Say No to LNG – Global Shipping Campaign
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FAQs

Biomethane Use in Shipping

In this Document

BACKGROUND

In simple terms, biomethane is produced by a process that removes impurities, including CO2, from biogas (i.e., a gas generated during the decomposition of organic remains–agricultural/livestock waste, sludge from water treatment plants, etc.). Biomethane can also be produced through gasification of solid biomass (e.g., forest residues), though the process is not commercialized yet. Not all biomethanes are produced the same. The greenhouse gas (GHG) profile of each type of biomethane differs significantly depending on feedstock and production pathway (see chart by ICCT in Q3).

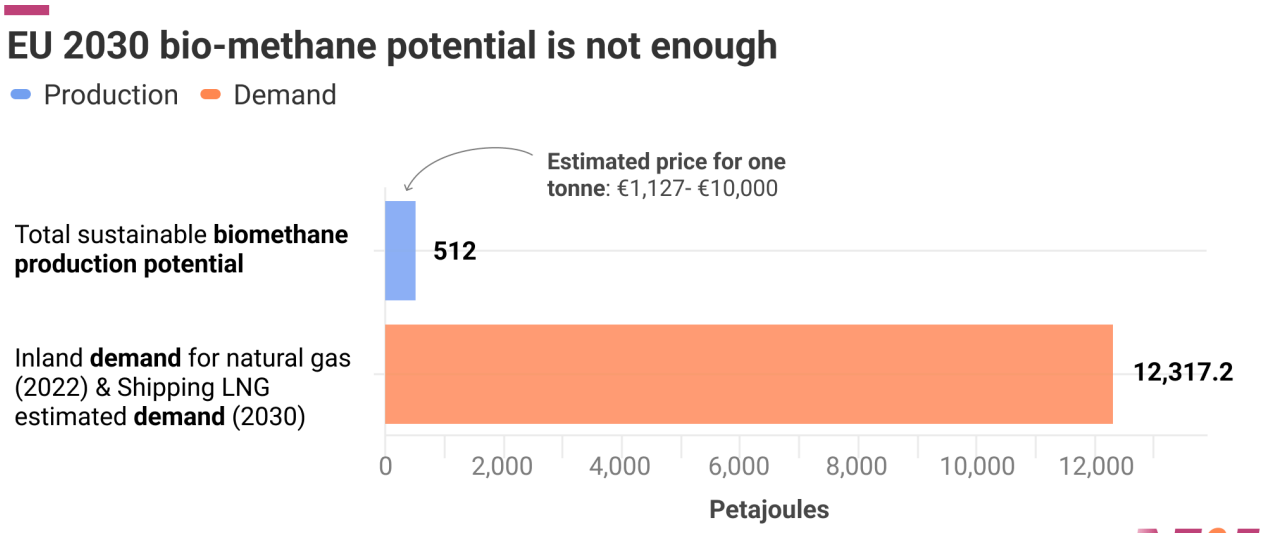
Biomethane can be used to generate electricity or to power vehicles or vessels as compressed natural gas or liquified natural gas. While it has been considered a potential fuel for reducing emissions in marine shipping, as it can have a lower GHG profile than fossil LNG, there are significant limitations and challenges associated with its widespread adoption.

Bio-LNG is considered by some to be a stopgap solution for those currently using fossil LNG. Although it can utilize existing LNG infrastructure, its scalability is limited. However, without strong policies and incentives for other sustainable, zero-emissions fuels and technologies, there is a risk that bio-LNG could become a lifeline for prolonging the use of fossil LNG.

Q1: Is biomethane a viable solution for decarbonizing marine shipping?

A: Several key challenges hinder biomethane's effectiveness as a solution for decarbonizing marine shipping:

- Scalability: Biomethane production may face scalability issues, similar to other biofuels, limiting its availability for widespread use in the shipping industry.



Source: Eurostat (2024), T&E (2023), CE Delft (2020), ICCT (2022)

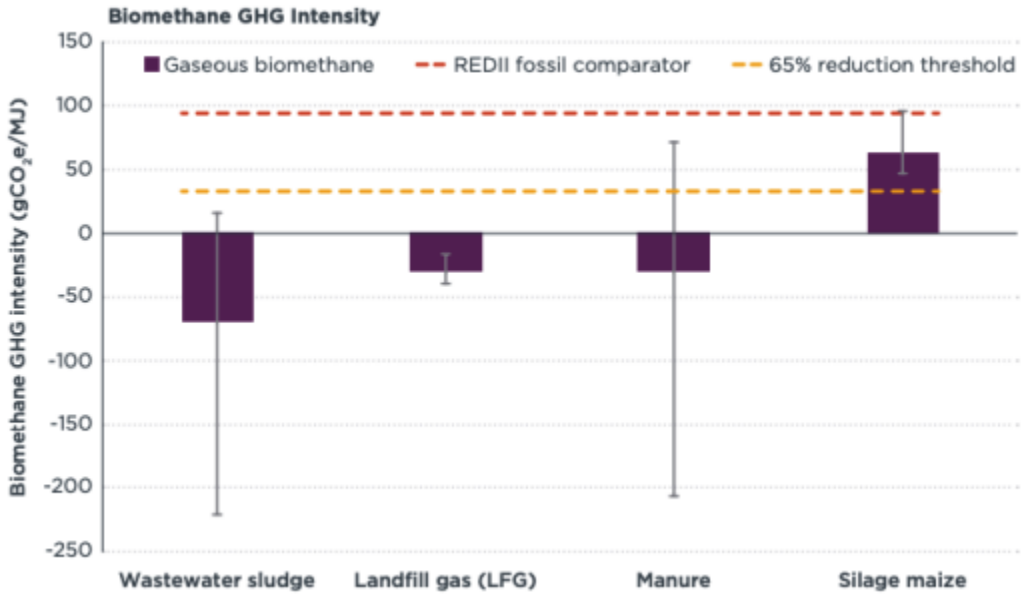
- Competition with other sectors: Biomethane use in shipping competes with other sectors, such as energy generation for houses and land transport, for resources and infrastructure, potentially impacting its availability and affordability.
- Traceability: Ensuring a robust traceability system for biomethane sources is essential to maintain sustainability standards and prevent potential environmental harm. For example, the traceability requirements of FuelEU regulation require bio-methane to be injected into the EU grid to produce FuelEU-compliant fuel.
- Methane slip: Biomethane production and use may result in methane slip, *contributing to greenhouse gas emissions and undermining its environmental benefits.*
- Better alternatives: Directing subsidies towards e-fuels with superior emission profiles and lower total cost of ownership, albeit requiring vessel modifications and infrastructure development, may offer a more effective decarbonization strategy.
- Cost considerations: Transitioning from LNG to biomethane may not be economically viable due to cost differentials

Q2: Does regulatory support for bio/e-methane suggest its viability as a marine fuel?

A: While regulatory frameworks such as the Renewable Energy Directive (RED) may list bio from some feedstocks as an alternative fuel with a low GHG intensity, this does not necessarily indicate its viability as a long-term solution. Concerns persist regarding scalability, competition with other sectors, and methane slip emissions.

There are concerns about how the values were established in the first place. For example, ILUC is not considered, and methane leakage assumptions associated with biomethane digesters are probably very low. The graphic in Q3 shows the uncertainty about emissions savings from different biomethane feedstocks. Silage maize could thus be as bad as fossil fuels, while manure savings highly depend on practices.

Q3: Why do manure and wastewater sludge have such a wide error margin in their climate impact calculations?



Source: Life-cycle greenhouse gas emissions of biomethane and hydrogen pathways in the European Union - International Council on Clean Transportation

A: One significant factor is methane leakage during production, which can negate any climate benefits if the leakage is high. Another factor is how the waste is treated when not used for biomethane. For example, open ponds of livestock manure release a lot of methane, while capped ponds reduce emissions—the more methane that would have escaped during non-treatment, the better the climate benefit of using biomethane.

Q4: Is there a growing trend of shifting from animal farming to energy production through biomethane?

A: There is a concerning trend where the push for biomethane production risks locking in unsustainable livestock farming practices. Despite the scientific consensus advocating for a reduction in animal farming and meat, egg, and dairy consumption for both climate and health reasons, a significant portion of biomethane targets rely on manure as a feedstock. This could lead to the rise of "energy pigs," "energy cows," or "energy chickens," where animals are raised primarily for their manure, giving intensive farming an economic incentive. In the US, particularly in California, high credits provided for biomethane under programs like the California Low Carbon Fuel Standard have contributed to the intensification of farming practices. This trend is at odds with efforts to reduce methane emissions, as the livestock sector is a top methane emitter. In

addition, some residues currently used in fertilizer cycles could be diverted to biomethane production, leading to their replacement with even more harmful alternatives.

Q5: Why is the cost of manure-based biomethane higher than other sources?

A: Collection costs drive up the expense. Rural farms are often spread out, meaning that a lot of manure must be transported to a central facility. Additionally, biogas from manure is only 50-60% methane and contains off-gases like sulfides, which require cleaning and compression to create pipeline-ready biomethane. The lack of nearby pipeline infrastructure in rural areas adds to the cost.

Q6: Is gasification the standard process for converting forest residues into biomethane?

A: Yes, forest residues are processed using gasification to create biomethane. However, the cost is driven by the technology required for the process. In countries like China, efforts to adapt coal gasification technology for biomass are underway but have been unsuccessful at scale, highlighting the feedstock-specific challenges of gasification.

Q7: Does manure decompose and lose efficiency during transport?

A: While efficiency losses in cleaning and compressing manure are accounted for, there is uncertainty about how much manure decomposes during transport. The decomposition rate could impact the overall energy efficiency, but it's not always factored into cost assessments.

Q8: What happens to the off-gases from biomethane production?

A: Some facilities capture the off-gases, while others may release them. There is a stronger incentive to flare potent methane, i.e., turn methane into CO2. However, the use of Carbon Capture, Utilization, and Storage (CCUS) could further reduce emissions, yet it is energy-intensive and costly.

Q9: Is palm residue a viable source for biomethane production?

A: Not all palm residues are suitable for biomethane. While some residues like palm oil mill effluent can be captured and processed, other by-products like palm fatty acid distillates (PFADs) have economic value and are processed differently. Concerns around sustainability and potential fraud in palm oil supply chains persist, particularly in the context of EU regulations.

Q10: Are there enforcement challenges in ensuring biomethane is produced sustainably?

A: Enforcement is a significant challenge, especially in regions like the EU, where fraud has been uncovered in the bio-oil sector. Chemical testing for the origin of biomethane is complex, making it harder to verify the sustainability of its source.