

Methane policy recommendations for the EU

Reducing methane emissions in the
agricultural and waste sector

I. CONTEXT

Very often, when addressing greenhouse gas emissions from various sectors in the EU economy and in the world, a sector which is often overlooked or sidestepped is agriculture whose emissions have long proved complex to address. Nevertheless, solutions to reduce emissions exist. A similar issue occurs in the waste sector where the majority of waste is landfilled without the implementation of methane recovery systems at sites. According to the “Annual European Union greenhouse gas inventory 1990–2018 and inventory report 2020”¹, these sectors are the two largest sources of methane emissions in the EU (enteric fermentation 41%, farming 9% and anaerobic waste 18%). An evolving topic is the idea of improving waste management and reducing landfills by turning the (municipal and agricultural) waste and residues into products or energy, thereby providing circular solutions along with new activities and additional income, particularly when combined with carbon capture and storage or utilisation to reach negative emissions. The production of biomethane could help reduce worldwide greenhouse gas (GHG) emissions by 10-13% according to the world biogas association, and is explored in detail in the recently published methane strategy but also in the Waste to Energy communication (COM(2017) 34) published in 2017.

Already a key topic for the Juncker Commission, circularity and the circular economy remain high on the agenda in the context of Von Der Leyen’s Commission’ Green deal. Building on the assessments of the benefits and potential of the bioeconomy, the rolling out of truly circular processes can revolutionise the way several sectors support the energy transition. This is similarly true for agriculture, where traditional activities of crop growing and livestock grazing can be diversified to cover much more. In the EU a farmer may now, in addition to the possibility for self-production and consumption of renewable power, produce molecules by processing sequential crops, residues and waste, such as manure, through the consolidated process of anaerobic digestion.

This process, on top of generating renewable methane, which can be substitute traditional natural gas uses such as heating, power production and mobility while generating extra benefits for the whole system, such as organic digestate which can replace chemical fertiliser. In addition, the recovered biogenic CO₂ can be used for the methanation of hydrogen and the production synthetic methane whilst in **the biogenic carbon cycle, the carbon originally utilized by the plant is returned to the atmosphere, contributing no net increase of CO₂.**

Considering the above background, this policy briefing aims to provide:

- policy recommendations for the EC to deliver legislative proposals to further reduce methane emissions in the EU, particularly by taking advantage of cross-sectoral actions in the waste and agricultural sectors;
- evidence of positive externalities from the biomethane sector;
- indication of mitigation measures for methane losses at biomethane plants.

¹ [Annual European Union greenhouse gas inventory 1990–2018 and inventory report 2020](#)

II. POLICY RECOMMENDATIONS

- Ensure support for biomethane development as a key solution to deliver on the EU green deal by helping to reduce and recover methane emissions from the agricultural and waste sector. Clear acknowledgement of its benefits could provide appropriate signals for Member States to build on synergies with other sectors in delivering on their National Energy and Climate plans. Tools such as certification and guarantees of origin are pre-requisites to help set-up and underpin the market which will be required for the rollout of these gases.
- Support sector integration and by extension the use of Pillar II instruments in the CAP² as tools to help the EU fulfil its climate ambitions and Sustainable Development Goals, by relying on solutions which would help reduce emissions in both the agricultural and energy sectors.
- Quantify the benefits and positive externalities from biomethane production and highlight the economic gains and environmental benefits of supporting its development.
- Feedstock availability is critical for stable investment pathways as such the revision of RED II must provide long term certainty with regards to sustainability of feedstock and production pathways authorised within the context of Annex IX.
- The waste hierarchy should be respected and rolled out to ensure optimal recovery from waste. Biomethane production in this respect is considered recycling and as such should be strongly encouraged. Quick and efficient implementation of the Waste Framework Directive to force separate collection of organic waste streams and its treatment according to the waste hierarchy should be ensured. AD makes the best use of organic materials by producing renewable energy and organic fertiliser while closing the nutrients cycle and reducing greenhouse gas emissions.
- Continue to support the implementation of voluntary best practices to mitigate methane emissions and initiatives for monitoring methane emissions at biomethane plants. The monitoring schemes and initiatives will improve data gathering and data accuracy regarding methane emissions from biomethane production, particularly important once the sector will be well developed and mature.

² Pillar II – “the EU’s rural development policy is designed to support rural areas of the Union and meet the wide range of economic, environmental and societal challenges of the 21st century” this pillar can help farmers reduce emissions from their sectors whilst reinforcing the local economy and value chain

III. POSITIVE EXTERNALITIES

As often described in debates, policy options usually carry externalities, either positive or negative, which are basically direct and indirect consequences of a specific policy pathway. In the case of biomethane, several positive externalities linked to its accelerate rollout should be noted and are outlined below.

- **Avoided emissions**

While GHG emissions from agriculture mainly depend on methane produced from the enteric fermentation (i.e. cows digestive processes) and waste/manure management, it should be remembered that the agricultural activities don't only produce greenhouse gases, but they absorb it through the processes of photosynthesis, sequestration of the carbon in the organic matter soil and biomass production. As such, there is no doubt that the agricultural sector can provide powerful GHG mitigation measures through the adoption of innovative practices such as the optimization of fertilizers and the biogas/biomethane production with direct and indirect positive carbon footprint impacts: direct because it reduces methane emissions from effluents spreading on soil; indirect because it replaces fossil fuels with renewable energy sources.

By recovering these emissions, a large quantity of methane is avoided, explaining why the production of biomethane, especially waste-based production pathways, can be **CO₂/GHG-negative**.

- **Rural recovery**

The current process of decentralisation of the energy system offers concrete opportunities to bring closer bonds between cities and rural areas, linked through renewable energy production, but also the development of shorter circular value chains for production and consumption. A case in point is the development of biomethane which has been shown to provide significant opportunities in terms of creating jobs in rural Europe and helping to repopulate certain areas. Indeed, according to the [European Biogas Association](#), the anaerobic digestion sector already accounts for over 70,000 jobs across the EU, many in disadvantaged rural areas. Under the right regulatory conditions there is potential for much more growth.

- **Farmer income**

This rural recovery and closer bond between the central and decentralized part of the system will also mean concrete economic opportunities for farmers. Through an increased focus on sustainability and organic production in their approach, farmers are encouraged to produce and sell more locally, but also in the way they trade, to limit waste. Biomethane production helps with this, by ensuring that waste can be recycled and valued as energy, bringing additional income to farmers. Groups of farmers can also cooperate and share waste and feedstock, thereby bringing cooperatives together in support of local biomethane production.

- **Energy system integration**

Biomethane is a renewable and programmable source: being similar to natural gas it can fully utilise the existing gas infrastructures, allowing its supply to fit different spatial and temporal demand conditions in all consumption sectors, without additional investments on infrastructure to integrate it into the energy system. In addition, the biomethane value chain shows considerable potential for integration with other technologies that will further contribute to the decarbonisation process:

- **Power-to-Gas:** electricity production from intermittent renewable sources such as wind and solar can be converted into a synthetic methane through the methanation of recovered biogenic CO₂ captured during the process of biogas purification
- **Carbon Capture and Storage:** technology applied to the production and consumption of biomethane can deliver negative emissions as emphasised by the fifth UNFCCC Report on Climate Change and its conclusions on BECCS - Bioenergy with carbon capture and storage solutions.

IV. MITIGATION MEASURES FOR METHANE LOSSES AT BIOGAS/BIOMETHANE PLANTS

Anaerobic digestion (AD) plays a major role preventing methane emissions from agriculture, waste management and also the energy sector. The biomethane industry is therefore a large net reducer of methane emissions per-se.

In addition, thanks to existing research, the components in biogas/biomethane plants where leakages may occur are well known and the sector has been working on various reduction measures for years. Due to economic, safety and environmental significance of methane losses, biogas plants are now planned, built, and operated with the explicit aim to minimise methane losses. The state of the art of biogas plants and affected plant components (gas tight covers, permeation of gas holder membranes, gas flare etc.) have developed significantly to achieve this additional reduction of methane during the production process, in addition to the emissions which are captured and avoided through anaerobic digestion itself.

Some noteworthy technical measures to reduce methane emission are listed below.

- **Emissions from tanks upstream of the digester**

Emissions in receiving stage can be avoided, e.g. by gas tight covering of open tanks, appropriate temperature and pH value. For liquid manure, it is recommended to bring it directly into the gas-tight biogas plant to avoid emissions and achieve a high biogas yield.

- **Leakages at gas holders and gas holder fixation**

Careful consideration should be given to the orientation of low-emission operation already in the planning phase, including the design of the tanks, the dimensioning of the gas pipes, etc. The diffusion through gas holder membranes can be considerably reduced by performing regular maintenance of the foils.

- **Emissions from safety valves (pressure relief valves)**

They constitute a last resort in case of overpressure and should be activated after gas flaring mitigation is activated. In certain cases where gas holders are close to full capacity, the safety valve may release before flaring, to avoid this, gas holders should not be filled above 50%.

- **Emissions from open or not gas-tight covered digestate storage tanks**

The methane formation process may continue in the biogas residue. Therefore, it is important to reach maximum degradation of digestible organic matter. The most suitable way to handle residual biogas is to keep it in a gas-tight covered digestate storage tank that is connected to the gas system while some digestion may still take place

- **Emissions from biogas utilisation units (e.g. Combined Heat and Power (CHP)) and biogas upgrading units**

During biogas utilization, methane emissions can occur in a biogas plant. There are mainly two types of gas utilization: combustion of biogas to generate heat and electrical power by a CHP unit and upgrading of biogas to biomethane. In certain rare operational modes, e.g. malfunction of CHP, the excess gas must be burned via a biogas utilization like a flare or burner, so that the methane is converted to carbon dioxide and water.

While methane emissions related to anaerobic digestion (AD) itself are minimal³, and while AD helps avoid and recover methane emissions from the waste and agricultural sectors, these emissions should be avoided where possible. To this end, the use of clearly defined **voluntary systems at EU and Member State levels** could help by, for instance:

- **Leak detection and repair work** to address identified leaks.
- **Measuring emissions on-site** with systemic emissions and/or whole site emissions to quantify emissions and losses - here the measurements can be undertaken by the operators and/or a third party. The verification process should be performed by an independent third party whilst avoiding undue administrative burden for plant operators.

Biomethane is already covered in several legislative texts. Its GHG emissions reduction benefits are considered through complementing existing solutions, replacing more polluting alternatives, and avoiding emissions from waste and agriculture. A non-exhaustive list of references is summarised below:

RED II (2018/2001/EU) – the renewable energy directive defines the type of feedstock and the sustainability of the different production pathways for biomethane. These pathways outline GHG emissions associated with the anaerobic digestion, in a lifecycle perspective, from production to consumption.

Industrial Emission Directive– Directive 2010/75/EU (the Industrial Emissions Directive or IED) is the main EU instrument regulating pollutant emissions from industrial installations. The IED aims to achieve a high level of protection of human health and the environment taken as a whole by reducing harmful industrial emissions across the EU, in particular through better application of Best Available Techniques (BAT). Permits must take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The IED contains mandatory requirements on environmental inspections with visits to take place at least every 1 to 3 years, using risk- based criteria, and as such was referenced by the Commission as a potential vector through which to address methane emissions in the Inception Impact Assessment published in January.

Pollutants register- The European Pollutant Release and Transfer Register (E-PRTR) is the Europe-wide register that provides easily accessible key environmental data from industrial facilities and large plants in European Union Member States and in Iceland, Liechtenstein, Norway, Serbia and Switzerland. For each facility, information is provided concerning the amounts of pollutant releases to air, water and land as well as off-site transfers of waste and of pollutants in waste water from a list of 91 key pollutants including heavy metals, pesticides, greenhouse gases and dioxins for years 2007 onwards

³ [In addition biogenic methane \(from agricultural sector such as cows manure\) should be considered a short-lived climate gas](#)

ETS (EU Emissions Trading System)/ESR (Effort Sharing Regulation) – the use of biomethane guarantees of origin (and certificates) in sectors submitted to the ETS is currently allowed in certain Member States, along with the use of biomethane to prove emission reduction in the transport sector

EU Fertilising Product, Regulation (EU) 2019/1009 The regulation adopted in 2019 establishes an optional harmonised system for manufacturers of fertilizing products who wish to put their products on the EU internal market. The full requirements of the regulation will come into force from July 2022. Digestate from fresh crops and bio-waste, but not digestate from sewage sludge and industrial waste water, may be used as input material for the production of CE-marked fertilising products.

DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 October 2014 on the deployment of alternative fuels infrastructure that considers biomethane, both gaseous and liquefied, as alternative fuel.

Companies supporting the recommendations

