Renewable natural gas: growing significance in a niche market

Renewable natural gas is set to be in more demand in the coming years to help reduce emissions and diversify energy supply chains. Supported by policy and customer willingness to pay, the market is expected to nearly triple in Europe and more than double in the US by 2030. Despite this growth, challenges remain around policy streamlining and innovation

Biogas plants convert organic waste like agricultural residue, manure, and food scraps into biogas, which is then refined into RNG

Surging popularity

Renewable natural gas (RNG), also known as biomethane in Europe, is experiencing a resurgence in popularity due to its significant benefits.

As a clean energy source, RNG not only prevents methane emissions from waste but is also fully compatible with the existing natural gas infrastructure, making it a seamless and sustainable alternative to conventional natural gas.

While the market is niche right now, it is rapidly growing. Between 2024 and 2030, we forecast a 2.7-fold increase in production in the EU and a 2.3-fold increase in the US.

Still, the higher cost of production creates challenges for the industry, and we think targets set by

the EU may be too ambitious. Indeed, current policies and market dynamics lead us to expect that EU production will be less than half of the bloc's target, while the aspirations of US companies and state governments may also face obstacles. To unlock the production potential, we believe that policy support can be further improved.

In this article, we explore the RNG market by examining its societal benefits, supply and demand dynamics, and policy developments in the US and Europe.

RNG is produced from organic materials and refined to meet high purity standards. Production methods include:

1. **Capturing methane** that would otherwise be emitted from landfills.
2. Processing bio-feedstock such as animal byproducts and agricultural waste through an **anaerobic digester or thermal gasification**.

The societal benefits of RNG

Greenhouse gas emissions reduction	RNG reduces emissions by capturing methane from waste sources like landfills, livestock farms, and wastewater treatment plants. Methane is a potent greenhouse gas and converting it into RNG prevents its release into the atmosphere. While RNG does produce CO_2 when used as an energy source or feedstock, the overall climate impact is generally positive.
Circular economy	RNG production through AD utilizes organic waste materials, providing a sustainable solution to bio/agricultural waste problems and circularity of supply chains. It also generates valuable circular products like fertilizer, biogenic CO_2, and solid and liquid digestate.
Green feedstock	In hard-to-abate sectors, although companies mainly use RNG as an energy source today, it can also be a valuable feedstock for clean fuels like hydrogen. Additionally, RNG is increasingly considered as a feedstock to produce green methanol to decarbonize the shipping industry.
Fuel diversification & green energy	RNG increases and diversifies domestic energy production, reducing reliance on fossil fuels, either domestically produced or imported.
Improved air quality	Using RNG can improve local air quality by reducing emissions of pollutants associated with fossil fuels such as conventional natural gas or coal.
Economic benefits	RNG projects are typically smaller and more locally embedded. Hence, developing RNG projects can boost local economies through the construction of processing facilities and fueling stations and the supply chain to source feedstock locally.

Niche but growing market

These attractive traits, combined with government mandates and incentives, have boosted RNG's momentum in recent years. Production capacity is estimated to have doubled in both Europe and the US between 2020 and 2024.

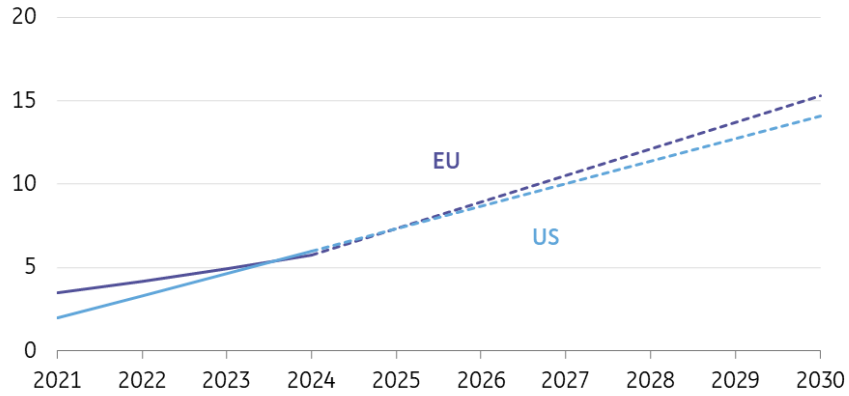
Looking ahead, new growth drivers have emerged. The **first** is versatile decarbonisation. RNG's role, initially concentrated in transportation, is expanding into additional sectors. The **second** is supply diversification. The willingness to add RNG to natural gas portfolios, particularly in Europe, to reduce dependence on Russian imports, is translating into concrete actions.

As a result, we anticipate robust expansion of the RNG market, with annual production projected to

rise to around 15 billion cubic meters by 2030 in the EU, experiencing a 2.7-fold growth. During the same period, US RNG production is likely to increase 2.3-fold to about 14 Bcm.

Strong growth in RNG

RNG production in billion cubic meters (Bcm)



Source: ING Research, European Biogas Association, Rystad Energy, Boston Consulting Group, Wood Mackenzie

It is true that the RNG market will remain niche. RNG production will likely account for 5.2% of natural gas demand in the EU by 2030, from 1.5% in 2023. For the US, the share is expected to increase from 0.5% to 1.6% during the same period. Nonetheless, RNG represents one of the fastest-growing alternative gas markets, and its appeal in energy security and decarbonisation means the fuel will only become more important in the future.

Supply: revenue streams expand but challenges remain

The profitability of RNG projects is supported by several pillars, and as the RNG market evolves, revenue streams have become more diverse, boosting the outlook for production.

1. **Supportive Policies:** Government subsidies, tax credits, and market-based credit systems like the Renewable Fuels Standard (RFS) in the US, the Low Carbon Fuels Standard (LCFS) in California, the Emissions Trading System (ETS) in the EU, and the RNG Guarantees of Origin (GOs) and Proofs of Sustainability (PoSs) in the EU enhance the business case.
2. **Direct Offtake Agreements:** These provide stable, long-term revenue from sustainability-committed customers.
3. **New Revenue Sources:** Emerging sources include fees from waste management and recycling.

Nevertheless, cost remains a challenge. Today, the cost of RNG production ranges from $17 to $26 per million British thermal units (mmBtu) (€51-78/MWh) for anaerobic digestion in Europe, while natural gas prices at the Netherlands-based Title Transfer Facility (TTF) are around $10-$12/mmBtu (€32-38/MWh). In the US, the range of RNG production costs is wider, from less than $10/mmBtu for the cheapest landfill-to-RNG projects to over $40/mmBtu for certain projects through anaerobic digestion. That compares with natural gas prices of around $3-4/mmBtu. In both markets, the thermal gasification process for RNG production from bio-feedstock is more expensive, and there is more limited application of this method.

The abovementioned revenue streams are thus crucial to making projects profitable and attractive. But in various cases, they can be either uncertain or insufficient. For instance, policy support can sometimes be concentrated in a specific sector and not others; high RNG premiums can also discourage smaller customers from purchasing. Additionally, RNG production is tied to feedstock price and availability. For instance, RNG produced from landfill gas depends on the quantity and composition of waste collected at landfill facilities. Similarly, RNG produced from manure relies on the availability of animal waste, such as from cows.

The cost of RNG production is on a downward trajectory because of improving feedstock collection mechanisms, advancing biogas upgrading technologies, developing infrastructure, etc. Nevertheless, fluctuations in feedstock costs can impact the total cost of RNG production.

These challenges, along with ambitious targets, create a significant gap between aspirations and reality. The EU aims to produce 35 Bcm of RNG by 2030 under the REPowerEU strategy. It is estimated that about 27bn euros of investment was committed to RNG in the EU by the end of 2024, which could add around 6.3 Bcm of annual production by 2030 from just over 6 Bcm in 2024. While investment is likely to go up further, current policies and market dynamics have led us to expect the EU to produce over 15 Bcm of RNG by 2030. This means that less than half of the bloc's target is likely to be met, highlighting the discrepancy between the EU's expectations and what member states can realistically deliver.

The US does not have an RNG production target and would not have any under the Trump administration. Nonetheless, there may still be a gap between the ambitions of corporations and state governments and the actual production levels.

Policy: crucial for RNG's growth

Policy has played a pivotal role in facilitating historical RNG market growth and will continue to be key for the fuel's future. Policy—both carrots and sticks—will be key to providing comfort for offtakers to sign long-term deals, which can unlock easier financing for RNG producers.

In the **US**, the federal **Renewable Fuels Standard (RFS)** has been instrumental in stimulating RNG production. This support is expected to continue, as biofuels have been listed by President Trump as a resource to be promoted for US energy dominance. However, this strategy requires balancing the interests of the agricultural and refining industries, which are on opposite ends of the supply chain. We anticipate the Environmental Protection Agency will set moderately aggressive RFS obligations while working with small refineries on waivers and postponed compliance.

At the state level, **California's Low-Carbon Fuel Standard (LCFS)** is another key enabler for RNG. Last year, the state proposed reforms requiring the physical delivery of RNG to California and reducing the number of years a new facility can generate carbon credits under the LCFS, starting next decade. We expect these reforms to proceed, with only a mild impact on the long-term RNG outlook. California's LCFS market is the largest, and several other states have adopted similar standards, with a few more in the process.

The RFS and LCFS programmes primarily target the transport sector. The **Inflation Reduction Act**, on the other hand, awards tax credits to both the production of RNG as a clean transport fuel and as a source of renewable power. This is a pivotal policy for expanding RNG's application in the US economy, and we expect these provisions to largely remain in place.

Additionally, policies in about 30 states aim to enhance RNG usage across sectors. These include allowing gas utilities to recover related costs (e.g., Ohio, Nevada), rolling out tax incentives (e.g., Colorado, Hawaii), and making RNG eligible under state renewable portfolio standards (e.g., New Hampshire). While these policies are not as influential as the RFS or LCFS, they are laying the groundwork for broader RNG application.

Similarly, **Europe** has a long history of supporting RNG. Production surged following key legislative changes, such as Germany's Renewable Energy Sources Act amendment in 2012, France's Energy Transition for Green Growth Act in 2016, and Italy's decree to promote RNG in the transport sector in 2018. These policies were primarily in the form of targets, subsidies, feed-in tariffs, and contracts for difference.

As countries in the EU work towards achieving their national RNG targets, two policy trends have emerged:

1. **Expansion of RNG support beyond transportation:** In 2022, Italy extended support for RNG from transportation to all final uses under its National Recovery and Resilience Plan. In 2024, Germany made RNG eligible for renewable heating targets under its Building Energy Act.
2. **Shift from subsidies to market-based systems:** Governments are shifting from pure subsidies to market credit-based systems for long-term resilience. For example, France started mandating gas suppliers to purchase biogas production certificates in 2024 to reduce reliance on government subsidies. Such policies will be crucial for future RNG production growth in the EU.

Additionally, the EU is enhancing its two RNG certification and tracking systems:

- **Guarantees of Origin (GOs)** follow a book-and-claim principle, allowing separation between certificate trading and RNG delivery. However, they cannot be used to comply with the EU's renewable energy mandates.
- **Proofs of Sustainability (PoSs)** adopt a mass balancing principle, require physical delivery with certificate purchasing, and can be used to demonstrate target compliance.

These certificates are still under development. Currently, only 15 member states have official GO issuing bodies. Notable exclusions are Poland, Portugal, and Sweden. And while Germany has an issuing body, it will not be operating until 2026. Moreover, of the 15 countries with issuing bodies, only 9 have at least one cross-border transfer system. Nevertheless, ongoing efforts will enhance the transparency and robustness of the European RNG market.

To unlock the production potential, policy support can be further improved. The EU would need to streamline regulations and strengthen cross-country pipeline infrastructure. For the US, policies can be enhanced in non-transport sectors, focusing on injection standardisation and book-and-claim systems. For both jurisdictions, a higher carbon price would strengthen the business case for RNG. The EU's ETS prices are on a long-term upward trajectory, which will help with RNG development, but the ETS can benefit from an even broader sector coverage and deeper emission cap cuts. In the US, there is no nationwide system, and none is expected soon, so other supply drivers will need to play a bigger role.

Feedstock: different choices across the Atlantic

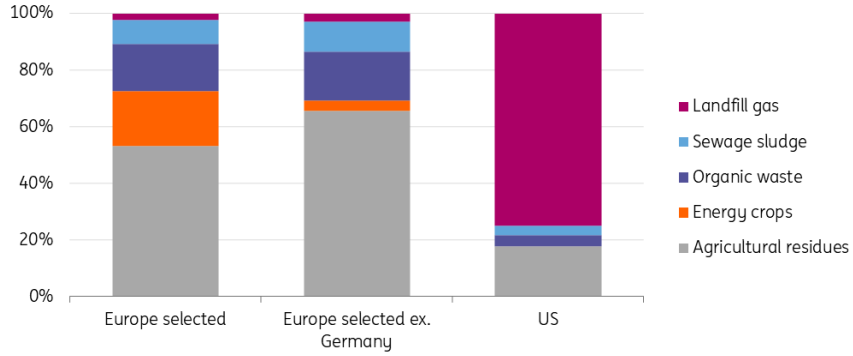
Another critical aspect of RNG production is feedstock choices, which vary significantly across the

Atlantic.

In the **US**, landfill gas is the dominant feedstock, offering the lowest production cost per mmBtu. Landfill gas is a natural byproduct of the decomposition of organic materials. These projects are typically large, benefiting from economies of scale. Landfill gas has high potential for future RNG production in the US, with only 10% of resources having been tapped. It is expected to remain the largest source of RNG feedstock in the US, with production likely to grow more than sevenfold by 2050. In **Europe**, agricultural residues (manure, crop residues, etc.) are the primary feedstock due to the abundance of agricultural waste. Interestingly, dedicated energy crops (grown for non-food purposes) account for 20% of RNG feedstock in Europe. Germany is the biggest contributor—energy crops make up over 70% of its RNG feedstock mix.

Differences in feedstock use: landfill gas in the US, agricultural residues in Europe

Feedstock use as percentage of total supply

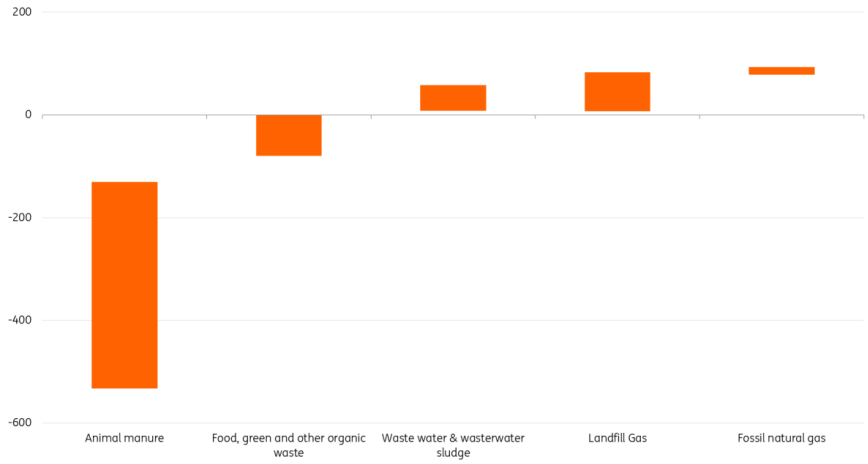


Source: ING Research based on Bloomberg New Energy Finance, Argonne National Lab, Sia Partners. Note: Selected European countries include Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Sweden, Switzerland, and UK. Agricultural residues include manure, crop residues and sequential crops.

While renewable natural gas (RNG) can help reduce emissions, its carbon intensity, determined under carbon markets like California's LCFS, varies across its life cycle depending on the feedstock type, influencing producer choices. **Manure-based RNG** has the lowest assigned carbon intensity, meaning that while manure is not the cheapest feedstock, its higher emissions reduction potential allows producers to earn more carbon credits. We expect manure to gain traction as a widely used RNG feedstock in both the US and Europe. However, debate continues over whether avoided emissions from RNG production should be assigned negative carbon intensity attributes. Nevertheless, absent major policy changes in markets like California, the current carbon intensity scoring system is expected to continue to impact market player decisions. **Food waste-based RNG**, although less effective in lowering emissions, offers valuable circularity benefits, as RNG producers can receive feedstock and generate revenue through waste management. We think its use will rise in the US, but the outlook in the EU is mixed. The bloc has recently set targets to reduce food waste by 2030, putting downward pressure on food waste supply. Moreover, food waste is increasingly used to produce added-value products such as pharmaceuticals and cosmetics. Nevertheless, improved waste separation is allowing more food waste to be repurposed rather than discarded.

Carbon intensity weighs on feedstock choices

Life-cycle carbon intensity of fossil gas vs RNG from different feedstocks, gCO2e/MJ



Source: California Air Resources Board, ING Research

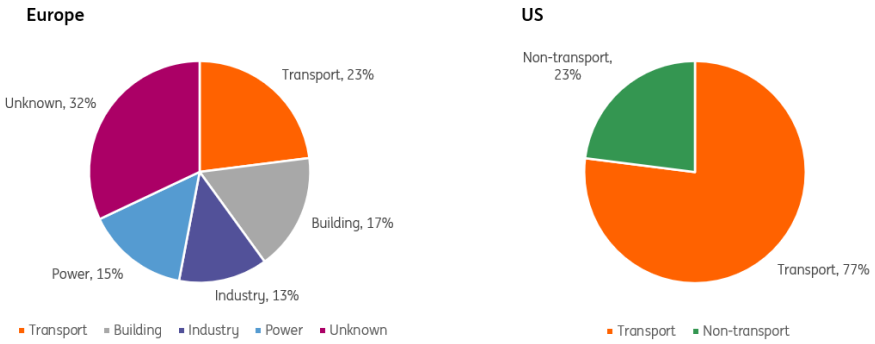
The environmental impact of energy crops is more complex, as their cultivation and processing generate emissions. To ensure a net reduction in emissions compared to fossil gas, dedicated energy crops should ideally come from existing sources, such as cover crops used for soil preservation, rather than being newly grown. As Europe progresses toward its climate targets, no new energy crop-based RNG plants have been established since 2020, and the share of energy crops in the feedstock mix is expected to decrease further.

Beyond carbon intensity, production yield is another key factor in feedstock selection. For RNG production from bio-feedstock through AD or gasification, wastewater and food waste can offer a higher yield than animal manure. Meanwhile, novel feedstock options—such as fish silage—are gaining attention for their attractive yield.

Demand: Europe leads the US in diversifying RNG end use

RNG policy, especially in the US, favours the transportation sector, making it the largest end-user. However, there are regional differences. The transportation sector accounts for 77% of RNG demand in the US, while in Europe, it contributes only 23%, including unspecified uses. This is facilitated by increasingly diverse policies in Europe that stimulate stationary use.

RNG demand by sector in Europe and the US



Source: Argonne National Lab, European Biogas Association, ING Research

Looking ahead, even though the US natural gas vehicle fleet already uses a high percentage of RNG, we still anticipate moderate growth in RNG demand from the transport sector both in the US and Europe. This growth is supported by policy, the expansion of the heavy-duty vehicle fleet, and increased fuel switching. For example, Amazon is transitioning its trucking fleet to be powered by RNG. Additionally, RNG could gain more traction in marine shipping as an alternative fuel.

RNG market players are also exploring other sectors:

- **Power and heating**: RNG is more widely used in these sectors in Europe than in the US. Last year, 32% of RNG uses in Europe were for power and heating. Nevertheless, RNG usage in power and heating is growing in the US. AstraZeneca has signed a contract with Vanguard Renewables to purchase RNG made from food waste and manure for heating and cooling on its US campuses.
- **Industrial processing**: Although still in its infancy, RNG is being explored to offset emissions from natural gas during industrial processes. In steel production, SSAB was the first to sell a 'virtually zero emissions' (SSAB Zero) product, achieved through renewable electricity and RNG. SSAB also announced a deal with GE Vernova to supply SSAB Zero steel for wind turbine production in the US. In chemical production, BASF signed a seven-year contract with Engie to receive RNG for its manufacturing in Germany and Belgium. RNG's role in decarbonising heavy industries is growing, as it can be a cheaper and infrastructure-ready option compared to other green solutions like hydrogen.
- **RNG and byproducts as low-carbon feedstock:** For example, US Gain is supplying RNG for hydrogen production. And one of Amageroa's RNG plants in Italy uses biogenic carbon dioxide, an RNG byproduct, to produce up to 9,000 tons per year of calcium carbonate fertiliser.

The expansion of RNG usage into more sectors is enabled by increased injection of RNG into gas pipelines. In **Europe**, the RNG injection rate reached 85% in 2024, with the EU prioritising RNG production over less pure biogas. In the **US**, over 20 gas utility companies, including SoCalGas, Duke Energy, Dominion Energy, Chesapeake Utilities, and NorthWestern Energy, are actively procuring and injecting more RNG into pipelines. This is coupled with efforts by gas utilities to improve tariff frameworks for selling RNG to consumers, as well as a more mature book-and-claim system. Additionally, RNG producers are signing offtake contracts directly with consumers, using existing infrastructure but bypassing utilities in the transaction process.

Contracting with gas utilities and RNG producers each has its advantages. Buying RNG from utilities can be convenient for end-users with established relationships with the utilities. Purchasing directly from producers gives consumers more control over the feedstock and carbon intensity of RNG, though it may require more logistics.

Conclusion

The future of RNG is promising because of its versatile applications, compatibility with conventional natural gas, minimal need for new infrastructure, continuous policy support, and significant decarbonisation potential. Additionally, RNG can be more cost-effective than other green options in harder-to-abate sectors. Beyond its role in decarbonisation, RNG addresses waste management issues and enhances supply chain circularity. While the RNG market may remain niche, it offers unique value for supply chain sustainability and security. The expansion of RNG into more sectors solidifies its role in the energy mix and energy transition. While this article's focus is on the US and Europe, Asia and Latin America are also emerging to become competitive suppliers of RNG.

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