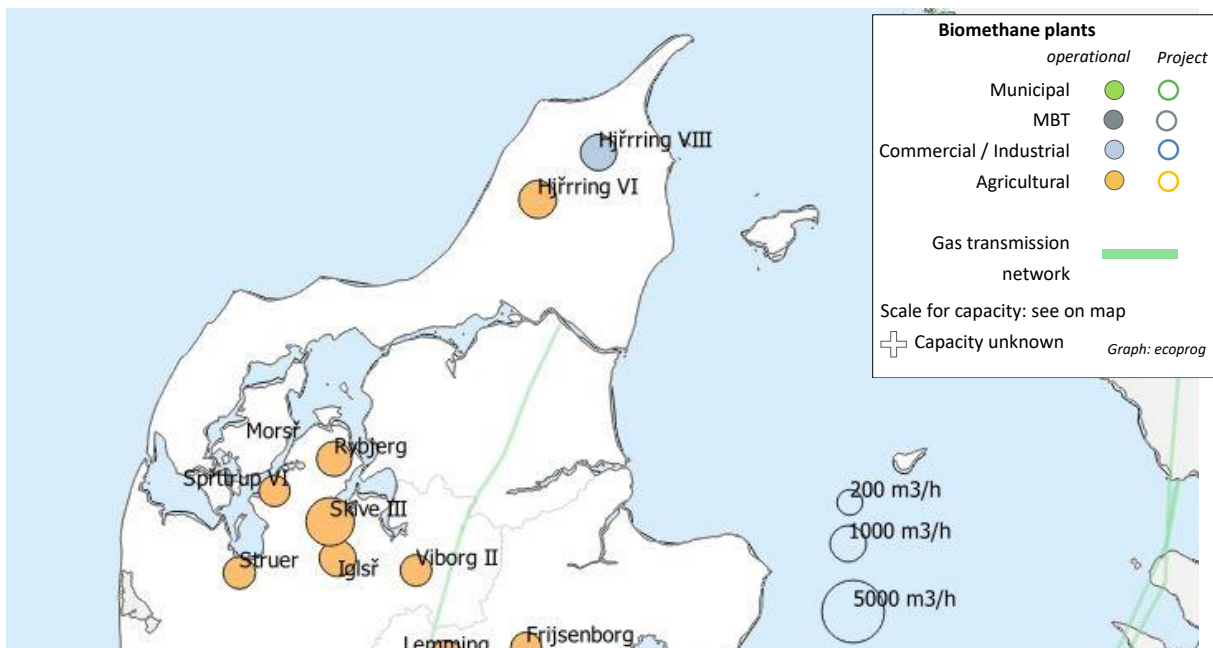
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draft, the strategy shall support the cascade use of biomass and the use of waste and residual biomass.

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Plant asset

Figure 1: Locations of plants and projects in Denmark

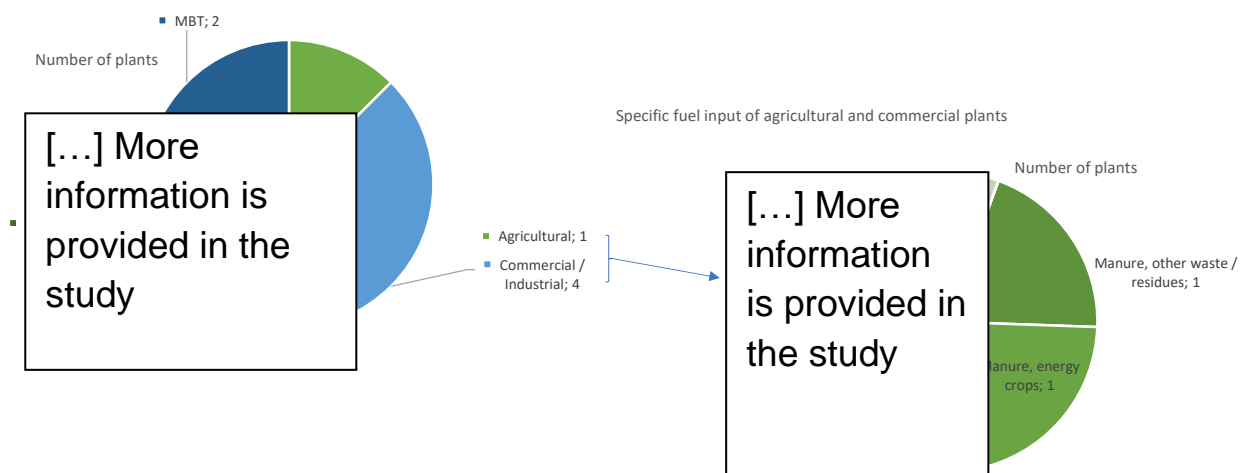


[...] More information is provided in the study

As of February 2023, there are [...] plants with a combined production capacity of about [...] (partly estimated) operational in Denmark. Many of the plants are in the segment >1000 nm³/h, leading to the large average capacity of about [...]. Recently, in 2022, two of the largest upgrading plants have become operational in Køng Sogn and Kværs, which were both developed by [...]

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Figure 3 Fuel input for biomethane plants in Spain



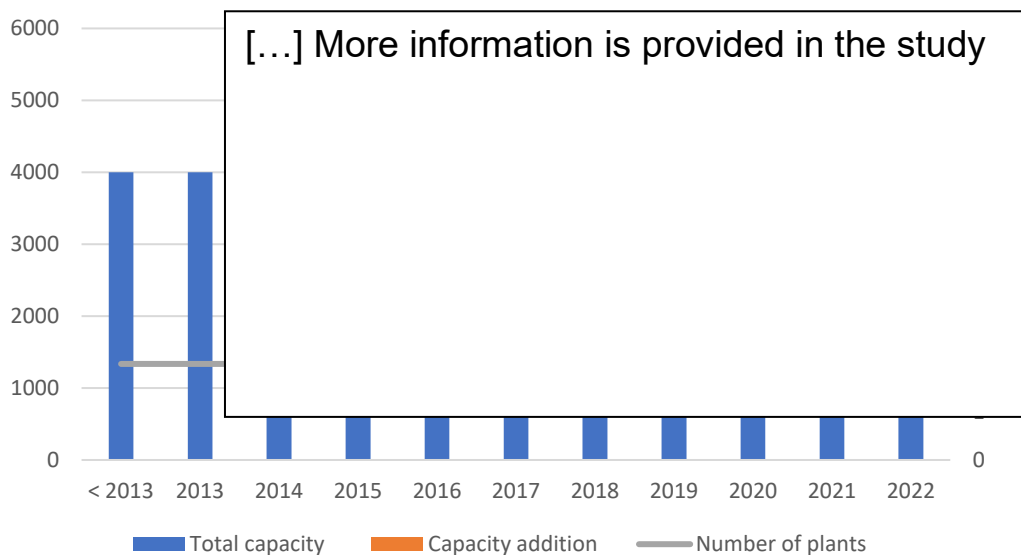
Source: ecoprolog

Additionally, we know of [...] biogas AD plants that do not upgrade the generated raw biogas. Some of the CHP plants have comparably high individual electrical capacities of up to [...].

Still, the average capacity of the remaining plants is comparably high with more than [...] of the plants are located at MBTs and another [...] treat separately collected organic waste. Other than that, agricultural plants dominate, with the majority using (partly) [...]. The average age of the plants is [...]. With most of the plants being built before 2010, AD plants will continuously drop out of their subsidy period in the next years, creating potential for the installation of upgrading plants.

Market development

Figure 4 Biomethane plant asset and capacity growth in Spain



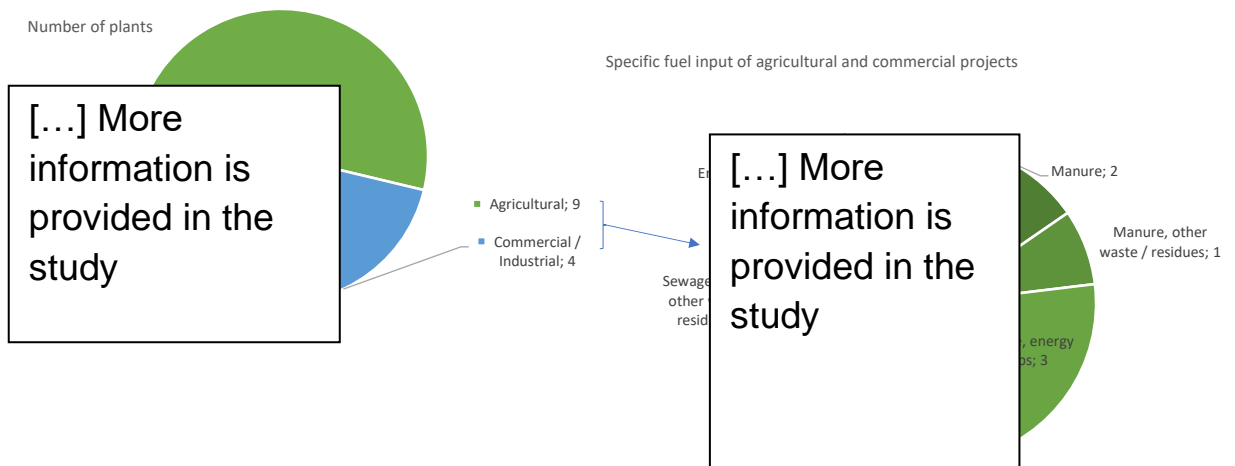
Source: ecoprolog

Spain's biomethane market is very young and is just about to start developing. [...]

The plant becoming operational in 2022 was the first plant to use agricultural fuel. It was installed at an already existing AD plant.

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Figure 5 Fuel input for biomethane projects in Finland



Source: ecoprolog

The plant in Toholammi is a biomethane refinery project, which was first reported on in September 2021. Raw biogas shall be obtained from manure, while hydrogen shall be produced with electricity from solar and wind power. It shall be added to the raw biogas to increase the methane content and thus produce

[...] More information is provided in the study

would translate in the need of additional upgrading capacities of roughly 15,000 nm³/h. This can be both achieved through building new projects as well as installing upgrading technology at existing biogas plants.

Figure 2: Project outlook Finland

Name	Fuel category	Capacity, nm ³ /h (partly estimated)	Start of operation
Hailuoto	Agricultural	n/a	2023

[...] More information is provided in the study

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[...] More information is provided in the study

Toledo V	MSW, separately collected	n/a	2023
Vencillón	Agricultural	1,200	2023

Competition

The first biomethane plant close to Madrid is operated by the local public authority. The first private biomethane plant with gas grid connection is the La Galera plant, which was developed by special purpose

[...] More information is provided in the study

with Spanish engineering company Genia Bioenergy.

Furthermore, Danish infrastructure fund Copenhagen Infrastructure Partners (CIP) has acquired two sites in La Sentiu and Linyola to develop two large industrial-scale AD plants through its CI Advanced Bioenergy Fund I in November 2022. The plants shall be developed in partnership with Spanish company Connect Bioenergy. However, the final investment decision has not been made yet.

As many of the plants are still in early development stages, the technology providers are not known.

List of active plants

You can find further information on all plants, such as specifications on technical equipment, manufacturer, or fuel, for 12 months at: <https://data.ecoprolog.com/ecopr/>. This database is updated every week. Please use the username and password that have been sent to you by e-mail.

Name	Fuel category	Capacity, nm ³ /h (partly estimated)	Start of operation
Burgos III	Commercial / Industrial	200	2021

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Price and product information

You can order the market report here:

<https://www.ecoprolog.com/publikationen/abfallwirtschaft/biomethan-europa.htm>

Price models:

- Single-user version: 2,900.- €*
- Company version: 5,800.- €*
- Corporate version: Price on request

Product information:

Single-user copy: personal copy (personalized and password-protected PDF file, sent via email)

Company version: company-wide copy (legal entity), PDF file, sent via email

Corporate version: for different, legally connected companies (e.g. sister companies, subsidiaries abroad). Price depends on number of companies and employees.

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