REGEN

Summary for policymakers

Making the most of biomethane

An examination of biomethane's role in the energy transition.

Produced in partnership with The MCS Foundation.

SEPTEMBER 2025 – V1

About The MCS Foundation

The MCS Foundation drives positive change to decarbonise homes, heat and energy. It commissions robust, independent research that informs and shapes better decision making to drive a carbon-free future for all UK homes.

About Regen

Regen provides independent, evidence-led insight and advice in support of our mission to transform the UK's energy system for a net zero future. We focus on analysing the systemic challenges of decarbonising power, heat and transport. We know that a transformation of this scale will require engaging the whole of society in a just transition.

Acknowledgements

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Executive summary

Key messages:

- Biomethane could provide a low-carbon alternative to fossil methane for use in hard-to-decarbonise and high-value applications such as flexible power generation, high heat industrial processes, some aspects of non-road transport and local rural/agricultural decarbonisation.
- It will not, however, become a ubiquitous fuel for general consumers; the availability of sustainable feedstocks, as well as cost, will limit supply.
- Government policies to support biogas and biomethane production have produced mixed results.
- Any new policy to support production needs to be underpinned by a clear strategic and spatial plan, and must maintain high sustainability standards.

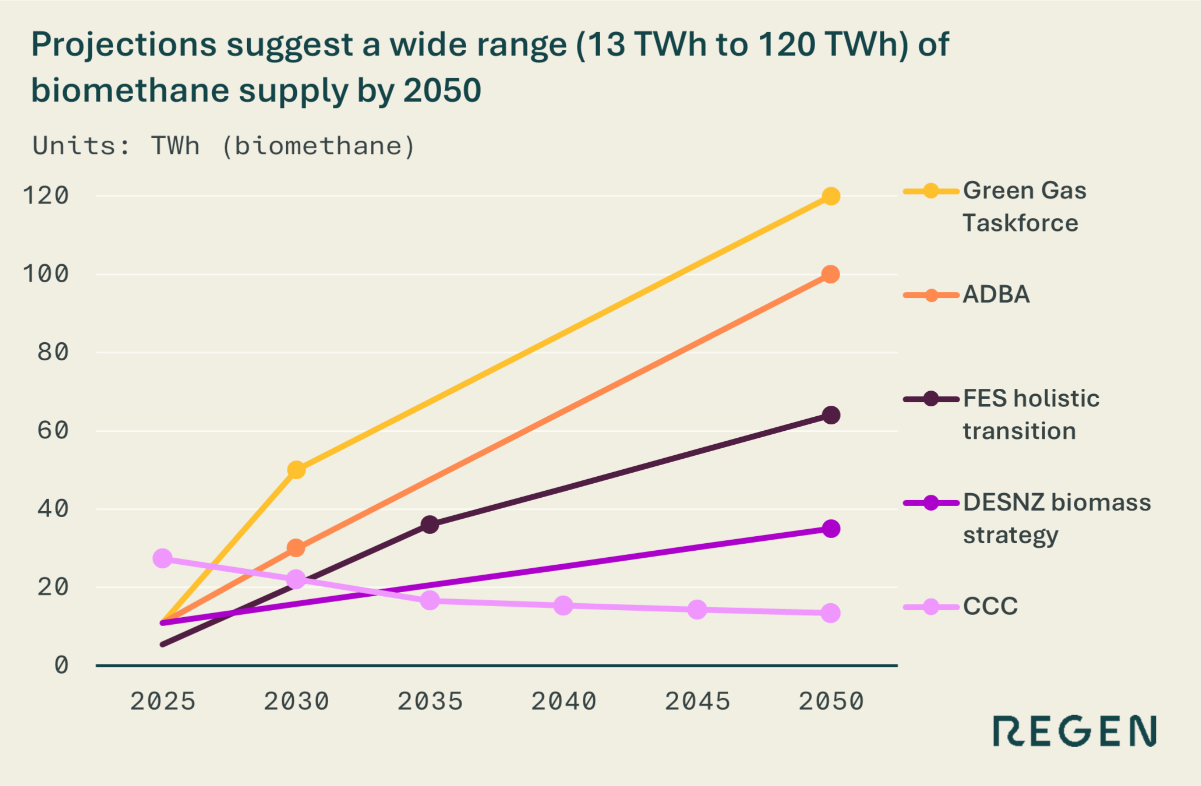
As a direct fossil methane replacement, biomethane could become an important fuel in the energy transition, especially for those areas of the energy system that are difficult to decarbonise and will continue to rely on fossil gas. It may compete with other low-carbon solutions such as CCUS and hydrogen, where the cost of plant conversion is highest.

Regen was commissioned by The MCS Foundation to conduct a literature review to better understand the potential role and scale of opportunity for biomethane in a future net zero energy system. This report presents several areas of analysis, including forecasts for biomethane production, the likely availability of sustainable biogas feedstocks, and an assessment of current and future policies to support biomethane production and demand decarbonisation. In the likely scenario that biomethane availability is limited, it also considers ways in which the use of this fuel could be prioritised to provide consumer value and reduce emissions.

The report findings are broadly aligned with previous analyses by the Climate Change Committee (CCC), the National Energy System Operator (NESO), the Green Gas Taskforce and other organisations, which suggest that biomethane could play an important role in a net zero energy system. Still, its use will be limited and should be targeted at areas of the economy that would otherwise be difficult to decarbonise.

Future Biomethane Supply

Figure 1: Comparison of biomethane availability projections reviewed by Regen[1]



Across all credible scenarios, the volume of biomethane will be limited by the production of biogas and other competing uses for feedstocks. It will also be limited by the availability and economic viability of organic feedstocks, including food waste, sewage, farm manure and energy crops. The wide range of recent projections for biomethane production, from less than 13 TWh to 120 TWh in 2050, reveals the high degree of uncertainty and the number of variables that will determine both the production of biogas and how much is then upgraded to biomethane.

The high estimate of 120 TWh would represent less than 18% of the UK's current methane consumption – this level of supply could make a significant contribution towards future gas demand, but only if the UK can significantly reduce demand for gas in heating, industry and power generation over the coming decades. The UK must cut gas demand by over 80% in all biomethane production scenarios.

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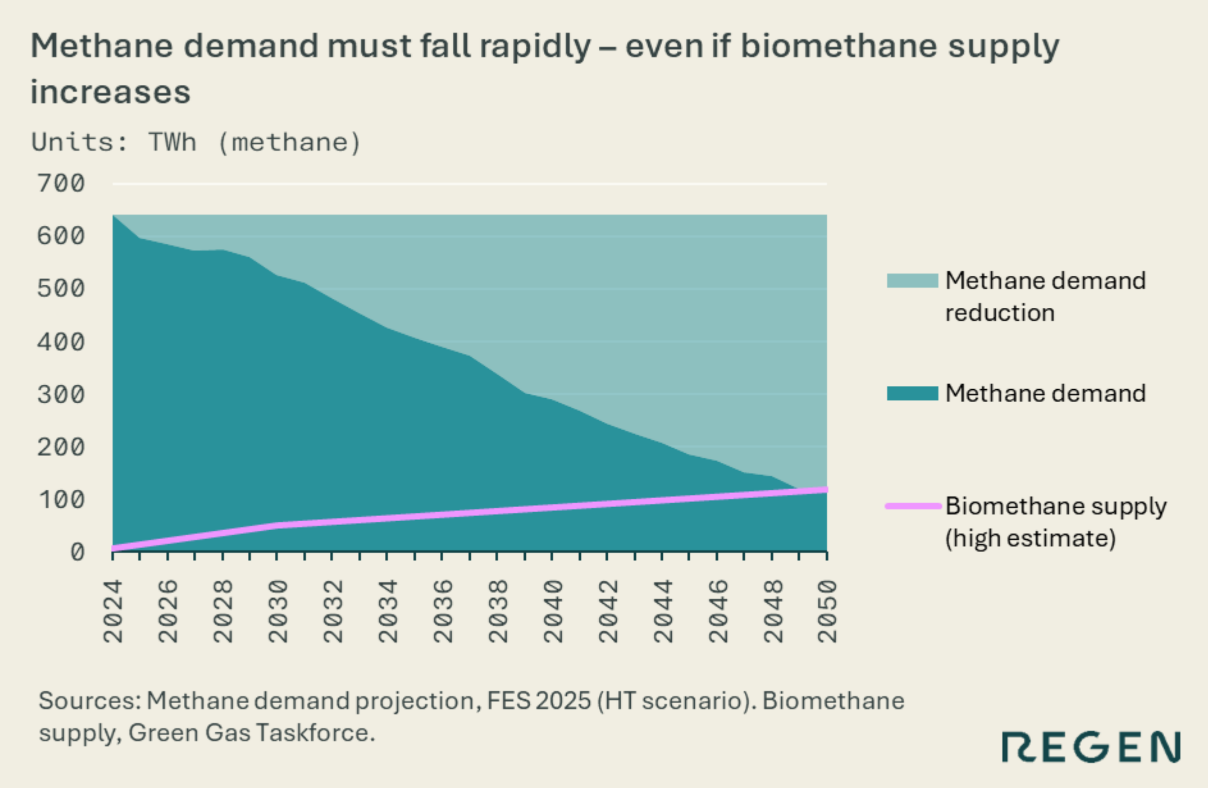
[1] Sources reviewed included: Unlocking the Future of Biomethane (Green Gas Taskforce, 2025), The role of green gas in net zero (ADBA, 2024), Future Energy Scenarios (NESO, 2025), Biomass Strategy (DESNZ, 2023), Methodology Report (Climate Change Committee, 2025). Note the CCC's projection includes both biogas and biomethane, so biomethane production would be lower than projected.

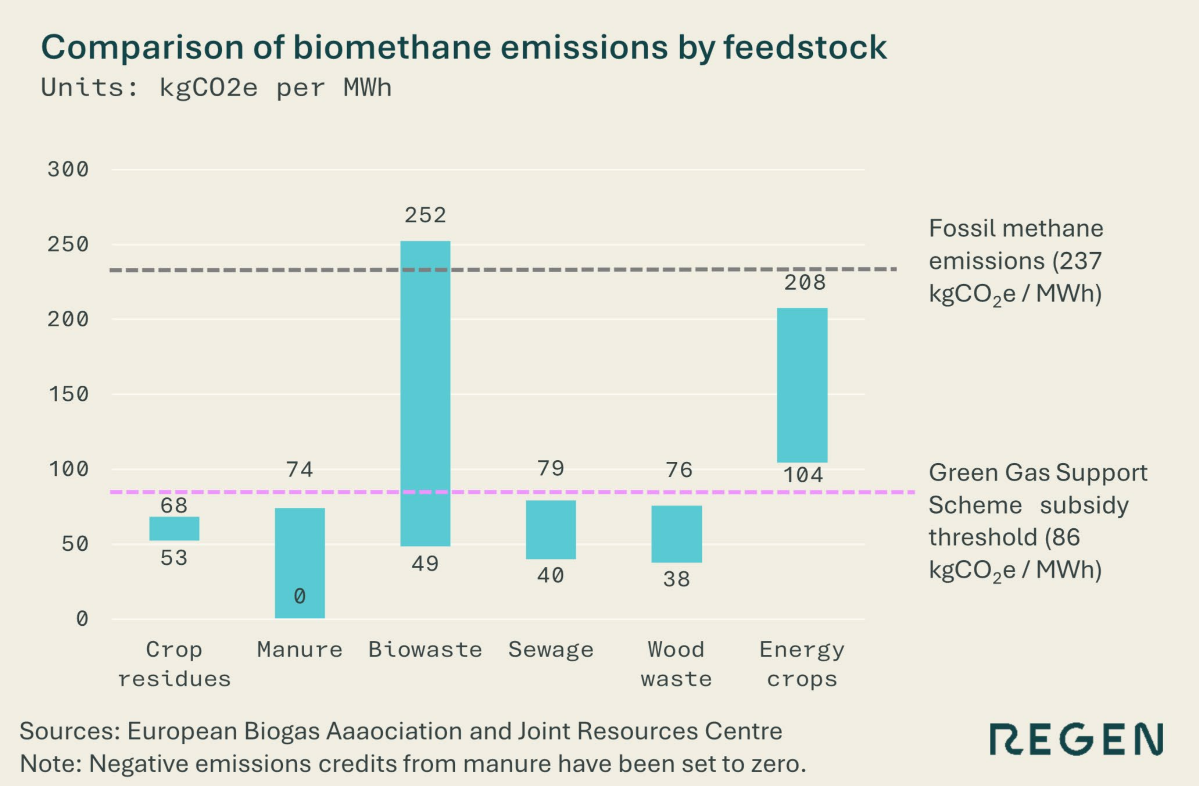
Figure 2: FES 2025 natural gas demand compared with projected biomethane production capacity (TWh)



Sustainability

As well as cost, a factor that has become more prominent in recent studies is biomethane's potentially high carbon footprint, depending on how it is produced and the source feedstock. The Green Gas Support Scheme (GGSS) requires biomethane to have a production carbon intensity lower than 86.4 kgCO2e/MWh. Studies by the European Biogas Association and the European Commission Joint Research Centre have shown that some biomethane feedstocks do not always meet this standard and can have higher whole-cycle emissions than fossil methane.

Figure 3: Typical ranges of greenhouse gas emissions by feedstock[2]



The sustainability of biomethane production is critical, and the biggest sustainability question concerns the use of energy crops. Other feedstocks, such as sewage and food waste, are unlikely to grow at scale, and food waste in particular may even decrease in availability over time. At a smaller scale, farm manure could have a significant role in local rural and agricultural decarbonisation schemes, of which there are already some great examples, but it will have limited national availability.

In theory, large-scale cultivation of energy crops could significantly increase organic feedstocks for biogas and biomethane. This is, however, highly contentious against both emissions and land-use criteria. The CCC gives some mixed messages regarding the use of energy crops in its Seventh Carbon Budget reports; while supporting the use of some energy crops for bioenergy, and biomass in particular, its lower projection for biomethane assumes the phased reduction of energy crops for biogas production, on the grounds that this would compete with food production and “carbon savings from other [land/crop] uses”.[3]

[2] Sources: Beyond energy - monetising biomethane’s whole-system benefits (EBA, 2023); solid and gaseous bioenergy pathways: input values and GHG emissions (JRC, 2017). Note: negative emissions credits from manure not included.

[3] CCC 2025, Methodology Report page 351

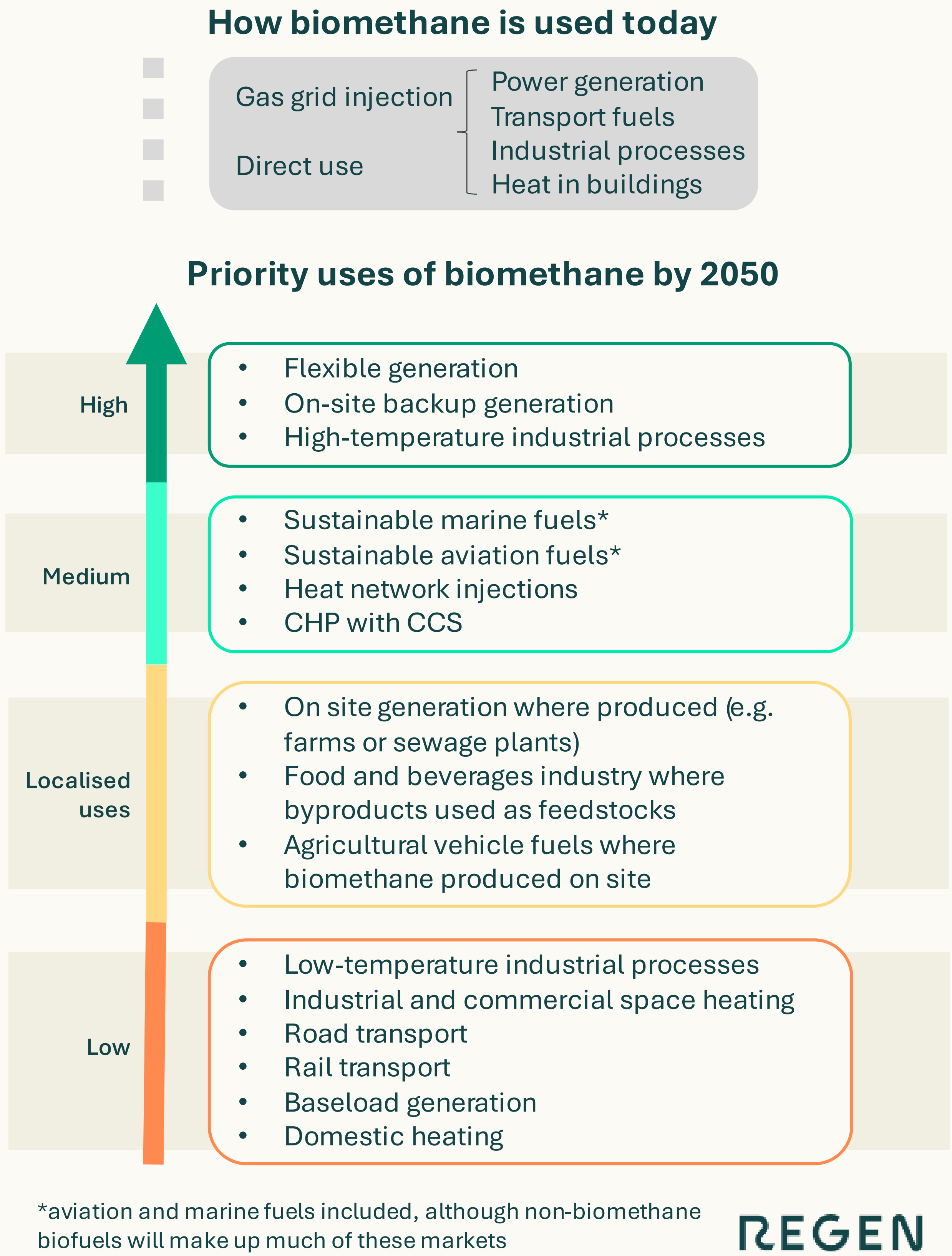
Priority end uses

Our analysis concludes that, whilst biomethane supply projections range from 13 TWh and 120 TWh by 2050, depending on the economics of biogas production and its upgrade to biomethane, even a high-end forecast would imply that there will not be enough biomethane for it to be used as a ubiquitous fuel in heating, industry and power generation like fossil gas is today. As a result, there is likely to be significant competition for biomethane across different end-uses.

Biomethane’s long-term deployment should therefore be prioritised for providing dispatchable electricity generation and focused on the hardest to decarbonise sectors of demand where decarbonisation through electrification, hydrogen or CCS is not viable. These applications will likely include high-temperature heating in industry, long-distance shipping, and biokerosene or liquified biomethane production for aviation.

Injection of biomethane into the gas grid could be a cost-efficient way to add more low-carbon energy to the system, displacing fossil fuels. The allocation of green gas to particular end users would be determined by market dynamics and the extent to which consumers are willing to pay a premium for supply certified through bundled Renewable Gas Guarantees of Origin (RGGOs). Clear messaging is, however, needed to ensure that grid injection does not become a rationale for delayed decarbonisation where more appropriate solutions are available.

Figure 4: Summary of priority end uses for biomethane



Policy interventions

Putting aside the question of future biomethane production, the analysis of current and future policy measures highlights some of the barriers that this sector faces. Recent policies encouraging greater biomethane production have had mixed results, as shown by the rise and fall in biogas production. The literature review suggests that, while the Non Domestic Renewable Heat Incentive (RHI) did lead to an increase in both biogas and biomethane production, the Green Gas Support Scheme has not brought forward a significant increase in anaerobic digestion capacity.

Unfortunately, except where biomethane is injected into the grid, it is difficult to isolate the precise split between biogas and biomethane production. We can see, however, that biogas production increased until 2018, reaching over 35 TWh, supported by the RHI, before falling significantly in 2019 and has seen a low rise since then. In 2024, DUKES reports a total of 33 TWh of biogas, of which 8 TWh was upgraded to biomethane and injected into the grid. The remainder, used mostly for on-site power generation with some usage in transport and industry, is likely to have been consumed as biogas, but may include some proportion of upgraded biomethane.

If the Government wants to increase biomethane production, then it will need to look at both supply-side and demand-side policies. A good starting point, however, would be to underpin future policy with a clear strategic plan and assessment of the role that biomethane should play and what capacity of biomethane feedstock and production would support that. Among the report recommendations, we have highlighted the need for biomethane and bioenergy to be included within future iterations of the Strategic Spatial Energy Plan (SSEP) being produced by NESO.

Meanwhile, on the supply side, the Government has asked for evidence to support the replacement of the GGSS. This seems necessary, and we have recommended that the Government consider a contract-for-difference type support scheme similar to that developed for hydrogen supply. The fact that these are likely to be competing gases would suggest that similar schemes and levels of support would be appropriate.

On the demand side, several policy interventions could be made. Firstly, policymakers must tackle the future design of the Emissions Trading Scheme (ETS) and ensure consistent carbon pricing across fuels and sectors. This will help push demand towards low-carbon fuels, including biomethane. A further policy lever would be to accelerate and strengthen the pace of decarbonisation required to participate in the GB Capacity Market. Incentivising fossil gas power generators to decarbonise, either by blending or a complete switch to biomethane, would create a significant demand pull and could strategically use biomethane as an energy store for use during energy stress events.

Key recommendations for policymakers include:

- **Recommendation 1:** Develop a clear, long-term strategy for biomethane that defines its role in the energy system, assesses sustainable feedstock availability, and sets out realistic production capacity pathways. This should feed into infrastructure planning exercises such as the Strategic Spatial Energy Plan and Regional Energy Strategic Plans to ensure gas network infrastructure considers reduced fossil methane flows and greater decentralised biomethane production.

- **Recommendation 2:** The Government is right to look at an alternative revenue support mechanism for biomethane – and should endeavour to align this with support for competing fuels such as hydrogen – but must ensure that any mechanism for biomethane production is only available to projects that meet strong sustainability criteria. These criteria are outlined in Section 5: Policy interventions.
- **Recommendation 3:** Establish consistent carbon pricing across fuels and sectors to create a natural market for biomethane based on its value as a low-carbon fuel, helping to guide its use into the sectors with greatest carbon reduction and value.
- **Recommendation 4:** Clear messaging is needed to ensure that consumers are accurately informed about the use and benefits of biomethane without delaying the transition to more appropriate low-carbon fuels or electrification.
- **Recommendation 5:** The Government and Ofgem should develop a long-term plan for gas network cost recovery, asset depreciation and gas distribution network decommissioning. Given that the volume of available biomethane will not be sufficient to replace fossil gas, the Government must consider the impact this will have on the future gas grid, including plans for a coordinated gas grid decommissioning and fair cost allocation to existing and future consumers.

Contents

1 Biomethane in the UK today

An overview of the current biomethane production, use and policy.

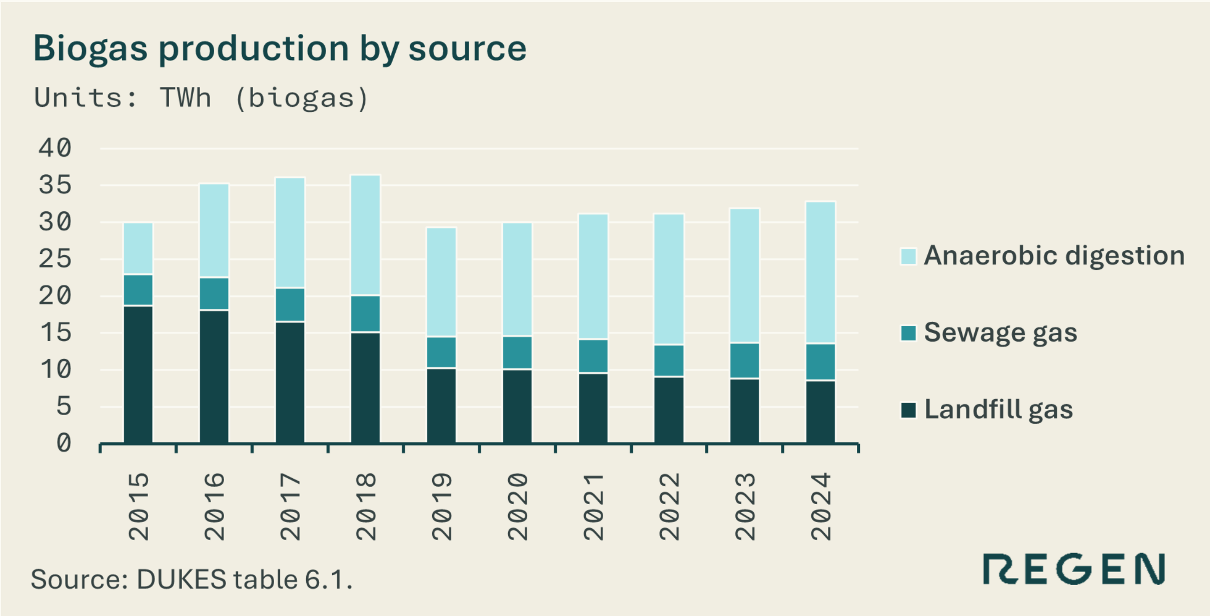
Key messages:

- Production of biogas has fluctuated between 30 to 35 TWh over the last decade.
- Biogas is mainly used on-site for power generation. In 2024, around 8 TWh of biogas was upgraded to biomethane for injection into the gas network.
- Production continues to be subsidised. The current Green Gas Support Scheme will end in 2028 and the Government is due to decide on future biomethane support.

Biomethane production and use today

Biomethane is produced by upgrading biogas, removing CO2 and other impurities, to create a versatile fuel with nearly identical properties to fossil methane (CH_4).

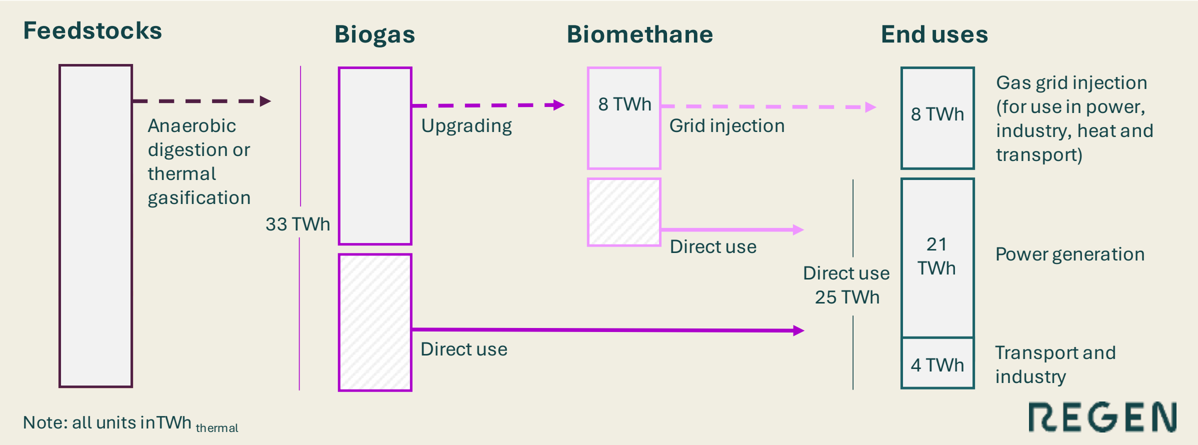
Figure 5: Biogas production since 2015 as estimated by DUKES



In 2024, the UK produced around 33 TWh of biogas from anaerobic digestion, sewage, and landfill gas.[4] Anaerobic digestion production has increased steadily, though total production has fallen from highs in 2018, as landfill gas output has dropped, driven by the diversion of biodegradable waste away from landfill and the decline of gas yields from older landfill sites.

Biogas, which contains 50–70% methane (with the remainder carbon dioxide, water vapour and trace contaminants), is mostly produced in the UK via dedicated anaerobic digestion. Biogas can be used directly as a fuel or upgraded to biomethane (see Figure 6). Biomethane has a higher methane content, making it more energy dense, and is compatible with the gas network and existing appliances designed for fossil methane.

Figure 6: Overview of biomethane production and use in 2024 (source DUKES 6.1)



Biogas and biomethane are used in the energy system in various ways. As Figure 6 illustrates:

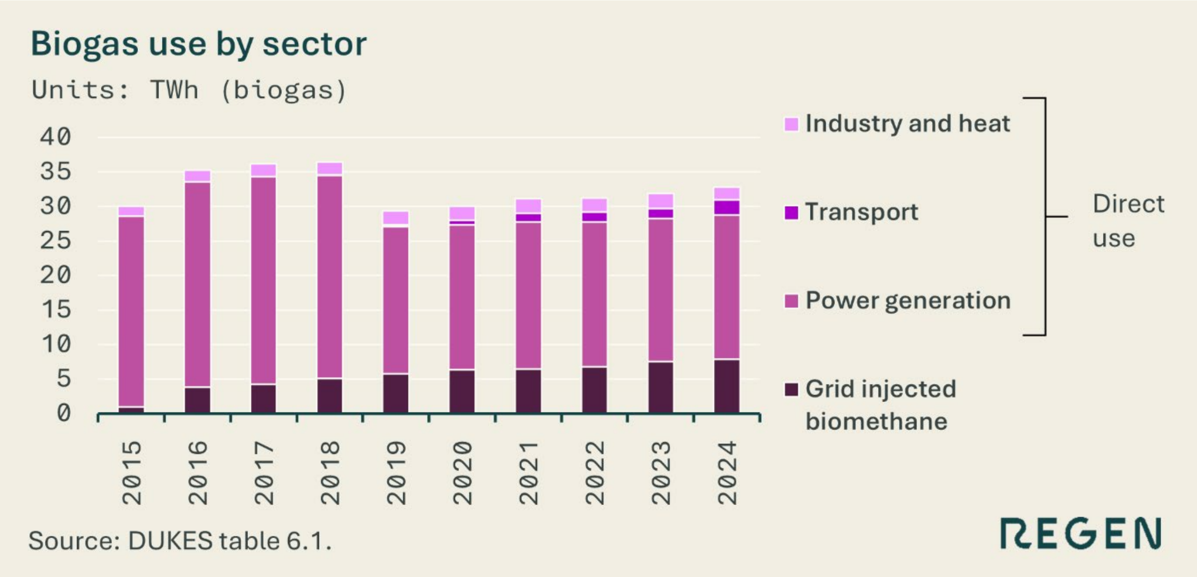
- Feedstocks are converted into biogas through anaerobic digestion at landfill sites, sewage works or dedicated anaerobic digesters (and also in very small volumes via thermal gasification).
- Biogas is then either upgraded to produce biomethane or used directly for power generation, heat or industry.
- If upgraded to biomethane, this is then either injected into the gas grid for distribution or used directly for power generation, heat, industry or transport.
- End users with gas grid connections can buy biomethane injected into the gas network, with its renewable origin tracked and verified through Renewable Gas Guarantees of Origin (RGGOs).

Figure 7 below shows how the use of biogas and biomethane has evolved over the last decade. The data from DUKES does not paint a complete picture. Still, it does show that whilst there has

[4] DUKES 6.1, DESNZ, 2025

been a trend of gradually increasing injection of biomethane into the gas grid, these volumes remain small relative to the overall production of biogas.

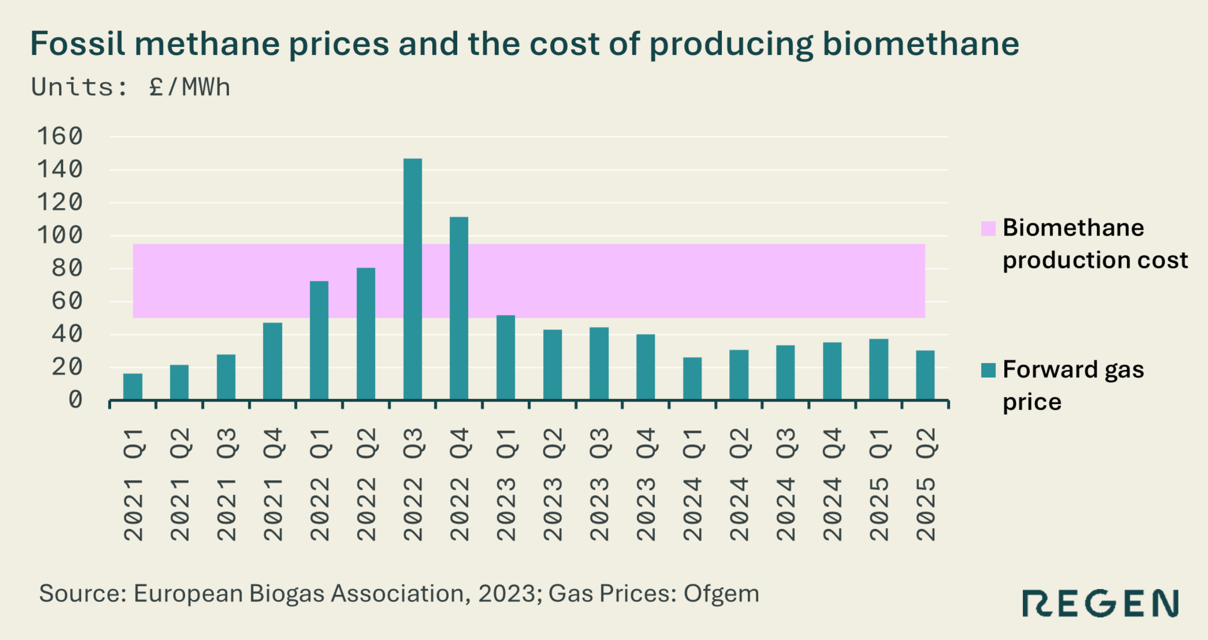
Figure 7: Breakdown of biogas use by sector over time, as estimated by DUKES



Policies to date

Subsidies have been used to incentivise production of biomethane, as the cost of production has historically exceeded the price of fossil methane – although, as Figure 8 shows, during the gas price crisis in 2022, prices rose above the cost of production.

Figure 8: Biomethane production costs compared to forward prices for fossil methane[5]



The 2023 Biomass Strategy sets out the UK's long-term approach to sustainably using bioenergy resources, including biogas and biomethane. Whilst it stopped short of prescribing a hierarchy of uses, it did establish guiding principles that policies related to biomethane should adhere to – principally to ensure it is directed where it delivers the most carbon benefit in harder-to-decarbonise sectors.

> The use of sustainable biomass must be prioritised in sectors that offer the greatest opportunity to reduce emissions and where there are fewest options to decarbonise through alternative low-carbon technologies.
>
> **Biomass strategy, UK Government, 2023**

The Green Gas Support Scheme is due to end in 2028. In 2024, the Sunak Government launched a call for evidence on a Future Policy Framework for Biomethane Production, which outlined various options for increasing biomethane production when the support scheme ends. The success of historic subsidy schemes and policy options ahead are explored in Section 5: Policy interventions.

[5] Estimates for biomethane production costs include £77 / MWh (ADBA, 2025. The Role of Green Gas in Net Zero) , £70 / MWh (Ecotricity and GBF, 2022. Green gas: The green economy under our feet) and £50 - £95 / MWh (European Biogas Association, 2023. Beyond money- monetising biomethane's whole-system benefits)

2 Future biomethane supply

An investigation into the likely trajectory of future biomethane supply.

Key messages:

- Projections of future biomethane availability vary widely, driven by different assumptions about which feedstocks will be available in the future. The most contentious feedstock is the use of energy crops.
- A lack of transparency regarding methodologies and underlying assumptions makes it difficult to compare different projections.
- There is a gap between supply and demand; credible estimates range from 13 TWh to 120 TWh of UK-based biomethane supply by 2050, which are significantly less than gas demand in 2024 (681 TWh).

Biomethane supply projections

Regen's review of projections for future biomethane supply in the UK found a wide range in possible production by 2050, as shown in Figure 9. Projections from the industry include 120 TWh from the Green Gas Taskforce (GGT)[6] and 100 TWh from the Anaerobic Digestion and Bioresources Association (ADBA).[7]

Lower projections have been produced by the National Energy System Operator (NESO) in its Future Energy Scenarios (FES) holistic transition scenario (64 TWh)[8] and by DESNZ in its 2023 Biomass Strategy (30-40 TWh).[9] The Climate Change Committee projected just 13 TWh in its Seventh Carbon Budget,[10] and NESO's FES electric engagement scenario projects biomethane falling to 0 TWh by 2050.

[6] Green Gas Taskforce 2025, Unlocking the Future of Biomethane

[7] Anaerobic Digestion and Bioresources Association and Business Modelling Applications 2024, The Role of Green Gas in Net Zero

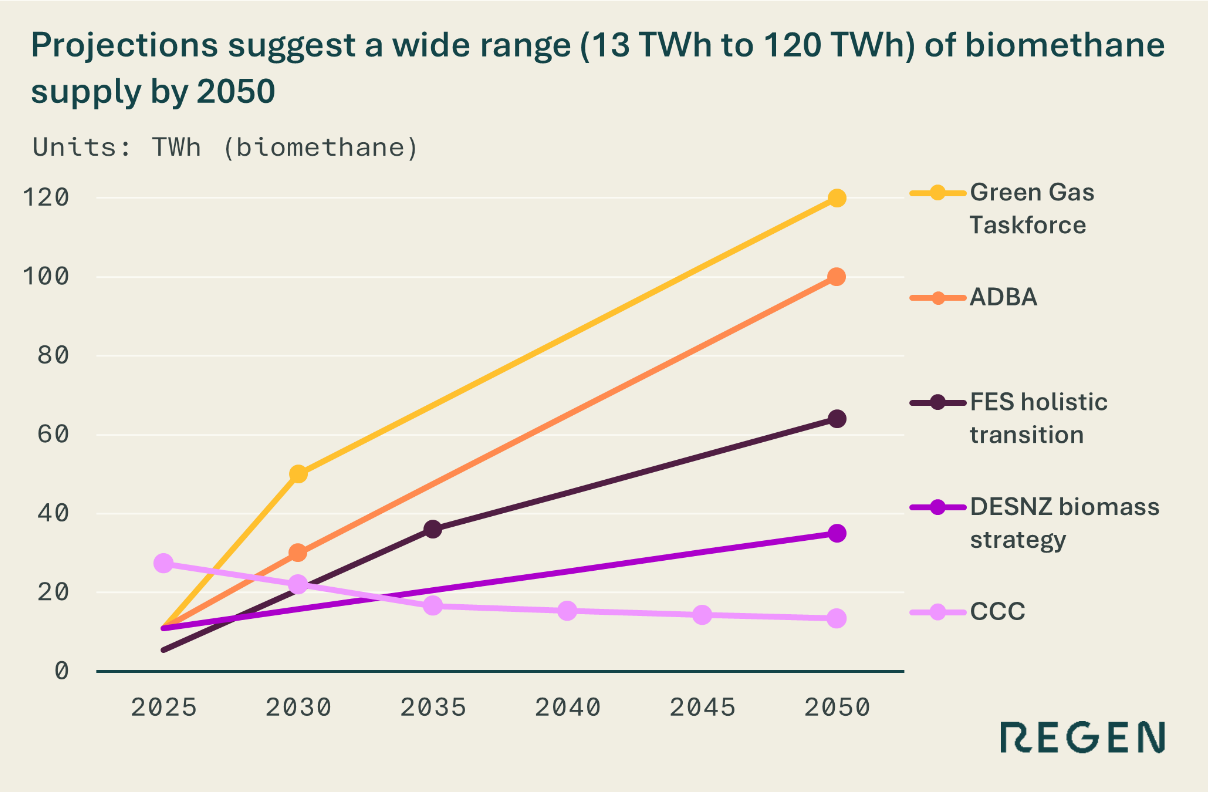
[8] NESO 2025, Future Energy Scenarios 2025

[9] DESNZ 2023, Biomass Strategy

[10] CCC 2025, Seventh Carbon Budget

Figure 9 highlights that even the most ambitious estimates show a near-term availability of c. 50 TWh in the next five years. The UK's total natural gas consumption in 2024 was 681.[11] Implications of this supply and demand gap will be further discussed in Section 5: Policy interventions.

Figure 9: Comparison of biomethane availability projections reviewed by Regen[12]



Several reports were reviewed but not included in the above comparison. Two reports from the Electricity Networks Association[13] and the Green Britain Foundation & Ecotricity[14] offer substantially higher biomethane estimates than the studies cited here (193 TWh and 236.5 TWh, respectively). These were not deemed credible as the ENA report projected 121 TWh of its 193 TWh figure being produced through thermal gasification, a less well-developed and more

[11] DUKES 2025, Aggregate energy balances (DUKES 1.1)

[12] Sources reviewed included: Unlocking the Future of Biomethane (Green Gas Taskforce, 2025), The role of green gas in net zero (Anaerobic Digestion and Bioresources Association, 2024), Future Energy Scenarios (NESO, 2025), Biomass Strategy (DESNZ, 2023), Methodology Report (Climate Change Committee, 2025). Note the CCC's projection includes both biogas and biomethane, so biomethane production would be lower than projected.

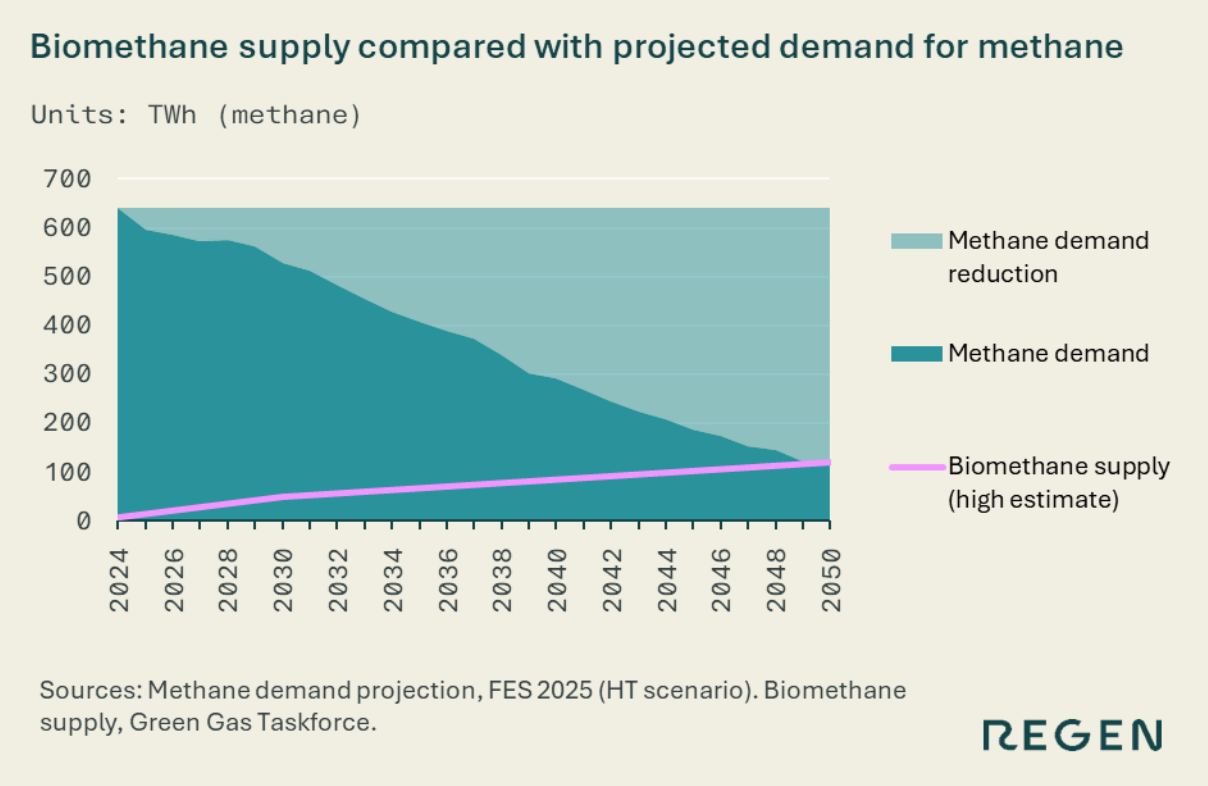
[13] ENA 2021, Gas Goes Green: Delivering the Pathway to Net Zero

[14] Green Britain Foundation and Ecotricity 2022, Green Gas: The Green Economy under our feet

expensive method for producing biomethane; to achieve the 236 TWh figure in Ecotricity's report, 6.46 million hectares (26% of the UK's land) would be required.

Given supply limitations, biomethane is unlikely to meet more than 18% of today's natural gas demand by 2050, even if all available UK-based feedstocks are to be converted to biomethane.

Figure 10: FES 2025 natural gas demand vs projected biomethane production capacity (TWh)

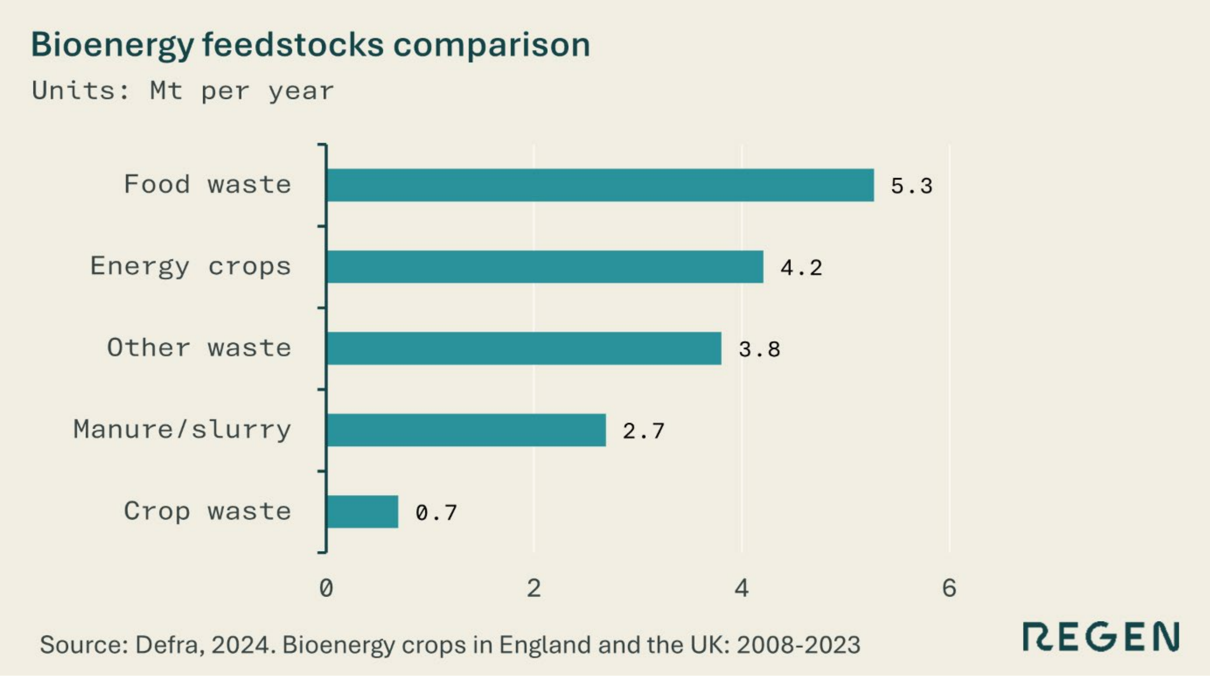


Existing feedstock supply

In 2023, crop-derived materials accounted for 29% of the feedstocks used in operational AD plants, equivalent to around 4.9 million tonnes.[15] Of this, 4.2 million tonnes (25% of total feedstocks) came from crops grown specifically for anaerobic digestion (AD), while 0.7 million tonnes (4.2%) were from crop waste. The remaining 71% of feedstock mass consisted of non-crop wastes such as food waste and manure.

[15] DEFRA 2024, Bioenergy Crops in England and the UK: 2008-2023. Note: DEFRA reports AD installation data in electrical capacity terms, but this does not mean that these plans generate electricity exclusively. This statistic likely does not include the capacity of AD facilities producing biomethane for direct injection into the gas grid.

Figure 11: Bioenergy feedstocks used anually in the UK in 2023



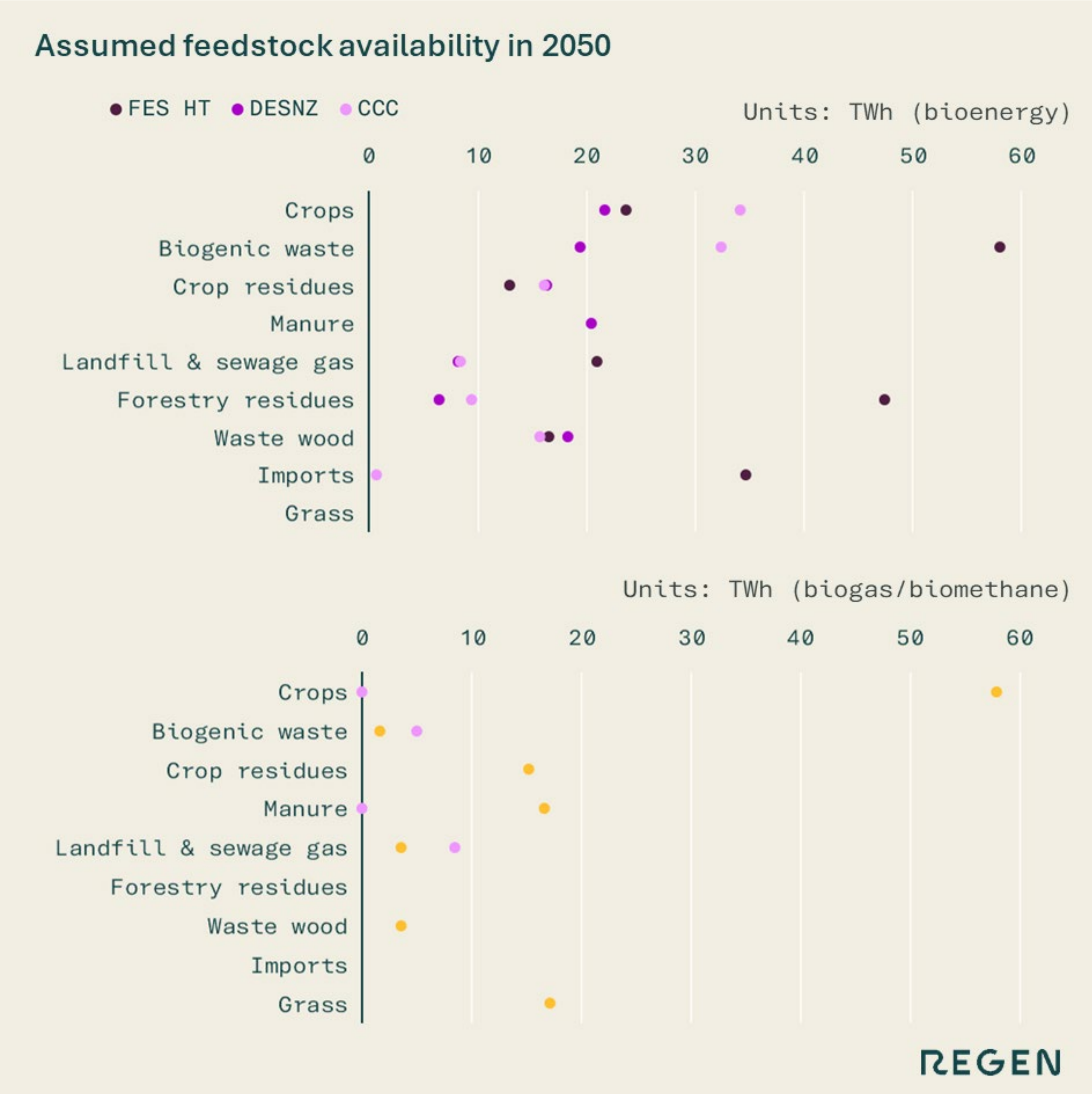
Future feedstock availability

The reports included for comparison took the following approaches to projecting future feedstock availability:

- The CCC (methodology report)[16] and GGT provided projections of feedstocks for biomethane specifically
- DESNZ and FES projected feedstocks for bioenergy more broadly
- The ADBA report did not provide explicit feedstock projections, but stated the current balance is likely to be maintained at around 50% food waste, 20% energy crops, 20% agricultural wastes and 10% sewage.

[16] CCC biomethane feedstock projections were taken from the 2025 Methodology Report, in combination with the Seventh Carbon Budget (2025). The methodology report projects 5 TWh from food waste and 10 TWh from landfill and sewage gas by 2040, while the Seventh Carbon Budget projects 13.43 TWh total biomethane by 2050. As biogas is projected to decrease to 8.43 TWh by 2050, production from food waste has been assumed to remain at 5 TWh.

Figure 12: Biomethane and bioenergy estimates by feedstock in 2050[17]



Projections of biomethane feedstock availability differ widely between studies. Energy crops and biogenic waste are generally projected to be the most available feedstocks, with most reports projecting crop residues and landfill and sewage gas at significant but lower levels.

The future availability of feedstocks for biomethane remains uncertain, and will depend on policy, economic and technological developments. Key trends in availability have been

[17] Note the CCC's projection refers to both biogas and biomethane together, so feedstock available for biomethane would be lower than shown.

summarised in Table 1, alongside low and high projections of biomethane feedstock availability included in the CCC and GGT reports.

Table 1: Low and high feedstock projections by 2050

Feedstock	Description	Trend	Low projection	High projection
Energy crops	Miscanthus, maise, short-rotation coppice and short-rotation forestry	Likely to increase in future, but growth will be limited by land availability	0 TWh (CCC)[18]	57.9 TWh (GGT)
Biogenic waste	Any biodegradable municipal, commercial or industrial waste. Projections for this feedstock mainly focus on food waste	Likely to increase slightly in the short term, but with limited ongoing growth	1.6 TWh (GGT)	5 TWh (CCC)
Crop residues	Includes crop residues post-harvesting and waste feedstocks generated through the processing of crops	Lack of data - moderately available feedstock	15.2 TWh (GGT)	15.2 TWh (GGT)
Manure	Waste produced by livestock, including slurry and solid waste	Use is likely to be limited to regions with concentrated availability or on-farm biomethane production	0 TWh (CCC)[18]	16 TWh (GGT)

[18] The CCC considers energy crops and manure in their analysis, but models them as 0 TWh production by 2050 due to modelling assumptions around on-site production of fertiliser for manure and phase out of energy crops that compete with food production (See CCC Methodology Report, pg 350-352).

Feedstock	Description	Trend	Low projection	High projection
Landfill and sewage gas	Landfill gas is produced when biodegradable waste undergoes anaerobic digestion in landfills. Sewage gas is produced through anaerobic digestion of sewage sludge at wastewater treatment plants.	Landfill gas will continue to decrease, while sewage gas will increase to some extent with population growth	3.6 TWh (GGT)	8 TWh (CCC)
Woody biomass	Includes forestry residues and waste wood	Likely to be used for other forms of bioenergy	3.5 TWh (GGT)	3.5 TWh (GGT)

Factors affecting future feedstock availability

The following pages briefly describe the factors affecting availability for each feedstock.

Crops

Energy crops are a more versatile feedstock than waste resources, as production can be increased to meet demand. Their main limiting factor is land use and competition with food production. In addition, there are environmental concerns such as soil degradation, water use, fertiliser use and biodiversity impacts, which could affect production volumes if strict sustainability standards are reflected in future policies. To avoid this conflict, the CCC has modelled a transition away from energy crops as a biomethane feedstock, focusing instead on waste resources.[19] In the Biomass Strategy, DESNZ modelled an increase in energy crop cultivation, but only on abandoned agricultural land. By contrast, the GGT and ADBA reports suggest that crop production can be increased alongside food production by using sequential or rotational cropping (see Section 3: Sustainability). These differing approaches lead to various

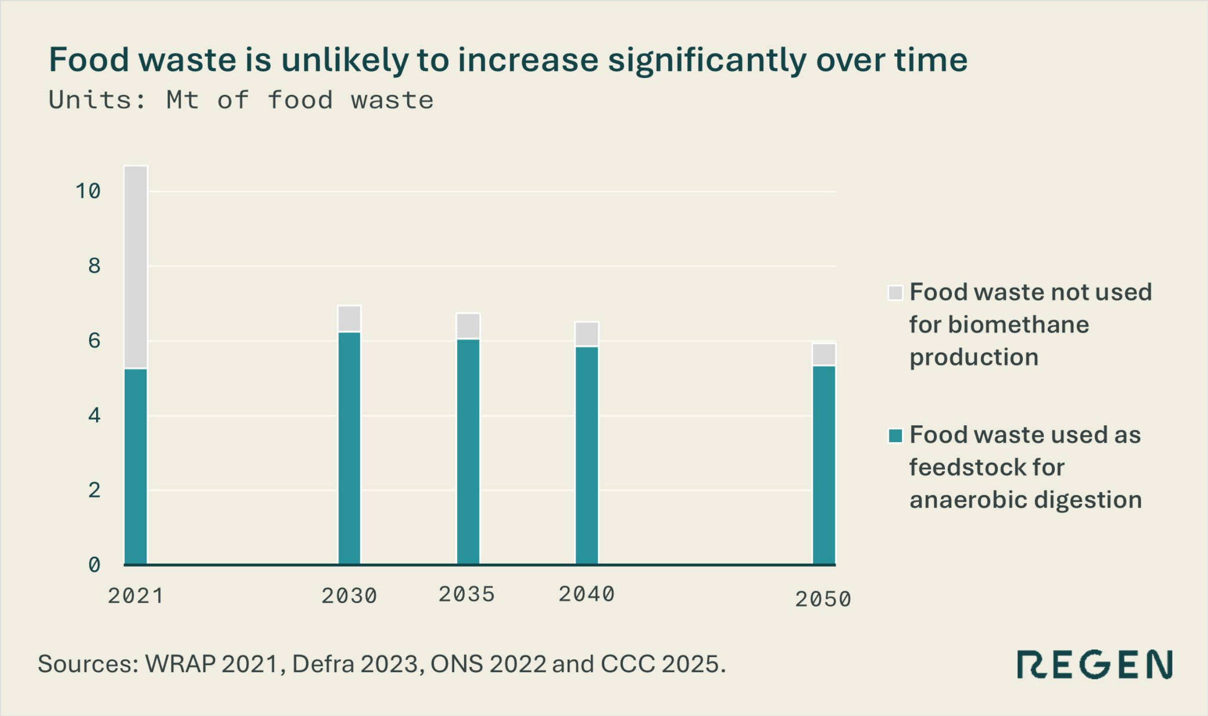
[19] CCC, 2025. Methodology Report pages 350-351

projections for energy crop availability as a biomethane feedstock, ranging from 0 to 57.9 TWh in 2050.

Food waste

The Seventh Carbon Budget set targets to halve the amount of food waste generated per capita in the UK by 2050 and collect 90% of food waste for anaerobic digestion by 2030. If both targets are achieved, there is unlikely to be a significant change in the availability of food waste as a biomethane feedstock beyond a small short-term increase (Figure 13). As a waste resource, this feedstock will remain important for biomethane production, but will be limited, and demand for biomethane should avoid undermining targets to reduce food waste.

Figure 13: Food waste projections by 2050



Crop residues

Projections of available crop residues vary widely, lacking official data. Defra statistics indicate that 0.694 Mt of crop residues were used for anaerobic digestion in 2023.[20] Donnison et al. state that currently 1 Mt out of an available 3-4 Mt of crop residues is used for bioenergy.[21] In

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[20] DEFRA 2024, Bioenergy crops in England and the UK: 2008-2023

[21] Donnison et al. 2024, Expert workshop gives a reality check on bioenergy with carbon capture and storage (BECCS): trust, demand and collaboration are critical

contrast, Supergen Bioenergy Hub[22] puts the UK's available crop residues at 24.9 Mt. This feedstock is likely less important than crops and biogenic waste for biomethane production, but still a significant contributor, with projections ranging from 3 to 20 TWh.

Manure and livestock

The low energy density of manure makes it uneconomical to transport long distances, meaning use for anaerobic digestion will likely be restricted to regions with concentrated availability. This was reflected by an analysis of manure availability from an academic study, which was updated using recent livestock data.[23] Although this analysis found the UK has around 20 of manure which could be collected from farms, only 32% of this technical potential is likely to be economically feasible for use as a biomethane feedstock.

The Seventh Carbon Budget included a target to reduce the numbers of UK cattle and sheep by 38% from 2023 levels by 2050.[24] If achieved, this would reduce the amount of manure available as a feedstock. However, increases from current levels could still be achieved if manure is collected for anaerobic digestion from a greater number of farms. Demand for manure as a biomethane feedstock should not undermine CCC targets to reduce livestock production and associated emissions.

Landfill and sewage gas

Landfill gas is decreasing in availability over time as more biogenic waste is diverted from landfills. UK landfill gas has fallen from 19.9 TWh in 2013 to only 8.6 TWh in 2024,[25] and this trend is likely to continue in line with the CCC target for the near elimination of biodegradable waste sent to landfill by 2028. Sewage gas will increase gradually, driven by population growth and improved wastewater treatment processes. However, wastewater treatment plants have high energy and heat demands, with some using significant proportions of the biomethane they produce to supply their own operational gas requirements. Overall, both landfill gas and sewage gas will remain relatively small feedstocks for biomethane.

Woody biomass

Woody biomass is unlikely to be a sustainable or cost-effective source of biomethane. In particular, processing requirements using gasification technology are costly and not proven at

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[22] Supergen Bioenergy Hub 2025, Supergen Bioenergy Hub response to UK Government consultation on land use framework

[23] Scarlat et al. 2018, A spatial analysis of biogas potential from manure in Europe

[24] CCC 2025, Seventh Carbon Budget

[25] DUKES, 2025. Renewables and waste: commodity balances (DUKES 6.1) - Excel

scale. The reports reviewed projected greater use of woody biomass as a feedstock for bioenergy than for biomethane.

Each of these feedstocks has alternative uses, and many are in high demand across other sectors, which can drive up prices and limit their availability for biomethane production. Some of the highest-competing sectors include farm use of crop residues and manure, the production of other forms of biofuels (including sustainable aviation fuel), animal feed made from food waste, and Combined Heat and Power (CHP) plants, which use solid biomass.

3 Sustainability

An examination of the environmental impacts of producing biomethane.

Key messages:

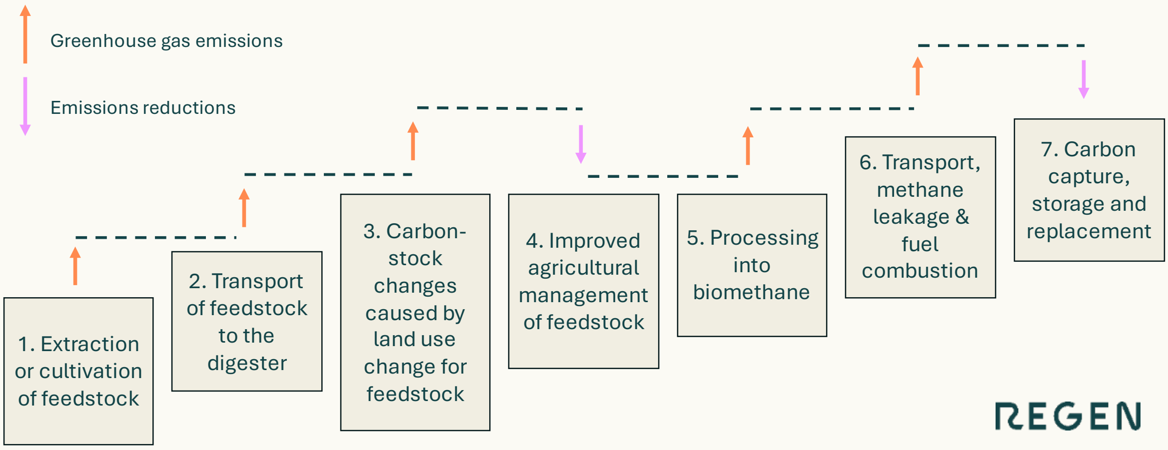
- Biomethane-related greenhouse gas (GHG) emissions vary substantially depending on the feedstock and processing techniques. Many biomethane feedstocks, including some waste feedstocks under certain processing circumstances, do not meet sustainability criteria as set out by the GGSS.
- Waste feedstocks and energy crops are likely to have a lower GHG impact than natural gas under most processing conditions.
- Land use and sustainability concerns are unique to each feedstock type; government plans for land use in non-energy sectors will compete for the same land as feedstocks for biomethane.
- Waste feedstock dependency can have unintended consequences around increased demand.
- Livestock emissions contribute to 7.4% of the UK's greenhouse gas emissions; continued demand for manure could risk disincentivising a reduction in livestock agriculture and related emissions from this sector.

Greenhouse gas emissions

Biomethane and other forms of bioenergy are often described as carbon neutral or having net zero carbon emissions. This is because the biomass used to produce them contains carbon absorbed from the atmosphere recently, as opposed to fossil fuels, which contain carbon absorbed from the atmosphere thousands of years ago. When biomethane is burned, it releases carbon dioxide, but as this carbon was already in the atmosphere until recently, re-emitting it has a net zero impact on the carbon stores of the planet. By contrast, burning fossil fuels releases carbon stored in the lithosphere for thousands of years, increasing atmospheric carbon stores.

However, biomethane is not always carbon neutral. Growing, harvesting, processing and distributing biomass all require energy and other inputs, which can generate additional emissions if not decarbonised. A graphical representation of the greenhouse gas reporting calculations under the Green Gas Support Scheme's Actual Value Method is shown in Figure 14.

Figure 14: Biomethane lifecycle emissions calculation diagram, as in Green Gas Support Scheme Regulations[26]



The degree of emissions savings compared to natural gas varies by feedstock type and is influenced by decisions made during each step of the production process. According to the European Commission, biomethane can deliver emission reductions from as low as 10% compared to fossil fuels, with certain production pathways achieving over 200%[27] where carbon credits are considered.[28] However, poor processing conditions could lead to high emissions, approaching similar levels to natural gas well-to-tank emissions. According to JRC research, this was found to be the case according to a modelled worst-case scenario of biowaste with open digestate, high upgrading emissions and no off-gas combustion.[29]

The energy and agricultural inputs used to produce, process and distribute energy crops will likely generate greater emissions than other feedstock types. Most energy crop lifecycle emissions surpass the GGSS sustainability threshold of 86.4 kg CO2e/MWh, disqualifying them for participation in the support scheme. More sustainable agricultural practices, using energy from renewable sources and electrifying machinery and transport, can all reduce these emissions (see Figure 14).

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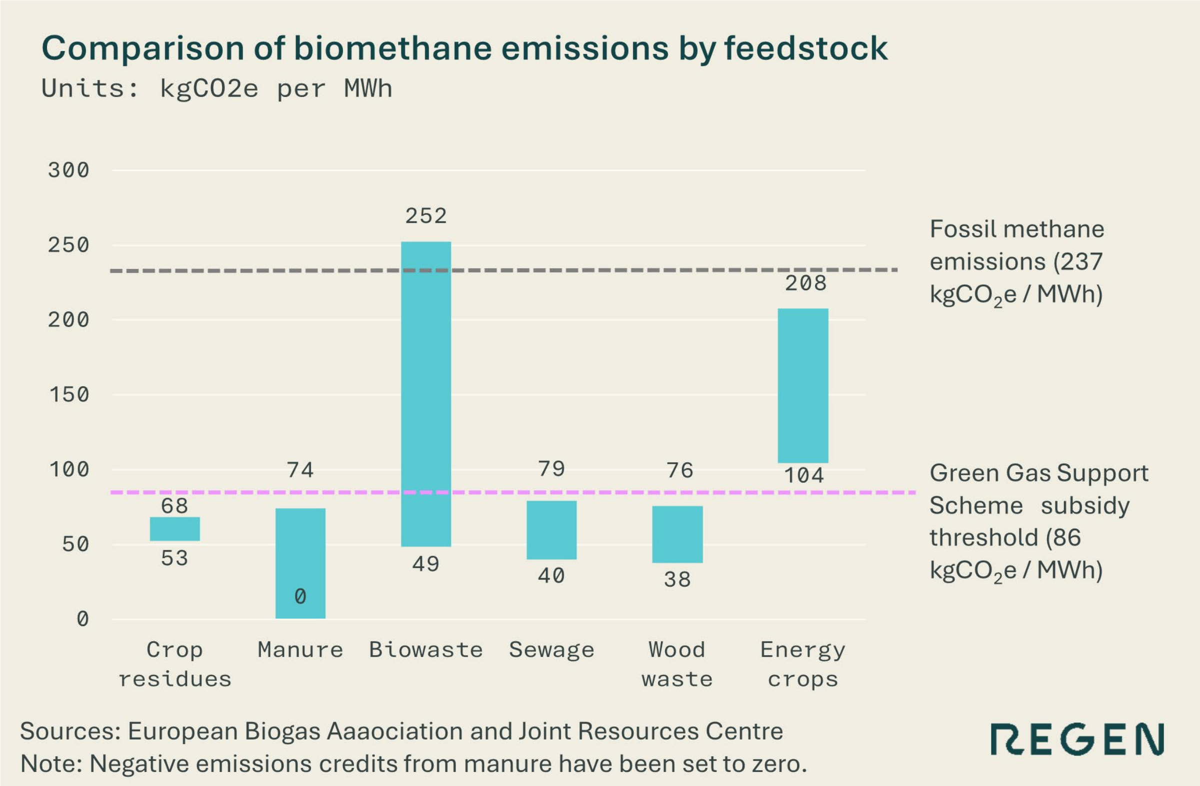
[26] DESNZ, 2025. GGSS Greenhouse Gas Calculator: User Guide. Note: This diagram is illustrative.

[27] European Commission 2018, Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast), Annex VI

[28] Note: Emissiosn calculations used by the European Commission Joint Resources Centre use emissions credits to calculate a negative greenhouse gas effect, particularly in the case of manure production pathways that use closed, gas-tight digestate storage.

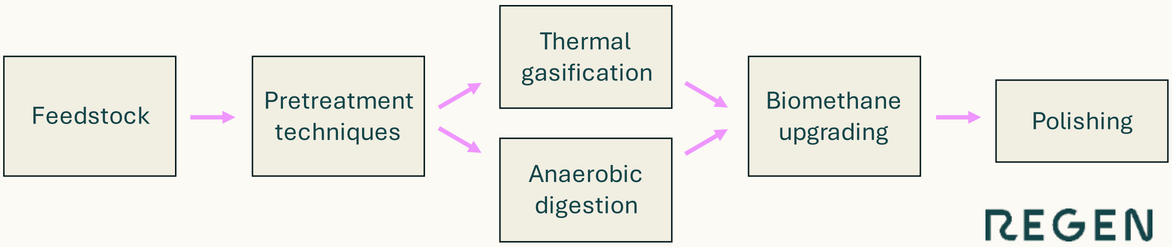
[29] JRC 2017, Solid and gaseous bioenergy pathways: input values and GHG emissions

Figure 15: Typical ranges of greenhouse gas emissions by feedstock



Importantly, processing techniques can strongly influence the lifecycle emissions of feedstocks, depending on factors such as pretreatment techniques, whether or not digestate is stored in open or sealed conditions, and upgrading technologies used (Figure 14).

Figure 16: High-level process of biomethane production



Although waste feedstocks have the potential for high upstream emissions, the Green Gas Support Scheme regulations do not require waste feedstocks to report on emissions prior to the process of collection. Food has been grown, processed, distributed, stored and possibly cooked, all using energy which will likely generate carbon emissions (which can be reduced through transport electrification and net zero energy sources). Landfill and sewage gas will include similar upstream emissions, as well as those associated with the collection and processing of waste. Livestock production accounts for 7.4% of the UK's greenhouse gas emissions, with 5.6% being produced through enteric fermentation alone, meaning significant emissions are associated with the production of manure even before considering the energy required to transport and process it, making it harder to decarbonise.[30] However, as long as these feedstocks are waste resources and have already been produced, using them for biomethane extracts more value from the existing resource without generating additional upstream emissions.

This leads us to a key conclusion: biomethane can be a green gas but only if produced at the appropriate scale. Producing biomethane from existing waste feedstocks is an excellent way to extract value from these resources – but policies mustn't incentivise deliberate increases in food waste, manure or landfill gas to make more biomethane, as this would lead to a rise in emissions.

Carbon negative claims

Biomethane can only be carbon negative if the carbon dioxide released through the upgrading of biogas and combustion of biomethane is captured and stored. This relies on carbon capture and storage technology, which has not yet been deployed at scale. Some carbon can remain stored in soils after biomass feedstocks have been harvested, which can also make biomethane carbon negative. However, this will depend on how the soil is managed and is unlikely to form a significant store of carbon unless perennial crops are used as a feedstock (which is not currently common practice).

Some carbon credit systems or industry stakeholders consider biomethane to be carbon negative if it avoids emissions. Regen considers these claims to be incorrect. For example, these claims are sometimes made on the basis of capturing landfill gas which would otherwise have been emitted, and avoiding the methane emissions which manure produces when it is stored awaiting use as fertiliser. According to the World Economic Forum, to be truly carbon negative, a company (or in this case, process) must remove more CO_2e from the atmosphere than it emits.[31] The biomethane production process does not inherently involve the removal and storage of greenhouse gases, and avoiding emissions does not actually reduce the amount of carbon in the atmosphere.

By analogy, manufacturers of electric vehicles cannot claim their products create negative emissions because they lead to lower emissions from petrol and diesel vehicles. Avoiding emissions is beneficial, but biomethane cannot be considered as having a net negative carbon impact without capturing and storing carbon at some stage of its lifecycle.

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[30] DESNZ, 2024. Final UK greenhouse gas emissions national statistics: 1990 to 2022

[31] World Economic Forum, 2024. What's the difference between carbon negative and carbon neutral?

Land use

Both manure and energy crops have significant land use impacts. Manure feedstock dependence could lock in an over-reliance on animal-intensive agriculture, while energy crops risk displacing arable land for food production, renewable electricity generation or other uses.

Land use in the UK is dominated by livestock production. According to DEFRA, "The majority (85 %) of the utilised agricultural area is used to feed livestock rather than for direct human consumption.[32] When considering arable land as opposed to all agricultural land, the proportion used for animal feed is lower at around 58 %."[33]

The Seventh Carbon Budget included targets to reduce the numbers of cattle and sheep farmed by 38% by 2050 compared to 2023 levels. It also included other land-release measures, such as reducing food waste and increasing crop yields, which it estimates will release 32% of land from agricultural production by 2040.[34] This freed-up land could, in principle, be used to cultivate more energy crops, but ultimately production will remain limited by land availability and competition for other uses. The UK has ambitious targets to increase woodland cover, restore peatlands and protect 30% of land for nature, and build new homes and infrastructure.

Despite these challenges, there are opportunities to grow bioenergy crops in ways which reduce land use impacts. Perennial crops such as Short Rotation Coppice willow and miscanthus can be grown on marginal or contaminated land unsuitable for food production or planted alongside rivers to mitigate flood risks.[35] Cultivating bioenergy crops at small scales can increase diversity within agricultural landscapes, supporting higher levels of biodiversity by providing different habitats.[36] Sequential cropping, where energy crops are cultivated before or after the primary crop, could also reduce competition for land. However, it has yet to be tested in the UK, and could increase requirements for fertiliser, generating additional environmental risks.[37] Overall, the sustainability of bioenergy crop cultivation for biomethane production will depend on which crops are grown, how they are grown, in which places and at what scales.

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[32] In this estimate all grassland has been assumed to be for animal feed.

[33] Defra 2024, Agriculture in the United Kingdom 2024

[34] CCC, 2025. Seventh Carbon Budget, pages 189 and 195

[35] Supergen Bioenergy Hub, 2025. Supergen Bioenergy Hub response to UK Government consultation on land use framework

[36] Donnison et al., 2021. Land-use change from food to energy: meta-analysis unravels effects of bioenergy on biodiversity and cultural ecosystem services

[37] European Biogas Association, 2023. Beyond energy: monetising biomethane's whole-system benefits

Finally, biomethane uses more land than other renewable energy types, emphasising the limited role it should play where electrification can be preferred. In 2023, around 2% of arable land in the UK (93,000 hectares) was used to produce crops for anaerobic digestion. Solar and wind generation generate far more useful energy per square metre where feasible. Research shows that a solar farm can generate 100 times as much energy as using the same land to produce biomass as energy crops.[38]

Table 2: Land use by energy type

Technology	Area used (hectares/MWe)	m^2 / MWhe[39]
Bioenergy[40]	10-30	29-86
Solar PV (ground-mounted)[41]	1.6	17
Onshore wind (turbine only)[42]	0.06-2.4	0.2-9.1

Broader impacts

The broader impacts of different biomethane feedstocks and byproducts on ecosystems are also important to consider. These can include impacts to: air quality, water quality, water use, soil quality, habitat loss and biodiversity.

Almost all biomethane feedstocks begin as biomass grown in agricultural systems, so sustainable agricultural practices are important in reducing their impacts. Currently, conventional agriculture in the UK can lead to pollution of local ecosystems with fertilisers, pesticides and eroded soil. Support is needed for UK farmers to adopt best environmental practice, including through the Environmental Land Management Scheme.

One of the byproducts of producing biomethane is a nutrient-rich digestate, which can be used as an alternative to synthetic fertilisers or manure. While this can avoid the high emissions levels associated with producing synthetic fertilisers and storing manure, digestate applied to fields as a fertiliser contains more readily available nutrients than manure, which can increase

[38] RSPB and 3Keel 2022, Biomass for energy: a framework for assessing the sustainability of domestic feedstocks

[39] Assumes 40% load factor for bioenergy, 11% for solar PV and 30% for onshore wind.

[40] IEA Bioenergy, 2011. Land Use Change and Climate Change Mitigation

[41] Regen calculation using REPD data

[42] NREL, 2009. Land-use Requirements of Modern Wind Power Plants in the United States

ammonia emissions and risk of nitrate pollution.[43] Therefore, careful management is needed to avoid negative environmental impacts.

Finally, using waste resources to produce biomethane risks undermining waste reduction targets by creating demand for a waste stream. Although using waste resources can have benefits, avoidance and minimisation are the first priorities of the waste hierarchy and should not be neglected in favour of maintaining feedstock levels. Energy crops can be used to meet demand above the level of available waste feedstocks, but only to the extent they can be sustainably cultivated without threatening food production or other land uses. Biomethane should use waste feedstocks as long as they are available, without incentivising unnecessary waste.

[43] AHDB, 2025. Using anaerobic digestion to reduce emissions

4 Priority end uses

Regen's assessment of the role biomethane can play in each energy demand sector.

Key messages:

- Guiding principles for priority applications should consider availability, geographical and infrastructure considerations, sustainability, viable decarbonisation options, scalability and economic considerations, and policy support mechanisms.
- In the electricity generation sector, biomethane should be prioritised for flexible, on-site or backup generation where fossil gas would otherwise be used.
- In the industry sector, biomethane should be reserved for high heat industrial processes (e.g. in glass or ceramics manufacturing) where electrification options may be difficult to scale.
- In the transport sector, biomethane should be prioritised for difficult-to-electrify non-road transport, such as long-distance marine and Sustainable Aviation Fuels.
- In the heat & buildings sector, electrification should be the primary route to decarbonisation, with a small role for biomethane in heat networks.

Section 2: Future biomethane supply highlights that even if the most optimistic industry projections are achieved, biomethane supply is likely to be significantly lower than demand for fossil methane today.

Biomethane will have greatest emissions impact when it displaces high carbon fuels. In sectors where demand could be electrified, using biomethane could increase emissions relative to the electric alternative. Given uncertainties around biomethane availability, it must be used to enable or accelerate electrification and fossil gas demand reduction, rather than avoiding or delaying the switch away from gas.

Guiding principles for priority applications

The Green Alliance has called for a 'biomass hierarchy', similar to frameworks for CCS and hydrogen, to steer policy and priority use cases for bioenergy in the industry.[44] This paper

[44] The Green Alliance 2025, The need for a biomass hierarchy.

responds to an even more specific need for a *biomethane* hierarchy. The guiding principles that follow to identify the highest-value uses of biomethane in different sectors are based on the following criteria:

Figure 17: Guiding principles for priority applications

Availability, geographical and infrastructure considerations

Availability – Is there enough feedstock available to meet demand in this end use sector?

Geographical considerations – Is supply likely to be close to demand?

Local – Can it be produced on site?

Infrastructure considerations – Is infrastructure in place? Does it need improving?

Sustainability and viable decarbonisation alternatives

Sustainability – Are there environmental or land use impacts?

Viable decarbonisation alternatives – Is this end use easy to electrify? Could biomethane have greater global warming impact than viable alternatives?

Flexible – Is the use case prioritising flexibility over business as usual?

Scalability and economic considerations

Scalability – Is the technology readiness level sufficient, and have demonstrators been successful?

Costs – How economically feasible is this solution compared to others?

Markets and revenue potential – Is the market driving high revenue potential in this end use sector?

Policy support mechanisms

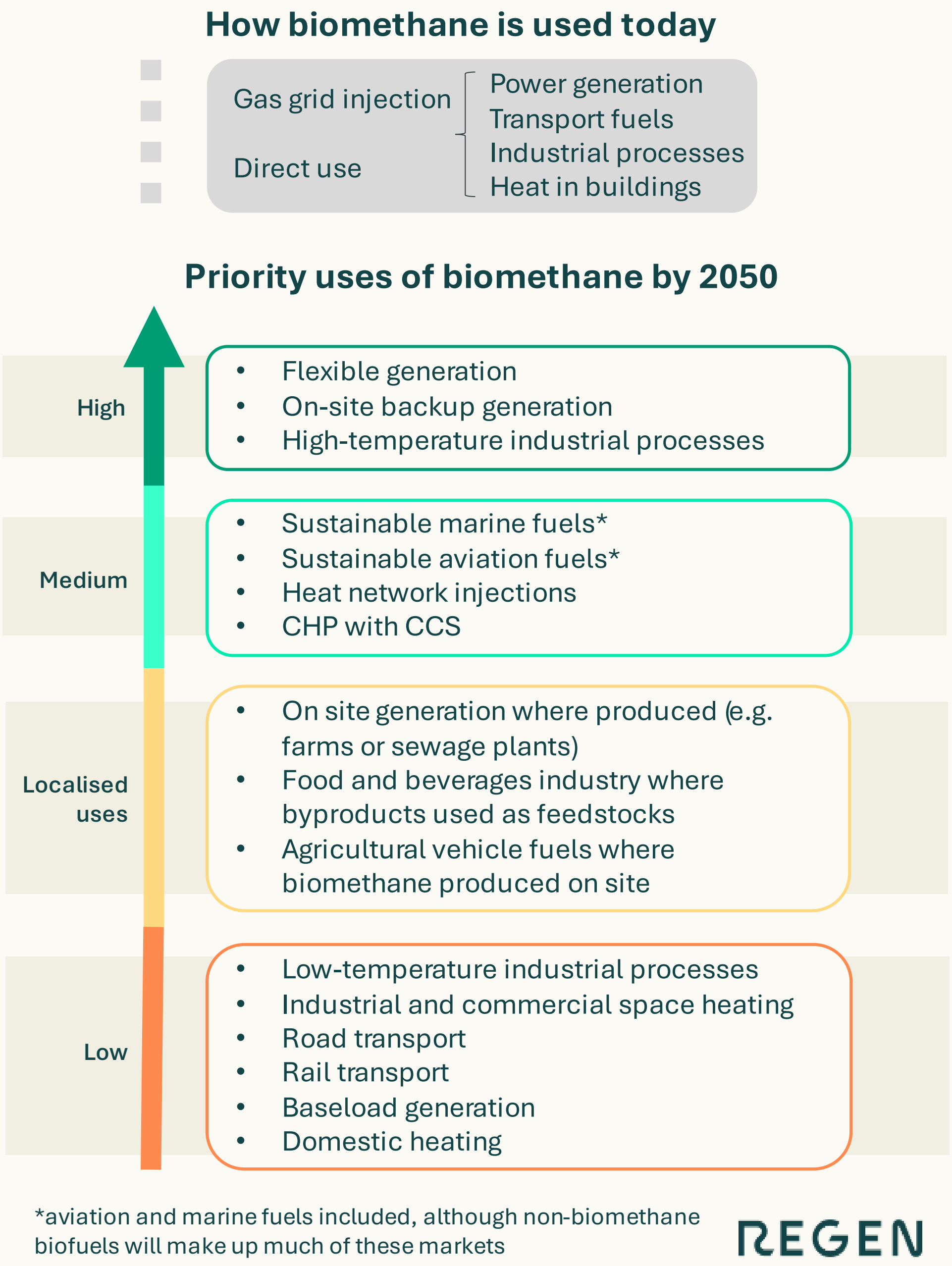
Enabling policies – Are incentives currently in place for this end use?

Restrictive policies – Are current policies or regulations creating barriers to uptake in this end use sector?

Prioritisation by energy sector

Each energy end use sector has been considered in isolation to understand the best uses of biomethane in the future as the UK aims to decarbonise. The limitation of biomethane's use in each energy sector has been contextualised against the FES Holistic Transition projections for natural gas reductions (see Figure 10Figure 19). A discussion of the existing uses of biomethane and natural gas in each sector was presented in Section 1: Biomethane in the UK today. This section concentrates on the future role of biomethane.

Figure 18: Summary of priority end uses for biomethane

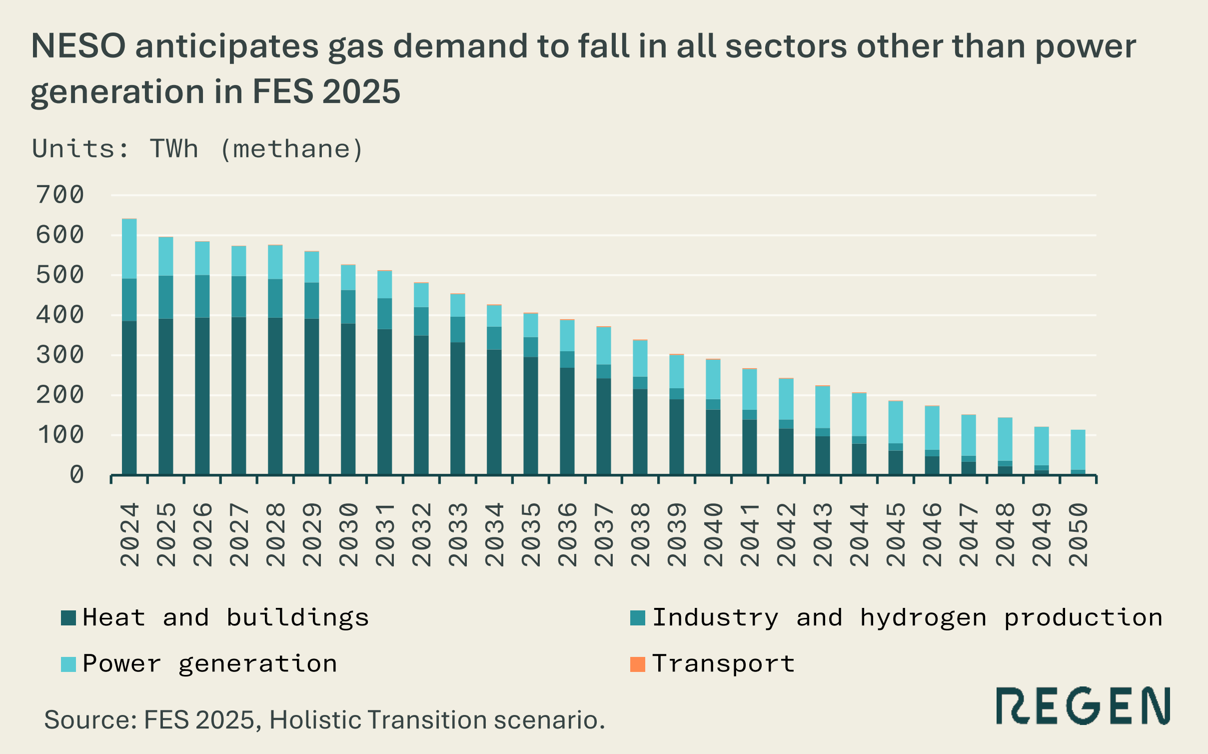


Electricity generation

One of the most important questions for the future GB energy system built around high levels of renewable electricity is how supply will meet demand during periods of low wind and low solar output. A particular challenge is how to manage extended periods of low wind output in the winter with high demand, though summer stress events may also become more common.

The central Holistic Transition scenario developed by NESO in its 2025 Future Energy Scenarios envisages that the use of gas falls across sectors over the next 25 years. The only exception is in power generation, where NESO's modelling suggests that gas demand will fall before increasing again with the deployment of carbon capture and storage (CCS).

Figure 19: FES 2025 Holistic Transition natural gas demand by energy sector



Regen has previously argued that expanding our toolset beyond the fleet of thermal generation will be a prerequisite for moving to an electrified energy system – increasing flexibility of demand, greater interconnection capacity, a more geographically diverse renewables fleet, and more battery and long-duration energy storage capacity can all reduce the length and frequency of system stress events.[45,46] However, it is inevitable that even then, we will require significant

[45] A decarbonised energy system, Bridging the Gap to net zero - A Day in the Life of 2035, NESO

[46] DESNZ's Clean Flexibility Roadmap targets 10 to 12 GW of Consumer Led Flexibility (which excludes 5 to 7 GW of storage heater flexibility). Table 1, Clean Flexibility Roadmap, DESNZ

dispatchable generation capacity that can operate flexibly around the output of renewable generation.

Regen's A Day in the Life of 2035 analysis for the system operator identified that around 35 to 50 GW of low-carbon dispatchable and unabated back-up capacity would be required to balance a decarbonised power system through a challenging winter week with low levels of wind output.[47]

Since this report was published in 2022, support for biomethane in electricity generation has gained traction for two key reasons. Firstly, Carbon Capture and Storage has been slow to develop. NESO's latest FES Holistic Transition scenario envisages that capacity would start to come online by 2029 at the earliest – highlighting the significant commercial challenges and lack of appetite among developers for these technologies. Secondly, the limited role of unabated gas generation has been cemented in the near term by the Clean Power 2030 plan, targeting less than 5% of gas generation. NESO's CP30 advice and DESNZ's subsequent Action Plan envisage 35 GW of unabated gas remaining on the system – largely unchanged from current capacity levels, but operating at very low capacity factors. Given the age of the gas fleet, this level of capacity could potentially require new gas plants and commit the GB energy system to methane.

Biomethane's role in electricity generation has been gaining traction amongst energy experts in the UK. The University of Cambridge Energy Policy Research Group demonstrates how biomethane is the most cost-effective option compared to other low-carbon fuel blends due to compatibility with existing infrastructure, reducing the need for retrofit.[48] Furthermore, biomethane is being considered in NESO's Strategic Spatial Energy Plan as playing a role in power generation. Regen welcomes this, provided that the limited availability and sustainability of production, as highlighted in this paper, are properly considered.

Increasing biomethane production can help reduce the carbon emissions of existing gas plants. As highlighted in Section 3: Sustainability, emissions factors for biomethane can be significantly below those of fossil methane if produced from the right sources in the right way. Reductions in emissions could be possible without the need for equipment changes to the generation assets or the gas transmission or distribution infrastructure. This is a key advantage over hydrogen, which would require coordinated development of new generation infrastructure, transport infrastructure and electrolysis production.

Using biomethane in flexible electricity generation is therefore a high-priority use in the long term, provided that it is used during peak price and energy stress events around renewable generation. Over time, CCS could be added to biomethane-fuelled plants to deliver negative

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[47] A decarbonised energy system, Bridging the Gap to net zero - A Day in the Life of 2035, NESO

[48] University of Cambridge Energy Policy Research Group, 2025.Exploring the feasibility of low-carbon fuel blends in CCGTs for deep decarbonization of power systems

emissions, but a key challenge will be that limited biomethane supply may not support the high operating hours needed to make CCS installations economic.

Table 3: Guiding principles for priority applications in electricity generation

Electricity Generation		
Guiding principle	**Challenges**	**Opportunities**
Availability, geographical and infrastructure considerations **Availability** **Geographical considerations** **Local** **Infrastructure considerations**	**Injection and flow constraints:** Regional grid constraints in low-demand areas; lack of reverse flow limits the ability to transport biomethane to power plants. **Geographical mismatch:** Many suitable feedstock types are located far from existing gas infrastructure. **Insufficient storage:** There are only 32 TWh of gas storage[49] – investment may be required to use biomethane as a balancing fuel for long periods of low wind and solar.	**Availability:** If significant gas demand reductions are achieved in line with net zero targets, biomethane availability could decarbonise much of the remaining gas generation. **On-site generation:** AD plants and sewage treatment works can use biomethane locally to avoid infrastructure challenges. **Compatible with gas turbines:** Biomethane-fuelled generation could be blended with natural gas at higher levels than today to reduce emissions of remaining gas supply in line with CP30 reduction targets.
Sustainability and viable decarbonisation alternatives **Sustainability** **Decarbonisation alternatives** **Flexible**	**Renewable alternatives:** Using biomethane in baseload plants may slow renewable and battery storage deployment in the power generation sector.	**Use for flexible power:** Biomethane could be best used in flexible generation to balance the grid and reduce gas generation. Due to the requirement for dispatchability, biomethane would be a more viable option than intermittent renewables. **Use for back-up or on-site power:** Biomethane can be used on site for behind-the-meter generation. Valorising waste products and reducing energy costs incentivises use where it is produced.

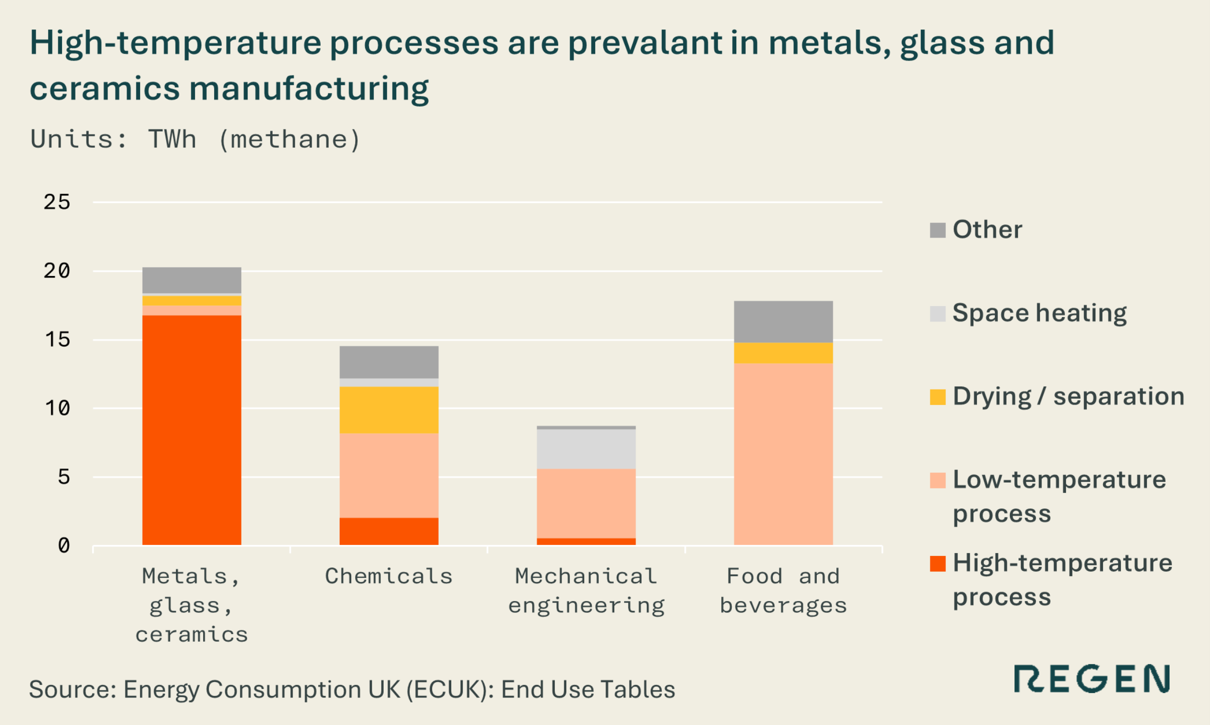
[49] Ofgem, 2025. Great Britain Gas Storage Facilities. 3,115 mcm converted to TWh, assuming 1 mcm = 10.55 GWh.

Electricity Generation		
Guiding principle	**Challenges**	**Opportunities**
Scalability and economic considerations Scalability Costs Markets and revenue potential	**Production costs:** Biomethane costs £50-95/MWh[5] compared to fossil methane (£34/MWh), requiring subsidy to compete with fossil gas in electricity markets. **Transport costs:** Reliance on road transport can increase costs and emissions for generators not connected to gas networks. **CCS and biomethane costs:** Using biomethane and CCS to justify low-emission electricity generation faces high cost and scalability challenges.	**Scalability:** Biomethane and biogas have been proven for electricity generation and are scalable. **Reform of Capacity Market:** Stricter carbon intensity limits and reducing carbon allowances may enable a better route to entry for biomethane-fuelled power generation in the Capacity Market.
Policy support mechanisms Enabling policies Restrictive policies	**Consumer protection gap:** Subsidies support producers but do little to shield consumers from high gas market prices. **Gas-to-grid biomethane for power:** Excluded from CfD support, exposing it to wholesale market risks. **Lack of production subsidy:** Small-scale AD plants face barriers due to high upgrading costs. **Limited SEG uptake:** In 2022/23, only 22 micro-generators received payments.	**Guaranteed subsidy via GGSS:** Provides revenue certainty for biomethane producers, and tiered tariffs give higher support to small producers (<60 GWh). **CfD inclusion:** CfDs have provided support to biogas since AR4. AR7 administrative strike prices (£195/MWh) for AD were significantly higher than landfill gas (£94). **Smart Export Guarantee:** Small generators of <5MW paid for exported electricity.

Industry

The industrial sector is one of the most challenging to decarbonise. Still, electrification opportunities are nonetheless available, with technologies including industrial-scale heat pumps, resistance furnaces, resistance kilns and electric arc furnaces. Electrification of high-temperature processes is difficult, mainly due to higher costs relative to fossil-fuelled processes, although in some cases, there are also technical challenges to overcome. Biomethane provides a decarbonisation option for industrial processes currently reliant on natural gas that are most challenging to electrify.

Figure 20: Natural gas consumption in the top four industry subsectors by end use



The Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050 and other supporting literature envisage a significant role for biomethane or biogas in the following industrial subsectors:

- **Minerals and metals: glass manufacturing.** In glass manufacturing, biomethane is valued for its similarity to natural gas, unlike alternatives that risk affecting product quality. Co-firing with biogas has shown limited impacts on glass quality,[50] while biomethane offers an even closer substitute, since it is free of contaminants. A container glass trial in Derrylin, Northern Ireland,[51] demonstrated that full fuel switching to biomethane is feasible in existing furnaces. The Glass Industrial Decarbonisation and Energy Efficiency Roadmap models 25% fuel switching by 2035 and 40% by 2045, favouring biomethane over solid fuels, which cause ash contamination, and hydrogen, which presents technical challenges.[52]
- **Minerals and metals: ceramics.** The ceramics sector uses 83% of fuels from natural gas, indicating a feasible replacement of biomethane in gas-fired kilns. Commitments are

[50] Fiehl et al 2017, Biogas as a co-firing fuel in thermal processing industries: implementation in a glass melting furnace

[51] British Glass n.d., Encirc and Glass Futures partner for 'most sustainable glass bottle' trials

[52] DECC & DBIS 2015, Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050. Note: although ten years at the time of writing, the Industrial Decarbonisation and Energy Efficiency Roadmaps remain a key and detailed source on concrete industrial decarbonisation alternatives.

already being made in countries like Brazil to use biomethane to decarbonise kilns previously run on natural gas; a pilot project of 10 plants in Santa Gertrudes is already underway, with operation expected in 2025.[53] According to modelling in the Ceramics Industrial Decarbonisation and Energy Efficiency Roadmap, between 18% and 35% of total sites would adopt biomass gasification by 2050. Although electric kilns are feasible and already used in studio ceramics, tableware and speciality applications, scaling that to heavy, bulk ceramics is both technically and economically difficult.

- **Food and beverage.** Biomethane can provide low-temperature steam and hot water in the food and beverage sector, though electrification remains the main decarbonisation route. A circular economy benefit arises when food wastes from industrial processes are converted to biomethane on site, reducing fuel transport needs. For example, BrewDog's Ellon brewery operates a 2 MWth biomethane plant using its own residues, cutting natural gas use by 52.4% (2.7 kt CO_2e).[54] Biomethane production also yields biogenic CO_2, valuable in food-grade applications: a plant in Northern Italy[55] already captures purified CO_2 for this purpose, as does the Ellon facility.

Other industry subsectors, such as Cement and Chemicals, have been assessed by this study, but ultimately not put forward as high value compared to the sectors mentioned above.

Table 4: Guiding principles for priority applications in industry

	Industry	
Guiding principle	**Challenges**	**Opportunities**
Availability, geographical and infrastructure considerations	**Road transport:** Plants off the gas distribution network grid must rely on trucked Bio-CNG due to the cost of new grid connections and compression stations, as well as distribution network limits. **Availability:** Use of biomethane will need to be restricted to niche uses where methane gas is difficult to replace.	**Rural industries could benefit:** Rural industries located near supply could benefit from reduced infrastructure needs. **Existing gas grid connections:** Industrial sites on the gas grid can access biomethane without bespoke infrastructure. **On-site production:** Some agricultural and food industries can fuel processes directly with on-site biomethane, reducing infrastructure

[53] Ceramics of Brazil 2024, Biomethane and its application in the Brazilian ceramics industry

[54] REA n.d., Annex 3 to REA's response to Biomass Strategy: Examples of Biogas and ACT projects

[55] Esposito et al. 2019, Simultaneous production of biomethane and food grade CO_2 from biogas: an industrial case study

Availability Geographical considerations Local Infrastructure considerations		costs and strengthening circular economy models.
Sustainability and viable decarbonisation alternatives Sustainability Decarbonisation alternatives Flexible	**Certification:** Reliance on gas networks means industrial users require a robust certification scheme to account for biomethane consumption.	**Low-carbon alternative to fossil gas:** Biomethane is a strong interim solution for hard-to-electrify industrial processes (e.g. high-temperature furnaces).
Scalability and economic considerations Scalability Costs Markets and revenue potential	**Inconclusive industry trends:** Long-term OPEX competitiveness vs electrification remains uncertain. **Limited incentives:** Reliance on voluntary corporate initiatives rather than natural market limits the incentive to switch.	**Interchangeability:** Biomethane can be used in existing industrial machinery without costly retrofits, leading to lower CAPEX than electrification in many cases. **ESG targets:** Corporate net zero targets (e.g. AstraZeneca[56] plant) drive private investment in biomethane production.
Policy support mechanisms Enabling policies Restrictive policies	**Non-domestic Renewable Heat Incentive closure:** Closure of the NDRHI removed an important support mechanism.	**The Green Gas Support Scheme** supports biomethane production, which will reach gas grid connected industrial consumers.

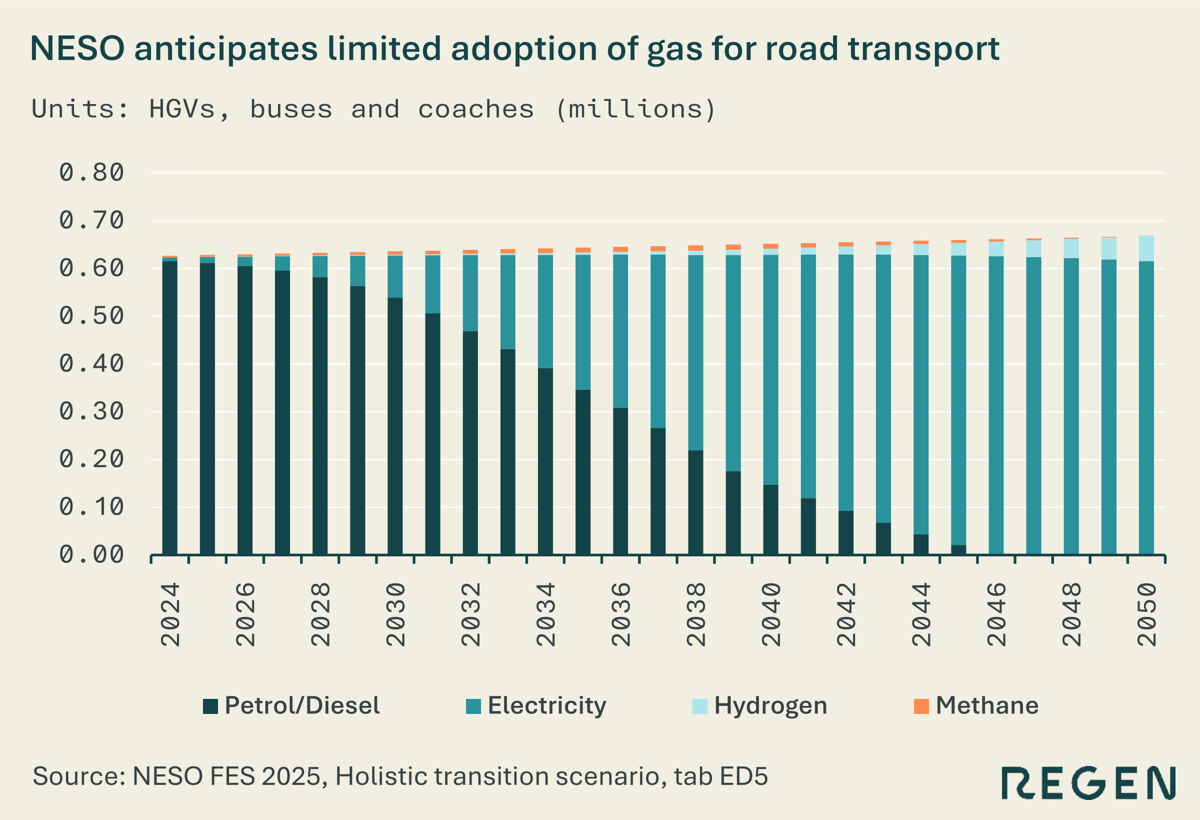
[56] Reuters, 2025. AstraZeneca opens biomethane plant in UK to cut emissions .

Transport

There is a broad consensus among the Government, NESO and the Climate Change Committee that electrification will drive most surface transport decarbonisation, including HGVs, buses and coaches, once thought hard to electrify. Legal requirements for driver rest breaks make regular charging feasible, and initiatives like the DfT/Innovate UK ZEHID programme fund large vehicle charging infrastructure in the UK and Europe.

NESO's 2025 Holistic Transition scenario models only a modest uptake of methane-fuelled vehicles, peaking at c. 11,000 in the 2030s (from 3,500 in 2024). The case for encouraging uptake of methane-fuelled vehicles is not strong: in the near term, vehicles would run mostly on fossil methane, while long-term biomethane use would be constrained by supply and risk displacing cleaner options in harder-to-electrify sectors.

Figure 21: Fuel use in HGVs, buses and coaches under the FES Holistic Transition scenario



Currently, liquified/compressed gas refuelling infrastructure for road transportation in the UK is very limited. As of 2025, 29 LNG and 23 CNG biomethane refuelling stations were operating across the UK.[57] For biomethane to become a widespread road fuel, investments would be

[57] Renewable Transport Fuel Association 2025, RTFA member company renewable gas filling stations.

required at a time when significant investments in electric vehicle charging infrastructure are also needed.

Agricultural machinery is a sector where the case for biomethane adoption is more positive, thanks to synergy between on-site production and use (avoiding the need for distribution). Cornwall-based Bennamann has demonstrated this concept with its ‘biogas to biomethane upgrader’, which collects biogas from slurry pits.[58] More detail on the Bennamann case study is discussed in Regen’s Great South West Energy Prospectus.

A key barrier for biomethane adoption in the agricultural sector is the exemption of fuel duty (usually charged at £0.53 per litre) for agricultural machinery, which disincentivises farmers from switching away from cheap red diesel.[59]

It is possible that farmers would electrify their machinery if faced with stronger incentives to decarbonise. Farms typically have significant roof and land space for on-site renewables, which uses much less land than bioenergy per MWh produced (see Table 2: Land use by energy type), potentially making it more cost-effective to electrify machinery and then sell biomethane or biomethane feedstocks.

When used as a road transport fuels biomethane is typically compressed into Bio-CNG or Bio-LNG (compressed or liquefied biomethane). Due to the limited availability of and competing uses for feedstocks, it is unlikely that most HGVs, LGVs and cars will be able to switch to biomethane.

Significant uncertainty exists around the decarbonisation pathways for non-road transport sectors, including maritime and aviation. This uncertainty is illustrated in the Government’s 2025 Maritime Decarbonisation Strategy, which included five modelled fuel mix scenarios (found on page 68 of the strategy), with a wide range in outcomes across the scenarios.[60]

Unlike other end uses, Sustainable Aviation Fuel (SAF) is mandated by the UK government to increase supply over time. This is a strong policy for the development of biomethane as an SAF.[61] Aviation infrastructure for SAF is converted at purpose-built facilities and then blended and distributed using existing jet-fuel networks separate from gas networks. Under the UK Department for Transport’s Advanced Fuels Fund, Willis Sustainable Fuels secured £4.7 million to develop a Midlands SAF facility using biomethane-derived intermediates.

Biofuels will likely play a role in decarbonising aviation and maritime sectors, driven by the high costs of alternatives and existing markets. However, the implication of greater use of liquid

[58] Farm Contractor Magazine, 2022. Sustainable slurry systems.

[59] Using rebated fuels in vehicles and machines (Excise Notice 75)

[60] Page 68, Maritime Decarbonisation Strategy 2025

[61] Several Sustainable Aviation Fuel (SAF) companies (e.g. BioFlight Fuels, using Fischer-Tropsch technology) are pursuing drop-in liquified biomethane substitutes for existing aircraft.

biofuels in the maritime and aviation sectors is that bioenergy feedstocks may be less available for biomethane for use in other sectors.

Table 5: Guiding principles for priority applications in transport

Transport		
Guiding Principle	**Challenges**	**Opportunities**
Availability, geographical and infrastructure considerations Availability Geographical considerations Local Infrastructure considerations	**Availability:** Current road transportation demand far outstrips scenarios for future biomethane availability. **Road refuelling infrastructure:** Very limited biomethane refuelling infrastructure. Scaling road refuelling would require major new refuelling station investment at the same time as EV charging roll-out. **Marine:** Rural/remote refuelling infrastructure gaps could restrict uptake. **Aviation:** Dependence on bespoke SAF conversion facilities (separate from gas networks) adds cost and complexity.	**Marine:** Existing LNG bunkering network is already compatible with bio-LNG and demonstrations (e.g., Shell Marine bio-LNG bunkering at Southampton; Portsmouth pilot) show technical readiness.[62,63] **Aviation:** Aviation infrastructure can process biomethane-derived intermediates into SAF via existing jet-fuel networks. **Local use:** Biomethane could be used on-site for agricultural vehicles and machinery, bypassing transportation costs.
Sustainability and viable decarbonisation alternatives Sustainability Decarbonisation alternatives Flexible	**Road and rail electrification:** Road and rail transport strongly favour electrification due to policy and market trends, leading to stranded biomethane refuelling assets risks. **Other sustainable fuels:** competition from other alternative fuels (e.g. methanol, ammonia, SAF) could displace biomethane in maritime and aviation and use up feedstocks. **Emissions:** continued use of biomethane in road transport will impact air quality.	**Flexibility for long journeys:** Biomethane is well-suited for difficult-to-electrify transport (e.g. long-distance shipping, aviation). It can provide a practical alternative where batteries are infeasible in the short term (long-haul vessels, aircraft).

[62] Bunker Market, 2025. Bio-LNG Is Here: Shell Marine Powers Carnival's Arvia at Southampton Port

[63] Portsmouth International Port, n.d.. Portsmouth international port introduces LNG bunkering for cleaner sailings

Scalability and economic considerations Scalability Costs Markets and revenue potential	£ **Competition in markets:** In road transport, cheaper electrification will likely outcompete bioenergy. **Higher lifecycle costs:** Biomethane-fuelled cars and LGVs face 15–20% higher life cycle costs than diesel/petrol. **Production costs:** Overall production costs of biomethane (£50-95/MWh)[5Error! Bookmark not defined.] remain high, limiting scale in road transport unless subsidised.	**Scalability:** Biomethane is proven in road transport and is already being adopted for aviation, maritime and agricultural vehicles. £ **Aviation market:** The market for SAFs signals a willingness to pay and potentially higher revenues than road transport. Shipping could become a growth market if biomethane can provide a cost-effective decarbonisation pathway. **Heavy road transport:** HGVs show cost parity across lifetimes compared to diesel – biomethane could be viable in niche freight.
Policy support mechanisms Enabling policies Restrictive policies	**Fuel duty exemption:** The absence of fuel duty for agricultural vehicles disincentivises biomethane adoption over diesel. **Volatility:** Reliance on volatile RTFC market prices may undermine investment confidence. **SAF supply mandate:** Using biofuels in shipping and aviation might lead to diversion of feedstocks from biomethane production.	**Renewable Transport Fuel Obligation (RTFO):** This creates strong financial incentives (1.9 RTFCs/kg, double to 3.8 for waste-based biomethane). **SAF supply mandate:** Gives a clear long-term demand signal for biomethane-derived fuels, including £198m to date (£63m in the latest SAF round).

Heat and buildings

Government policy is increasingly focused on electrifying space and water heating in buildings, with heat pumps identified as the central technology to enable this transition. NESO's recent FES 2025 Holistic Transition scenario envisages that the vast majority of space and water heating will be powered by electricity in 2050.

In the long term, given supply constraints, outlined in Section 2: Future biomethane supply, it is highly unlikely that biomethane could provide large numbers of households and businesses with energy for heat like fossil methane does today. Heat produced from biomethane under the NDRHI has increased from 3.7 TWh in 2020 to 4.3 TWh in 2024, equivalent to 1.1% of today's gas heating demand.[64] NESO's FES Holistic Transition scenario envisages 7.5 TWh of

[64] Figures 3.2 and 3.3, Non-Domestic Renewable Heat Incentive (NDRHI) Annual Report (2024 to 2025), Ofgem

biomethane and bioLPG delivering heat across residential and commercial buildings in 2050. Existing gas demand for heat and buildings is around 390 TWh; even if all biomethane available under the most optimistic modelling were used for space and water heating, the vast majority of buildings would require electrification, and no biomethane would be available for other sectors.

Given the demand from other sectors, any use for heating in buildings will be in very small volumes and phase out over time. As less energy is distributed through the gas network Ofgem anticipates network charges to rise rapidly in the 2030s, potentially reaching 30 to 40 pence/kWh[65]. This highlights a key challenge for using biomethane for heating homes; the small volumes available mean biomethane is unlikely to be a low-cost alternative to electrification in the long-term.

Policymakers should be looking at ways to avoid spiralling network charges. Key actions would include Government and Ofgem acting early to develop a long-term plan for gas network cost recovery, asset depreciation and coordinated decommissioning of parts of the gas distribution network that will lose customers to electrified heating.

Table 6: guiding principles for priority applications in heat and buildings

Heat and buildings		
Guiding Principle	**Challenges**	**Opportunities**
Availability, geographical and infrastructure considerations Availability Geographical considerations Local Infrastructure considerations	**Supply:** Total biomethane supply is far too limited to meet heating demand (300+ TWh vs c. 8 TWh produced in 2024). **Decentralisation:** Gas networks are built for large injection points; regional mismatches and lack of bi-directional flow may prevent supply reaching demand. Rural areas of the grid with higher biomethane injection levels will likely remain in local grid networks, while areas with less production volumes will receive little-to-no biomethane compared to fossil gas volumes. **Off-gas grid properties:** Biomass boilers supported under the BUS for rural off-grid properties, but not biomethane.	**Infrastructure readiness:** Biomethane is fully compatible with existing gas infrastructure, and households and businesses on the gas grid could switch without major appliance upgrades.

[65] Figure 4, RIIO-3 Sector Specific Methodology Consultation – Finance Annex, Ofgem.

Heat and buildings		
Sustainability and viable decarbonisation alternatives Sustainability Decarbonisation alternatives Flexible	**Electrification viability:** Heat pumps, district heating, and geothermal are scalable alternatives to fossil heating. **Risk of lock-in:** Using biomethane widely could lead to stranded assets as electrification advances. **Low decarbonisation value:** Heavy reliance on biomethane risks diverting supply from higher-value applications.	No clear opportunities identified
Scalability and economic considerations Scalability Costs Markets and revenue potential	**Production costs:** Biomethane production costs (£50–95/MWh) are much higher than fossil methane, requiring subsidy. **Market volatility:** Prices track fossil gas, offering no consumer protection from market volatility. **Network costs:** Gas consumers will face higher distribution charges as gas volumes fall, disproportionately affecting fuel-poor. **Market competitiveness:** Long-term competitiveness against the electrification of heating is highly doubtful.	**Upfront costs are cheap:** No need for technology upgrades where gas is already used, reducing CAPEX costs compared to electrification.
Policy support mechanisms Enabling policies Restrictive policies	**Boiler Upgrade Scheme:** There is no support for biomethane heating appliances; only biomass boilers in off-grid rural areas are eligible.	**The Green Gas Support Scheme (GGSS)** offers 15-year payments to support biomethane injection, which will reach some on-grid gas boilers.

5 Policy interventions

Regen's recommended policy interventions

Assessment of past policies

The UK has supported biomethane through several schemes. The NDRHI has subsidised around 29 TWh of biomethane production since its opening for non-domestic participants in 2011 at a cost of £2.4bn, with injection volumes peaking in 2022/23.

Its successor, the Green Gas Support Scheme (GGSS), offers a guaranteed tariff for grid-injected biomethane from anaerobic digestion. It is funded via the Green Gas Levy on gas suppliers (recovered through consumer bills). The scheme runs until March 2028 and uses tiered tariffs, with higher rates for smaller plants.

Table 7: Green Gas Support Scheme tariffs

Tier	MWh per year	p/kWh
Tier 1	Up to 60,000	6.33
Tier 2	60,000 -100,000	4.06
Tier 3	100,000 - 250,000	3.59

In parallel, the Renewable Transport Fuel Obligation (RTFO) allows suppliers of transport-grade biomethane to earn tradable certificates, creating additional demand in the fuel sector.

In addition to government support schemes, the Green Gas Certification Scheme (GGCS), led by a non-governmental certification agency, issues Renewable Gas Guarantees of Origin (RGGOs) for each unit of biomethane, enabling producers to monetise their green credentials through trading and to distinguish biomethane from fossil gas in corporate offtake contracts.

In terms of stimulating increasing volumes of biomethane production, previous policies have had mixed results. Whilst biomethane production has steadily increased, volumes of biogas have fallen from highs in 2018 (see Figure 5). According to DESNZ, 8 TWh of biomethane was injected into the gas grid in 2023, increasing from nominal levels in the early 2010s when the first commercial plants were being piloted.[66] The Non-Domestic Renewable Heat Incentive, which paid generous subsidies with inflation adjustments, has had the greatest impact. Under

[66] Page 16, Green Gas Support Scheme and Green Gas Levy Evaluation, DESNZ

the NDRHI, biomethane injection grew rapidly, peaking in 2022/23, with high levels continuing into 2024/25.

Table 8: biomethane production and payments from the RHI , RTFO and GGSS [67,68,69]

Scheme	Production in 2024 (TWh_{th})	Cumulative production (TWh_{th})	Total payments made (£m)
Non Domestic Renewable Heat Incentive[70]	4.3 TWh	29 TWh (2011 to 2025)	£2,429m
Renewable Transport Fuel Obligation	1.8 TWh	Not available	Not available
Green Gas Support Scheme	0.28 TWh	0.3 TWh (2021 to 2025)	£20.1m

There are, however, several challenges for historic policies that a future framework would need to address:

- **Low uptake in the Green Gas Support Scheme:** The GGSS has attracted only 7 participants to build new AD sites. This is partly a consequence of an intentional decision to support only new build sites, rather than supporting existing sites already accredited under the NDRHI. A future scheme could look to encourage sites currently in receipt of NDRHI support to expand.
- **Protecting consumer bills:** The NDRHI and GGSS both guarantee a fixed tariff for every MWh of biomethane produced, regardless of market gas prices. When fossil gas prices rise, this means consumers end up paying more than necessary for biomethane, handing producers a windfall. A two-way contract (where payments increase if gas prices fall and drop if gas prices rise) would protect consumers from overpaying while still giving producers long-term revenue certainty.
- **Maximising emissions reductions:** Current biomethane policy focuses on how much biomethane is produced, but not whether it is being used in the most carbon-efficient way. As a result, distortions in the system can lead to sub-optimal deployment from an emissions perspective. For example, biomethane is being used where it delivers lower

[67] Figures 3.2 and 3.3, Non-Domestic Renewable Heat Incentive (NDRHI) Annual Report (2024 to 2025), Ofgem

[68] Rows 19 and 20, Tab RF_0101, RTFO statistics 2024, Department for Transport

[69] Figure 3.1, page 18, Green Gas Support Scheme Annual Report (2025 to 2025), Ofgem

[70] Note: eligible technologies under the domestic RHI included biomass only boilers, air source heat pumps, ground source heat pumps and solar thermal systems.

carbon savings compared with other decarbonisation solutions that could achieve deeper reductions. Addressing this would ensure that limited biomethane resources deliver the maximum possible climate benefit.

- **Sustainability criteria**: Under the NDRHI, sustainability criteria were progressively strengthened over time, with higher GHG saving thresholds and stricter feedstock rules. By contrast, the GGSS has been introduced with static criteria that do not tighten over the scheme's lifetime. Improvements are needed, including introducing leakage detection and repair (LDAR) requirements and closing loopholes that allow high-carbon feedstocks to be blended with low-carbon ones to meet average limits.
- **Locking in gas consumption**: Certification could disproportionately incentivise large corporations to purchase RGGOs, propagate messaging that gas grids are on the route to decarbonisation, and risk slowing the rate of gas demand reductions.

Policy objectives

The Green Gas Support Scheme is due to end in March 2028. In 2024, the Conservative Sunak Government issued a Call for Evidence on a Future Policy Framework for Biomethane Production, in which it set out the Government's objective for the new policy framework: [71]

"The main objective of the framework is to facilitate a biomethane market where a sufficient volume of biomethane is produced to meet strategic aims, in a way that is environmentally sustainable, efficient, and commercially viable. We expect this to be contingent on relevant market frameworks reflecting the social value of biomethane or biogas, depending on the eventual end-use [...]:

- **Sufficient volume:** sufficient to meet UK Carbon Budgets, enable optimal pathways to net zero and bolster security of supply.
- **Environmentally sustainable:** reduces carbon emissions after the whole life cycle of production and adheres to, and where possible advances, environmental standards, policy objectives and targets.
- **Efficient:** produced cost-effectively from a societal perspective, reflecting the cost of carbon, environmental and wider economic impacts. Production is optimally placed to maximise wider benefits to the energy system but also consider how it can play a role in the decarbonisation of hard-to-abate sectors.
- **Commercially viable:** the biomethane market is attractive to investors, and biomethane production becomes profitable and innovative without direct government subsidy."

These wide-ranging objectives can be distilled into two key challenges:

1. Delivering sustainable and cost-effective increases in biomethane production
2. Ensuring biomethane is used in the highest value applications with the greatest emission reductions

[71] Call for Evidence: Future Policy Framework for Biomethane Production, DESNZ, 2024

Regen's view on policy options ahead

The Government has identified that policy changes will be required to incentivise production when the Green Gas Support Scheme (GGSS) ends in 2028.[72] Whilst the GGSS was a supply-side subsidy, DESNZ are now considering both demand and supply policies to create a market for biomethane. The policies being considered in the future framework Call for Evidence included:

- Changing the Emissions Trading Scheme (ETS) so that emissions from biomethane are treated differently from those of fossil methane, potentially creating a natural market for biomethane without the need for subsidy
- Contracts for Difference (CfD) [73] - a contract that guarantees a fixed price by adding to revenues if the market price is below the strike price and taking money back if it's above, providing revenue protection for developers whilst ensuring consumers do not overpay
- Supplier Obligations (SO) – where energy suppliers must provide a proportion of biomethane or achieve a certain carbon intensity of supply
- Grants and loans are targeted at specific areas where access to capital is blocking investment.

Regen strongly supports DESNZ in considering both demand and supply-side policies. Creating a natural market for biomethane based on its value as a low-carbon fuel will reduce the level of subsidy required and should enable biomethane to be used in ways that have the greatest impact. Adjusting the ETS to incentivise the purchasing of biomethane is a logical first step to achieving this. Changes to the Capacity Market mechanism, requiring generators to meet tougher sustainability criteria with lower emissions, could also increase demand for biomethane.

However, there are significant carbon price distortions in the energy market which need to be addressed to give a positive signal so that biomethane can be effectively allocated across the economy in ways that maximise emissions reductions and economic value. These distortions occur where effective carbon prices vary drastically across fuels, sectors, or uses, thereby sending weak or perverse signals for decarbonisation. Some examples include:

- **Exemptions from fuel duty:** The most significant distortion is fuel duty exemptions. Fuel duty at £0.53/litre on petrol and diesel provides a strong signal to decarbonise of £200 to £230/tCO2e. Sectors such as agriculture have fuel duty exemptions and fuel duty does not apply to all fuels, like kerosene or gas. Without change, it is likely that

[72] Biomethane production costs are estimated between £50 and £95/MWh. The forward price of fossil methane has been below £40/MWh for the last year.

[73] For clarity, in this document we refer to CfDs for electricity generation as **electricity CfDs**

biomethane will be used in sectors without fuel duty exemptions, even if emissions reductions would be higher in other sectors.

- **VAT:** Reduced rates and exemptions from VAT are also a significant distortion. VAT is applied at 20% on transport fuels (on top of fuel duty) and 5% on all fuels to domestic consumers. The aviation sector is excluded entirely.

A critical recommendation from this report is to provide long-term and consistent price signals in proportion to carbon emissions, across fuels and across sectors, to help drive decarbonisation whilst ensuring that biomethane is used optimally alongside hydrogen and electricity.

Even with a stronger carbon price across fuels and sectors, further revenue support may be necessary to stimulate biomethane in the near term. It is positive that DESNZ are considering a “two-way” revenue protection scheme, such as a Contract for Difference, which would benefit consumers when gas prices are high. Key lessons from the electricity CfDs have included:

- Balancing auction competition with procuring a diverse set of production methods, as smaller technology “pots” can lead to low levels of liquidity and higher prices. This is particularly relevant for biomethane, where production via anaerobic digestion dominates currently.
- Incentivising the utilisation of production revenue streams: in other words, aligning incentives for producers to produce at times of greatest system need. Incentivising on-site storage so gas can be injected when demand is greatest would provide significant system benefits.

Separately, DESNZ has recently developed the Hydrogen Allocation Round (HAR) funding delivered via the Low-Carbon Hydrogen Agreement (LCHA). The objectives of the hydrogen support mechanism have strong parallels with the objectives for biomethane. The HAR is a Contracts for Difference style arrangement, with adjustments made to account for the immaturity of hydrogen markets and the lack of an accessible reference price for hydrogen. As competing fuels, it would be logical for arrangements for biomethane to align with those for hydrogen.

Policy recommendations

Recommendation 1: Develop a clear, long-term strategy for biomethane that defines its role in the energy system, assesses sustainable feedstock availability, and sets out realistic production capacity pathways.

Government should task NESO with creating a national bioenergy hierarchy, ensuring biomethane is explicitly prioritised for the highest-value applications. This should include:

- Ranking of biomethane use cases against clear criteria: emissions reduction, availability of alternatives, scalability, and economic value.
- Integration of biomethane within a wider bioenergy hierarchy, alongside biomass and liquid biofuels
- A strategy for gradually directing biomethane towards the hardest-to-electrify sectors (principally high-temperature industry and flexible power generation).
- This should feed into infrastructure planning exercises (e.g. SSEP, CSNP, RESP) to ensure gas network infrastructure takes into account reduced fossil methane flows and greater decentralised biomethane production

Recommendation 2: The Government is right to look at an alternative revenue support mechanism for biomethane – and should endeavour to align this with support for competing fuels such as hydrogen – but must ensure that any mechanism for biomethane production is only available to projects that meet strong sustainability criteria.

Government ensure that support beyond the current GGSS should only be available to projects that meet strengthened sustainability criteria, including:

- Prioritising waste and UK-based feedstocks.
- Tightening lifecycle greenhouse gas thresholds over time.
- Limiting the use of energy crops through maintaining the 50% waste feedstock requirement.
- Not include the averaging loophole under the GGSS that allows high-carbon feedstocks to qualify.
- Mandating best practice methane leakage detection and repair for producers.
- Limit carbon credits to a minimum value of 0 to preventing over-rewarding of manure use and avoiding lock-in of intensive livestock farming.

This will ensure biomethane growth delivers genuine emissions reductions whilst avoiding unintended environmental impacts.

Recommendation 3: The Government should establish consistent carbon pricing across fuels and sectors

Government should reform the application of fuel duties, VAT and carbon pricing so that all fuels and sectors face a consistent carbon price signal in line with their emissions. Current distortions, such as zero fuel duty for agriculture, exemptions for aviation and reduced VAT on domestic gas, mean that biomethane is not always used where it delivers the greatest carbon benefit. A universal framework would:

- Create a natural market for biomethane based on its value as a low-carbon fuel
- Ensure limited biomethane supply is directed towards the hardest-to-abate sectors, rather than those benefiting from tax exemptions.
- Provide investors with confidence by creating a stable, long-term demand signal.
- Protect consumers by reducing the risk of misallocation that drives up costs without maximising emissions reductions.

Recommendation 4: Clear messaging is needed to ensure that consumers are accurately informed about the use and benefits of biomethane without delaying the transition to more appropriate low-carbon fuels or electrification.

A key conclusion of this report is that biomethane could be a very valuable alternative to fossil gas and play an important role in helping decarbonise the most difficult gas uses. It could also provide an important source of energy storage for flexible power during stress events.

However, it must be recognised that the availability of biomethane will be limited and it cannot therefore replace the supply of fossil methane at current demand levels. Small amounts of grid injection may reduce emissions, but should not prevent or delay the transition to lower-cost solutions. This is especially true of home heating, where electrification is expected to play a far bigger role. Policy makers should:

- Ensure limited biomethane supply is directed towards the hardest-to-abate sectors, rather than those currently benefiting from tax exemptions.
- Provide investors with confidence by creating a stable, long-term demand signal.
- Protect consumers by reducing the risk of misallocation that drives up costs without maximising emissions reductions.

Recommendation 5: The Government, regulator and networks should develop a plan for a reduction in gas demand and the eventual decommissioning of the gas distribution networks.

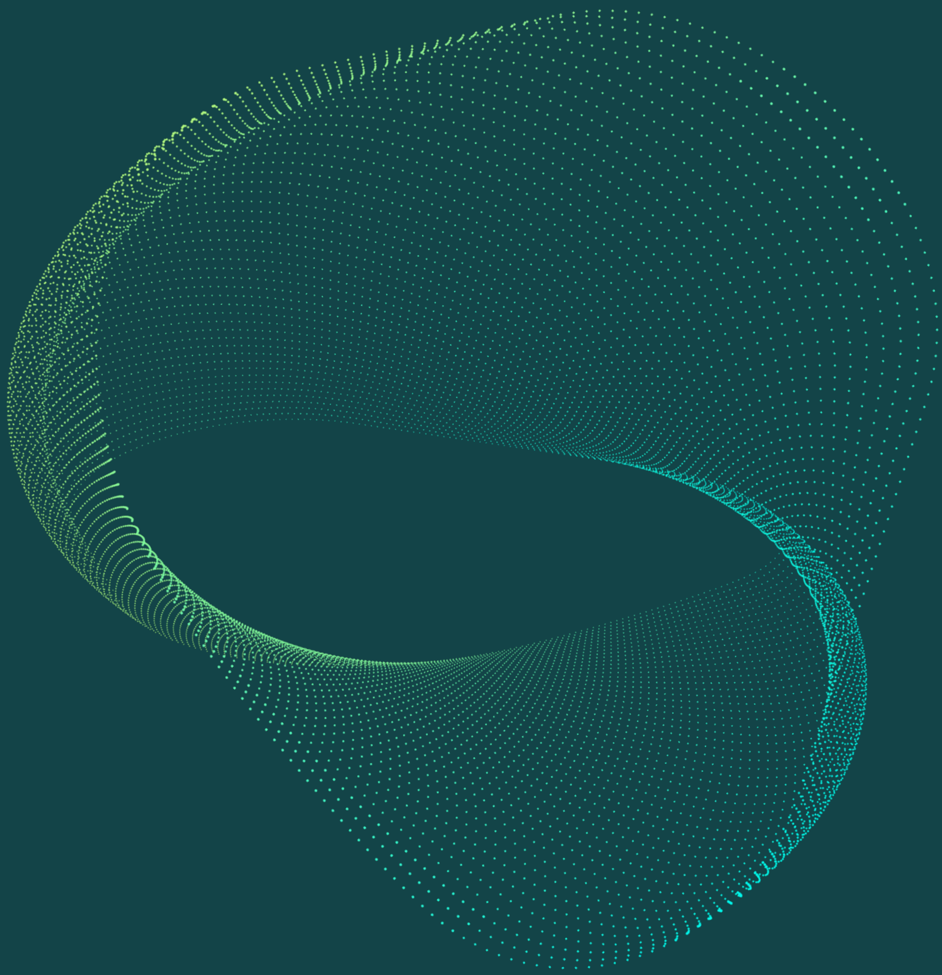
A key conclusion of this study is that biomethane will not be available at a scale and cost to make a meaningful contribution to current gas demand for household heating. This adds further weight to the argument that, as less energy is distributed through the gas network, fixed costs for remaining consumers could rise and that, over time, major parts of the gas network will be decommissioned.

The Government and Ofgem should now develop a long-term plan for gas network cost recovery, asset depreciation and gas distribution network decommissioning.

Glossary of terms

Term/acronym	Definition
AD (Anaerobic Digestion)	Biological process where organic materials (food waste, manure, sewage, crops) decompose without oxygen, producing biogas and digestate.
Biogas	Raw gas from anaerobic digestion, containing methane (CH_4), carbon dioxide (CO_2) and trace gases.
Biomethane	Chemically identical to fossil methane when pure, produced by upgrading biogas and compatible with the UK gas grid.
Bio-CNG (Compressed Biomethane)	Biomethane compressed to high pressure, used as a renewable alternative to compressed natural gas in transport.
Bio-LNG (Liquefied Biomethane)	Biomethane cooled to liquid form for use in heavy-duty transport or shipping.
Digestate	Nutrient-rich by-product of anaerobic digestion, used as fertiliser but can increase ammonia or nitrate pollution if mismanaged.
Energy crops	Crops (e.g. maise, miscanthus, short rotation coppice) cultivated specifically for AD and biomethane production.
Food waste	Biodegradable waste from households, retail, or industry used as a feedstock for biomethane.
Manure	Livestock slurry and solid waste used as a biomethane feedstock; can deliver low lifecycle emissions if leakage is minimised.
Agricultural residues	Crop leftovers (e.g. straw, husks) and residues from crop processing, used in AD.
Landfill gas	Biogas released from decomposition of waste in landfills, captured for energy use.
Sewage gas	Biogas produced from sewage sludge digestion at wastewater treatment plants.

Woody biomass	Forestry residues or waste wood; occasionally used but more suited to other forms of bioenergy.
GGSS (Green Gas Support Scheme)	UK government scheme providing tariffs for biomethane grid injection until March 2028.
GGCS (Green Gas Certification Scheme)	Scheme issuing RGGOs for biomethane, enabling green gas certification and trade.
RGGO (Renewable Gas Guarantee of Origin)	Certificates demonstrating the renewable origin of biomethane.
RTFO (Renewable Transport Fuel Obligation)	UK regulation requiring transport fuel suppliers to blend renewable fuels; includes biomethane.
RTFC (Renewable Transport Fuel Certificate)	Tradable certificates issued under RTFO for biomethane and other renewable transport fuels.
FES (Future Energy Scenarios)	NESO modelling that projects possible energy futures, including biomethane blending scenarios.
Digestate management	Practices for applying digestate to land, balancing fertiliser benefits with risks of ammonia/nitrate pollution.
Biomethane blending	Process of injecting biomethane into the gas grid where it mixes with fossil methane.
MWe (Megawatt electrical)	Unit of electrical output capacity, used for measuring power generation from AD or biomethane facilities.
MWth (Megawatt thermal)	Unit of thermal output capacity, used for measuring heat production from AD or biomethane facilities.



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