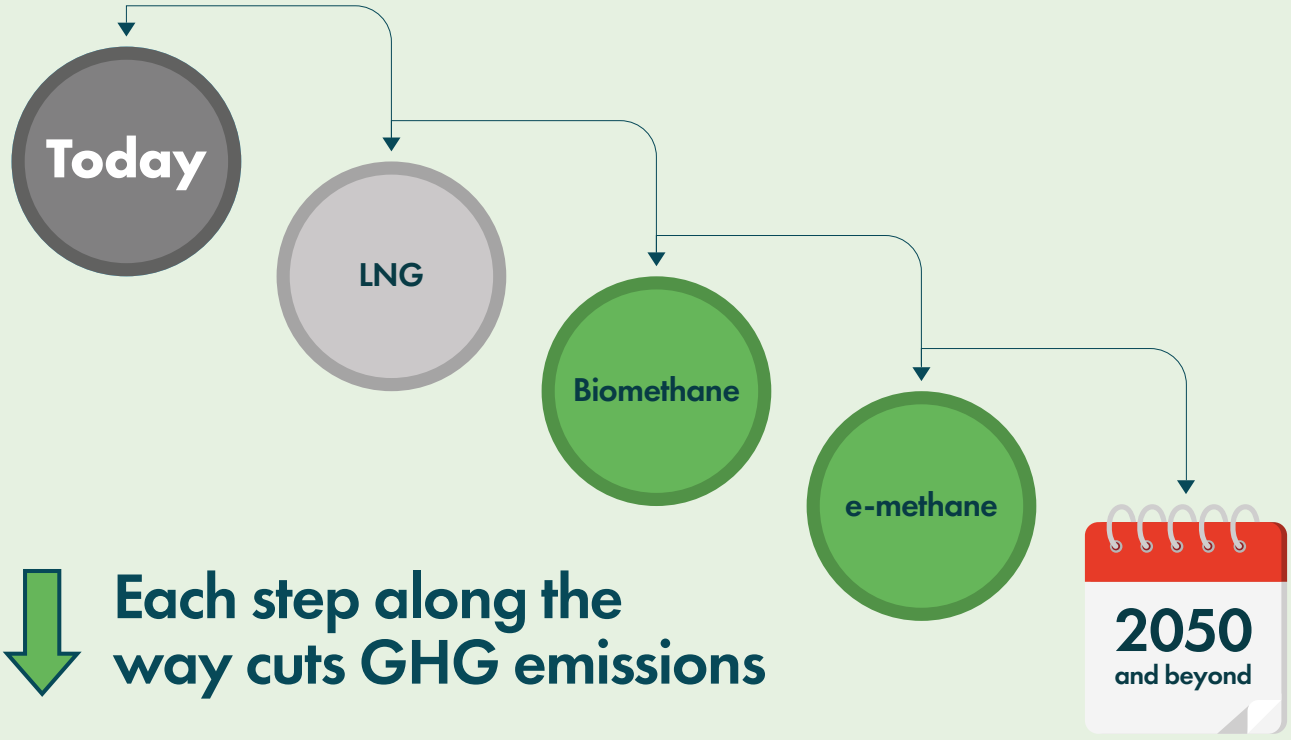
METHANE PATHWAY



Each step along the way cuts GHG emissions

SEA-LNG

What is the methane pathway?

The methane, or methane decarbonisation, pathway refers to the pathway to net-zero based upon utilising the properties of the methane (CH4) molecule to power deep-sea shipping. This pathway is especially important for hard-to-decarbonise industries such as deep-sea shipping for which electrification is not a viable option for the foreseeable future. For deep-sea shipping, the pathway is based upon cutting local and some GHG emissions today by converting to clean LNG from traditional heavy fuel oils and steadily increasing the share of renewable biomethane and e-methane in future years.

How does the methane pathway compare to other fuels for shipping?

The methane pathway is a better solution for low emissions shipping because the bunkering infrastructure already exists, the fuel is proven operationally from a commercial and safety perspective, and as an almost pure single molecule (CH4) fuel. Swapping fossil-derived LNG for liquefied biomethane and e-methane requires no modification and does not carry blending risks associated with some other biofuels. In short, methane is the practical and realistic option today.

How can the methane pathway contribute to Clean Industrial Deal?

EU production of biomethane in 2024 increased by 21% year on year[1], representing about 7% of total European gas demand. Increasing production of biomethane boosts both EU industrial capacity and reduces GHG emissions by replacing fossil-derived methane in transportation and heavy industry. e-methane production is at an early stage in Europe with 35 projects in operation, accounting for about 2,800 GWh production pa, with a further 20 plants under development[2].

How can the methane pathway strengthen resilience and contribute to energy security in Europe?

Fossil-derived LNG is a globally produced and traded commodity with the largest exporters USA, Australia and Qatar being allied to the EU. African production of LNG is also expanding. In the medium term the potential to grow domestic biogas and biomethane production is huge. By 2040 the sector could deliver approximately 101 bcm of biomethane to the EU, covering more than 80% of gas consumption[3], making a major contribution to EU energy security.

How can the methane pathway help make Europe more competitive?

Methane, unlike other alternative marine fuels, can be moved into and across the EU via the existing EU natural gas infrastructure. The EU can assist competitiveness by ensuring European industries and maritime transport have access to sufficient amounts of biomethane and e-methane irrespective of where it has been produced (inside or outside the EU).

How can the EU encourage and support investment in bio-methane and e-methane technologies and fuels, and address the supply and affordability challenges?

The EU should prioritise funding for low and zero carbon maritime fuels production including liquefied biomethane and e-methane. It should also uphold technology neutrality and performance-based decarbonisation targets. Policymakers should set the clear targets and enable business and industry to choose the most efficient way of reaching them.

The EU should ensure that EU ETS and FuelEU Maritime align with evolving IMO measures, avoiding overlap or duplication, to streamline compliance, prevent double regulation, and achieve decarbonisation more efficiently and fairly, with the EU focusing on driving effective global implementation and ambition at IMO.

1. https://www.europeanbiogas.eu/wp-content/uploads/2024/12/EBA_stats_report_complete_241204_preview.pdf
2. https://www.europeanbiogas.eu/publication/mapping-e-methane-plants-and-technologies/
3. https://www.europeanbiogas.eu/wp-content/uploads/2024/12/EBA_stats_report_complete_241204_preview.pdf

How can LNG contribute towards decarbonisation of transport within Europe?

The EU Sustainable Transport Investment Plan (STIP), explicitly recognises LNG, bio-methane and e-methane within the clean-fuel mix, noting that "LNG, with effective methane-slip mitigation technologies, can also reduce GHG emissions,' and the trend of 'ocean-going ships moving towards methane (LNG, bio-methane and in future e-methane)."

The Plan highlights the steps needed towards a more integrated fungible market for bio-methane. It urges Member States to avoid barriers to methane use and harmonise bio-methane eligibility.

How can the EU make business easier for those involved in the methane pathway?

New EU industrial, investment, state aid, and ports policies should secure a well-functioning, barrier-free Single Market for bio- and e-methane by upholding technological neutrality to foster fair competition and innovation across all decarbonisation pathways, reduce complexity and administrative burdens.

Creating a unified – single, cross-border - European market for trading green certificates remains a key demand. The new Union Database should facilitate the tracking of proof of sustainability (PoS) certificates[4] required under the Renewable Energy Directive (RED).

How does methane slip affect GHG emissions?

Lifecycle studies[5], which take account of methane slip, have shown that overall well-to-wake reductions of up to 23% can be achieved using LNG instead of heavy fuel oils. However, methane slip is a recognised challenge which industry is well on the way to solving.

Today, approximately 75% of LNG-fuelled ships on order have high pressure engine technologies with effectively no methane slip. For low pressure engines where it remains an issue, continuing innovations by engine manufacturers have resulted in levels of methane slip falling more than four-fold[6] over the past 25 years and with increased focus by engineers this progress has intensified recently. Methane slip in the latest 4-stroke low pressure engines has gone from about 2.5% in 2019 to lower than 1.4% in 2025. In 2-stroke low pressure engines, the figure has dropped from about 1.5% in 2019, to 0.8% in 2025.

The technology to virtually eliminate methane slip from ship engines is very promising, with a 2025 trial achieving 98% reductions in methane slip[7]. With such constant advances in technology, the industry is confident the issue of methane slip can be solved within this decade.

What about methane emissions from the LNG supply chain

Methane emissions in the LNG supply chain are important, accounting for about 4% of total (Well-to-Wake) GHG emissions. Here LNG suppliers have been making progress on a voluntary basis and in response to regulations, particularly in the US and Europe. Rystad Energy's recently published definitive study on supply chain GHG emissions finds average Well-to-Tank emissions to be 13.9gCO2eq/MJ[8] well below the compared to the 18.5g CO2eq/MJ default emissions factor adopted by the EU in FuelEU Maritime regulations.

4. See SEA-LNG's Chain of Custody Factsheet: https://sea-lng.org/2024/08/sea-lng-provides-insight-into-chain-of-custody/
5. https://sea-lng.org/reports/independent-study-confirms-lng-reduces-shipping-ghg-emissions-by-up-to-23/
6. Paper submitted to IMO ISWG-GHG 7/3/1 - FURTHER CONSIDERATION OF CONCRETE PROPOSALS TO REDUCE METHANE SLIP AND EMISSIONS OF VOLATILE ORGANIC COMPOUNDS (VOCS)
7. https://www.mol.co.jp/en/pr/2025/25078.html
8. https://sea-lng.org/2025/09/rystad-energy-publishes-definitive-study-on-marine-lng-well-to-tank-wtt-emissions/

What is the EU Industrial Maritime Strategy (March 2026)?

The European Commission adopted the EU Industrial Maritime Strategy in March 2026 as part of the EU Competitiveness Compass and European Ocean Pact. It sets out a vision for a competitive, resilient and sustainable European maritime sector built around three pillars: "Build, Equip and Repair"; "Transport and Connect"; and "Secure and Protect". It was adopted alongside the EU Ports Strategy.

How does the EU Industrial Maritime Strategy support the methane pathway's green transition?

The "Transport and Connect" pillar promotes fleet decarbonisation by simplifying EU ETS Maritime and FuelEU Maritime compliance and accelerating the green transition. The Strategy explicitly recognises LNG as a key transition fuel — noting that European operators control around 33% of the global LNG carrier fleet — and supports scaling liquefied biomethane and e-methane as drop-in replacements using existing methane infrastructure.

The Strategy also signals a clear policy direction towards market integration, stating that the Commission will pursue an integrated market for biomethane and calling on Member States to ensure that national measures do not introduce barriers to cross-border trade or limit its availability within the Single Market.

How does the EU Industrial Maritime Strategy mobilise funding and global engagement for the methane pathway?

The Strategy mobilises funding through the Connecting Europe Facility, the Innovation Fund, Horizon Europe (EUR 530 million for zero-emission waterborne transport) and InvestEU. It also reinforces EU engagement at the IMO to achieve a global level playing field on green shipping standards, consistent with the methane pathway's call for technology-neutral, performance-based global regulation. A new EU Industrial Maritime Value Chain Alliance and a high-level Maritime Industries and Ports Board will coordinate implementation.

What is the EU Ports Strategy (March 2026)?

The EU Ports Strategy, adopted in March 2026 alongside the EU Industrial Maritime Strategy, is a comprehensive framework to strengthen the competitiveness, resilience, security and sustainability of Europe's ports. EU ports handle around 74% of external trade and over 3.4 billion tonnes of goods annually, and are central to the clean energy transition. Its five priorities cover competitiveness and digitalisation, decarbonisation, security, infrastructure investment and international cooperation.

How does the EU Ports Strategy support LNG bunkering and the transition to bio-LNG and e-methane?

The Strategy recognises ports as essential hubs for the clean energy transition, including the supply of low-carbon marine fuels. As of January 2026, LNG bunkering is available in 222 ports worldwide — far ahead of any other alternative fuel — and the Strategy creates policy conditions to strengthen this advantage further. Bio-LNG and e-methane use identical port infrastructure to fossil LNG with no modification, making EU port decarbonisation investment directly applicable to all three stages of the methane pathway.

How does the EU Ports Strategy support a single market for bio- and e-methane?

The Strategy calls for harmonised port access conditions, elimination of barriers to single-market operation, and EU-guided investment in port energy infrastructure. Biomethane bunkering operations are already taking place across Belgian, Dutch, French, Italian, Finnish and Spanish ports. The Strategy's emphasis on technological neutrality, and on directing EU funding towards strategically important port infrastructure, supports the methane pathway's call for a barrier-free single market for bio- and e-methane on equal terms with other fuels.