

What is methane slip?

In LNG-fuelled marine engines, methane slip refers to the small amounts of the fuel that does not burn in the engine but escapes with the exhaust gases into the atmosphere.

Why is methane slip important?

Methane slip is important because methane is a powerful greenhouse gas, with a global warming potential of 28-36 times that of carbon dioxide on a 100-year timescale, according to the IPCC (Intergovernmental Panel on Climate Change). Methane slip reduces the benefit of lower carbon dioxide emissions offered by LNG-fuelled engines.

What determines levels of methane slip?

Levels of methane slip are dependent on engine technology and the way in which the engines are operated. High-pressure, diesel cycle dual fuel engines offer negligible levels of methane slip, while higher methane slip values are reported for low-pressure, Otto cycle dual fuel engines. Operations at lower engine loads tend to increase methane slip compared to higher engine loads where vessels operate for the majority (90%) of their voyage time.

Are all LNG-fuelled engines affected by methane slip?

No, high-pressure 2-stroke, diesel cycle engines have effectively eliminated methane slip. These engines account for approximately 75% of the LNG-fuelled vessel order book.

Does methane slip eliminate LNG's GHG emissions benefits?

No, independent analysis¹ based on data from all major engine manufacturers shows that once methane slip is taken into account, the use of LNG as a marine fuel offers significant GHG emissions reductions on a full lifecycle (Well-to-Wake) basis, compared with the use of traditional marine fuels. These reductions range from 6% to 14% for low pressure, 4-stroke engines and up to 23% for high pressure, 2-stroke engines which represent three quarters of the vessel order book.

Can methane slip be fixed?

Yes, for those low-pressure engine technologies for which methane slip is an issue, manufacturers have already cut the levels of slip from low pressure, 4-stroke engines by more than 85% over the past 25 years. It is worth noting that methane slip has been eliminated for the similar LNG dual fuel engine technologies used in the heavy-duty vehicle sector.

1. https://sea-lng.org/wp-content/uploads/2021/04/2021_Sphera_Study_Key_Findings_Document.pdf

What is being done to address methane slip?

Addressing methane slip is the focus of a number of industry initiatives including the Methane Abatement in Maritime Innovation Initiative (MAMII)² and the EU-funded GREEN RAY³ project. These initiatives are accelerating the development of new engine technologies and exhaust stack abatement solutions which can be retrofitted to older engine technologies. Equipment manufacturers are confident methane slip will have been eliminated for all engine technologies within the decade.

What about the high levels of slip claimed by recent NGO studies?

Recent NGO studies reporting apparently high levels of methane slip from LNG-fuelled vessels⁴ use an experimental near-shore airborne measurement methodology which is not verified against industry standards. Putting the experimental nature of the measurement approach to one side, these studies were based on vessels using older engine technologies in atypical operating conditions i.e. vessels operating at low engine loads, manoeuvring in or near ports. These conditions are not representative of the vast majority of vessel activities.

What is the effect of methane emissions in the LNG supply chain?

Methane emissions in the LNG supply chain are responsible for a small fraction, approximately 5%, of the overall (Well-to-Wake) GHG emissions associated with the use of LNG as a marine fuel.

What is being done to address LNG supply chain emissions?

Eliminating LNG supply chain emissions is a major focus of the oil and gas sector. As a response to the Global Methane Pledge announced at COP26, the Oil and Gas Climate Initiative, whose members are responsible for one third of global oil and gas production, launched the Aiming for Zero Emissions Initiative⁵ in March 2022. Existing emissions are below 0.2% and the goal is to reach near zero methane emissions from its members' operated oil and gas assets by 2030.

2. <https://mamii.org>

3. <https://greenray-project.eu>

4. <https://sea-lng.org/2024/01/iccl-fumes-study-risks-misleading-regulators/>

5. <https://aimingforzero.ogci.com/about/>