

STATE OF PLAY OF BIOGAS & BIOMETHANE IN EUROPE:

An update on market gaps
and policy recommendations

Cluster of Horizon Europe-funded projects on innovative
biomethane production

Second report (October 2024)



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ACRONYM GLOSSARY

AD:	Anaerobic Digestion
AIB:	Association of Issuing Bodies
BAP:	Biomethane Action Plan 2024-2040
bcm:	Billion Cubic Metres
BPA:	Biomethane Purchase Agreements
BPC:	Biogas Production Certificates
CAPEX:	Capital Expenditures
CBAM:	Carbon Border Adjustment Mechanism
CCUS:	Carbon Capture, Use and Storage
CHP:	Combined Heat and Power
CINEA:	European Climate, Infrastructure and Environment Executive Agency
CNG:	Compressed Natural Gas
CoO:	Certificate of Origin
CO₂:	Carbon Dioxide
CPB:	Certificats de Production de Biogaz
C&D:	Communication and Dissemination
EBA:	European Biogas Association
EC:	European Commission
EEG:	Renewable Energies Act
ENTSO-G:	European Network of Transmission System Operators for Gas
ETS:	Emissions Trading System
EU:	European Union
GEG:	Buildings Energy Act
GO:	Guarantees of Origin
GHG:	Greenhouse Gas
GW:	Gigawatt
GWh:	Gigawatt hour
HE:	Horizon Europe
i.e.:	<i>id est</i> (=that is)
kWe:	Kilowatt electric
LNG:	Liquefied Natural Gas
MRR:	Monitoring and Reporting Regulation
Mtoe:	Million tonnes of oil equivalent
MWh:	Megawatt hour
NECCS:	Negative Emissions Carbon Capture and Storage
NECP:	National Energy and Climate Plan
Nm³:	Normal Cubic Meter
OJEU:	Official Journal of the European Union
PJ:	Petajoule
PoS:	Proof of Sustainability
PPE:	Programmations Pluriannuelles de l'Énergie
PRTR:	Recovery, Transformation and Resilience Plan
R&D:	Research and Development

RFNBO: Renewable Fuels of Non-Biological Origin
SAEE: Ukrainian State Agency for Energy Efficiency and Energy Savings
SFEC: Stratégie Française pour l'Énergie et le Climat
SNG: Synthetic Biomethane
t/a: Tons per annum
t/d: Tons per day
TWh: Terawatt hour
UABio: Bioenergy Association of Ukraine
UDB: Union Database for Biofuels
WPG: Heat Planning Act
WTP: Wastewater Treatment Plants

EXECUTIVE SUMMARY

According to the forecasts projected by European Union (EU) Member States on their respective draft updated National Energy and Climate Plans (NECP) —collected by the European Commission in its report on the first two years of the REPowerEU scheme¹—, biogas and biomethane production could reach a range of 30-32 billion cubic metres (bcm) by 2030. Many of these countries have already submitted their updated plans, but biogas and biomethane ambitions remain unchanged in the vast majority.

Even though these figures underline the commitment to this technology and the transnational importance given to it for the decarbonization of Europe, further efforts would be needed to reach the target of producing 35 bcm of biogas and/or biomethane per year by 2030 set in REPowerEU plan.

The heterogeneity and complexity of the national biomethane markets in Europe, subject not only to European regulations but also to those of each of the Member States, make legislation the real catalyst (or limiting factor, as the case may be) for this renewable biogas to boost. Hence, it is a variable to keep a close eye on for any entity committed to the production of biomethane, either on the Research and Development (R&D) level or for industry deployment purposes.

Following the European Climate, Infrastructure and Environment Executive Agency (CINEA) expectations, this report aims to align policy recommendations developed by projects funded under the same topic (in this case, HORIZON-CL5-2021-D3-03-16 'Innovative biomethane production as an energy carrier and a fuel'²) and therefore contribute to common information and dissemination activities to increase visibility and synergies between actions supported by Horizon Europe (HE).

Creating common spaces for discussion between stakeholders from different countries makes it possible to better identify the legal and administrative barriers that hinder biomethane production and contributes to providing solutions that reduce uncertainty and facilitate investment in the medium to long term.

HyFuelUp project has overseen the coordination of this deliverable (M24), which is an update from the previous report 'Joint Policy Recommendations on Biomethane'³, published in October 2023. To do so, BIOPLAT, leader of the Communication and Dissemination (C&D) of this project, scheduled a series of early meetings to discuss the content and set a calendar of monthly

¹ European Commission: https://energy.ec.europa.eu/topics/markets-and-consumers/actions-and-measures-energy-prices/repowereu-2-years_en#:~:text=Renewable%20gases,-Tackling%20cross%2Dsectoral&text=Based%20on%20the%20ambitions%20and,investment%20mobilisation%20by%20February%202024

² European Commission: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl5-2021-d3-03-16>

³ Joint Policy Recommendations on Biomethane. https://bioplat.org/wp-content/uploads/2024/04/D8.12_Joint-Policy_EU_Biomethane_Projects_v2.2.pdf

deliveries to jointly create the draft of this second report on Joint Policy Recommendations on Biomethane.

A final meeting took place in early September to finalise the details for the editing of the final version.

1. INTRODUCTION

In recent years, the biogas sector and, particularly, the biomethane sector, has become one of the EU's key players in accelerating the ecological transition, boosting energy efficiency and resilience, and reducing geopolitical tensions arising from the import of fossil fuels.

The REPowerEU Plan⁴, aimed at reducing Europe's dependence on fossil fuel and accelerating the transition to green energy, in addition to setting a target of producing 35 bcm of biogas and/or biomethane by 2030, laid the groundwork for steering cooperation between policymakers, investors and the biomethane value chain to drive technological innovation, address bottlenecks and gaps and, ultimately, accelerate the expansion of the sector.

One of the many ramifications of this cross-border collaboration is the joint work of the four European projects funded under the HORIZON-CL5-2021-D3-03 'Hybrid catalytic conversion of renewable energy to carbon-neutral fuels'⁵ call under the topic HORIZON-CL5-2021-D3-03-16 'Innovative biomethane production as an energy carrier and a fuel': HyFuelUp, BIOMETHAVERSE, METHAREN and SEMPRE-BIO. These four HE-funded biomethane projects involve a total of 65 partners, 14 countries and 10 demonstration plants (demo sites) in 8 countries.

After publishing a first report on 'Joint Policy Recommendations on Biomethane' in October 2023, this update published one year later (October 2024) is focused mainly on pointing out new policy regulations on biomethane promotion in European countries, reviewing and updating market gaps and policy recommendations to overcome the main barriers, as well as discussing sustainability and Guarantees of Origin (GO).

⁴ REPowerEU Plan: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483>

⁵ European Commission: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl5-2021-d3-03-03>

2. UPDATE ON MEASURES TO PROMOTE BIOMETHANE PRODUCTION IN THE EUROPEAN UNION COUNTRIES

Identifying what measures are being taken in terms of promotion, support, and legal regulation of biomethane in different European countries, including those contained in each National Energy and Climate Plan (NECP), is key. It is also convenient to analyse whether the implemented measures are appropriate for the development of the sector or not, considering countries' potentials and their identified targets, according to those plans.

2.1. ANALYSIS OF THE NATIONAL ENERGY AND CLIMATE PLANS

The NECPs were established under the Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999⁶, part of the Clean Energy for All Europeans package adopted in 2019.

These plans delineate how EU countries aim to address the five dimensions of the energy union:

- Decarbonisation
- Energy efficiency
- Energy security
- Internal energy market
- Research, innovation, and competitiveness

This comprehensive approach needs coordinated efforts across all government sectors and facilitates planning to attract both public and private investments.

Timeline and 2023 Update

Member States were required to submit their first draft NECPs for the 2021-2030 period by December 31, 2018, which were then reviewed by the European Commission (EC), leading to an overall assessment and country-specific recommendations in June 2019. Following these recommendations, final NECPs were submitted by December 31, 2019. The Commission provided a detailed EU-wide assessment of these plans on September 17, 2020; followed by individual assessments for further guidance.

⁶ Regulation on the Governance of the Energy Union and Climate Action (EU) 2018/1999. <https://eur-lex.europa.eu/eli/reg/2018/1999/oj>

Member States are obligated to report progress every two years, with the Commission monitoring overall EU progress in its State of the Energy Union report. Additionally, public consultation with citizens, businesses, and regional authorities was required during the drafting process. By June 30, 2023, updated NECP drafts were due, with the Commission publishing technical assessments and country-specific recommendations by December 2023. The update should consider the new sets of climate and energy targets included in the set of proposals of the Fit for 55 Package⁷ and consider REPowerEU indicative targets, including the one on biomethane.

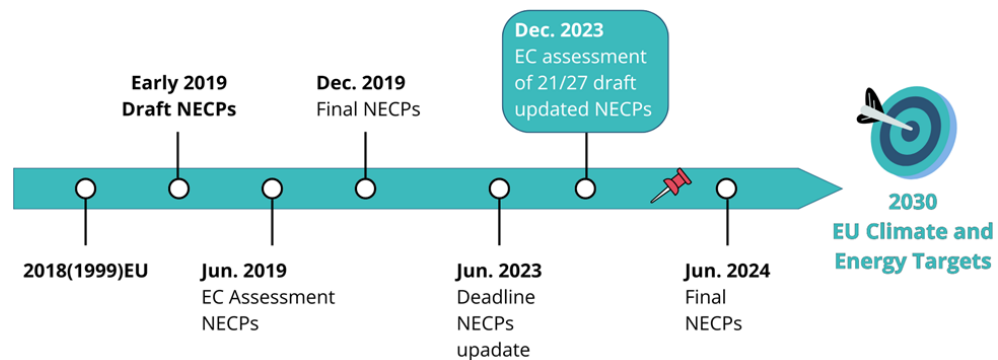


Figure 1. NECPs timeline (Source: European Biogas Association - EBA)

The European Commission revealed on 30 June 2024 that just four countries — The Netherlands, Denmark, Finland and Sweden— had met their commitment in a timely manner of presenting their updated NECPs, with the remaining 23 Member States still outstanding.

European Commission sources argue that their timely submission will help trigger the investments needed to meet 2030 targets and advance the clean transition and decarbonisation of our industry. They consider themselves to have worked hard to agree ambitious, science-based legislative targets with the European Parliament and Member States and now it would be time for national authorities to turn them into concrete plans and deliver the benefits of the green transition to European citizens and businesses.

⁷ Fit for 55 Package. <https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55/>

The European Commission's Guidance to Member States: What's in it for biomethane

The European Commission's 'Notice on the Guidance to Member States for the update of the 2021-2030 National Energy and Climate Plans'⁸ underscores the necessity for Member States to incorporate specific infrastructure and incentive measures to meet ambitious renewable energy targets. The updated NECPs must reflect the deployment strategies aligned with the REPowerEU initiative, which aims to produce 35 billion bcm of sustainable biogas and/or biomethane by 2030.

The Commission called on Member States to redouble their efforts, since projections indicated that the EU-27 would only reduce their carbon dioxide (CO₂) emissions by 51% by 2030 compared to 1990 and would fall short of the 55% they have committed to by law.

Furthermore, the Commission encourages Member States to outline any initiatives, planned actions, or international partnerships that support this goal. The guidance also calls for a comprehensive component of sustainable biogas and biomethane production, urging countries to assess their national potentials and establish clear trajectories to meet these targets by 2030 and 2050. This approach aims to ensure that NECPs are not only aligned with EU-wide climate goals but are also robust and forward-looking in their planning and execution.

The existence of a European biogas/biomethane pathway towards 2030 provides the sector with promising prospects in the medium term and can also act as a driver for investments to take place. However, as the analysis below demonstrates, the heterogeneity of the NECPs in terms of quality, units of measurement and details provided leads to complexity and, with this, comes uncertainty.

The Draft plans

At the time of preparation of the present report, only 12 countries presented their final NECPs. For the rest, all there is available so far are the draft NECPs and the European Commission's first assessment.

26 countries have so far submitted their draft report while 1 failed to submit (deadline was June 2023). Out of 26 draft NECPs, all mention at least once biomethane but only 12 have included a clear biomethane target and 17 in total have included either a biomethane or generic biogas target. The total biomethane target at the EU level as per the commitment of the 12 Member

⁸ Commission Notice on the Guidance to Member States for the update of the 2021-2030 national energy and climate plans. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX%3A52022XC1229%2802%29&from=EN>

States that have included this in the planning is 14,16 bcm a year by 2030. While some of the generic biogas targets may also contribute to the total volume, the ambition seems significantly lower than the indicative target identified by the REPowerEU Plan.

Regarding the final NECPs, only Denmark, Finland, France, Germany, Ireland, Italy, Latvia, Luxembourg, Portugal, The Netherlands, Spain and Sweden have updated their Plans, of which only Italy and The Netherlands have included biomethane targets of respectively 5.7 bcm and 2 bcm.













Countries' NECPs with a 2030 biomethane target			
 Belgium	0.11 bcm (Walloonia)	 Ireland	0.58 bcm (5,7 TWh)
 Czechia	0.5 bcm	 Italy	5.7 bcm
 Denmark	0.4 bcm (biomethane production to cover 100 % of the gas consumption in 2030)	 Lithuania	0.13 bcm (1,4 TWh)
 Estonia	0.04 bcm (380 GWh/year)	 The Netherlands	2 bcm
 France	4.15 bcm (44 TWh)	 Slovakia	0.3 bcm
 Greece	0.2 bcm (2,1TWh)	 Slovenia	0.05 bcm
TOTAL: 14.16 bcm			

Figure 2: Countries' NECPs with a 2030 biomethane target. (Source: EBA)

2.2. COUNTRIES' POTENTIAL VS IDENTIFIED TARGETS

To assess the level of ambition of Member States regarding the 35 bcm/year REPowerEU target, this report has set out to compare the proposed targets with the 2030 biomethane potential extracted from the 2022 'Gas for Climate study on Biomethane Potentials'⁹.

⁹ Biomethane production potentials in the EU. https://www.europeanbiogas.eu/wp-content/uploads/2022/07/GfC_Biomethane-potentials_2022.pdf

Table 1: Draft NECP biomethane target and 2024 updated NECPs (Source: Own elaboration based on the MS NECPs as of 09/2024)

Country	Draft NECP biomethane target	2024 Updated NECPs	2030 potential (Gas for Climate)
Austria	NECP not published	Not yet published	0.57 bcm
Belgium	0.11 bcm	Not yet published	0.62 bcm
Bulgaria	No target mentioned in NECP	Not yet published	0.67 bcm
Croatia	No biomethane target, only biogas	Not yet published	0.21 bcm
Cyprus	No biomethane target, only biogas	Not yet published	0.04 bcm
Czech Republic	0.5 bcm	Not yet published	0.72 bcm
Denmark	0.4 bcm	Political ambition: Danish biogas production should correspond to 100% of Denmark's total gas consumption by 2030	0.83 bcm
Estonia	0.04 bcm	Not yet published	0.1 bcm
Finland	No biomethane target, only biogas	No target mentioned in NECP	0.72 bcm
France	4.15 bcm	No target mentioned in NECP	6.96 bcm
Germany	No target mentioned in NECP	No target mentioned in NECP	8.14 bcm
Greece	0.2 bcm	Not yet published	0.54 bcm
Hungary	No target mentioned in NECP	Not yet published	1.03 bcm
Ireland	0.58 bcm	No target mentioned in NECP	0.7 bcm
Italy	5.7 bcm	5.7 bcm	5.79 bcm
Latvia	No target mentioned in NECP	No target mentioned in NECP	0.16 bcm
Lithuania	0.13 bcm	Not yet published	0.38 bcm
Luxembourg	No biomethane target, only biogas	No target mentioned in NECP	0.03 bcm
Malta	No target mentioned in NECP	Not yet published	0.01 bcm
The Netherlands	2 bcm	2 bcm	1.34 bcm
Poland	No target mentioned in NECP	Not yet published	3.26 bcm
Portugal	No target mentioned in NECP	No target mentioned in NECP ¹⁰	0.63 bcm
Romania	No target mentioned in NECP	Not yet published	1.99 bcm
Slovakia	0.3 bcm	Not yet published	0.3 bcm
Slovenia	0.05 bcm	Not yet published	0.1 bcm
Spain	No biomethane target, only biogas	No target mentioned in NECP	4.09 bcm
Sweden	No target mentioned in NECP	No target mentioned in NECP	1.14 bcm
TOTAL	14.16 bcm		41.07 bcm

¹⁰ However, the Portuguese NECP refers to the national Biomethane Action Plan 2024-2040 which has a biomethane target of 0.26 bcm for 2030.

Based on the spread between the target and the sustainable potential identified in the study, countries are divided into 5 categories:

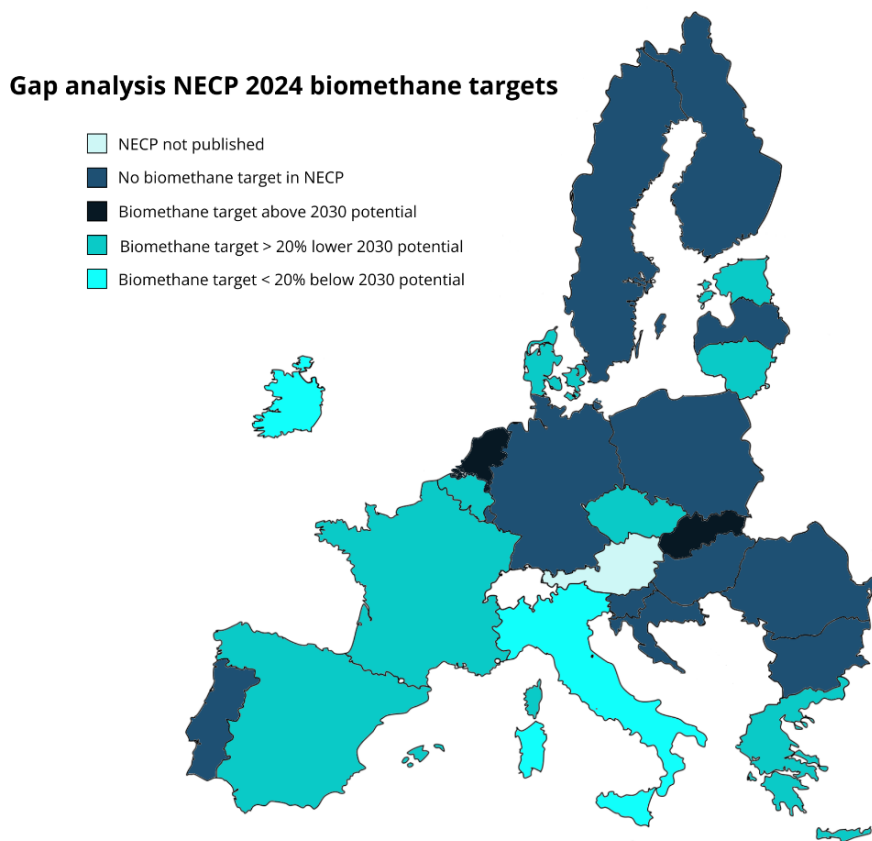


Figure 3: Countries' NECPs with a 2030 biomethane target (Source: EBA, based on the MS NECPs as of 09/2024)

Fit for 55: Drivers and challenges for biomethane development

The Fit for 55 Package, a cornerstone of the European Green Deal¹¹, includes several positive drivers for the development and deployment of biomethane, which are crucial for achieving the EU's climate targets.

Targets and Planning (RED, Governance, Gas Package)

The Council of the EU and the Parliament reached in December 2023 a provisional political agreement on a regulation that establishes common internal

¹¹ European Green Deal. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

market rules for renewable and natural gases and hydrogen¹². Finally, the Council adopted the regulation and directive on 21 May 2024, and these were published¹³ in the Official Journal of the European Union (OJEU) on 13 June 2024. This regulation is part of the hydrogen and gas markets decarbonisation package, which also includes a directive; and both the regulation and the directive are part of the Fit for 55 Package.

To aim to diversify gas supplies and phasing out dependence on Russian gas, the co-legislators agreed on Member States having the possibility to take proportionate measures to temporarily restrict gas supplies including Liquefied Natural Gas (LNG) from Russia and Belarus.

As a way of upscaling renewable gas and low-carbon gas in coal and carbon-intensive regions, the European Commission will be invited to support and encourage the penetration of renewable and low-carbon gas—in particular hydrogen and biomethane—, into the Union energy system.

As regards biomethane production and to avoid mentioning a biomethane target in the Articles, two new recitals were added: first, specifying that the Commission has proposed in its RePowerEU Plan to significantly increase the production of sustainable biomethane in the Union up to 35 bcm per year by 2030; second, stressing the link to NECPs. In addition, the European supply adequacy outlook will need to include a monitoring of the progress on the annual production of sustainable biomethane.

The percentage of blending of hydrogen is set at 2% in the Article on cross-border coordination of gas quality in the natural gas system (Article 19). Up to this threshold, Member States will be able to launch a conciliation mechanism regarding the gas quality and restriction to flows.

As well, to promote biomethane, regulation Article 20b empowered the European Commission to establish common specifications for biomethane in specific situations if market stakeholders are not able to reach a common agreement.

In Article 23 of the regulation, a Gas Quality Monitoring report is required for the European Network of Transmission System Operators for Gas (ENTSOG) in which the amount of biomethane/renewable natural gas (and hydrogen) added to the gas system should be shown. Additionally, new transparency requirements oblige the publication of the main gas quality parameters,

¹² Proposal for a Regulation of the European Parliament and of the Council on the internal markets for renewable and natural gases and for hydrogen: <https://data.consilium.europa.eu/doc/document/ST-16522-2023-INIT/en/pdf>

¹³ OJEU: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1789&qid=1727693604834>

including oxygen (of special importance for biomethane) in the ENTSOG transparency platform at relevant points of the gas network.

In case both the European supply outlook and the final updated national energy and climate plans show that the annual production is not sufficiently progressing or that the natural gas consumption is not sufficiently decreasing in view of the available potential, the Commission may issue recommendations to the Member States, if necessary to achieve the objectives of the Energy Union.

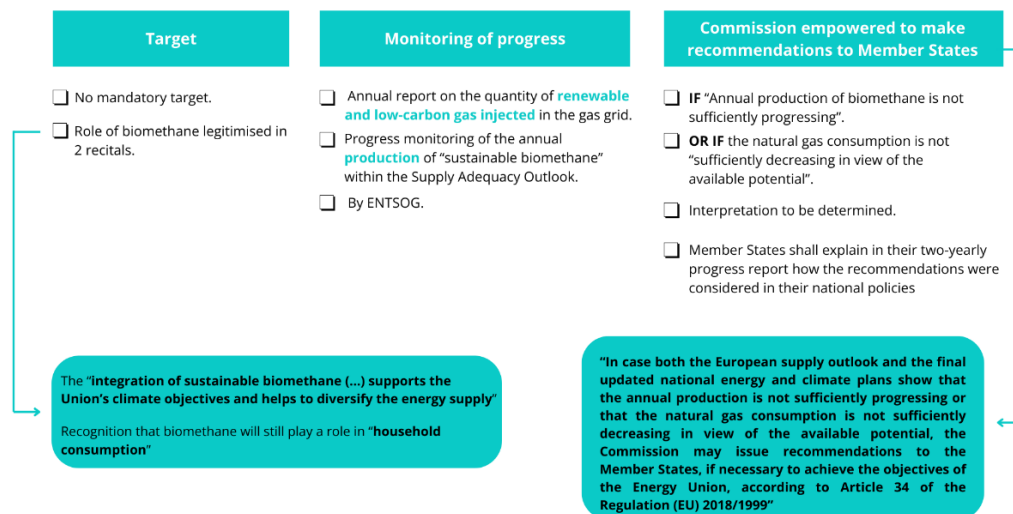


Figure 4: Targets and planning on the regulation of the internal markets for renewable and natural gases and for hydrogen (Source: EBA)

Enabling a faster scale-up

Both the European Union's new Renewable Energy Directive (RED III)¹⁴ and the Net-Zero Industry Act¹⁵ have set out to facilitate the growth of the European Union's renewable energy sector and guarantee acceleration of renewable energy and energy savings to phase-out dependence on Russian fossil fuel, always by the REPowerEU plan.

Even though it is still limited to a small number of Member States and large undertakings, with significant administrative, technical, and financial barriers remaining in large parts of the Union's market, the market for renewable power purchase agreements is rapidly growing and provides a complementary route to the market of renewable generation in addition to support schemes by Member States or to selling directly on the wholesale electricity market.

¹⁴ Renewable Energy Directive (RED III). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL_202302413

¹⁵ Net Zero Industry Act. https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en

The existing measures provided for in Article 15 of Directive (EU) 2018/2001 to encourage the uptake of renewable power purchase agreements should therefore be strengthened further, by exploring the use of credit guarantees to reduce the financial risks of such agreements, considering that those guarantees, where public, should not crowd out private financing.

In addition, measures in support of renewable power purchase agreements should be extended to other forms of renewable energy purchase agreements, including, where relevant, renewable heating and cooling purchase agreements. In that context, the Commission should analyse the barriers to long-term renewable energy purchase agreements, to the deployment of cross-border renewable energy purchase agreements, and issue guidance on the removal of those barriers.

On the other hand, further streamlining of administrative permitting procedures would be advisable to remove unnecessary administrative burdens and thus establish renewable energy projects and related grid infrastructure projects.

Based on the integrated National Energy and Climate progress reports submitted by Article 17 of Regulation (EU) 2018/1999, the European Commission has two years from the entry into force of this Regulation to consider whether additional measures are needed to further support Member States in implementing the provisions of Directive (EU) 2018/2001 on permitting procedures, including the requirement for the contact points established or designated by Article 16 of that Directive to ensure compliance with the deadlines for permit granting procedures set out in that Directive.

Such additional measures should be able to include indicative key performance indicators on, inter alia, the duration of permitting procedures for renewable energy projects located inside and outside renewable energy acceleration zones.

The Zero Net Industry Act also aims to ease the conditions for investing in green technologies by simplifying permitting procedures and supporting strategic projects.

To this end, the permit delivery period for the construction or expansion of large net-zero technology manufacturing projects (more than 1 gigawatt (GW)) will be a maximum of 18 months. For smaller projects (less than 1 GW), the permit delivery period will be 12 months. Shorter deadlines will also be set for strategic projects.

The procedure will ensure that such projects are safe and environmentally sustainable and meet environmental, social and safety requirements, irrespective of the deadlines to which they are subject.



Figure 5: Targets and planning on the regulation of the internal markets for renewable and natural gases and for hydrogen (Source: EBA)

Facilitate industrial utilisation of Biomethane

The Renewable Energy Directive introduces annual renewable energy targets for the industrial sector and requires member states to report on progress.

The EU emissions trading scheme recognises biomethane as zero-rated if compliant with the RED sustainability criteria. This ensures that Emissions allowances can be traded on the EU Emissions Trading System (ETS) market. In this way, if an EU ETS operator has reduced its emissions faster than expected, it can either sell its remaining allowances to other companies and traders on the allowance market or keep them to cover its future needs.

Installations that fall under the scope of the EU ETS may purchase biomethane to replace their natural gas consumption. In this way, they reduce their Greenhouse Gas (GHG) emissions and no longer need to surrender emission allowances in their annual emissions report for the natural gas they would otherwise have used.

To deliver these emission reductions, operators of installations covered by the EU ETS may apply a zero-emission factor to biofuels, bioliquids or fuels derived from biomass if the sustainability and GHG emission reduction criteria applicable to these fuels are met. Article 14 of the EU ETS refers to Regulation (EU) 2018/2066 on Monitoring and Reporting Regulation (MRR)¹⁶ for the application of those criteria. The MRR sets out the rules for the monitoring and reporting of GHG emissions from activities covered by the EU ETS. It has

¹⁶ Regulation (EU) 2018/2066 on Monitoring and Reporting Regulation (MRR). https://eur-lex.europa.eu/eli/reg_impl/2018/2066/oj

undergone a series of modifications, in 2020 with provisions for the treatment of biomass and in 2023 to take the revised EU ETS Directive into account.

With the amendments introduced by the Implementing Regulation (EU) 2020/2085¹⁷, the MRR now provides for a zero-rating of biomass (MRR, Article 38 (2)). For this zero-rating to apply, the MRR references the sustainability and GHG emission savings criteria set out in the Directive (EU) 2018/2001 on Renewable Energy¹⁸ (RED), so that:

- Biomass fuels used for combustion shall fulfil the sustainability and the greenhouse gas emissions saving criteria respectively laid down in paragraphs 2 to 7 and 10 of Article 29 of the RED.
- Biomass fuels produced from waste and residues, other than agricultural, aquaculture, fisheries, and forestry residues as well as waste and residues that are first processed into a product before being further processed into biomass fuels shall only meet the GHG emission-saving criteria laid out in paragraph 10 of Article 29 of the RED (MRR, Article 38 (5)).

The MRR being an implementing regulation, it is therefore of direct application in the Member States and prevails over national laws that would contradict it. This ensures that the regulation is implemented in a harmonized way across the EU. However, some Member States have incorporated the regulation into their national law by adjusting existing national legislation, while some have not transposed it at all.



Figure 6: Green Deal Industrial Plan (Source: EBA)

¹⁷ Regulation (EU) 2020/2085 on the Monitoring and Reporting of Greenhouse Gas Emissions. https://eur-lex.europa.eu/eli/reg_impl/2020/2085/oj

¹⁸ Directive (EU) 2018/2001 on Renewable Energy (RED). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC

Finally, not all Member States that allow the use of domestic GOs in the EU ETS allow the use of GOs imported from other EU countries. Where permitted, conditions specific to each country may apply.

The future: Biomethane's contribution in the decade 2030 to 2040

The EU's focus extends to 2040 as an essential milestone towards climate neutrality. The European Commission aims for a 90% reduction in GHG emissions by 2040 compared to 1990 levels, necessitating extensive decarbonization efforts across all economic sectors. Despite accelerated electrification, there will remain a significant demand for gas, which renewable gases like biomethane can increasingly fulfil.

The 2040 Climate Target Communication initiates the procedure for establishing the EU's 2040 climate objective, sparking a political discourse on the pathways available to European citizens and governments. This discussion will provide insight into the forthcoming Commission, which assumes office after the 2024 European elections. The upcoming Commission will propose legislation to incorporate the 2040 target into the European Climate Law, ensuring the implementation of an equitable and cost-effective post-2030 policy framework to achieve the 2040 objective.

The 2040 Climate Target Communication recognize that biomethane represents a “win-win solution” in achieving the EU climate and energy objectives.

While the Impact Assessment projects a heavy electrification of end uses the role of gas will still be important, although reduced. “The consumption of natural gas, biomethane and biogas reaches approximately 105 – 155 million tonnes of oil equivalent (Mtoe) by 2040 (4.5– 6.5 EJ)”.

Grid-injected gaseous fuels consumption would amount to 100 Mtoe for 2040 (~ 119 bcm, id est (i.e.) 1/3 of the EU's natural gas consumption of 2019) and 80 Mtoe by 2050 (i.e. ~95.24 bcm).

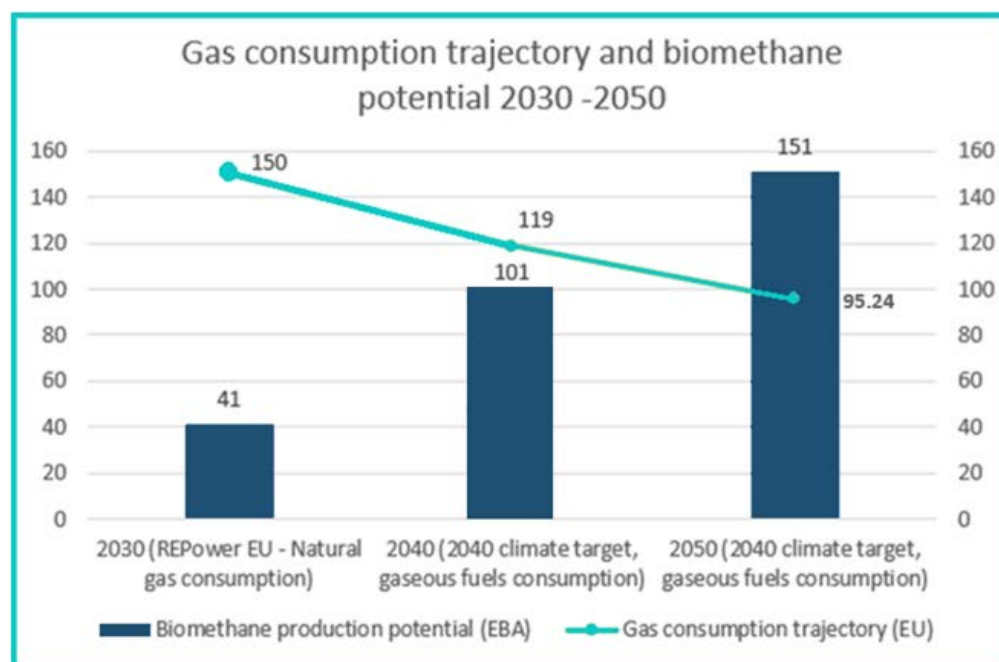


Figure 7: Gas consumption trajectory and biomethane potential 2030-2050. (Source: Own elaboration)

How substantial could the role of biomethane be by 2040? A recent report by Guidehouse¹⁹ indicates that EU-27 has the potential to produce 101 bcm of biomethane by 2040. This volume could cover a considerable part of current and future gas consumption. As of 2022, Europe produces 4 bcm of biomethane, supported by newly constructed plants and upgrades to existing biogas units. Additionally, raw biogas production, mainly utilized in combined heat and power plants, stands at 17 bcm.^{3.1}

The Guidehouse report forecasts that by 2040, the EU could produce 68 bcm of biomethane through anaerobic digestion (AD) and 33 bcm via thermal gasification. Lead contributing countries will include Germany, France, Spain, Italy, and Poland. AD's production potential is largely derived from sequential crops (42%), animal manure (19%), and agricultural residues (19%). Thermal gasification will predominantly utilize wood waste, forestry residues, and organic municipal solid waste, particularly in Sweden, Germany, Spain, the UK, and France.

¹⁹ Biogases towards 2040 and beyond. https://www.europeanbiogas.eu/wp-content/uploads/2024/04/Biogases-towards-2040-and-beyond_FINAL.pdf

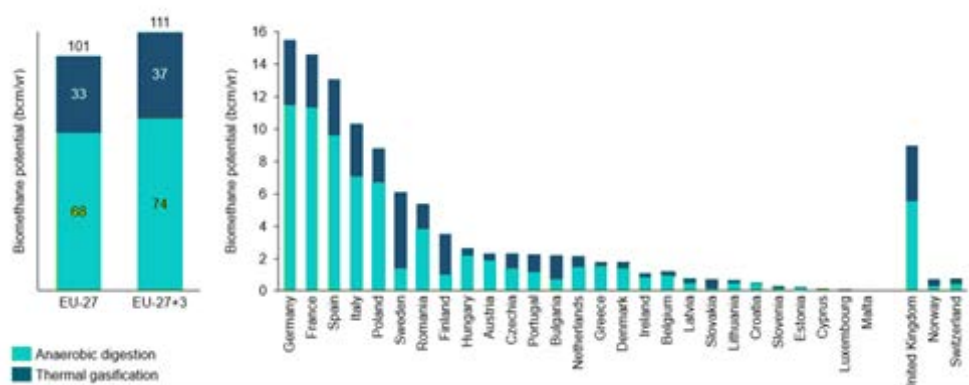


Figure 8: Biomethane potential (bcm/year). (Source: 2024, Guidehouse)

The report also revisits the 2022 Gas for Climate study²⁰, estimating that Europe could produce up to 44 bcm of biomethane by 2030 and 165 bcm by 2050. This assessment includes insights into new feedstocks and technologies that can enhance biomethane production. Realizing these potential hinges on a supportive and stable policy environment that provides certainty to stakeholders throughout the biomethane value chain.

Innovative feedstocks and technologies can further scale biomethane production without adverse effects on land use or food/feed production and can contribute to soil restoration. Prominent feedstocks include marginal and contaminated land, seaweed, and digestate. Technological advancements such as hydrothermal gasification offer versatile processing capabilities for various biogenic and fossil wastes, presenting benefits over traditional waste treatment methods like incineration.

Another promising technology is methanation, which produces e-methane by combining renewable hydrogen with biogenic CO₂. This carbon-neutral gas can replace conventional fuels and leverage existing natural gas infrastructure. Several demonstration projects across Europe are currently exploring the potential of methanation, highlighting a growing trend towards larger and more numerous plants.

²⁰ Biomethane production potentials in the EU https://gasforclimate2050.eu/wp-content/uploads/2023/12/Guidehouse_GfC_report_design_final_v3.pdf

3. POLICY, REGULATORY MARKET GAPS AND RECOMMENDATIONS IN EACH EUROPEAN UNION COUNTRY

To address further country-specific gaps and preliminary policy recommendations from the first report²¹(October 2023), information on the current cost of biomethane production contained in the BIP Europe Report²², among other sources, has been considered.

3.1. POLICY, REGULATORY AND MARKET GAPS

3.1.1. GENERAL OVERVIEW

The European Commission recognises the important benefits of biomethane in enhancing Europe's energy security and reducing GHG emissions (including the ability to generate negative emissions). Biomethane has other important benefits as an enabler of more environmentally friendly and circular agriculture and as a storable, energy-dense renewable energy source which can be transported through existing gas infrastructure.

For these reasons, there is a clear need to scale up biomethane by 2030, as outlined in the REPowerEU Plan. As a renewable and dispatchable energy source, increasing the production and use of biomethane also helps to address the climate crisis. The EU's biomethane production, either as biogas or its upgraded version, needs to reach 35 bcm per year by 2030 and the estimated investment need for the period amounts to €37 billion. Every country in the European Union must identify their regulatory market gaps and policies and try to solve them to achieve those objectives.

3.1.2. COUNTRY-SPECIFICS

BELGIUM

Growth in Belgium's biogas sector accelerated after the introduction of the National Green Certificate Scheme²³ in 2001, which awarded one certificate per megawatt-hour (MWh) of renewable electricity produced. Still, significant regional variations remain in the support schemes for biogas and biomethane. For what concerns legislation on this, the three Belgian regions (Flanders, Wallonia and Brussels Region) are considered as the competent entities. However, when it concerns renewable fuels used in transport, the federal authority is responsible. Under the revised

²¹ Cluster of Horizon Europe-funded projects on innovative biomethane production. First report (2023): https://bioplat.org/wp-content/uploads/2024/04/D8.12_Joint-Policy_EU_Biomethane_Projects_v2.2.pdf

²² BIP Europe Report. https://bip-europe.eu/wp-content/uploads/2023/10/BIP_TF4-study_Full-slidedeck_Oct2023.pdf

²³ National Green Certificate Scheme. <https://www.iea.org/policies/3827-green-certificate-scheme-federal>

Renewable Energy Directive (RED III), the transport sector must make additional efforts and reduce its GHG emissions by 14.5% by 2030 or aim to increase the share of renewable energy by 29% in final consumption by 2030.

To achieve this target, a sub-target of 5.5% is introduced for advanced biofuels, such as biomethane produced from waste, and renewable fuels of non-biological origin, with green hydrogen as the best-known example. These new targets must be transposed into federal regulations by 21 May 2025.

In 2022, Belgium produced 160 Gigawatts hours (GWh) of biomethane, with approximately 150 GWh coming from Wallonia and 10 GWh from Flanders. According to Fluxys, Belgium's transmission system operator, biomethane production could rise to 350 GWh by the end of 2023 and reach 1 terawatt hour (TWh) by 2026, depending on permit procedures.

Region: Flanders

According to the Progress Report of Biogas-E, Flanders counted a total of 147 active biogas plants at the end of 2023. Around 90% of the renewable energy from biogas is produced by agro-industrial digesters. The remaining 10% is produced by Wastewater Treatment Plants (WTP), sewage treatment plants, organic waste installations, landfill installations and pocket digesters (< 200 kilowatt-electric (kWe)). The green electricity production of all installations amounted to 787 GWh.

Four of the installations upgraded biogas to biomethane. In all cases, the upgrading is based on membrane filtration and most of the biomethane is injected into the grid. In one case, biomethane is also used in a Compressed Natural Gas (CNG) station as fuel for trucks. In another, part of the biomethane is used in the Combined Heat and Power (CHP) for the electricity and heat demand of the digester. In general, biomethane production thus remains limited compared to the neighbouring countries and despite the European boost. However, due to declining support, several biogas plants will be forced to look for a subsidy-free alternative, such as biomethane. Therefore, biomethane production is expected to increase in the coming years. Still, some operators are holding back however due to the absence of a balanced support scheme for biomethane upgrading.

In Flanders, a registry for biomethane GOs and the use of biomethane in ETS are already operational. The Flemish government has however not yet expressed any plans for the activation of biomethane. No specific targets or recognition of biomethane is given in the current policy plans even though there is a production potential of 7 TWh/y. A recent

study of Biogas-E showed that by 2030 about 1.4 TWh biomethane/y may be produced in Flanders by retro-fitted biogas installations.

DENMARK

The production of biogas in Denmark has increased significantly over recent years due to support schemes promoting the use of biogas for electricity production, process heat and upgrading to biomethane. Historically, electricity production dominated the use of biogas. However, in 2022, 80% of the biogas produced was already upgraded to biomethane, where the leftover 20% was used for industry, process, and heat and power production²⁴. By 2023, the proportion of biomethane injected into the Danish gas grid system reached 39.7%²⁵, and it is expected to reach 100% by 2030. The biogas production in Denmark is expected to reach 52 Petajoule (PJ) by 2035.

Policies supporting biogas production are currently regulated by the NECP for the period 2021-2030²⁶, and the Climate Agreement²⁷. There are multiple ongoing support schemes for biogas production, use and upgrading that derived from the Energy Agreement from 2012²⁸. However, these were closed to access as of 1 January 2020, while a cap on production support was introduced. Ongoing subsidies under these support schemes for biogas production from existing plants will be maintained until 2032, and for at least 20 years for individual plants²⁹.

Currently, the Danish Energy Agency is working on a new support framework for biogas and other green gases based on tenders, applicable only for new plants or new production capacity at existing plants³⁰. The first tender round opens in 2023, and these will extend until 2029, with a support period of 20 years. The tender includes support to produce two forms of green gas, i.e., upgraded biogas, and e-methane produced with carbon from the biogas plant and green hydrogen.

²⁴ Energistyrelsen, "Produktion af biogas," [Online]. <https://ens.dk/ansvarsomraader/bioenergi/produktion-af-biogas>

²⁵ Energinet, "Biogas via gasnettet," [Online]. <https://energinet.dk/gas/biogas/>

²⁶ Energistyrelsen, "EU Energy Union – Denmark's National Energy and Climate Plan (NECP)," [Online] <https://ens.dk/en/our-responsibilities/energy-climate-politics/eu-energy-union-denmarks-national-energy-and-climate>.

²⁷ "Klimaaf tale for energi og industri mv. 2020," Klima-, Energi- og Forsyningsministeriet, [Online] <https://www.regeringen.dk/aktuelt/tidligere-publikationer/klimaaf-tale-for-energi-og-industri-mv-2020/>.

²⁸ Energistyrelsen, "Biogas," [Online]. <https://ens.dk/ansvarsomraader/stoette-til-vedvarende-energi/biogas>

²⁹ Energistyrelsen, "Støtte til biogas," [Online]. <https://ens.dk/ansvarsomraader/bioenergi/stoette-til-biogas>.

³⁰ Energistyrelsen, "Støtteudbud til biogas og andre grønne gasser," [Online]. <https://ens.dk/ansvarsomraader/bioenergi/stoetteudbud-til-biogas-og-andre-groenne-gasser>.

The use of energy crops is also regulated in Denmark³¹. Biogas plants can increase their biogas production by using energy crops, where maize, beets, cereals, grass, clover and Jerusalem artichokes are suitable energy crops for biogas. However, from 2023/24 and the next two exercises, the energy crop limit is tightened, and a floor deduction is introduced, where the limit will be reduced from 12% to 4% in 2025/2026. Additionally, maize will be phased out as an energy crop from 2025/26. Biogas used directly for transport can only receive support for this purpose if no food is used in the production, which implies that maize, grain, beets and Jerusalem artichokes are exempt from transport support. However, the current use of energy crops is on average significantly lower than 12%, and energy crops could be replaced with residual biomass and straw to improve the sustainability of the biogas sector and its impact on the climate.

To increase the financial incentive to capture and store CO₂, two new subsidy pools have been introduced in Denmark, namely, the Carbon Capture, Use and Storage (CCUS) pool and the Negative Emissions Carbon Capture and Storage (NECCS) pool, which are expected to be phased in from 2025/26³². The NECCS supports explicitly negative emissions based on CO₂ capture from biogenic sources and its subsequent underground storage. The first tender round, however, resulted in significantly lower CO₂ storage capacity than expected. According to Biogas Danmark³³, this was due to a few tender conditions, together with the risk of large fines for lack of CO₂ storage, that prevented many potential actors from bidding for the NECCS pool. Biogas Danmark expects that future tender rounds will provide better tender conditions and will include support for the development of power-to-x technologies.

A new CO₂ taxation will be introduced in Denmark from 1 January 2025. In this regard, Biogas Danmark pointed out that green biogas delivered through the gas network will be taxed like fossil natural gas³⁴. At the same time, companies abroad will not be burdened by the new CO₂ taxation,

³¹ Energistyrelsen, "Energiagrøder til biogas," [Online].

<https://ens.dk/ansvarsomraader/bioenergi/energiagroeder-til-biogas>.

³² Energistyrelsen, "CCS-udbud og anden støtte til udvikling af CCS," [Online].

<https://ens.dk/ansvarsomraader/ccs-fangst-og-lagring-af-co2/ccs-udbud-og-anden-stoette-til-udvikling-af-ccs>.

³³ Biogas Danmark, "Lagring af biogen CO₂: fiasko eller et første vigtigt skridt?," [Online].

https://www.biogas.dk/lagring-af-biogen-co2-fiasko-eller-et-foerste-vigtigt-skridt/?_gl=1*_zaobq4*_up*MQ..*_ga*MTA0OTE4NzEwOS4xNzI0ODM0ODA4*_ga_3JBKTK2CY7*MTcyNDgzNDgwNy4xLjAuMTcyNDgzNDgwNy4wLjAuMA

³⁴ Biogas Danmark, "Paradoksalt CO₂-afgift på biogas skal afskaffes, og det haster," [Online].

https://www.biogas.dk/paradoksalt-co2-afgift-paa-biogas-skal-afskaffes-og-det-haster/?_gl=1*_1c0la9p*_up*MQ..*_ga*MTA0OTE4NzEwOS4xNzI0ODM0ODA4*_ga_3JBKTK2CY7*MTcyNDgzNDgwNy4xLjAuMTcyNDgzNDgwNy4wLjAuMA

which will impose new challenges to Danish competitiveness in the market.

Lastly, the Danish state gas distribution company Evida has proposed a new tariff model from 1 January 2025, which could have negative consequences for the green transition in industry and district heating³⁵. In this new tariff model, the incentives to use biogas will be considerably reduced due to a new and large feed-in tariff for biogas producers. According to Biogas Danmark, this will contribute to increasing the price of biogas for end users and reduce the overall deliveries of biomethane into the gas network.

FRANCE

France represents one of the fastest-growing biomethane sectors in Europe. In 2023, the total biomethane production can be amounted to 9.1 TWh³⁶. In the first quarter of 2024, France holds the leading position in Europe counting 675 biomethane plants. The corresponding total upgrading capacity of French biomethane plants accounts for 132.818 m³_{STP}/h placing the country in second place in Europe after Germany³⁷.

The Multi-Annual Energy Plan (Les Programmmations pluriannuelles de l'énergie, PPE) sets the biogas production target of 14 TWh in 2023, of which 6 TWh are biomethane injection into the gas grid. This goal was significantly surpassed due to the multiple biomethane plants that went into operation in the last years. The biomethane production costs in 2023 can be amounted to 75 EUR/MWh_{HHV}. By 2028, PPE sets the target for biogas production between 24 and 32 TWh, thereof the biomethane injection between 14 and 22 TWh and the desired biomethane production costs of 60 EUR/MWh_{HHV}. By 2030, the target is 7 to 10% biomethane in French gas consumption by 2030. By the end of 2024, a new Multi-Annual Energy Plan must be adopted.³⁸

³⁵ Biogas Danmark, "Ny tarifmodel for gas rammer industrien, fjernvarmen, biogassen og den grønne omstilling," [Online]. Available: https://www.biogas.dk/ny-tarifmodel-for-gas-rammer-industrien-fjernvarmen-biogassen-og-den-groenne-omstilling/?_gl=1*1c0la9p*_up*MQ..*_ga*MTA0OTE4NzEwOS4xNzI0ODM0ODA4*_ga_3JBKTK2CY7*MTcyNDgzNDgwNy4xLjAuMTcyNDgzNDgwNy4wLjAuMA

³⁶ DFBEW (2024a): Barometer of renewable energies in the French electricity sector - Key figures from the year 2023, Spring 2024 (in German). https://energie-fr-de.eu/de/systeme-maerkte/nachrichten/leser/barometer-frankreich.html?file=files/ofaenr/01-actualites/03-barometre/00-energiewende/DFBEW_Barometer_Energiewende_Frankreich_2023.pdf

³⁷ EBA (2024): European Biomethane Map 2024 – Data analysis. Brussels, July 2024.

³⁸ DFBEW (2024b): Regulatory framework, objectives and support mechanisms for biomethane in France, May 2024. https://energie-fr-de.eu/de/veranstaltungen/leser/online-konferenz-zu-biomethan-in-deutschland-und-frankreich-1645.html?file=files/ofaenr/02-conferences/2024/240529_Biomethan/Presentations/02_Matthieu_Boulanger_MEFSIN_OFATE_DFBEW.pdf

The draft of the French Energy and Climate Strategy (La Stratégie Française pour l'Énergie et le Climat, SFEC) was published at the end of 2023 and subsequently subject to public consultation, providing indications for the future direction of French energy and climate policy. However, SFEC is not legally binding. The targets for biogas are 11.8 TWh/a by 2023, 50 TWh/a by 2030, thereof 44 TWh to be injected into the gas grid (equivalent to 15% of biomethane in the gas grid), and 50-85 TWh/a by 2035.

Biogas plants with an installed electrical capacity of > 300 kWe have to process the biogas into biomethane and feed it into the natural gas grid. Only small-scale biomethane plants with an annual capacity of < 25 GWh can receive the fixed feed-in tariffs for 15 years, which were adjusted since 2011 three times in 2020, 2021, and 2023. For biomethane plants with greater capacities of more than 25 GWh/a, there is an auction model in place from 2023 to 2026. For the first auction round in 2023, which ended in February 2024, 500 GWh_{HHV}/a were put out for tender. Two further rounds are expected in 2024. The total production capacity put out for tender in 2024 encompasses 1.6 TWh_{HHV}/a. Concerning the auctions, the accepted bids will receive the purchase agreements for 15 years.

Contrary to these two state-aid-based models from 2026 on, the new scheme of biomethane certificates is expected to get into operation based on the green certificate system (Certificates de Production de Biogaz, CPB). Initially, CPB was introduced by the Climate and Resilience Act (loi climat et résilience). On July 7, 2024, a decree and an order defining the terms of the obligation to return BPC were adopted in France.³⁹

According to that, the national gas suppliers must return the certificates to the French state. They can produce and feed biomethane into the gas grid or purchase certificates from biogas producers. Relevant is the amount of gas supplied to the end customers, which will have to pay the price of the biomethane development. In addition, one further instrument is represented by the Biomethane Purchase Agreement (BPA), which can be concluded between producers and (industrial) consumers with guaranteed contract length, price, and volumes of biomethane.

The obligation to return BPCs will:

- Support the production of biomethane,
- Accelerate the deployment of methanization installations across France,

³⁹ Decree no. 2024-718 of 6 July 2024.

https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000049891497?init=true&page=1&query=2024-718&searchField=ALL&tab_selection=all

- Contribute to reducing GHG emissions by substituting natural gas with renewable energy.

The decree and order include specific provisions for methanation installations that have been in service for more than 15 years. These installations will be able to continue producing biomethane and benefit from the CPB system. The first period of the obligation to return biogas production certificates extends from January 1, 2026, to December 31, 2028.

Each gas supplier is required to provide:

- In 2026: 0.0041 biogas production certificates per megawatt-hour (MWh) of the higher heating value of gas consumed by the supplier's customers;
- In 2027: 0.0182 biogas production certificates per MWh higher heating value;
- In 2028: 0.0415 biogas production certificates per MWh higher heating value;

In other words, the obligation approximately increases tenfold between 2026 and 2028. Their design is still in progress. Currently, only 2 BPA are in place. The planned return amount can be accounted for 1.2 TWh in 2026, 5 TWh in 2027, and 10.4 TWh in 2028.

The general development is towards competitive biomethane production without state support due to the relative maturity of the sector. Overall, the challenge is to decrease production costs which are under the influence of high capital expenditures, biomass availability, and high electricity prices. The average feed-in tariff for new facilities can amount to around 150 EUR/MWh in 2023. The transition process is accompanied by the stakeholder dialogue with gas producers, suppliers, etc., and the administration on public policy design and possible challenges.

The deployment of substrate for anaerobic digestion in France has been marked by using organic residues and manure. French public policies focused on manure-based biogas, especially in the 2000s and limited the use of energy crops to 15% of the annual substrate amount to avoid competition with food production. Within the French Energy and Climate Strategy (SFEC), the focus is especially on intermediate crops as a valuable source for biomethane production. Due to the biomass tensions, the priority setting for different types of biomethane uses is required. Technologies such as methanation or gasification can contribute to reaching the production goals set within the SFEC for 2030 and beyond.

Biogenic CO₂ sources, such as those from biogas and biomethane plants, are increasingly in demand. A new market for biogenic CO₂ emerged in France especially due to the recent development in 2022/2023 with the CO₂ production capacities of around 3,200 t/a of biogenic CO₂ (except a few examples) due to the smaller average size of 197 m³STP/h in biomethane plants in the country⁴⁰.

Currently, the focus is clearly on CO₂ valorisation in greenhouses while producing food-grade CO₂.

GERMANY

At the end of 2023, around 8,700 biogas plants (including upgrading plants for biomethane) were in operation in Germany. The total biogas production amounts to around 100 TWh. Of this, around 1/10 of the biogas produced in Germany is currently upgraded to biomethane and fed into the natural gas grid. There are currently around 250 biogas plants with upgrading technologies to produce biomethane in operation.

The majority of the biomethane-produced results from energy crops. The Renewable Energies Act EEG⁴¹ (use in CHP) continues to be the most important utilization path for biomethane. Around 77% of the total biomethane was used in the EEG sector for CHP plants in 2022⁴².

However, waste-based biogas/biomethane is increasingly becoming a promising option for the fuel market. The requirements of RED II and RED III and the new regulation on the GHG quota in the Federal Immission Control Act open new prospects for the use of biomethane from residues and manure in the fuel market. In the transport sector, biomethane is primarily used as an advanced biofuel made exclusively from waste and residues and is intended in particular to help decarbonize heavy goods transport.

The energy crisis (gas shortage) and falling GHG quotas due to the introduction of palm oil derivatives from China led to market distortions in the biomethane sector. Due to the significantly higher willingness to pay in the fuel sector—especially for biomethane from manure but also from other residual and waste materials—the last biomethane tenders were not attended. For electricity generation

⁴⁰ Denysenko, V.; Daniel-Gromke, J.; Binder, P. M.; Foix, L. (2023). Opportunities for the valorisation of CO₂ extracted from biogas (11/2023) <http://sempr-bio.com/wp-content/uploads/2024/10/SB-WP4-D4.1-OpportunitiesValorizationCO2-PU.pdf>

⁴¹ Renewable Energies Act EEG. https://www.gesetze-im-internet.de/eeg_2014/

⁴² Marktmonitoring Bioenergie 2023. https://www.dena.de/fileadmin/dena/Publikationen/PDFs/2023/ANALYSE_Marktmonitoring_Bioenergie_2023.pdf

in highly flexible biomethane power plants, it is assumed that biomethane based on cultivated biomass (energy crops) will be considered for use in the CHP sector in the medium term.⁴³

With the EEG 2023, both the annual tender volumes for new highly flexible biomethane plants with 600 MWe per year (from 2023 until 2028) and the requirements for flexible plant operation were increased by reducing the rated output (from 15 to 10%) to focus more strongly on highly flexible peak load power plants with a short operating time of maximum 876 hours per year.

Against the background of the current regulations of the EEG, no further increase in electricity generation from biogas can be expected from the existing plants and new construction activity via the tenders in recent years. The number of decommissioning and final closures in the biogas sector is already increasing. In addition to adjustments to the tendering volumes in conjunction with incentives for flexible plant operation and the expansion of reasonable heat utilization concepts, further incentives are needed to significantly increase the proportion of biogenic gases and thus ensure the security of the supply of domestic biogas and biomethane. With the introduction of the Heat Planning Act (WPG)⁴⁴ and the need for municipal heat planning and minimum shares for renewable heat in existing buildings (Buildings Energy Act, GEG), new opportunities are also seen for the use of biogas in the heating sector.

In the first half of 2024, further adjustments for the expansion of renewable energies were made as part of the so-called 'Solar Package I', whereby —as the name suggests— the focus was on the regulations for the further expansion of PV and wind - less so on biomass.

Given the target of climate neutrality in the EU by 2050 and the required defossilisation of industrial sectors, the production of biogas and biomethane with subsequent CO₂ capture and utilization will continue to increase in the future. Biogenic CO₂ sources, such as those from biogas and biomethane plants, will be increasingly in demand. In combination with green hydrogen, biogenic CO₂ from biogas can increase the quantities of Synthetic Biomethane (SNG).

⁴³ Preparation and support in the preparation of a progress report in accordance with the Renewable Energy Sources Act. https://www.bmwk.de/Redaktion/DE/Downloads/E/erfahrungsbericht-biomkdg-230818.pdf?__blob=publicationFile&v=2

⁴⁴ Heat Planning Act (WPG). <https://www.bmwsb.bund.de/SharedDocs/gesetzgebungsverfahren/Webs/BMWSB/DE/kommunale-waermeplanung.html>

Biogenic CO₂ from biogas and biomethane plants is increasingly being utilized, both in Germany and in Europe. Most CO₂ capture plants currently in operation supply food-grade CO₂ from biogas and biomethane. The survey results on the planned plants in European countries show that the future use of CO₂ will primarily be in the food and beverage sector and power-to-X technologies, while the previous use of CO₂ in greenhouses is receding into the background.

An overall national biomass strategy is currently being developed by the German government and three Federal Ministries for Economic Affairs and Climate Action, Agriculture and Food, and Environment with a multi-stage stakeholder dialogue.

There are currently no fixed targets (fixed target values) for biomethane. The main obstacles to the expansion of biomethane are still the same as those described in the 1st report. Important is an overall perspective and reliable, long-term framework conditions for the biomethane market.

ITALY

Italy ranks among Europe's leading biogas producers, with over 1,800 operational plants in 2023, making its biogas market second only to Germany's. In 2023, Italy produced a total of 25 TWh of biogas. Additionally, Italy is one of the continent's fastest-growing biomethane markets. The biomethane sector expanded from a single plant in 2018 to 96 operational plants by the end of 2023, generating 7.8 TWh of biomethane annually.

Recent regulatory support, such as the Decree n.99 from the Ministry of the Environment and Energy Security of March 12, 2024⁴⁵, was established to support investment bankability for biogas innovations. Further incentives are provided by the FER2 Decree (DM 19/06/2024)⁴⁶, which aims to increase renewable energy, including 150 MW of electric capacity from biogas, by 2028 to help meet Italy's 2030 decarbonization targets. Under FER2, incentives are awarded through public competitive processes run by Gestore dei Servizi Energetici (GSE) from 2024-2028, with minimum guaranteed prices set at €200-240/MWh to ensure production cost coverage.

⁴⁵ Dm Ambiente 13 marzo 2024, n. 99. <https://www.reteambiente.it/normativa/54210/dm-ambiente-13-marzo-2024-n-99/>

⁴⁶ Decreto 19 giugno 2024 recante "Incentivazione degli impianti a fonte rinnovabile innovativi o con costi di generazione elevati che presentino caratteristiche di innovazione e ridotto impatto sull'ambiente e sul territorio" https://www.mase.gov.it/sites/default/files/Archivio_Energia/Archivio_Normativa/dm_19-06-2024_FER2.pdf

Italy's biomethane sector has also advanced significantly, starting with its first biogas plant upgrade in 2012. Although early plants were small and not grid-connected, government support in 2018 spurred growth, particularly in biomethane for transport. By 2022, the number of biomethane plants had reached 48, doubling to 96 by 2023, marking Italy as one of Europe's fastest-growing biomethane markets. Estimates suggest that Italy will reach 130 operational biomethane plants by mid-2024.

Plants beginning operations in 2023 could select from incentives in two overlapping decrees—the March 2018 Decree, which focused on biomethane for transport, and the Biomethane Decree of September 15, 2022, which expanded use to other sectors. The 2022 Biomethane Decree allocated €1.73 billion from the EU's Recovery and Resilience Facility under Italy's National Recovery and Resilience Plan (NRRP) and €2.8 billion in incentive tariffs over 15 years. By August 2024, four tenders had been completed, with 243 plants approved, collectively producing up to 10.6 TWh/year (about 1 bcm). To qualify for this funding, plants must be completed by June 30, 2026. Italy's finalized National Energy and Climate Plans (NECPs) include a biomethane target of 5.7 bcm by 2030, covering roughly 9% of current natural gas imports.

As a result of the 2018 Decree strongly promoting biomethane production for the transport sector, almost all of Italy's biomethane production is currently used in transport as 'advanced' fuel. By 2023, Italy had 1,672 CNG and 166 LNG filling stations, with 8 active biomethane filling stations, including 3 Bio-LNG stations. By the end of 2023, 15 Bio-LNG plants were operational in Italy, with a planned total Bio-LNG production capacity of approximately 3 TWh annually by 2025.

NORWAY

Biogas production in Norway has overcome 700 GWh but is still very limited compared to neighbouring countries such as Denmark (> 5 TWh) and Sweden (> 2 TWh). Data published by IEA Bioenergy⁴⁷ show that solid biomass (55% of bioenergy supply) and liquid biofuels (27%) represent the two most relevant sources of bioenergy production in Norway; on the other hand, only 5% is associated with biogas.

However, there has recently been a significant increase in the number of large industrial plants to produce upgraded and liquid biogas. 50 biogas plants are currently registered in Norway (Figure 1): 10 of these are food waste and composting facilities, 28 are sewage and sludge-based

⁴⁷ IEA Bioenergy. <https://www.ieabioenergy.com/>

facilities, while the remaining 12 treat hatchery sludge and animal manure⁴⁸.

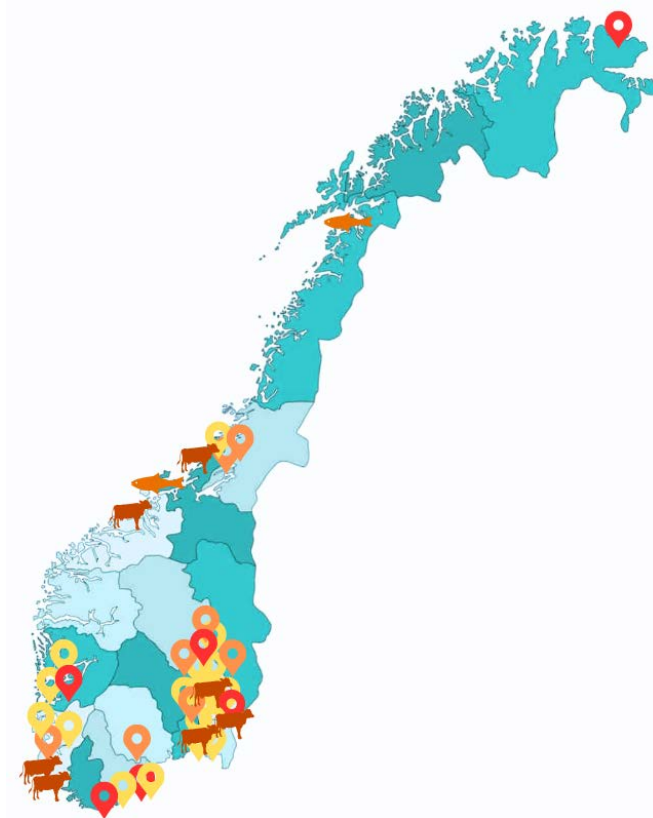


Figure 9: Biomethane production plants in Norway. (Source: Biogasstatistikk 2021 – Norwaste)

The most relevant examples are⁴⁹:

- Biokraft AS. The production started in 2018, and the capacity is about 12.5 million normal cubic meters (Nm³) of liquefied biomethane per year. The system will process fishery waste and residual paper mill slurry to biogas, which will be further converted into biomethane to be liquefied, cooled to minus 160°C, and stored in insulated tanks⁵⁰. Having the biogas in the liquid phase, rather than as compressed gas, makes it a viable fuel for heavy-duty vehicles since larger energy can be stored onboard;

⁴⁸ Biogasstatistikk 2021 – Norwaste. <https://norwaste.no/en/biogasstatistikken-er-enderlig-ute/>

⁴⁹ Implementation of bioenergy in Norway – 2021 update. https://www.ieabioenergy.com/wp-content/uploads/2021/11/CountryReport2021_Norway_final.pdf

⁵⁰ World's largest liquid biogas-producing plant due to open in Norway | European Biogas Association. <https://www.europeanbiogas.eu/worlds-largest-liquid-biogas-producing-plant-due-open-norway/>

- Greve Biogas/municipality of Tønsberg is a biogas production plant integrated with a liquefaction plant. The total capacity is 180-200 GWh per year;
- In 2022, the biomethane plant in Stord municipality (western Norway) was re-opened by Renevo AS after the expansion of the capacity and substrate input to 55,000 tons per annum (t/a) (42,500 t/a cattle manure, 11,250 t/a salmon farming waste, 1,250 t/a fish sludge). The plant is expected to produce 8 tons per day (t/d) of bio-LNG and 10 t/d of biogenic CO₂. Renevo AS signed an agreement with Nippon Gases Norway AS, the largest supplier of CO₂ for commercial use in Norway, on biogenic CO₂ from the plant site in Stord municipality to be used for cooling, water treatment, production of dry ice and carbonated beverages.⁵¹
- VEAS owns the largest WTP in Norway, which is located in Asker. The capacity is about 70 GWh per year.

Currently, 70 to 80% of biomethane production is exploited for public local transportation, but the short-term plan is to increase its use for long-distance transport.

The key role of biomethane towards the achievement of defossilisation and decarbonization targets in Norway is reflected also by political actions, with a claimed aim to reach 10 TWh productivity by 2030. In June 2021, the Norwegian Parliament voted to equalize biogas with electricity and hydrogen in all public policies, both on a national and local level⁵².

The key step forwards arising from the new legislation were to achieve equal treatment of biogas, electricity, and hydrogen, to secure the development of all infrastructure needed for zero and low-emission technologies and to improve the financial support scheme from the Norwegian authorities for filling stations and heavier vehicles, to enhance the financial support for biogas-fed vehicles, as well as to harmonize the Norwegian biomethane policies and market with the other Nordic countries.

⁵¹ Denysenko, V.; Daniel-Gromke, J.; Binder, P. M.; Foix, L. (2023): Opportunities for the valorisation of CO₂ extracted from biogas. Deliverable 4.1 Report with the current state, progress made up to date and future challenges of advanced technologies for efficient CO₂ valorisation at multiple scales, from pilot to market scale, in the European Union. EU-Projekt SEcuring doMestic PRoduction of cost-Effective BIOMethane (SEMPRE-BIO), GA 101084297, 30.11.2023

⁵² Norway: Biogas equal to electricity and hydrogen in all policies | European Biogas Association.
<https://www.europeanbiogas.eu/norway-biogas-equal-to-electricity-and-hydrogen-in-all-policies/>

In conclusion, there are large opportunities for producing considerably more biogas in Norway. If a larger share of the theoretical production potential is used, biogas has the potential to represent a significant part of the future energy and fuel mix in Norway.

PORTUGAL

According to EBA, 62 biogas plants were in operation in Portugal in 2022 with the country's total biogas production floating around 900 GWh/y. Currently, only one is producing biomethane and injecting it into the national gas grid but the sector is gaining momentum with 3 plants under construction, totalizing an expected production capacity of 174.7 GWh/y, and more being planned.

Biomethane production is still in an early stage, but Portuguese legislation has been gradually pushing towards biomethane production. In 2020, Decree-Law n^o. 62/2020 from the 28th of August, allowed grid injection of renewable gases (biomethane and hydrogen). Since 2022, gas distributors that supply over 2000 GWh/y are obligated to inject at least 1% biomethane or renewable hydrogen into the gas grid (Decree-Law n^o. 30-A/2022, from 18th of April⁵³), which is verified by a guarantee of origin system. Furthermore, Portuguese legislation has established minimum quotas for low-carbon fuels in the transport sector, including biomethane. Since 2023, a minimum of 11.5% is required, and the value escalates to 16% in 2029, as defined by Decree-Law N^o. 84/2022, 9th of December⁵⁴.

Much of these developments have been boosted by the Portuguese Biomethane Action Plan 2024-2040 (BAP)⁵⁵, which was published by the Resolution of the Council of Ministers n^o. 41/2024 from 15th of March 2024, and includes 20 action lines divided into 2 phases and 1 transversal axis. The document estimates that Portugal can produce 2.7 TWh of biomethane by 2030 and 5.6 TWh in 2040, which is expected to replace 9.1% and 18.6% of natural gas injected into the grid, respectively.

The updated version of the Portuguese NECP already includes the targets and main recommendations considered in the BAP 2024-2040. After completing a formal period of public consultation, the final document is now pending approval by the Portuguese Parliament and includes the creation of several support mechanisms and legislation reforms to

⁵³ Decree-Law n^o. 30-A/2022, from 18th of April. <https://diariodarepublica.pt/dr/detalhe/decreto-lei/30-a-2022-182213906>

⁵⁴ Decree-Law N^o. 84/2022, 9th of December. <https://diariodarepublica.pt/dr/en/detail/decreto-law/84-2022-204502328>

⁵⁵ Resolution of the Council of Ministers No. 41/2024 <https://files.diariodarepublica.pt/1s/2024/03/05400/0003000080.pdf?lang=EN>

increase anaerobic digestion capacity and accelerate and simplify project licencing for biomethane production. The NECP also points to the end of the usage of natural gas for electricity production until 2040.

Regarding incentives, the national recovery and resilience plan included a 145 M€ Capital Expenditures (CAPEX) support for renewable hydrogen and biomethane production intending to increase the installed capacity for both renewable fuels by 200 MW, which was reinforced under RepowerEU, with 70 M€ to further increase production capacity to 277 MW, according with the Ordinance n°. 168/2024/10 from 18th of June.

Additionally, a 140 M€ scheme to support the production of renewable hydrogen and biomethane was published by the Ordinance n° 15/2023, from 4th of January and expects to reach 150 GWh/y of biomethane with a maximum cost of 62 €/MWh. Under the scheme, the aid would take the form of a variable premium under a two-way contract for the difference of 10 years and will be awarded by a competitive bidding process where beneficiaries are selected based on the strike price per MWh of renewable hydrogen or biomethane offered.

Biomethane production in Portugal could be improved by simplifying and speeding up the licensing of greenfield and brownfield projects. At the same time, differentiating funding opportunities between hydrogen and biomethane production has also been pointed out as necessary to accelerate developments in the national biomethane sector.

ROMANIA

Romania has recently published its draft National Energy Strategy for the period 2025-2035⁵⁶, following a round of public consultations. This strategy is notable for being one of the first legislative acts to place significant emphasis on the biomethane sector, recognizing its potential as a key replacement for natural gas. Romania is identified as one of the European Union Member States with the highest biomethane production potential, with projections of reaching 2 bcm by 2030, 5.5 bcm by 2040, and 8 bcm by 2050. While the document acknowledges that there is currently no biomethane production in Romania, it stresses the importance of developing this sector and outlines the need for financial incentives to stimulate its growth.

The draft strategy also addresses the need for a guarantee of origin registry for biomethane, akin to the system already in place for electricity.

⁵⁶ Strategia Energetică a României 2025-2035: <https://energie.gov.ro/strategia-energetica-a-romaniei-2025-2035-cu-perspectiva-anului-2050-versiunea-actualizata-care-a-rezultat-in-urma-procesului-de-consultare-publica-desfasurat-in-perioada-14-iunie-13-iulie-2024-si/>

This registry would help ensure transparency and traceability in the biomethane market, fostering consumer confidence and supporting market development. On the financial side, the strategy highlights that initial financial support will be necessary to assist producers in establishing their operations. Notably, the value of GO that benefits from state support will be lower than those issued to producers who finance their production facilities from private funds. Funding for these initiatives is expected to come from the Modernisation Fund (Recovery and Resilience Plan funds).

In terms of specific targets, the draft strategy sets ambitious goals for biomethane's contribution to the national gas supply. By 2030, biomethane is expected to represent 5% of the gas provided in the network, with this share projected to increase to 10% by 2050.

SPAIN

In 2020, 146 biogas plants were in operation in Spain according to the Spanish Biogas Roadmap⁵⁷, and the total biogas production capacity was around 300 MWh. Of this, just 1 of the 146 biogas plants upgraded to biomethane and fed into the natural gas grid. Since then, many things have changed.

The Spanish Biogas Roadmap established a biogas production target of 10.41 TWh in 2030. This target has been updated through the National Energy and Climate Plans 2023-2030⁵⁸ published in September 2024. Biogas and biomethane production is increased by exploiting the available potential from different sources. The biogas forecast involves doubling the amount quantified in the Biogas Roadmap, reaching 20 TWh in 2030.

To achieve this biogas production target there are several lines of action underway, including the development of innovative renewable energy facilities, the incorporation of renewable energy into the industrial and residential sectors and, at the same time, generating biogas knowledge, dissemination and awareness-raising.

Even though there is not a specific biomethane production target in Spain, the number of biogas plants upgraded to biomethane and fed into the natural gas grid is increasing gradually. There are currently 11

⁵⁷ Spanish Biogas Roadmap. https://www.miteco.gob.es/content/dam/miteco/es/energia/files-1/es-es/Novedades/Documents/00HR_Biogas_V6.pdf

⁵⁸ Ministerio para la Transición Ecológica y el Reto Demográfico (2024): Plan Nacional Integrado de Energía y Clima. Actualización 2023-2030 https://www.miteco.gob.es/content/dam/miteco/es/energia/files-1/pniec-2023-2030/PNIEC_2024_240924.pdf

biomethane plants in operation and around 80 biogas/biomethane plants whose projects are involved in the development phase.

To continue developing the biogas and biomethane sector, two programmes to support feasibility studies on biogas and biomethane were opened in April 2024, such as Biomethane for Heavy Transport Programme and Biogas for Power Generation, Heating and Cooling Programme.

It is planned that, in the next months, the second call for biomethane and biogas innovative projects shall be published since the public consultation on the regulatory basis took place in April. In addition, from 26 September to 31 October took place the fifth call of the aid Programme for singular energy communities pilot projects (CE IMPLEMENTA) in which the development of biogas/biomethane facilities for heating and cooling was among the chosen actions.

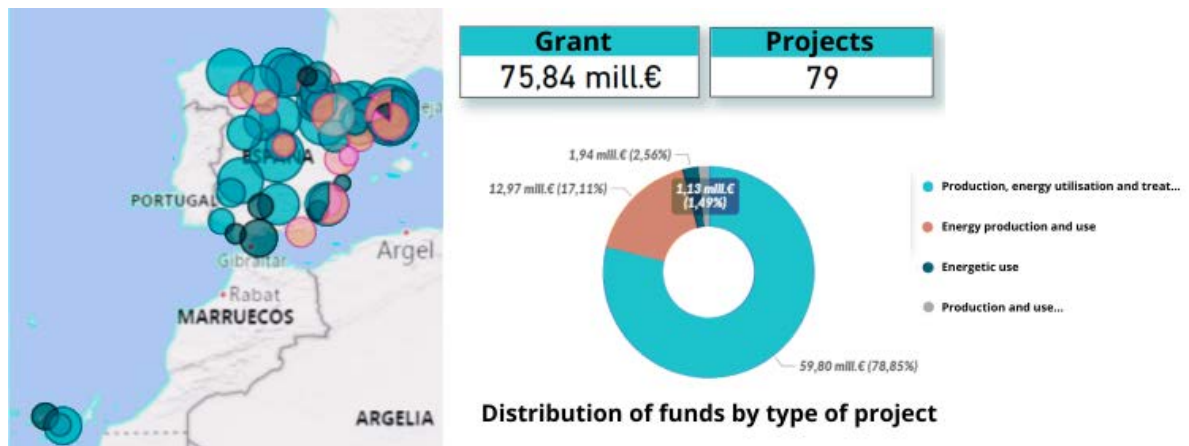


Figure 10: Result of the first call for grant applications for projects for unique biogas facilities. (Source: Instituto para la Diversificación y Ahorro de la Energía, IDAE, 2024)

RD 376/2022⁵⁹ establishes the creation of a Committee of Subjects of the system of guarantees of origin, which will have a dual function: to know and be informed of the functioning and management of the system of guarantees of origin, and to draw up and channel proposals that may result in the better functioning of the system, including the proposal of modifications to the management procedure to the Ministry for Ecological Transition and the Demographic Challenge.

⁵⁹ Ministerio para la Transición Ecológica y el Reto Demográfico (2022): Real Decreto 376/2022. <https://www.boe.es/buscar/doc.php?id=BOE-A-2022-8121>

Some regions are currently developing their own strategies to promote the construction and start-up of new biomethane plants in Spain:

In May, the region of Catalunya published the Catalan Biogas Strategy 2024- 2030⁶⁰ which sets a biogas generation target of 2 TWh/year. It foresees the development of 12 new biogas plants each year contributing, in this way, to decarbonization.

Finally, in June, the public consultation on the draft Royal Decree for the Castilla-La Mancha region Biomethane Action Plan took place. This biomethane action plan aims to manage and recover the agricultural and livestock wastes generated and to develop biomethane generation in this region.

UKRAINE

Ukraine and the EU signed the Memorandum of Understanding on a Strategic Partnership on Biomethane, Hydrogen and Other Synthetic Gases⁶¹ in February 2023, highlighting the importance of the development of the sustainable gases sector by sustainability and EU definitions for bioenergy. It also remarked on the market integration and cross-border trade, while implementing the EU legislation into Ukrainian law such as the Renewable Directive (RED) and Gas and Hydrogen Package (European Commission, 2023). As of October 2024, the Roadmap for implementing the Memorandum of Understanding between the EU and Ukraine on a Strategic Partnership on Biomethane, Hydrogen, and other Synthetic Gases is under development.

As a result of the February 2023 signed Memorandum, within the Biomethane Industrial partnership, a special Task Force 6 was created in order to facilitate the production of biomethane in Ukraine, focusing on cross-border trading and export, increasing domestic production and demand. These topics will be addressed from the technical, administrative and regulatory perspectives⁶².

In April 2023, the first Ukrainian biomethane plant was commissioned in Lynovysia, Chernihiv region based on the previously existing biogas plant of the Gals Agro company with on-site electricity generation with a

⁶⁰ Departamento de Acción Climática, Alimentación y Agenda Rural, consejería de Agricultura, Ganadería, Pesca y Acción Climática (2024): Estrategia Catalana de Biogás I Plan de Acción 2023-2030. https://icaen.gencat.cat/web/.content/30_Plans_programes/40_Estrategia-Catalana-biogas-2030/Estrategia-Catalana-Biogas-2030_AdG.pdf

⁶¹ Memorandum of Understanding on a Strategic Partnership on Biomethane, Hydrogen and other Synthetic Gases: https://energy.ec.europa.eu/document/download/0b10e313-1084-49e5-a320-9460108d4cb7_en?filename=MoU_UA_signed.pdf

⁶² BIP, 2024: <https://bip-europe.eu/2024/04/17/task-force-6-was-kicked-off-marking-the-beginning-of-collaborative-efforts-to-integrate-ukraine-as-a-supplier-of-sustainable-biomethane-into-the-eu/>

capacity of 6.9 MWe. The feedstock is provided by manure, sugar beet pulp and energy crops. The plant has a production capacity of 3 bcm biomethane p.a. CO₂ separation is done by the membrane technology⁶³. The module of biogas upgrading to biomethane was installed by Gals Agro to have an alternative to the production of electricity from biogas. It was assumed that biomethane would be sold for export. Sale to the local market was not considered at all. Since export was not possible in 2023, only electricity has been produced so far. On the other hand, the procedure for connecting and obtaining permission to feed biomethane into the gas distribution networks is not completed, it is in the final stage so far.

According to the Bioenergy Association of Ukraine (UABio), the biomethane potential in Ukraine can be amounted to 21.8 bcm p.a. by 2050. To fully exploit this potential, there are specific measures required such as the improvement of the gas grid access for biomethane including preferential grid access as well as the development of the co-financing scheme for biomethane producers for grid access. Further, there is a need for the development of the Ukrainian biomethane registry which can be linked to the EU Union Database and must be operated by the Ukrainian State Agency for Energy Efficiency and Energy Savings (SAEE)⁶⁴.

The first biomethane Law of Ukraine from 2021 introduced definitions and regulations for biomethane production, establishing a Biomethane Register and GO. The procedure of the Register of Biomethane Production and Consumption functioning was adopted by the Resolution of the Cabinet of Ministers of Ukraine in July 2022⁶⁵ (Decree No. 823), resulting in a trial launch of the Register of Biomethane Production and Consumption in 2023. According to the Law on biomethane export (2024), the Ukrainian biomethane register will be operational only after it is synchronised with the Union Database.

Initially, the Ukrainian register was developed by the German Energy Agency dena in 2023, however, now Ukraine is going to develop its version. According to the information from the Bioenergy Association of Ukraine (UABio), Ukraine does not consider an integration into ERGaR so far.

⁶³ Geletukha, 2023: https://www.energy-community.org/dam/jcr:2faa4d31-3eb8-4cc8-a6ff-9b8b322e3c09/S1_4_UABIO_Geletukha.pdf

⁶⁴ UABio, 2024: <https://uabio.org/news/16062/>

⁶⁵ Українська Енергетика (2022): <https://ua-energy.org/uk/posts/ukraina-zmushena-zupynyty-eksport-pryrodoho-hazu>

For biomethane utilisation in the transport sector, there are legislative incentives for the use of biomethane as fuel in agricultural machinery and public transport. The specific targets in the National Energy Strategy between 5 and 10% concerning the natural gas demand in the transport sector by 2030 are to be defined. There is also the target for the installation of gas filling stations as well as the support of the development of CNG and LNG filling stations needed. In addition, technical requirements for biomethane as a fuel are to be developed and implemented (UABio, 2024). While integrating the biomethane produced in Ukraine into the single European market, one further challenge might be the concern about the competition with the European farmers⁶⁶, also considering providing subsidies for biomethane production while avoiding the doubling or even multiplication of the (public) funds. From the European side, there is no regulation for biomethane originating from third countries within the RED III or the Regulation (EU) 2022/996 on rules to verify sustainability and GHG emissions saving criteria and low iLUC-risk criteria. The statistical/ virtual biomethane trade regime between EU countries is not sufficiently defined, and it is not clear if the countries can handle them according to the RED III or EU ETS mechanism, which might be a promising option for Ukrainian biomethane in the long term⁶⁷.

The Law of Ukraine 'On state support of investment projects with significant investments in Ukraine', No. 3311-IX as of August 2023 provides broader support to the biogas and biomethane projects in Ukraine with total investments of more than €12 million. This includes, among other things, several tax exemptions from VAT and customs duties on imports and purchases of equipment for biomethane plants, and income tax exemptions for 5 years. It further provides the predominant right to land use of state or communal property, compensation of costs for connection to engineering transport networks and provision at the expense of budget funds for the construction of engineering and transport infrastructure or compensation for such construction.

As a reaction to the Russian invasion of Ukraine, the ban on exporting natural gas from Ukraine was introduced on 4 March 2022 by the Order of the Ministry of Energy of Ukraine No. 87 within the framework of the measures envisaged by the National Action Plan for the Energy Sector in

⁶⁶ BNE IntelliNews (2024): <https://www.intellinews.com/zelenskiy-launches-biomethane-market-in-ukraine-aims-to-attract-international-investment-327532/>

⁶⁷ DiXi Group (2024): https://dixigroup.org/wp-content/uploads/2024/03/policy-brief_spivpraczya-ukrayiny-ta-yes-v-biometanovomu-sektori.pdf

the Event of an Emergency Crisis, which was prolonged for the years 2023⁶⁸ and 2024.

Against the background of the export ban on natural gas to enable exports of biomethane produced in Ukraine to European countries, the amendment of the Law 'On Amendments to the Customs Code of Ukraine and Other Laws of Ukraine' No. 3613-IX entered into force in May 2024. By that, "the customs control and [...] clearance of biomethane transported by pipeline [...] will be carried out by the procedure stipulated [...] on customs matters for natural gas". Further, for biomethane to be transported across the customs border of Ukraine the periodic and additional customs declarations containing the number for the biomethane producer in the envisaged biomethane registry as well as the information on the guarantee of biomethane origin by Article 8 of the Law on Alternative Fuels. However, since the foreseen Ukrainian biomethane registry is currently not in operation and not connected to the Union Database of the EU, for the transitional period the registry excerpts can be replaced by the certificate of compliance with the biomethane sustainability criteria for the producer as well as the Proof of Sustainability of the relevant volumes of biomethane by the international certification scheme⁶⁹.

The transition phase is deemed to be completed when the National biomethane registry becomes operational and linked to the Union Database under RED III and the Guarantee of Origin will be issued in Ukraine and approved by the EU⁷⁰.

According to UABio's information, at least seven biomethane projects are expected to be operational by the end of 2024. All these projects are being actively built and are close to completion. Except for one project, all of them are based on existing biogas plants and are in Chernihiv (1x), Khmelnytskyi (2x), Kyiv (1x), Vinnytsia (2x), and Dnipropetrovsk (1x) region. There are plans to produce bio-LNG at 2 sites in Yuzefo-Mykolaivska biogas company (YM Liquid Gas LLC) and MHP (Mironovsky Hliboproduct).

The state-owned Naftogaz of Ukraine, representing the biggest national oil and gas group, is considering the pooling of biomethane from smaller biomethane capacities to export biomethane. While the financial

⁶⁸ Українська Енергетика (2023): <https://ua-energy.org/uk/posts/zaboronu-na-eksport-hazu-prodovzhyly-na-2024-rik#:~:text=%>

⁶⁹ Верховна Рада України (2024): <https://zakon.rada.gov.ua/laws/show/3613-20#Text>

⁷⁰ Energy Community, 2024:

<https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.energy-community.org/dam/jcr:40c1b5cb-4937-48e4-a3d8-ed4dc7d474c6/Note12-2024.pdf>

pooling for export is rather an obvious approach for such big players as Naftogaz, such an approach may lead to the formation of a monopoly in the biomethane market, which may negatively affect the development of the industry. The Bioenergy Association of Ukraine (UABio) believes that support of domestic use will be necessary for Ukrainian biomethane market development.

Given the end of the Russian invasion of Ukraine, the energy-demanding industries might stimulate the domestic demand for biomethane. The Carbon Border Adjustment Mechanism (CBAM) of the EU will affect the exports of electricity, fertilisers, and metals from energy-intensive production from January the 1st 2026⁷¹.

3.2. PRELIMINARY POLICY RECOMMENDATIONS

To unleash biomethane's full potential, European and national policymakers should take into consideration the following recommendations:

1. Ensure legal certainty and a level playing field among renewable vectors: Thanks to its low greenhouse gas footprint, biomethane can significantly displace fossil CO₂ emissions, particularly in those sectors that are more challenging to decarbonize. For the EU to achieve its energy and climate objectives, policymakers should establish regulatory conditions that support the profitable production and use of this green vector.
2. Set higher biomethane targets to unlock their rollout and ensure political commitment over time: Large amounts of green vectors are necessary to achieve the EU's climate neutrality goal. Translating regulatory drivers into tangible market developments requires time. Therefore, it is crucial to establish specific targets for biomethane to ensure legal certainty and encourage investment, allowing for increased production and deployment for its use in all sectors. Moreover, since the release of the RePowerEU Plan, the European Commission recommended member states incorporate deployment strategies that align with the 35 bcm/y target in NECPs. Establishing a European biogas and biomethane trajectory towards 2030 presents promising medium-term opportunities for the sector and can attract investments. However, policymakers should mandate that Member States set higher national targets and ensure they include clear technological pathways to maintain sustained political commitment.

⁷¹ Golz et al., 2023: <https://gas.info/fileadmin/Public/PDF-Download/policy-paper-de-ukr-biomethan-kooperation-libmod-en.pdf>

3. Develop policy measures able to internalise costs of daily and seasonal energy storage, flexibility, peak shaving, and waste management: Biomethane is a highly flexible green energy source, offering numerous socio-economic and environmental advantages. It can be easily stored and deployed throughout the energy system using existing gas infrastructure and end-use technologies. As a dispatchable energy carrier, biomethane can balance intermittent renewable energy generation, offering dynamic electricity production able to accommodate the fluctuations in electricity demand while promoting grid stability and seasonal energy storage. The potential of these green gases goes way beyond renewable energy provision, offering substantial, long-term benefits for the entire economy. This supports the European Green Deal and the transition to a more sustainable and circular economy. Policymakers should recognize these additional benefits and ensure that agricultural, climate, energy, and waste policies allow the sector to fully realize them.
4. Further incentivise the use of both biomethane as feedstock: Biomethane can and should be allowed to significantly contribute to the decarbonization of all sectors of our economy. EU legislation should introduce additional economic incentives for the use of biomethane in end-uses not currently covered by EU ETS and with low or no energy tax as well as CO₂ tax. This is the case in the chemical and metallurgical industry where biomethane is used as feedstock or a reductor.
5. Set up harmonised rules across Registries of Guarantees of Origin for the handling of GO in energy conversions: GO Registries should adapt their processes to energy conversions, while harmonisation of rules will avoid double counting and confusion in the market. To this end, the REGATRACE Project made technical recommendations that should be considered by GO Registries. This will facilitate market uptake and trade of biomethane when Guarantees of Origin are issued for consumer disclosure.
6. Design a consistent energy system framework: EU policymakers should design a long perspective and comprehensive market environment that encourages investment, innovation, and growth within the biogas industry. Avoiding a silos approach and taking stock of the sector's real needs will enhance the sector's contribution to renewable energy targets and support broader climate and environmental goals.

4. SUSTAINABILITY AND GUARANTEES OF ORIGIN

Since renewable gases are expected to play an important role in the decarbonization efforts of the European Union to become carbon neutral by 2050, biomethane has gained more recognition and the trend is expected to continue as the demand for it keeps growing.

To ensure that both the production of biomethane is sustainable, but also that the consumers are well informed on what they are using, the European Union has created two types of documentation to track and trace biomethane. Such documentation is also being used in the biomethane trading market and increases the attractiveness of this energy source both from an economical and sustainability perspective. The two types of documentation are the Proof of Sustainability (PoS) and GO, both having a legal basis in the Renewable Energy Directive.

4.1. PROOF OF SUSTAINABILITY (PoS)

This type of certification ensures that the biomethane produced is sustainable, following the criteria outlined in the Renewable Energy Directive (RED) II⁷². RED II sets binding requirements for the sustainable production and processing of biomass. Only biomethane meeting these requirements can be used for the renewable energy targets for Member States set by the RED II.

To be able to issue a Proof of Sustainability, a producer of biomethane must first be certified by one of the voluntary schemes recognised by the European Commission. Such voluntary schemes⁷³ ensure that the feedstock used to produce biomethane is sustainable and meets the criteria set in RED II. They are run privately, but they must be recognised by the European Commission as compliant with the rules set in the Renewable Energy Directive II.

The recognised voluntary schemes for the certification of renewable gases are:

- [REDcert](#)
- [International Sustainability and Carbon Certification \(ISCC\)](#)
- [Better Biomass](#)
- [2BSvs](#)

Some criteria that voluntary schemes must fulfil to be recognised by the European Commission include:

- Feedstock producers comply with the sustainability criteria and the criteria for Renewable Fuels of Non-Biological Origin (RFNBO) production

⁷² Renewable Energy Directive (RED) II. https://joint-research-centre.ec.europa.eu/welcome-jec-website/reference-regulatory-framework/renewable-energy-recast-2030-red-ii_en

⁷³ Voluntary schemes. https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en

set out in the Renewable Energy Directive and its implementing legislation.

- Information on the sustainability characteristics can be traced to the origin of the feedstock.
- All information is well documented.
- Companies are audited before they start to participate in the scheme and retroactive audits take place regularly.
- The auditors have both the generic and specific auditing skills needed regarding the scheme's criteria.

The recognition by the European Commission of a voluntary scheme has a validity of five years. A producer must apply to be certified by a voluntary scheme to be able to issue a PoS. It is the responsibility of the voluntary scheme to conduct verifications on the producers to ensure they are compliant and to prevent fraud.

The PoS also forms a key part of the evidence that a mass balance of renewable gas is achieved, and that mass balance can be cross-border. Each producer and trader needs to ensure the balance and is audited regularly.

4.2. GUARANTEES OF ORIGIN (GOs)

The Guarantees of Origin (GOs) have the purpose of showing to a final customer that a given share or quantity of energy was produced from renewable sources, as outlined in the Renewable Energy Directive⁷⁴. Article 19 of RED II, is the one providing a legal basis for GOs. Although Article 19 outlines that member states shall be able to issue a GO if a producer requests it, some EU countries do not have a registry that can issue such a certificate yet. Some countries have implemented the article, some are in the process of doing so and others have not started the process yet, thus creating a potential barrier for producers and for the sector to develop.

4.3. TOWARDS A HARMONISED CROSS-BORDER TRANSFER OF BIOMETHANE CERTIFICATES

Guarantees of Origin

An important element that helps drive a more developed and harmonised market for biomethane in Europe is the cross-border transfer of such certificates (PoS & GO).

Some of the biomethane produced has a PoS if the producer has been certified by a voluntary scheme, and sometimes the biomethane produced can have a GO

⁷⁴ Directive (EU) 2018/2001. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001>

if such a registry exists in the country of production and the producer has requested a GO. The biomethane can also have both a GO and a PoS.

To facilitate the cross-border transfer of renewable gas certificates (incl. biomethane), the European Renewable Gas Registry (ERGaR) has created the Certificate of Origin Scheme⁷⁵ (CoO Scheme), which has been operational since June 2021 and facilitated the cross-border transfer of over 3TWh of biomethane certificates until today. The ERGaR CoO Scheme has six System Participants: VertiCer (the Netherlands), AGCS (Austria), the German Energy Agency (Dena, Germany), GGCS (United Kingdom), Energinet (Denmark) and SPP Distribucia (Slovakia).

Since the beginning of 2024, the Association of Issuing Bodies (AIB)⁷⁶ has also launched its gas scheme with current members from Spain, Austria, Finland, Italy, Czech Republic and Latvia. The AIB gas scheme only allows mandated GO issuing bodies.

Given that there are two schemes now in operation at the European level (ERGaR and AIB) and trade between the two schemes is not possible, there are barriers to trade biomethane within Europe. The two associations managing the two schemes are working now to create one harmonised market and avoid fragmentation. Considering that transfers between the participants in the two schemes are not possible unless bilateral agreements are reached, the two organisations hope to reach an agreement and find a solution to support the harmonisation of the market for biomethane certificates.

Proof of Sustainability

For the cross-border trade of biomethane with proof of sustainability, there are fewer barriers. Particularly after the implementation of Regulation 2022/996 which states the EU gas grid is a single logistical facility. This means that as of this year capacity bookings at the interconnection point are not needed anymore. Up to last year it was required to book capacity at each border. Now, the proof of sustainability can be sent all over Europe if there is a connection to the EU gas grid.

One major development in the cross-border transfer of biomethane certificates is the introduction of the Union Database for Biofuels (UDB) which has become operational for liquid biofuels from 15 January 2024⁷⁷. It will become mandatory for gaseous fuels such as biomethane from 21 November 2024.

⁷⁵ Certificate of Origin Scheme. <https://www.ergar.org/ergar-schemes/ergar-coo-scheme/>

⁷⁶ Association of Issuing Bodies. <https://www.aib-net.org/>

⁷⁷ Union Database for Biofuels (UDB). https://energy.ec.europa.eu/news/eu-database-biofuels-becomes-operational-2024-01-15_en

The upcoming Union Database is designed to cover all biomethane produced which has a PoS, including biomethane that has a PoS + a GO. It will track the ownership of the Proof of Sustainability in its centralised database.

However, the UDB will not cover biomethane issues only with a Guarantee of Origin (even though it is expected that there will still be an important amount of biomethane in such a situation).

Thus, schemes such as the ERGaR CoO scheme and the newly established AIB gas scheme will continue to play a role in the cross-border transfer of biomethane certificates.

The Union Database is meant to be a mass balance system; thus, the cross-border transfer of certificates and cross-border trading should become much easier once this has been fully implemented and integrated with the different national systems.

While there is general support by stakeholders for the concept of the Union Database, as it can contribute to the harmonization of the European biomethane market, there are concerns about the practical implementation that need to be tackled and discussed. The timeline seems ambitious and experience from the liquid biofuels showed that there should be sufficient time available for testing the system.

Furthermore, it seems that the development process can be improved as the different relevant industry associations requested the European Commission for a robust stakeholder consultation to provide constructive comments⁷⁸.

4.4. CHALLENGES CONCERNING BIOMETHANE TRADING

With the existing Renewable Energy Directive there is a legal framework for the sustainability certificates. However, with the development of the biomethane market, there are several challenges with respect to sustainability requirements and biomethane trading. Below are several examples of issues that impact the biomethane market and could potentially negatively impact production growth.

National requirements

Several countries are currently introducing national biomethane blending requirements. This means that a certain percentage of the gas consumed in the country should be biomethane. Examples are blending obligations in France, Netherlands, Austria and Portugal⁷⁹. In most countries, these blending

⁷⁸ Hybrid workshop on Union Database concept. <https://www.entsog.eu/sites/default/files/2024-04/Conclusions.pdf>

⁷⁹ Review of blending obligations across Europe. <https://www.veyt.com/articles/review-of-blending-obligations-across-europe>

requirements can only be met by using locally produced biomethane having national certificates. While there could be good reasons for the introduction of such a scheme and it is expected to be beneficial for total production, the elements that don't allow biomethane from other countries to be used hinder the European integration of the biomethane market.

Clarity of statistics

Each European Member State has renewable energy targets as set in the Renewable Energy Directive which can be met by biomethane with a PoS. However, the current rules are not clear enough if the biomethane can be claimed by the country where the biomethane is produced or in the country where the biomethane with the PoS is consumed. Different Member States have different interpretations which increases the risk of double counting the biomethane in both countries. Clarity is important for market parties to avoid surprises afterwards and reliable European statistics. The expectation is that the Union Database will provide more clarity on the calculation methods coming from the SHARES manual.

Regulatory stability

Investments in biomethane production plants are a long-term investment with often long-term off-take agreements to reduce risks. For these investment decisions and contracts regulatory stability is important to allow for the projects to become viable.

One example of this year concerns the updated interpretation of the GHG emission calculations of co-digested biomethane. This has a major impact on the existing contracts. However, there was no consultation or public information provided by voluntary schemes or the European Commission before the new rules entered into force. Such a procedure is detrimental to the long-term trust that is needed to make investment decisions.

It would be beneficial for the market if there is stability in the rules and interpretations or to inform market participants well in advance of such major changes.

Biogenic CO₂ – towards a certification framework

One essential step towards decarbonising the European Union is carbon capture and utilisation, as well as storage. On 6 February 2024, the European Commission released its Industrial Carbon Management Communication, with the view of creating a single market for CO₂ in Europe. By 2050, around 450 million tonnes of CO₂ would have to be captured, and by 2040, about half of the CO₂ that is captured annually is expected to come from biogenic sources.

In the production of biomethane, the CO₂ is already being captured but it is released back into the atmosphere in most cases when the biogas gets upgraded to biomethane. By capturing the biogenic CO₂, it can be stored or utilised in industries such as food processing or construction or to produce RFNBOs. It can also be a source of income for biomethane producers, especially if there can be a premium for biogenic CO₂.

However, it will be necessary to differentiate between fossil/industrial CO₂ and that coming from biogenic sources. Therefore, a certification framework to be put in place for tracking and tracing such biogenic CO₂ is helpful.

The European Renewable Gas Registry has been working with different stakeholders, including European associations, voluntary schemes to develop such a biogenic CO₂ certification scheme. The aim is to support a future market and in the long-term lead towards a European single market for biogenic CO₂.

As regards the Sempre-Bio project, the deliverable report 4.1⁴⁰ was submitted by the end of November 2023 with the aim to provide an overview of the current and future options of biogenic CO₂ valorisation derived from biogas and biomethane in Europe while mapping the biogas and biomethane sites capturing biogenic CO₂, the CO₂ production capacities as well as the valorisation sectors of captured biogenic CO₂. Thereby, the focus was on commercial-scale Carbon Capture and Utilisation (CCU) projects without further consideration of possible Carbon Capture and Storage (CCS) developments. The report provides an overview of the selected options for the valorisation of biogenic CO₂ from biogas such as in agriculture, the food and beverage industry, energy production and the chemical industry. The report provides further insight into the requirements for the use of food-grade CO₂ uses, especially for, but also not limited to food and beverage industry. In addition, it delivers the mapping and listing of the biogas and biomethane plant sites with the CO₂ valorisation (current and expected by the end of 2023) in Europe as well as the description of the selected project examples in European countries.

5. CONCLUSORY REMARKS

Geopolitical tensions arising from fossil fuel imports have led the European Union (EU) in recent years to look to the biomethane sector as one of the most plausible (and already available) ways to foster resilience, accelerate the ecological transition and drive greater energy efficiency.

The REPowerEU Plan, in addition to setting a target of producing 35 bcm of biogas and/or biomethane by 2030, laid the groundwork for steering cooperation between policymakers, investors and the biomethane value chain to drive technological innovation, address bottlenecks and gaps and ultimately accelerate the expansion of the sector.

In line with the plan's objectives, the European Commission has called on Member States to redouble their efforts and to outline any planned initiatives along these lines. Projections indicated that the EU-27 would only reduce their carbon dioxide (CO₂) emissions by 51% by 2030 compared to 1990 and would fall short of the 55% to which they had committed themselves by law.

Thus, since the publication of the first report in October 2023, updates to the National Energy and Climate Plans (NECP) have emerged, more in line with EU climate targets and including a comprehensive component on sustainable biogas and biomethane production.

This has not only allowed countries themselves to assess their national potentials but also enables all stakeholders to identify the barriers that the sector faces, discuss sustainability and Guarantees of Origin (GO) and establish clear trajectories to reach these targets by 2030 and 2050. In addition to compiling and updating all information regarding policies, market regulatory gaps, potential and recommendations for each EU country in the consortium of the four biomethane projects funded by Horizon Europe, this report has also landed recommendations to contribute to the growth of the biomethane sector in Europe.

These recommendations include ensuring legal certainty and a level playing field between renewable carriers; the creation of higher biomethane targets to unlock deployment and ensure political commitment over time; the development of policy measures capable of internalising the costs of daily and seasonal energy storage, flexibility, peak shaving and waste management; incentivising the use of biomethane as a feedstock; establishing harmonised rules in all Guarantees of Origin Registers for the management of GO in energy conversions; or designing a coherent framework for the energy system.

Establishing common spaces for discussion between stakeholders in different countries is key to providing solutions that reduce uncertainty and facilitate investment in the medium and long term. It is to this task that this cooperative report is dedicated. A final expansion of this report will be released at M42 and will be coordinated by BIOMETHAVERSE.

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ANNEX I. Challenges and perspectives of innovative biomethane technologies and market

The European Climate, Infrastructure and Environment Executive Agency (CINEA) encourages projects funded under the same topic to work together on dissemination activities and thus increase visibility and synergies between actions supported by Horizon Europe (HE).

One of these opportunities was provided by the [32nd European Biomass Conference & Exhibition \(EUBCE\)](#) in Marseille (France), a major showcase for the biomass sector in Europe.

In this framework, the Horizon Europe project [HyFuelUp](#) held a workshop on 26 June 2024 as a parallel event on 'Defossilisation of long-distance road transport and maritime transportation in Europe with biomethane: challenges and opportunities'. At this meeting, which was attended by an audience mainly composed of stakeholders, a round table entitled '**Challenges and perspectives of innovative biomethane technologies and market**' took place, moderated by **Margarita de Gregorio** (from **BIOPLAT**, C&D leader in **HyFuelUp** project). She was joined by representatives of different EU-funded projects (as well as other industry professionals from outside the EU), linked to the renewable gases and biomethane sector.

One of the main aspects discussed was the different technologies involved in obtaining biomethane as a lever for innovation. Even though anaerobic digestion is playing a key role nowadays, the growing relevance of gasification in EU-funded projects points to a change of trend in the coming decades. *"Many pilots are going on, so I think this is promising. By 2040, we expect that gasification will also play a relevant role, something between 9 % and 30 %, which is interesting because it is a diversification option"*, said **Matteo Gilardi** (SINTEF), a representative from the [SEMPRE-BIO project](#).

In this sense, **Pietro Postachinni** (DTU), also from the SEMPRE-BIO project, pointed out that one of the main goals of innovation applied to the biomethane race is to intensify the process and to reduce the cost by integrating gasification, methanation and anaerobic digestion. *"There is a large agenda in terms of research and there are many things to do on the scale of the TRL"*, he stated.

Sam Lehr (Coalition for Renewable Natural Gas) could provide the US perspective on these topics, highlighting that the US and Canada might be 5-10 years behind Europe in terms of renewable gas use. *"We are just seeing now the first methanation technologies coming to the US, from companies that are based in Denmark. It is now becoming a priority to reuse waste for biogas upgrading"*, he said. Though the US industry seems to be very focused on the anaerobic digestion feedstocks, around 40% of their production facilities are currently upgrading, according to his data.

In his turn, **Francisco Girio** (LNEG), representative of the HyFuelUp project, gave an overview of the advances that the different European projects are offering, celebrating their contribution to the biomethane race. *"The EU-funded projects that are here represented have important demonstration projects, with some differences among them, but all equally contributing to*

boosting the biomethane market in Europe. I share my colleagues' ideas, and I believe that, in a really short term, the current biogas facilities must integrate CO₂ streams into their processes to become more sustainable and, therefore, to be more productive", he expressed.

Regarding the challenges that this industry faces, both technological and non-technological, Francisco Girio pointed out how beneficial would be to count on more standards and common policies applied to all EU countries. *"I believe that there are relevant challenges, not only technically, but regulatory and social. There are no common rules in this field, and each country has its legislation, environmental permissions, different bureaucracy, etc., which sometimes hinder the development of a biomethane market", he said. "I agree, we do not have the level of commitment at the federal level in the US and Canada that would be necessary either", Sam Lehr added.*

Matteo Gilardi found that the combination of the economic and environmental aspects is the main challenge for this sector and cited as an example the opportunity to valorise our bioproducts. *"We have the potential also to further valorise the entire value chain and try to be more competitive from the economic point of view".* On this idea of optimising all streams agreed Pietro Postachinni, who said that "we need to try to use every molecule of carbon that is getting useless, and this is translated at a policy level by fostering policies that support this transition".

Vanessa Ferreira de Almeida (IDENER), from [the Photo2Fuel project](#), redirected the debate towards the sustainability and acceptance of the population perspective. *"I think it is a very important challenge since gasification is sometimes not well accepted. Also, from the sustainability and emissions perspective, where these feedstocks come from is a main aspect",* she stated and proposed a solution to combine the different projects with other initiatives to justify the implementation and get funding, both from population and technological perspectives.



Source: EUBCE 2024

innovations in the
BIOMETHANE
uni**VERSE**

 **HYFUELUP**

 **METHAREN**


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