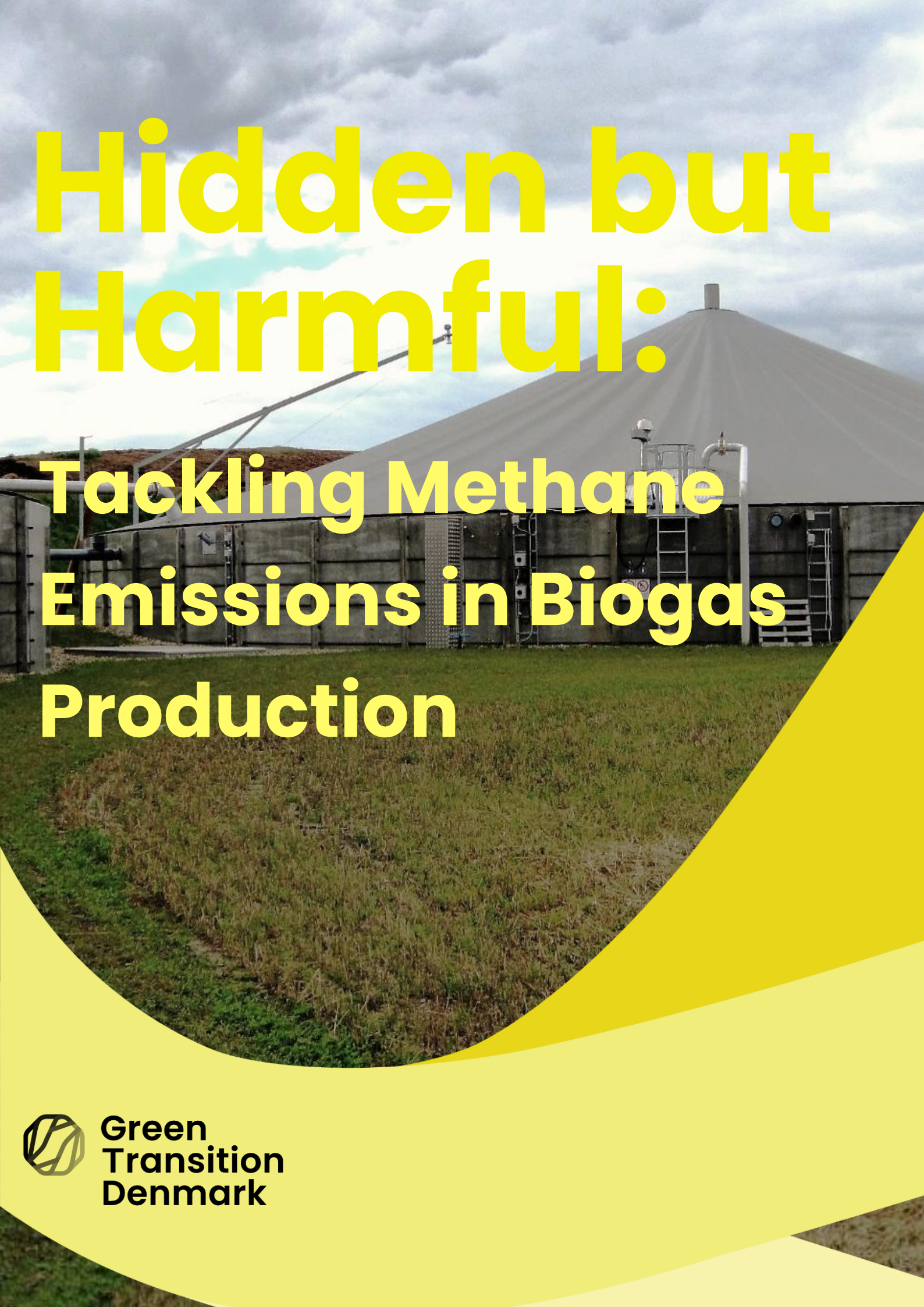


Hidden but Harmful:

Tackling Methane Emissions in Biogas Production

Green Transition Denmark

Green Transition Denmark is an independent climate- and environmental organization that works to promote a green and sustainable transformation of society.

The Methane Matters Coalition consists of experienced non-governmental organizations working to significantly reduce methane emissions in the relevant agriculture, waste and energy sectors by 2030. Green Transition Denmark is a partner organization of the Coalition.

This report is funded by the Methane Matters Coalition

Published: March 2026

Authors: Lærke Kjærbye-Thygesen (Consultant at Green Transition Denmark) and Christian Ege (Senior Consultant at Green Transition Denmark)

Acknowledgements: Thanks to our colleagues for their input and feedback: Erik Tang (Green Transition Denmark), Britt Dam (Green Transition Denmark), Alexander Bjørn Hansen (Green Transition Denmark).

Contact for further information: Christian Ege (Senior Consultant at Green Transition Denmark)

Rådet for Grøn Omstilling / Green Transition Denmark
Kompagnistræde 22, 3
1208 København K
Danmark
info@rgo.dk

Introduction

Biogas production is a process that combines the production of energy with the treatment of organic waste and by-products – including manure. Biogas is considered a renewable energy source that can replace fossil natural gas and thereby reduce greenhouse gas emissions. At the same time, managing manure through biogas production can reduce methane emissions from handling and storing of slurry, and transform nitrogen in the residues (digestate), leading to reduced leakage of nitrogen. A by-product of biogas production is high-quality natural fertiliser that can replace mineral fertiliser, and thereby reducing the use of fossil fuels needed to produce these fertilisers. However, methane is also emitted during the production of biogas, and emissions of greenhouse gases from the rest of the production value chain are often not considered[i]. On the other hand, when biogas production is partly based on manure there will most often be a net reduction of methane emissions, compared to when manure is spread on arable land without going through a biogas plant. However, it is important that biogas production does not result in a lock-in to the current level of industrial livestock production. Reducing the size of livestock production is a key measure for reducing methane emissions, as the industrial livestock production is a major source of methane emissions[ii].

Methane is a short-lived, but powerful greenhouse gas that is responsible for about a third of the total net global warming we are experiencing today[iii]. Methane warms the planet 28 times more than CO_2 calculated over a 100-year period, but over 80 times more over a 20-year period. Therefore, the more concerned we are about global warming in the short term, the more emphasis we must put on cutting methane emissions. Reducing methane emissions can have a rapid and significant impact on global warming and help to avoid harmful tipping points. Methane also contributes to the formation of ground-level ozone, and thus to the kind of air pollution called smog. Ozone air pollution causes about one million premature deaths a year worldwide (about 22.000 in EU-27 and 130 in DK[iv]), reduces crop productivity, and results in economic losses[v]. Read more about methane emissions in a Danish context here.

Benefits of biogas

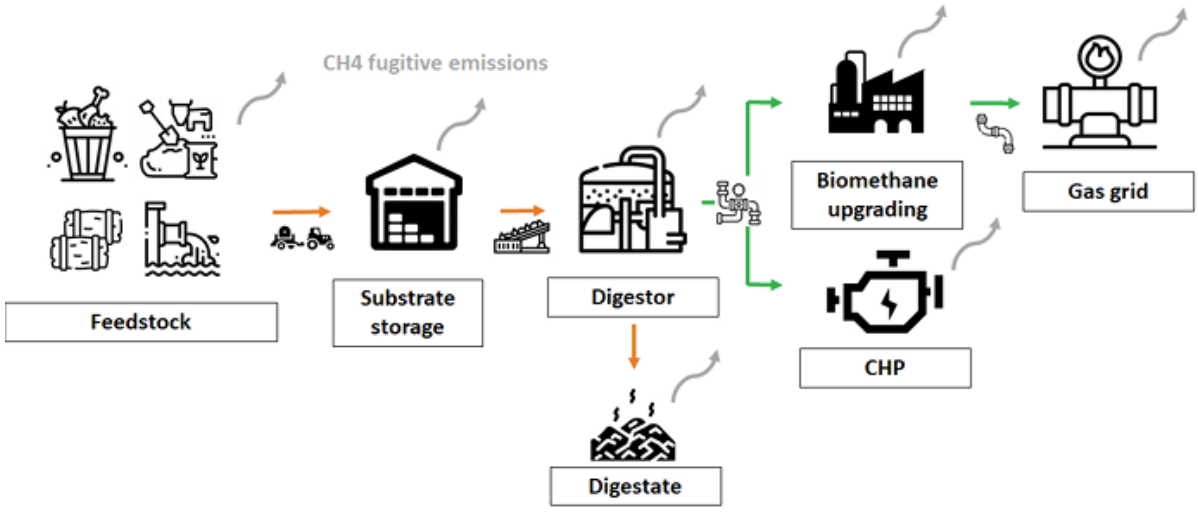
The production of biogas plays a role for both the energy- and agriculture system. The key advantage of producing biogas is the substitution of fossil energy with biogas, as biogas is considered a renewable and CO_2-neutral energy source[vi]. However, to achieve a positive climate impact, it is important to have a clear strategy for the use of biogas, the inputs for its production and the management of methane leakage. We will discuss this in more detail later. Another main benefit of biogas in the energy system is that it can be stored at low costs, making it a reliable source of energy that can complement wind and solar power. In the agriculture system, biogas production supports a circular economy by transforming organic waste—such as manure, food waste, and agricultural residues—into valuable energy and fertiliser. When manure is digested in a biogas plant, it can also help reduce methane emissions that would otherwise occur during conventional manure storage and handling, although this benefit depends on specific management practices[vii][viii].

Furthermore, the digestion process improves nitrogen use efficiency: the nitrogen in the digestate becomes more plant-available, reducing the need for artificial fertilisers and lowering the risk of nitrogen losses to the environment, especially in the autumn – because most of the nitrogen is used during the season of growth[ix]. This recirculation of biomass through biogas plants is particularly important for organic plant production. Organic farmers struggle to provide enough fertiliser for their fields as they cannot use artificial fertiliser. Biogas production therefore provides a means of ensuring a sufficient supply of fertiliser for organic plant production. Together, these benefits can make biogas an important tool in the green energy transition, in reducing water pollution, and in reducing methane emissions.

Pitfalls around biogas

While biogas is considered a green energy source, its climate benefits can be significantly reduced by methane leaks throughout the production and storage process. As shown in Figure 1, methane leaks can occur at all stages of biogas production. The figure bellow illustrates a newer and larger plant connected to the gas grid, where upgraded biomethane is filled into the grid and used to supply co-generation heat and power plants (CHP) and industries and gas burners for heating.

Figure 1: Methane emissions in a traditional biogas value chain[x]



Methane leaks is an important issue to focus on as they have a significant impact on the climate effect of biogas. And the issue of methane leaks will become even more important if European biogas production increases. In order to address this issue, it is necessary to regulate biogas production. The Danish regulation on biogas production may be taken as a starting point of how this can be done – except that the government waited too long to introduce mandatory rules, and that the mandatory limit for methane losses (1% of the production) only includes emissions from the upgrading part of the plants (read more below). The actual climate and environmental impacts of biogas depend on factors such as the type of biomass used and how emissions are managed - elements that are not always fully accounted for.

Therefore, in order for biogas to provide climate benefits, a number of criteria must be met:

1. As biogas production is part of both the energy and agricultural systems, it is important to determine its main purpose and how its size and infrastructure affect both systems. Biogas production should not be viewed as a green energy resource that can be scaled up without consequences; instead, the scale of production should be based on the amount of residual material available.
2. Secondly, emissions should be calculated for the entire life cycle of biogas production, i.e. digestate storage, combined heat and power (CHP) plants, gas networks, and transport from farm to biogas plant, etc. Currently, not all inputs or emissions are consistently accounted for, which result in an overestimation of the net climate benefit of biogas[xi].
3. In continuation of the above, methane emissions along the whole value chain must be kept to a minimum. This applies to the entire process, from the production of the feedstock materials[xii] and the management of manure and other biogenic inputs before it reaches the biogas plant, to the biogas plant itself, the gas upgrading plant, and the combustion facilities. It also applies to the residues (digestate) that will be stored and then spread on arable land.
4. The climate impact of biogas production depends heavily on the type of biomass used. Biogas plants should not be based on energy crops such as maize. If they are, the biogas production will be responsible for additional land use, and the climate gas emissions from this extra cultivation must be added to the biogas production account[xiii]. This is because the whole maize is produced and used for biogas, unlike the situation above with livestock animals for meat or dairy production, where only the manure goes to biogas plants. Therefore, it is positive that the use of maize in biogas plants has been banned in Denmark from 2025 onwards, as the last step in a phase-out that started with a limit of 25% by weight in 2013 (read more below)[xiv]. Other countries should take inspiration from this regulation.
5. Lastly, it is essential to ensure that biogas production does not result in a technological lock-in that sustains large-scale industrial livestock production. If manure is used as a feedstock for biogas production, it must be done in a flexible way, so that the biogas sector can increase the use of non-manure sources, as the agriculture sector makes the necessary transformation towards less industrial livestock farming. We should process the current amount of manure in biogas plants, but it is important that this does not create a lock-in to the current size of livestock production.
6. A new situation may occur in 10-15 years, if the number of livestock animals in Denmark has been drastically reduced, as we recommend. This would mean a 60-90% reduction in the number of cattle, poultry, and pigs. This would also drastically reduce the need for land to grow feed for the animals, providing enough space for nature, woodland, agriculture, and urban activities. The amount of manure would also be drastically reduced, and thereby also reducing the potential for biogas production, although new feedstocks would to some extent be able to substitute the manure. In this case, and if we, at that time, need a substantial contribution from biomethane to the production of especially jet fuel, we may have to consider a certain contribution of energy crops to the biogas

production. However, this is not relevant today. If, in 10–15 years, we use energy crops for biogas plants and use the biomethane for jet fuel, we will have to include the greenhouse gas emissions from growing the energy crops in the climate account for biogas production, as producing biogas will be the main reason for growing these crops. But if the energy crop also has other uses, the greenhouse gas emissions from the cultivation must be distributed between these uses. For instance, it could be grass, which serves the purposes of crop rotation and preventing nitrogen leakage. Currently, an EU order[xv] bans the use of energy crops for the production of jet fuel. Therefore, the situation above will only be relevant if this order is changed by then.

Biogas production in Denmark

In Denmark, biogas is primarily produced from manure, food waste, waste from biochemical industries, sewage sludge, straw and grass. Based on the biomass that the biogas plants utilise, the plants are categorised into four types — agricultural, wastewater treatment, industrial, and landfill plants — with agricultural plants accounting for 85% of the biogas production in 2022[xvi]. The main input for these plants is manure, and in 2023 about 35% of all Danish manure were digested in biogas plants (12.678.000 tons)[xvii]. Cattle manure accounted for 63% and pig manure for 37% of the total amount of manure used for biogas production[xviii]. The Danish Ministry of Climate, Energy and Utilities expects the amount of cattle and pig manure used for biogas to increase to around 16 million tons in 2030 (55% of the total amount of manure) as a result of support schemes for biogas production and the establishment of more biogas plants[xix].

Under the climate agreement *"DK2030: A Greener, Safer and Stronger Denmark"*, signed on 27 June 2022, the Danish Government has set a target of making all gas consumption green by 2030[xx]. Achieving this goal will require an increase in biogas production, combined with a reduction of the total consumption of gas. The latest “Climate Status and Projection” from 2025 estimates that the production of upgraded biogas will exceed the total pipeline gas consumption in 2032, meaning that gas consumption from 2032 will be 100% green in statistical terms[xxi]. If Denmark should reach 100% biogas in the Danish grid in 2030, further political action is needed.

According to the EU Commission[xxii] a national gas network must be 100% green in reality, in order to be considered decarbonised. Denmark exports a large share of its biogas production to other EU countries, but this is done by selling 'guarantees of origin'. This means that biogas will not be physically exported - the importing companies just pay a surplus price as a contribution to the surplus costs of producing biogas, compared to natural gas. The importing company can communicate in their marketing that they use biogas, but it will still be Denmark that can include the climate neutrality of the biogas in their climate account.

The Danish case: Methane leakages and regulation

In Denmark, the production of biogas operates under a regulatory framework aimed at ensuring its climate benefits, particularly with regards to minimising methane emissions[xxiii].

Studies on methane loss and the associated Regulation

In 2023, a Danish study issued by The Danish Energy Agency (measurements from 2021, made by the Danish Technical University (DTU), using a trace-gas method) covering 69 plants, representing 59% of national biogas production, found that methane losses at Danish biogas plants varied widely, from 0.3% to as high as 40.6% of total production[xxiv]. This study only included losses from the biogas plants, and not from storages for manure and digestate (degassed slurry), and from spreading on the fields.

Based on this study, the national emission factor (a weighted average) was set to be 2.5%, with a large variation between the sectors: for agricultural plants the average leakage is 2.1%, while for wastewater treatment plants it was 6.7%. Leaks of methane emissions from biogas plants are an important issue, as methane leaks above 1% reduce the greenhouse gas savings of biogas by about 7% for each additional percentage point of leakage[xxv]. The 2023 study also showed that emissions could be reduced by 46% through relatively minor technical improvements. In some cases, these improvements could be fully financed through increased energy sales[xxvi].

After the study was published, The Danish Energy Agency introduced regulation on methane leaks in 2023. The regulation states that all biogas plants must have a self-inspection programme in place and undergo an annual inspection by an independent third-party. The results of this inspection must be documented in a report submitted to The Danish Energy Agency. In addition, the regulation stipulate that all plants must take steps to reduce methane leakage. However, methane emissions are currently only measured from point sources—such as valves, pipes, and upgrading units—rather than from the entire plant[xxvii]. Further, facilities with upgrading units, where biogas is refined into biomethane (by removing CO_2), must ensure that no more than 1% of methane is leaked during the upgrading process.

A study from 2025 by Semra Bakkaloglu, commissioned by Deutsche Umwelthilfe (DUH), European Environmental Bureau, and Zero Waste Europe, showed median methane loss ranges between 5.4–5.8% for biogas and 4.5–4.8% for biomethane in Denmark based on bottom-up estimates, and a median of 3.8% based on top-down estimates (both estimates are calculated through Monte Carlo (MC) simulation)[xxviii]. In addition, the study identified digestate storage and Combined Heat and Power (CHP) units as key emission hotspots. These units are not included in the Danish regulation of methane loss from biogas production. And in the Danish measuring programmes they are only included, if they are situated near the biogas plant – which can be the case for a digestate storage, but normally not for a CHP. It is important that all these units are included together with mandatory annual leak detection and repair (LDAR).

The Danish Energy Agency conducted a new national assessment of methane loss from all biogas plants (using the trace-gas method), which was published by 26 November 2025, to evaluate the effectiveness of the Danish regulation[xxix]. Here the national emission factor was set to be 2.8%, which is slightly above the level from the 2023-study. In the meantime, there had been much focus on reduction of methane loss –

therefore it was surprising that no reduction was observed. The study has shown that further action is required to address and minimize methane loss from Danish biogas plants.

None of the Danish studies mentioned above cover methane emissions from biogas digestate, which normally must be stored in large tanks till field application is allowed in spring,

Regulation on energy crops

Since August 2018, the use of energy crops, such as beetroot, grain, grass[xxx] or artichokes, has gradually been reduced by introducing limits on their use. From 2018 to 2023, it was allowed to use up to 12 % of energy crops in the biogas production, and from August 2024 onwards, it is allowed to use up to 4 % of energy crops[xxxi]. Since monoculture crops, especially maize, have a negative environmental impact, only plant waste and by-products should be used for biogas. If the production of biogas is based on maize(kernels), it can, under worst-case conditions, have a climate impact corresponding to fossil natural gas[xxxii]. Therefore, it is very positive that the use of energy crops is controlled in Denmark, and especially that the use of maize as an energy crop has been forbidden since August 2025[xxxiii].

Methane emissions from digestate storage

Digestate from biogas production must be stored until spring, when new plants are able to absorb nitrogen and other nutrients. A study by the Danish Centre for Food and Agriculture at Aarhus University from 2025 showed that the level of methane emissions from stored digestate is much higher than previously calculated[xxxiv]. This is a particular concern for biogas facilities that use a high proportion of straw and other slowly degradable materials as inputs. Higher emissions will mostly come from the liquid fraction following the separation of digestate from biogas plants, particularly if these processes are not managed properly[xxxv]. Although the digestion process in the biogas plant reduces methane emissions from digestate storage, the digestate still emits a significant amount of methane. The obvious solution to the increased methane emissions observed in the liquid fraction would be a longer retention time, but additional measures may be needed (see table 1). Managing the digestate after the biogas process is important for the climate impact of biogas production. To address the issue of increased methane emissions from separated digestate from biogas plants, Seges Innovation, an independent research and innovation company working agriculture and food production, launched the Giga project in 2024[xxxvi]. The project aims to develop and demonstrate new methods of producing and applying digestate from biogas facilities that use a high proportion of straw and other slowly degradable materials as inputs.

Table 1: Potential solutions to minimise methane emissions[xxxvii], [xxxviii]

Point sources	Solutions
Storage tanks for degassed material (digestate)	Optimised biomass digestion in the biogas plant Installation of a cover with gas collection Cooling of degassed biomass to outdoor temperature Acidification
Upgrading plants	Installation of afterburners on water scrubber plants Selection of other upgrading technologies (membrane/amine)
Safety valves	Automated monitoring Regular self-inspection and maintenance

Sub conclusion

Overall, controlling methane leaks is critical not only for the climate, but also for plant safety and economic efficiency, as any escaped methane represents lost energy. Fortunately, many mitigation measures, such as improving retention time, operating at lower temperatures, and upgrading plant technology, are simple and some highly cost-effective, i.e. the repairs to decrease methane emissions can be paid back within a manageable timeframe using the increased revenues generated by the larger biomethane fraction recovered[xxxix],[xl]. Establishing concrete requirements for leak detection and repair is therefore essential to ensure that biogas lives up to its green potential.

Although reduction of methane losses leads to higher biogas/biomethane production and higher income to the plant owners, the fact that the Danish requirement of less than 1% loss of methane only applies to the upgrading plants can weaken the incentives to conduct leak detection and repair (LDAR) at the entire biogas plant. This should be prevented by new requirements (read more below under Conclusions and recommendations).

Biogas production in a European context

The European Union had a biogas production volume of 22.8 billion m^3 in 2024, making the EU “a global leader” in biogas production[xli]. Most of the EU's output is biogas and not biomethane. However, over the past five years, there has been a considerable increase in biomethane production, with biomethane accounting for 4.9 billion m^3 in 2023[xlii]. The production of biogas in the EU typically involves the anaerobic digestion of organic materials, including energy crops, agricultural- and food waste, and manure.

A report from 2025 by Profundo for the Methane Matters Coalition warns that, without robust and consistently enforced regulation, the production of biogas and biomethane can result in substantial methane

emissions and broader sustainability issues in the EU-countries[xliii]. While the EU's RePowerEU initiative and Biomethane Industrial Partnership aim to boost biomethane output to 35 billion m^3 annually by 2030, they currently lack a comprehensive environmental impact assessment.

The report points at measurement and control of methane leaks from biogas production as an important factor for ensuring that biogas contributes to, rather than undermines, the EU's 2030 climate goals. Denmark's biogas regulations provide a starting point for EU-level governance with its measurement and control of methane leaks, clear methane loss limit and regulation on the input of the biogas plants (limit/ban on energy crops). But the regulation at EU-level must go further than the Danish regulation. The regular measurements should include all parts of the production cycle, including the whole biogas plant, storages for residues (digestate), and the heat- and power plants. And the limit value for methane leaks of 1% should cover the whole biogas plant, which is not yet the case in Denmark.

Green Transition Denmark agrees that there are serious challenges in the design of the growing European biogas sector. For instance, there is first the issue of the far too slow phase-out (if any at all) of the use of energy crops in biogas plants and secondly the lack of a parallel strategy for a gradual transition to an agriculture based on less livestock and more plant production for direct human consumption. The most important conclusion to be drawn from the report is the need for a comprehensive environmental impact assessment of the 35 billion m^3 biogas and biomethane target set by REPowerEU.

Green Transition Denmark's opinion on biogas – looking beyond methane

In Green Transition Denmark, we recognise that biogas can play a role in the transition to a fossil-free energy system, but it must be developed responsibly, i.e. within planetary boundaries and according to a cascading use principle. More concretely, this means that biomass should be used where it creates the greatest societal value, and that biogas should only be used where there are no better alternatives – for heavy industry requiring high temperatures and for peak-load production of electricity and heating (as a flexible back-up for wind and solar energy). Biogas may also contribute to future production of alternative aviation – and perhaps marine - fuels, where it can contribute with both carbon and hydrogen. On the other hand, biogas should not be used in the ordinary heating sector, but only for peak-load on co-generation plants.

As feedstock we must prioritise residues like organic waste from industries, and food waste from industry, retailers, restaurants, canteens, and households, and deep litter (straw from stables with manure) and manure from agriculture. We should avoid the use of biomass that could be better used for higher purposes (up-cycling), for instance as fibres for insulation, textile industry, etc. Only biomass without higher-value applications should be directed toward biogas production.

A large share of the feedstock for the Danish biogas sector consists of livestock manure. But on the other hand, only 35% of Danish slurry is treated in biogas plants. Therefore, it will be possible to increase biogas production and simultaneously reduce the livestock numbers, by using a greater share of manure - alongside improved use of crop residues such as straw. Denmark must phase out combustion of straw for energy

purposes. Then we can use more straw for production of construction materials, and at the same time increase the use of straw for biogas production. It is important to ensure that biogas development does not sustain Denmark's large-scale livestock production or create new pressures on land and aquatic ecosystems. We must reduce the number of livestock to make room for nature and to abide by the Water Framework Directive. As explained above, this can to some extent be combined with further expansion of biogas plants, by increasing the share of manure and other residues that are sent through biogas plants. A study shows that even with a 50% reduction of the number of livestock animals by 2030, it is still possible to produce the necessary amount of biogas (40-50 PJ) for a fossil-free energy system in Denmark[xlivxlv].

Biogas production systems must also support nutrient recycling, ensuring that nutrients like nitrogen and phosphorus are returned to farmland while minimising leaching into water recipients. Anaerobic digestion improves nitrogen availability to crops, during the growth season, reducing environmental losses, while digestate separation can help recirculate phosphorus and reduce reliance on synthetic fertilisers. And most of the synthetic fertilisers used in the EU are imported, including a substantial share from Russia and Belarus (25% in 2023)[xlvi]. When straw and other plant residues are processed in biogas plants, the nutrients as well as the least degradable fractions remain in the residue (digestate) after it has been degassed and can contribute to a healthy and productive soil – unlike when you combust straw for energy purposes, where most of the nutrients and fibres are wasted.

In total, Denmark will likely need no more than around 20 PJ of biogas for industry and backup electricity generation by 2040[xlvii]. Therefore, to avoid locking in unsustainable practices and to level the playing field for other bio-based technologies, state subsidies for biogas should be gradually reduced. Biogas production should only be subsidised as an instrument to protect aquatic environment. This will enable other forms of biorefining that use biomass to access the resources that biogas plants can currently afford to pay more for.

Conclusion and recommendations

Biogas production offers environmental and climate benefits, but methane leakages from the production process are a serious problem that must be addressed if biogas production is to contribute to environmental protection and climate targets, rather than undermining them. Addressing methane emissions through better regulation and technology is key to ensuring biogas truly delivers on its promises. Overall, methane emissions from biogas plants must be strictly monitored, with gradually tightening limits and robust enforcement.

In the Danish context, Green Transition Denmark recommends:

1. More strict supervision of the biogas-plant owners by independent third parties, regarding emissions and control of cracks and leaks. The amount of methane loss from the entire biogas plant and storages for manure and digestate must be regularly measured and documented (using the trace-gas method). If the loss is too high this should require an extra leak detection and repair (LDAR). Mitigation measures that are already known to reduce methane leakage must be implemented.

2. The limit value for methane leaks of 1% from upgrading plants must be extended to cover the whole biogas plant and digestate storage. This requires a shift of method for measuring, but it is technically feasible and necessary in order to secure the climate benefits of biogas. As mentioned above, studies show that digestate storage and Combined Heat and Power (CHP) units are among the hotspots for methane leaks. Therefore, these should also be included in the limit value for methane leaks.
3. An immediate requirement for a longer retention time in the process reactor to prevent leakage where digestate is separated before being spread on agricultural land. Further research could establish whether a general requirement for a longer retention time is necessary. In Germany, the regulations require that if manure is used in the substrate mix, the retention time must be at least 50 days[xlviii].
4. A requirement for continuous supervision of pressure and prevention of overpressure (through a longer retention time). This can be secured by introducing administrative fines, when safety valves are released too often, due to over-pressure – and a requirement for measurements of residual gas in the digestate, securing a low level of this.
5. A carbon tax of at least 750 kr/t (100 €/t) CO_2e should be introduced for the agricultural sector, including biogas production and digestate storage. This should be combined with a consumption tax on the most climate-damaging foods such as meat, cheese and butter. Through the Green Tripartite Agreement, Denmark introduced the world's first carbon tax on agriculture, which includes a tax on livestock. However, the effective tax rate is far too low to drive the necessary structural transformation of agriculture away from industrial animal production, which partly is due to a base deduction of 60 %.
6. Biogas should be prioritised strategically and only used where there are no better alternatives, i.e. for:
    - Sectors with limited or long-term opportunities for electrification, such as certain heavy industries
    - Production of alternative sustainable fuels for aviation and maritime transport
    - Reserve load in an electricity/co-generation system based on renewables, mainly wind and solar.
7. No new gas stoves should be installed for heating, and the use of gas for domestic heating, including biogas, should be phased out as soon as possible, with an absolute ban by 2035 at the latest. Here, we already have better alternatives like district heating and heat pumps. The 2022 Climate Agreement on Green Electricity and Heating already set out a political ambition to phase out gas boilers by 2035[xlix].
8. Biogas should not be used for passenger cars, as these can be electric instead. For road-heavy vehicles, a majority of new heavy vehicles can be electrified within few years.

At the EU-level, Green Transition Denmark recommends:

1. The biogas sector must be regulated as the broader energy sector is[I]. This includes harmonised monitoring, reporting and verification (MRV) standards, mandatory leak detection and repair programmes, a ban on routine venting and flaring, technology standards, and a rapid response mechanism for super-emitter events.
2. The use of energy crops (food and feed grade crops), like maize, must be quickly phased out, like it has been done already in Denmark. The use of grass can be permitted, if the grass is part of a crop-rotation or it is used in refineries for production of protein, where the residues go to biogas plants.
3. Like recommended above in the Danish context, biogas should only be used where there are no better alternatives, e.g. for certain heavy industries that require high temperatures and peak load in the electricity and heat production. Biogas should not be used in the heating sector, and regarding transport it should be used where better alternatives are not available, mainly for production of fuels for air and sea transport.
4. It must be ensured that EU subsidies for biogas production under RED III and the Energy Taxation Directive do not encourage further expansion of the industrial livestock sector. The manure from the existing intensive and industrial livestock farms should still be treated in biogas plants.
5. The biomethane target of 35 billion m^3 by 2030 should be reconsidered following an environmental impact assessment, which has not yet been made. The EU framework, especially through RED III and REPowerEU, has set the target, which is a major increase from today's level of 4.9 billion m^3. An increase *can* be justified, if it is caused by a greater utilisation of existing manure production. Alongside greater use of manure, programmes must be adopted to transform European agriculture towards higher plant production for direct human consumption, while reducing meat and dairy production. An impact assessment must be made in order to provide a basis for determining to which extent biogas contributes to EU renewable energy targets.
6. The Nitrates Directive should be retained without amendment, and implementation and enforcement of both the Nitrates Directive and the Water Framework Directive must be strengthened. The directives must include mechanisms to achieve outcomes such as the post-composting of digestate (the residue from feedstock after anaerobic digestion for biogas production) before its application to land. This will reduce nitrogen runoff and water pollution.

Read more here

Reports from Green Transition Denmark:

Methane Emissions in a Danish Context

Clean Energy – within planetary boundaries in 2040

Reports from the Methane Matters Coalition:

Quantifying methane emissions in European biogas systems: A comparative supply chain analysis

Biogas Policies in the EU: Levelling up or locking in?

Green Transition Denmark

Green Transition Denmark (Rådet for Grøn Omstilling) is a partner organisation of the Methane Matters Coalition, who is working to reduce methane emissions in Europe and increasing European global leadership on methane mitigation. This report is funded by the Methane Matters Coalition.

References and footnotes:

[i] Buffi, M., Hurtig, O. and Scarlat, N., 2024. *Methane emissions in the biogas and biomethane supply chains in the EU – An analysis to update the greenhouse gas emissions accounting methodology of Renewable Energy Directive Annex VI*, Publications Office of the European Union: https://data.europa.eu/doi/10.2760/7927411

[ii] Rådet for Grøn Omstilling, 2024. *Methane Emissions in a Danish Context: Mapping of Denmark's current and projected methane emissions and how we can reduce them*: https://rgo.dk/wp-content/uploads/Finished_Report-on-Danish-Methane-.pdf

[iii] IPCC, 2023: Sections. In: *Climate Change 2023: Synthesis Report*. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647

[iv] EEA, 2024. *Denmark – air pollution country fact sheet:* https://www.eea.europa.eu/en/analysis/maps-and-charts/denmark-air-pollution-country-2023-country-fact-sheets

[v] EEA, 2024. *Impacts of air pollution on ecosystems in Europe*: https://www.eea.europa.eu/en/analysis/publications/impacts-of-air-pollution-on-ecosystems-in-europe

[vi] Klima, Energi og Forsyningsministeriet, 2021. *Green Gas Strategy: The role of gas in the green transition*: file:///C:/Users/rgolo/Downloads/2_groen_gasstrategi_en.pdf

[vii] Klima, Energi og Forsyningsministeriet, 2025. *Landbrugsprocesser*: https://www.kefm.dk/Media/638822882206541974/Kapitel%2018%20Landbrugsprocesser.pdf

[viii] Hafner, S.D., Møller, H., Dalby, F.R., Romio, C, 2025. *Management effects on methane emission from stored digestate - insights from coupling heat transfer and microbial models*. Research dissemination report from DCA – Danish Centre for Food and Agriculture, Aarhus University: https://dcapub.au.dk/djfpublikation/djfpdf/DCArapport238_net.pdf

[ix] AU Engineering, 2025. *Biogas - an environmental, climate and energy technology*: https://bce.au.dk/en/research/facilities/biogas-plant/biogas-an-environmental-climate-and-energy-technology

[x] Buffi, M., Hurtig, O. and Scarlat, N., 2024. *Methane emissions in the biogas and biomethane supply chains in the EU – An analysis to update the greenhouse gas emissions accounting methodology of Renewable Energy Directive Annex VI*, Publications Office of the European Union: https://data.europa.eu/doi/10.2760/7927411

[xi] Semra Bakkaloglu, Jasmin Cooper, Adam Hawkes, 2022. *Methane emissions along biomethane and biogas supply chains are underestimated*. One Earth. Volume 5, Issue 6: https://www.sciencedirect.com/science/article/pii/S2590332222002676#:~:text=Summary,at%20each%20supply%20chain%20stage

[xii] But this does not mean that all emissions in all parts of the entire process should be included in the climate account of the biogas plant – emissions from livestock animals and from growing feed for these must be put on the account of the meat and dairy products.

[xiii] This is counted as the 'Land Use, Land Use Change and Forestry' (LULUCF) factor.

[xiv] Energistyrelsen. 2025. *Energiafgrøder til biogas*: https://ens.dk/energikilder/energiafgroeder-til-biogas

[xv] EUR-Lex, 2023. *Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation).* https://eur-lex.europa.eu/eli/reg/2023/2405/oj/eng

[xvi] Energistyrelsen, 2025. *Produktion af biogas*: https://ens.dk/energikilder/produktion-af-biogas

[xvii] Energistyrelsen, 2024. *Biomasseindberetning 2016-2023*: https://ens.dk/media/6457/download

[xviii] Klima, Energi og Forsyningsministeriet, 2025. *Landbrugsprocesser*: https://www.kefm.dk/Media/638822882206541974/Kapitel%2018%20Landbrugsprocesser.pdf

[xix] Klima, Energi og Forsyningsministeriet, 2025. *Landbrugsprocesser*: https://www.kefm.dk/Media/638822882206541974/Kapitel%2018%20Landbrugsprocesser.pdf

[xx] Finansministeriet, 2022. *DK2030 - et grønnere, sikrere og stærkere Danmark 2030*: https://fm.dk/udgivelser/2022/september/dk2030-et-groennere-sikrere-og-staerkere-danmark-2030/

[xxi] Klima-, Energi- og Forsyningsudvalget. 2025. *Svar på KEF alm. del – spm. 317*: https://www.ft.dk/samling/20241/almdel/kef/spm/317/svar/2155021/3055481.pdf

[xxii] Klima-, Energi- og Forsyningsudvalget, 2025. *Klima-, Energi- og Forsyningsudvalget (KEF) Alm. Del. Bilag 411:* https://www.ft.dk/samling/20241/almdel/KEF/bilag/411/index.htm

[xxiii] Energistyrelsen, 2025. *Metantab fra biogasanlæg*: https://ens.dk/energikilder/metantab-fra-biogasanlaeg

[xxiv] Anders Michael Fredenslund, Einar Gudmundsson, Julie Maria Falk, Charlotte Scheutz, 2023. *The Danish national effort to minimise methane emissions from biogas plants*. Waste Management. Volume 157: https://www.sciencedirect.com/science/article/pii/S0956053X22006304

[xxv] Olesen, J. E., Møller, H. B., Petersen, S. O., Sørensen, P., Nyord, T. og Sommer, S. G.. Aarhus Universitet, 2020. DCA - Nationalt Center for Fødevarer og Jordbrug. 88 s. - DCA rapport nr. 175 https://dcapub.au.dk/djfpdf/DCArapport175.pdf, p.17

[xxvi] Anders Michael Fredenslund, Einar Gudmundsson, Julie Maria Falk, Charlotte Scheutz, 2023. *The Danish national effort to minimise methane emissions from biogas plants*. Waste Management. Volume 157: https://www.sciencedirect.com/science/article/pii/S0956053X22006304

[xxvii] Energistyrelsen, 2024. *Vejledning til anlægsgennemgang og lækagesøgning*: https://ens.dk/sites/default/files/media/documents/2024-10/2_vejledning_til_anlaegsgennemgang_og_laekagesoegning1.pdf

[xxviii] Deutsche Umwelthilfe, European Environmental Bureau, Zero Waste Europe (2025). *Quantifying methane emissions in European biogas and biomethane supply chains*: https://methanematters.eu/wp-content/uploads/2025/10/Report_-_Quantifying_methane_emissions_in_European_biogas_and_biomethane_supply_chains.pdf

[xxix] Energistyrelsen, 2025. *Metantab fra biogasanlæg*. Rapporten ligger under: *Læs undersøgelsen fra 2025 her*: https://ens.dk/energikilder/metantab-fra-biogasanlaeg

[xxx] This limit does not apply to organic grass in rotation. Source: Energistyrelsen, 2025. *Energiafgrøder til biogas:* https://ens.dk/energikilder/energiafgroeder-til-biogas

[xxxi] Klima-, Energi- og Forsyningsministeriet. 2025. *Bekendtgørelse om bæredygtighed og besparelse af drivhusgasemissioner for biomassebrændsler og flydende biobrændsler til energiformål, m.v.:* https://www.retsinformation.dk/eli/lta/2025/494

[xxxii] Baldino, C. (2023, November), *The climate risk of allowing feed crops in an EU biomethane target*, The International Council on Clean Transportation, pp. 1-7: https://theicct.org/wp-content/uploads/2023/11/ID-31-%E2%80%93-EU-biomethane-Briefing-A4-40040-fv-1.pdf

[xxxiii] Energistyrelsen, 2025. *Energiafgrøder til biogas*. https://ens.dk/energikilder/energiafgroeder-til-biogas

[xxxiv] Hafner, S.D., Møller, H., Dalby, F.R., Romio, C. 2025. *Management effects on methane emission from stored digestate - insights from coupling heat transfer and microbial models*. Research dissemination report from DCA – Danish Centre for Food and Agriculture, Aarhus University: https://dcapub.au.dk/djfpublikation/djfpdf/DCArapport238_net.pdf

[xxxv] Separation of digestate can be made in order to improve the utilization of nutrients when the digestate fractions are spread on agricultural land. Most phosphorous will appear in the fiber fraction, and this can be transported longer distances. In this way it can be utilized by plant-based farms, and you avoid spreading surplus phosphorous on livestock animal farms nearby.

[xxxvi] Seges Innovation, 2024. *Nyt projekt skal bane vej for, at biogasanlæg kan levere bedre gødningsprodukter til landmænd:* https://segesinnovation.dk/om-os/nyheder-og-presse/nyt-fra-seges-innovation/nyt-projekt-skal-bane-vej-for-at-biogasanlaeg-kan-levere-bedre-goedningsprodukter-til-landmaend/

[xxxvii] Biogas Danmark, 2021. *Minimering af metantab ved biogasproduktion*: https://www.biogas.dk/wp-content/uploads/2021/09/Faktaark-Metantab-fra-biogasanlaeg_21_09_01_web02.pdf

[xxxviii] Ma, Chun and Dalby, Frederik R. and Feilberg, Anders and Jacobsen, Brian H. and Petersen, Søren O., 2022. *Low-Dose Acidification as a Methane Mitigation Strategy for Manure Management.* ACS Agricultural Science & Technology, Volume 2/Issue 3: https://doi.org/10.1021/acsagscitech.2c00034

[xxxix] Anders Michael Fredenslund, Einar Gudmundsson, Julie Maria Falk, Charlotte Scheutz, 2023. *The Danish national effort to minimise methane emissions from biogas plants*. Waste Management. Volume 157: https://www.sciencedirect.com/science/article/pii/S0956053X22006304

[xl] O. Hurtig, M. Buffi, R. Besseau, N. Scarlat, C. Carbone, A. Agostini, 2025. *Mitigating biomethane losses in European biogas plants: A techno-economic assessment*, Renewable and Sustainable Energy Reviews, Volume 210: https://www.sciencedirect.com/science/article/pii/S1364032124009134#:~:text=Addressing%20biomethane%20leaks%20helps%20to,operators%20and%20significant%20climate%20benefits

[xli] Methane Matters, Deutsche Umwelthilfe, Chaning Markets Foundation, EIA, EEB, Zero Waste Europe (2025). Made by the consultancy group Profundo. *Biogas Policies in the EU: Levelling up or locking in?: https://methanematters.eu/wp-content/uploads/2025/10/Biogas-in-the-EU-Levelling-up-or-locking-in.pdf*

[xlii] Methane Matters, Deutsche Umwelthilfe, Chaning Markets Foundation, EIA, EEB, Zero Waste Europe (2025). Made by the consultancy group Profundo. *Biogas Policies in the EU: Levelling up or locking in?: https://methanematters.eu/wp-content/uploads/2025/10/Biogas-in-the-EU-Levelling-up-or-locking-in.pdf*

[xliii] Methane Matters, Deutsche Umwelthilfe, Chaning Markets Foundation, EIA, EEB, Zero Waste Europe (2025). Made by the consultancy group Profundo. *Biogas Policies in the EU: Levelling up or locking in?: https://methanematters.eu/wp-content/uploads/2025/10/Biogas-in-the-EU-Levelling-up-or-locking-in.pdf*

[xliv] EA Energianalyse, 2022. *Scenarieanalyse: Scenarier for husdyrgødning og biogasproduktion i Danmark*: https://www.greenpeace.org/static/planet4-denmark-stateless/2023/01/e03557a9-20221000_analyse_scenarier-for-biogas-mod-2030_ea-energianalyse.pdf

[xlv] Rådet for Grøn Omstilling, 2024. *Ren energi – indenfor planetære grænser I 2040*: https://rgo.dk/wp-content/uploads/Fremtidens-Energisystem_RGO.2040.rapport_enkeltsidet.pdf

[xlvi] Europaudvalget, 2025. *KOM (2025) 0034 – Bilag 2.* Page 3: https://www.eu.dk/samling/20241/kommissionsforslag/KOM(2025)0034/bilag/2/2978089.pdf

[xlvii] Rådet for Grøn Omstilling, 2024. *Ren energi – indenfor planetære grænser I 2040*: https://rgo.dk/wp-content/uploads/Fremtidens-Energisystem_RGO.2040.rapport_enkeltsidet.pdf

[xlviii] Buffi, M., Hurtig, O. and Scarlat, N., 2024. *Methane emissions in the biogas and biomethane supply chains in the EU – An analysis to update the greenhouse gas emissions accounting methodology of Renewable Energy Directive Annex VI*, Publications Office of the European Union: https://data.europa.eu/doi/10.2760/7927411

[xlix] Klima, Energi og Forsyningsministeriet, 2022. *Klimaaftale om grøn strøm og varme 2022: Et grønnere og sikrere Danmark*: https://www.kefm.dk/Media/637920977082432693/Klimaaftale%20om%20gr%C3%B8n%20str%C3%B8m%20og%20varme%202022.pdf

[l] EUR-Lex, 2024. *REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942:* https://eur-lex.europa.eu/legal-

content/EN/TXT/?uri=OJ:L_202401787&pk_campaign=todays_OJ&pk_source=EURLEX&pk_medium=X&pk_keyword=energy_sector&pk_content=Regulation&pk_cid=EURLEX_todaysOJ