

Reducing green gas costs

with bioCO₂

October 2026



Executive Summary

Achieving net zero will require more than simply reducing emissions. While renewable energy and energy efficiency will play critical roles in the energy transition, there will remain sectors, such as aviation and industrial processes, where emissions are prohibitively expensive to eliminate entirely. Such sectors will need to purchase greenhouse gas removals (GGRs) – produced from permanently capturing and storing carbon dioxide – to mitigate their residual emissions. This is the ‘net’ in net zero.

Biomethane is a green gas made from organic matter such as food and agricultural waste and because it is made from renewable sources, it is low-carbon. **By scaling up biomethane, the UK can decarbonise hard to abate sectors. Additionally, it has an opportunity to unlock one of the lowest cost approaches to generate domestic GGRs.** This is possible because biomethane production already creates a high-purity stream of biogenic CO₂ (bioCO₂) as a co-product. At the sector's full potential of 120 TWh of biomethane per year, the UK could generate approximately 17 million tonnes of bioCO₂ annually. **Even if only half of this potential is fulfilled, analysis suggests that UK biomethane could generate one quarter of the Climate Change Committee's (CCC) engineered GGRs target for 2050.**

While the biomethane sector currently requires Government subsidy to scale, early evaluations suggest that **selling these bioCO₂ GGRs to the private sector could reduce the level of Government support for biomethane by up to one-third** compared to today. BioCO₂ lowers the costs of renewable energy for consumers while encouraging new investment in domestic green gas production.

The technology to capture, liquefy, transport and store bioCO₂ exists, but policy and

infrastructure access have not yet been designed around smaller, geographically dispersed biomethane producers which require their CO₂ to be transported by road rather than pipe. Government's recently launched Non-pipeline transport (NPT) Pathfinder process is an important first step, but there is more work to do to fully evaluate this opportunity and how it links to the current regulatory landscape. The sector and Government can work together to unlock bioCO₂ capture and storage at scale by:

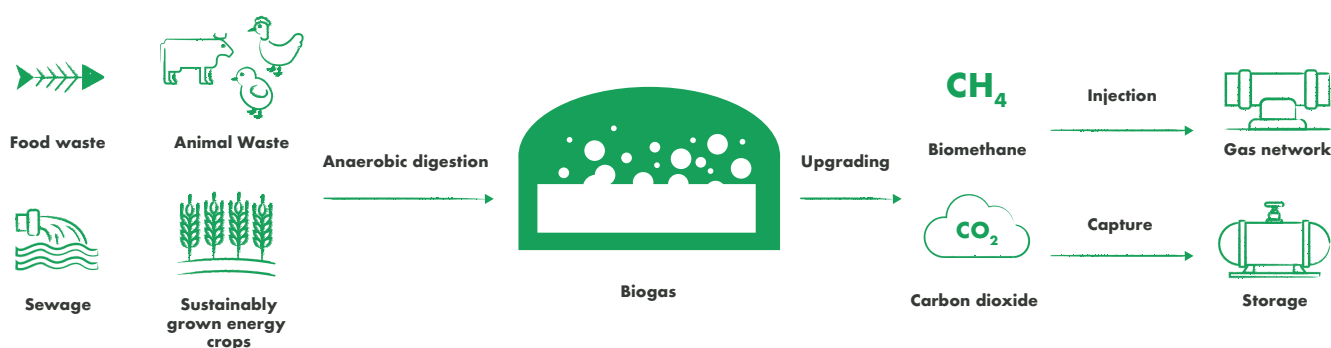
- Accelerating the development of the UK's CO₂ capture and storage (CCS) infrastructure.
- Streamlining access to this infrastructure for biomethane producers.
- Assessing how GGRs could complement sustainable aviation fuel (SAF) in reducing aviation emissions.
- Continuing to explore this opportunity further, including how to ensure that selling bioCO₂ GGRs reduces the need for biomethane subsidy, without negatively impacting producers that cannot feasibly access the UK's CCS infrastructure.

What are biomethane and bioCO₂?

What is biomethane?

Biomethane is a renewable gas produced through the anaerobic digestion of organic wastes and residues, such as food and agricultural waste. The 'biogas' produced in an anaerobic digester is a mixture of carbon dioxide and biomethane. Biogas is filtered, or 'upgraded', into biomethane, which has the same chemical composition as natural gas. The process is outlined in figure 1.

Figure 1: How biomethane and carbon dioxide are produced at an anaerobic digestion plant.



Under the current regulations, biomethane offers at least a 70% reduction in lifecycle carbon emissions compared to the use of fossil fuel natural gas¹. It can provide over 100% emissions reduction (i.e. net negative emissions) if it is made from feedstocks such as animal manures that would otherwise have emitted greenhouse gases during their disposal.

Because it is chemically identical to natural gas, biomethane can be distributed through our existing gas network and used by homes, businesses and industry without changing equipment or consumer behaviour. As the UK's largest gas distribution network, we are working to support connecting more biomethane to our network, enabling our customers to access lower-carbon energy.

There is substantial untapped potential to grow the UK's biomethane sector. The Green Gas Task Force identified the potential for the UK to produce up to 120 TWh of biomethane annually by 2050. At this scale, biomethane could make a material contribution to future gas demand, enhance domestic energy production and reduce reliance on imported energy supplies². Recent analysis by the National Energy System Operator (NESO) also concluded that biomethane can play an important and enduring role in delivering a cost-effective, resilient, net-zero energy system³.

1. Ofgem, Green Gas Support Scheme and Green Gas Levy

2. Green Gas Taskforce, A green gas future: Outlining the feedstock potential for biomethane generation, September 2025

3. National Energy System Operator (NESO), Exploring the Role of Biomethane in the Energy System to 2050, July 2026

What is bioCO₂?

The co-product of upgrading biogas into biomethane is a stream of high-purity biogenic carbon dioxide, commonly referred to as bioCO₂. This bioCO₂ originates from organic material such as plants and animal wastes that have absorbed carbon dioxide from the atmosphere. As a result, if this carbon dioxide is permanently stored rather than released, it removes carbon from the atmosphere. At 120 TWh per year of biomethane production, **the UK could generate approximately 17 million tonnes of bioCO₂ annually from producing biomethane.** This is equivalent to approximately half of UK international aviation emissions. Even if only half of this potential is fulfilled, that would be equivalent to approximately **one quarter of the Climate Change Committee's (CCC's) engineered GGRs target for 2050 (36 million tonnes of CO₂)⁴.**

How is bioCO₂ stored to generate greenhouse gas removals?

To generate greenhouse gas removal (GGR) credits, bioCO₂ must be permanently stored underground using carbon capture and storage (CCS) infrastructure. The UK's geology gives it a major competitive advantage in building CCS infrastructure. The country possesses around one-third of Europe's identified carbon storage capacity and has sufficient geological storage to accommodate centuries of UK emissions.

The UK has already begun constructing its first CCS infrastructure, starting with the HyNet and East Coast Cluster projects. Together these projects are expected to provide around 8.5 million tonnes of annual CO₂ storage capacity by 2028, with the potential to expand this to 20 million tonnes. Additional projects such as Acorn, Viking CCS and the Peak Cluster | MNZ are also progressing. Combined, these would unlock **approximately 100 million tonnes of annual CO₂ storage capacity.** The projects in development in the UK are shown in figure 2.

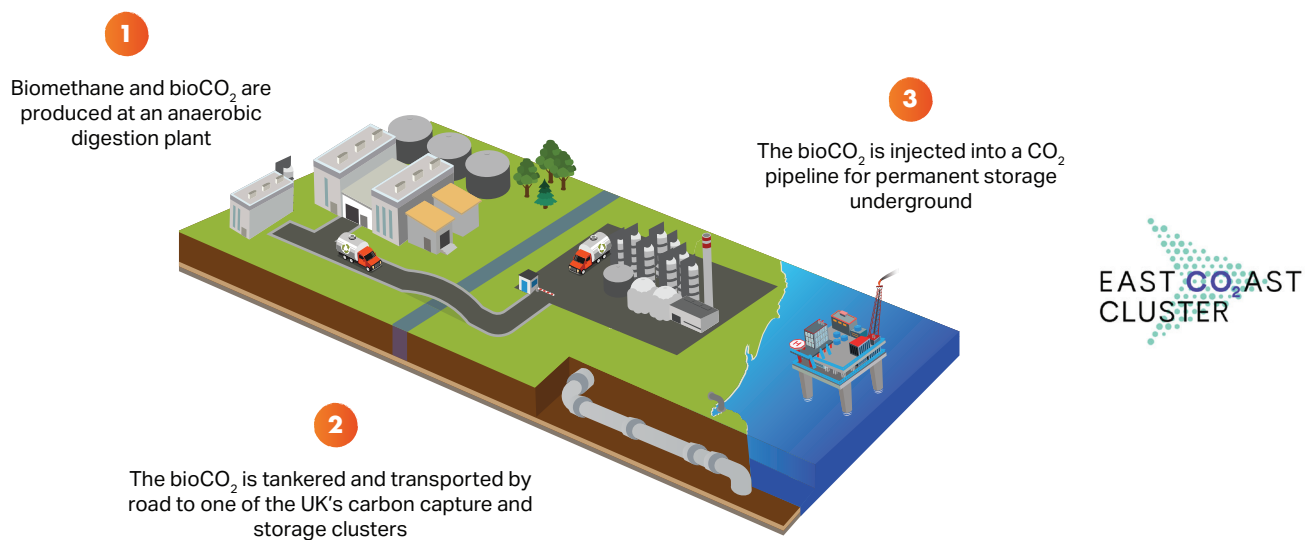
Figure 2: There are seven carbon capture and storage locations in advanced stages of development in the UK⁵. HyNet and East Coast Cluster are in construction.



4. Green Gas Taskforce, The renewable pathway to greenhouse gas removals, August 2025
5. Progressive Energy, Reducing Green Gas Costs via Bio-CO₂ Sequestration, March 2026

Most biomethane production sites are dispersed in rural areas across the country. This means connecting individual plants directly to these CCS projects' CO₂ transport pipelines is often impractical and expensive. Instead, bioCO₂ is expected to be transported by road tanker to aggregation facilities before entering transport and storage networks, a process known as 'non-pipeline transport', or NPT. This process is shown in figure 3.

Figure 3: The process of capturing bioCO₂ during the production of biomethane, and transporting it to a carbon capture and storage (CCS) cluster such as East Coast Cluster. Image based on design by Progressive Energy Limited.



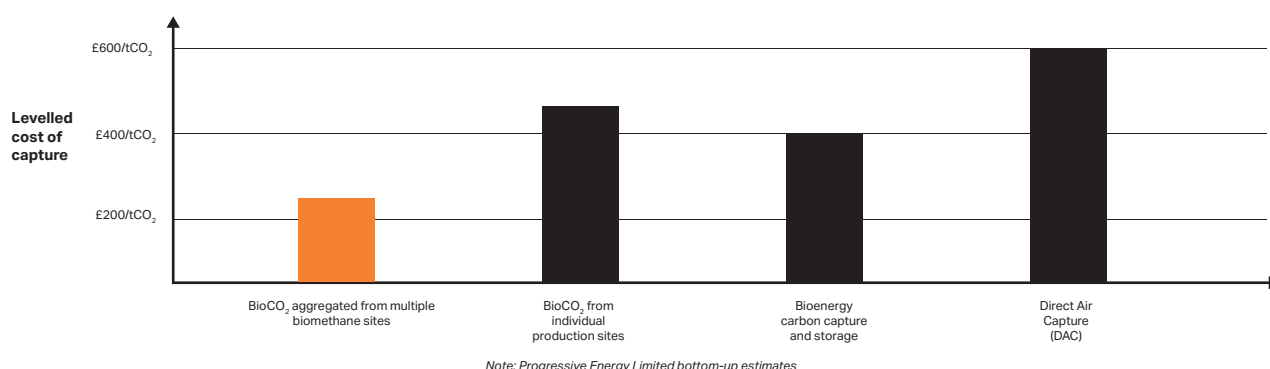
How does bioCO₂ lower costs of greenhouse gas removals and biomethane?

Lower cost greenhouse gas removals

There are various approaches to generating GGRs, with different costs. Some approaches, such as direct air capture, require substantial energy inputs and are less technically mature. Others rely on expensive feedstocks or emerging technologies.

By contrast, biomethane production already generates a concentrated, high-purity stream of carbon dioxide. As a result, the cost of capturing bioCO₂ can be significantly lower than for many alternative greenhouse gas removal pathways. When bioCO₂ from multiple biomethane producers is aggregated and transported to CCS networks at scale, analysis suggests **the resulting greenhouse gas removals can be among the lowest-cost available**, as shown in figure 4. This makes bioCO₂ an attractive option for helping the UK meet its growing requirement for GGRs while minimising costs to consumers and taxpayers.

Figure 4: BioCO₂ produced as a co-product of biomethane is one of the lowest cost sources of greenhouse gas removals (GGRs)



Lower cost biomethane

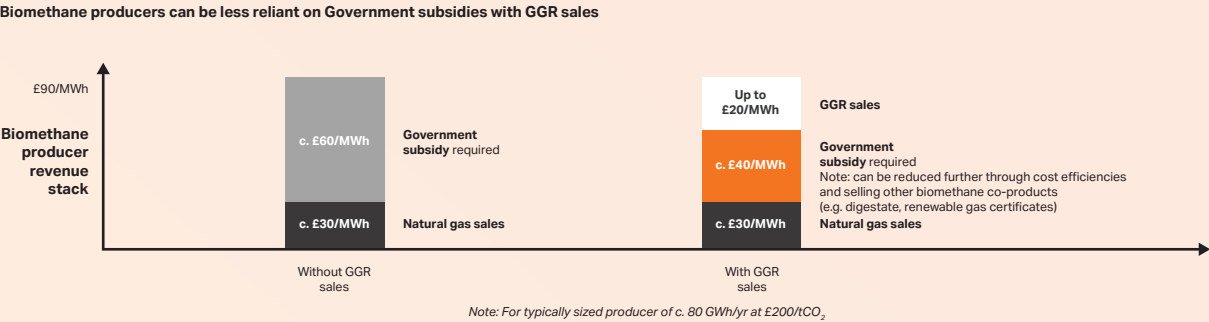
As at October 2026, biomethane producers receive a subsidy from Government of c. £60 per MWh of biomethane produced and injected into the gas network. The ability to generate GGR credits creates a second revenue stream for biomethane producers alongside the sale of their gas, reducing their reliance on subsidy.

Early evaluations suggest that biomethane producers could receive additional income equivalent to £20 per MWh of biomethane by selling their bioCO₂ for carbon capture. This would add c. £100-200/tCO₂ to the capture cost shown in figure 4 (depending on the ratio of bioCO₂ to biomethane in the producer's biogas), keeping the bioCO₂'s GGR price

competitive with other sources of GGRs. This additional revenue could offset the cost developers must recoup through biomethane alone, reducing the subsidy requirement for biomethane production by around one-third. Further reductions to subsidy are possible through delivering cost efficiencies with larger producers, and scaling the markets for biomethane's other co-products (e.g. renewable gas certificates and digestate, a natural fertiliser⁶).

It is important to note that the extent to which GGR revenues reduce subsidy requirements will depend on market design, regional access to CCS infrastructure, future policy design and commercial incentives for producers. Not all biomethane producers will be able to access CCS infrastructure due to cost or location, and it is important that it is still economically viable for producers unable to access CCS infrastructure to produce biomethane. This will require careful coordination between producers, CCS cluster operators and subsidy design.

Figure 5: Biomethane producers can be less reliant on Government subsidies by selling greenhouse gas removal (GGR) credits⁷.



In effect, bioCO₂ turns what is currently a by-product into a valuable commodity. This helps reduce the overall cost of green gas while accelerating deployment of additional biomethane production capacity.



7. Progressive Energy, Reducing Green Gas Costs via Bio-CO₂ Sequestration, March 2026

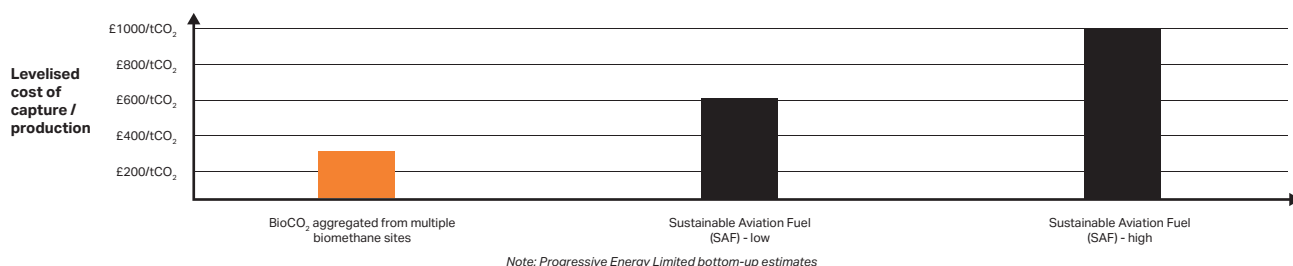
Case study: Decarbonising aviation affordably

Aviation represents one of the most difficult sectors to decarbonise. Government has now mandated UK airlines purchase a quota of sustainable aviation fuel (SAF) to partially offset their emissions. SAF will play an important role, but production remains limited and costs remain high.

GGRs generated from biomethane offer a complementary solution. Rather than relying exclusively on expensive fuel substitutions, **allowing airlines to purchase verified GGRs from bioCO₂ could provide a**

lower-cost route to addressing residual aviation emissions while supporting domestic green energy production. This would reduce pressure on ticket prices, stimulate investment in British infrastructure and provide a new source of funding for carbon capture projects. However, due to the SAF mandate the sector is focussed on decarbonising using SAF rather than alternative options to decarbonise.

The benefits extend beyond aviation. Greater private-sector demand for carbon removals would reduce reliance on taxpayer funding, enabling Government resources to be directed towards further biomethane support and additional decarbonisation initiatives.



The result is a virtuous circle: more biomethane production, more carbon removals, lower costs for consumers and faster progress towards net zero.

There is one additional benefit we have not focused on in this report. The carbon dioxide biomethane producers generate today is typically sold to industry (e.g. for sterilising equipment for the food and healthcare sector, or carbonating fizzy drinks) or vented when they cannot find a buyer. The UK's carbon dioxide supply has faced serious challenges during 2026, with the

Government having to step in and financially support Ensus, a major supplier of carbon dioxide in the UK⁹. It would only take an additional ~20 biomethane sites to start capturing their bioCO₂ to make as much CO₂ as the Ensus site does (250 ktCO₂/year). Given there are already 130 biomethane sites in the UK, this is well within the capacity of the sector today. Alongside representing a cost-effective source of GGRs, scaling biomethane can therefore also shore up the UK's domestic supply of CO₂ for critical industries and end-uses.

8. Progressive Energy, Reducing Green Gas Costs via Bio-CO₂ Sequestration, March 2026

9. UK Department for Business and Trade, Government safeguards critical UK CO₂ supplies with restart of plant, March 2026

Figure 7: An infographic of the potential for sequestering bioCO₂ from biomethane

Biomethane's hidden carbon removal opportunity

Capturing and storing the CO₂ produced alongside biomethane could deliver a major source of greenhouse gas removals for the UK.

1 One biomethane plant



≈ 400 Households

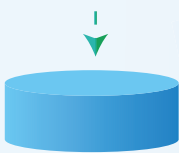
Equivalent to the annual emissions of nearly 400 UK households



2 The opportunity today and tomorrow

Today
1 MtCO₂ / year

Potential carbon removals available from biomethane plants that already exist



17x
larger than today's opportunity

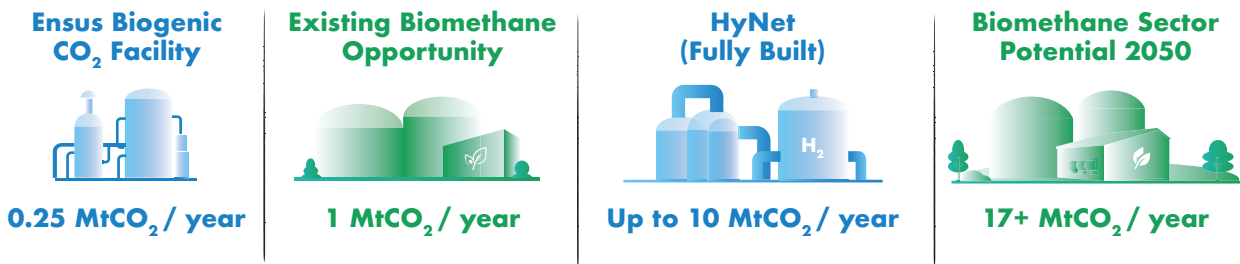
2050 Potential
17+ MtCO₂ / year

Potential annual carbon removals from a fully developed UK biomethane sector



3 How big is 17 MtCO₂?

Comparison with other UK biogenic CO₂ and CCS infrastructure



Why are biomethane producers not currently sequestering bioCO₂?

Despite the opportunity, widespread bioCO₂ sequestration (the process of capturing and storing bioCO₂) has not yet materialised. There are three main reasons:

1. **First, carbon capture and storage networks are still in the construction stages.** The UK's first transport and storage projects reached their final investment decisions in 2024 and 2025 and are expected to become operational from 2028. Until these networks exist, large-scale storage simply is not available.
2. **Second, policy development has lagged technological capability.** Historically, UK CCS policy has focused on large industrial emitters, with limited consideration given to smaller emitters such as biomethane production sites. While progress is being made, important elements of the policy landscape are still emerging.
3. **Third, previous competitions to allocate CCS network capacity have unintentionally excluded much of the biomethane sector** from participation. Allocation processes have favoured large projects connected directly to pipelines, have imposed minimum scale thresholds that most biomethane producers cannot meet individually, and have not permitted non-pipeline CO₂ transport. This has limited access to carbon transport and storage infrastructure for the majority of the sector.

Encouragingly, this situation is beginning to change. The Climate Change Committee has highlighted the need for substantial growth in greenhouse gas removals, while in 2025, the Government's independent review of greenhouse gas removals highlighted biomethane as a potentially low-cost source of

GGRs. In July, the Government published its response to the independent review, agreeing with the findings and the potential role biomethane can play. To that end, the Government has also recently launched the Non-Pipeline Transport (NPT) Pathfinder process, enabling a CCS cluster (East Coast Cluster) to source non-pipeline CO₂ for the first time. The process incorporated critical recommendations from the independent review and our recent work on GGRs, such as setting lower minimum project size thresholds. These changes better reflect the realities of the biomethane sector and could unlock participation from hundreds of producers across the UK.

Further work needed to unlock this opportunity

There is a clear opportunity for biomethane to provide cost-effective, domestically sourced GGRs. However, this technology is still in its infancy, and further innovation is needed within the sector to unlock this opportunity:

1. Explore ways to optimise and **reduce the cost of capturing and transporting bioCO₂** from biomethane producers.
2. **Pilot aggregation facilities** that can combine multiple sources of bioCO₂ and inject the gas into a CCS pipeline.
3. **Assess in detail the potential for revenues from bioCO₂** to reduce the need to subsidise the production of biomethane.
4. **Map biomethane feedstock hotspots alongside CCS clusters** in development to identify the areas of high potential for producing both biomethane and bioCO₂ GGRs.

Our suggestions for the UK Government

Government has already taken valuable first steps to support greenhouse gas removals from biomethane. However, given the economic and environmental benefits available, we recommend Government takes four further actions:

1. **Accelerate the development of UK CCS infrastructure.**
2. **Expand the NPT Pathfinder process** across all UK CCS clusters, ensuring producers across the UK can participate.
3. **Streamline the process of securing CCS capacity for small-scale CO₂ producers** (such as the biomethane sector) who can provide CO₂ without direct public subsidy.
4. **Assess how domestic GGRs from bioCO₂ could complement SAF in reducing aviation emissions.** This would create a powerful new market signal and encourage private investment.

By pursuing these actions, the UK can unlock one of its most cost-effective sources of carbon removals, reduce the cost of green gas, support investment in rural communities and strengthen domestic energy security. Most importantly, it can help deliver net zero at a lower cost to consumers while establishing a world-leading market for greenhouse gas removals.

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