

Working Paper

Assessing the GHG reduction potential of the EU Methane Regulation (2024/1787) on imports of oil and gas

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Abstract

Methane (CH₄) is a potent greenhouse gas and is the second-largest contributor to global warming after carbon dioxide (CO₂). To meet ambitious climate change mitigation targets, it is crucial to effectively reduce the emissions of methane along with other greenhouse gases. The EU has introduced the Methane Regulation (Regulation (EU) 2024/1787), ultimately aimed at setting methane intensity thresholds for domestic production and imports of oil, coal and natural gas. However, the level of these thresholds is to be set in a later stage in a delegated act amending the regulation. Moreover, methane emissions from maritime transport will not be covered by the regulation. In this paper we examine the GHG reduction potential of imposing a methane emissions intensity threshold on imports of crude oil and natural gas. Due to high uncertainty on emissions associated with natural gas and crude oil production, we examine reduction potential based on average, minimum and maximum values. Moreover, we assess the effect of extending the scope to methane slip from LNG fuelled shipping. The results may inform the forthcoming discussion on the maximum threshold under the EU Methane Regulation. We find that in 2023-2024 methane emissions from oil and natural gas imports in the EU accounted for about 155 MtCO₂e, assuming average production leakage rates. Crude oil imports contribute 105 MtCO₂e, 27 MtCO₂e came from LNG imports, and about 23 MtCO₂e originated from pipeline transport. With the exception of natural gas and crude oil deliveries from Norway, none of the current imports comply with a methane intensity threshold of 0.2%, as proposed in numerous publications (see, e.g. European Parliament (EP) 2023). Holding patterns and volumes constant, setting a methane intensity threshold in the range of 0.2%-0.4% can reduce GHG emissions by 95-120 MtCO₂e. Crude oil contributes about 66% to the total reduction. For crude oil, the largest total reduction with average production leakage rate comes from methane emissions from Libya, Kazakhstan and Nigeria contributing 13-16 MtCO₂e, each, while for natural gas the USA and Algeria are the largest contributors with 12-13 MtCO₂e, each. Taking crude oil and natural gas together, the USA and Algeria, each can contribute 12-13% to total emission reduction, if a 0.2% threshold is imposed. In particular for crude oil, the definition of the unit of the threshold is crucial: changing from mass-based to energy-based yields another 5-10 MtCO₂e reduction, depending on the threshold level. Given that many of the leakage mitigation measures have negative abatement costs, the EU Methane Regulation could create a win-win situation.

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1 Introduction

Methane (CH₄) is a potent greenhouse gas and the second-largest contributor to global warming after carbon dioxide (CO₂). **To meet ambitious climate change mitigation targets, it is crucial to effectively reduce the emissions of methane** along with other greenhouse gases. To address this challenge, the EU has introduced the Methane Regulation (Regulation (EU) 2024/1787). It establishes binding rules for monitoring, reporting, and verification (MRV), as well as for leak detection and repair (LDAR), venting and flaring restrictions, and transparency obligations along the fossil fuel supply chain. It covers the oil, gas and coal sectors in the EU, as well as imports, and will set maximum methane intensity thresholds for domestic production and imports.

The EU is not the first to introduce a comprehensive methane regulation for the energy sector.

The carbon tax applied in Norway since 1991 also covers the release of natural gas - which predominately consists of methane - into the air (Norwegian Offshore Directorate last updated 2024).¹ The 2025 level of the tax is 176 EUR/MWh² natural gas (LHV) which corresponds to 78,400 EUR/tCO₂e³ (Norwegian Offshore Directorate und Norwegian Ministry of Energy 2025). In the USA also several regulations target the reduction of methane emissions on the subnational but also national level. However, these are mostly systems where methane emission reductions could be used to offset the need to purchase emission allowances under the respective scheme (see e.g., California Compliance Offset Program (COP) (California Air Resources Board (ARB) 2025) or voluntary schemes, see e.g. Methane Emissions Reduction Program (MERP) (U.S. Department of Energy (DOE) 2024). Vice-versa, the Colorado Greenhouse Gas Crediting and Tracking System (GHG CATS) and its Recovered Methane Rule offers several compliance options, including performing adjustments in operations to reduce methane emissions or acquiring emission offsets which are credited in the scheme (Legal Information Institute (LII) 2025). On the national level, The Biden-Harris Administration introduced the U.S. Methane Emissions Reduction Action Plan (The White House 2023; The White House Office of Domestic Climate Policy 2021). One of the outcomes was the Waste Emissions Charge (WEC) that was to be applied for crude oil and natural gas production, gathering and processing, liquefaction, transmission pipelines and storage. The implicit methane intensity threshold for which natural gas and crude oil would have been exempt from the charge was 0.35%-0.52%⁴ depending on the supply chain configuration. Excess methane emissions would have been charged with 41,400 EUR/tCO₂e⁵, starting 2026. In May 2025, the EPA has

¹ The tax is charged on petroleum which is burnt and natural gas which is discharged to air and also on CO₂ separated from petroleum and discharged to air, on installations used in connection with production or transportation of petroleum, in Norwegian internal waters, Norwegian sea territory and on the continental shelf, in adjacent sea areas off the continental shelf, to the extent production of petroleum is reserved for Norway by agreement with a foreign state, in sea areas off the continental shelf restricted to Norwegian facilities for transportation of petroleum or in the realm, restricted to facilities covered by the Petroleum Tax Act, see Norwegian Offshore Directorate last updated 2024.

² The rate is 20.17 NOK/m³ for 2025. Assuming a LHV of 10,3kWh/m³ and an exchange rate of 0.09EUR/NOK yields 176EUR/MWh natural gas LHV.

³ Assuming a density of 0.75kg/m³ natural gas and a methane share of 92% in natural gas from Norway and applying GWP100 from AR6 of 29.8 yields about 78400 EUR/tCO₂e. Note however, that typical methane leakage rates for Norway are in the order of 0.01%, corresponding to a cost markup of 0.02 EUR/MWh natural gas LHV.

⁴ Min: On/Offshore natural gas production (0.2%)+onshore natural gas gathering and boosting (0.05%)+onshore natural gas processing (0.05%)+liquefied natural gas export equipment (0.05%); Max: On/Offshore natural gas production (0.2%)+onshore natural gas gathering and boosting (0.05%)+onshore natural gas processing (0.05%)+onshore natural gas transmission compression (0.11%)+onshore natural gas transmission pipeline (0.11%)=0.52%

⁵ 1500 USD/t of methane. Applying USD/EUR conversion of 1.08 and GWP100 from AR6 of 29.8 yields about 41400 EUR/tCO₂e. This means, if the IEA Methane Tracker value for leakage in unconventional

removed the WEC final rule (U.S. Environmental Protection Agency (EPA) 2025) following a disapproval by the Congress.

Infobox 1

Global Warming Potential of methane

- The selection of mitigation measures depends on factors such as feasibility, costs and the amount of emission savings. When measures that target different greenhouse gases are compared, the climate impact of these different gases must be made comparable. For this purpose, metrics have been introduced.
- The most common metric is the global warming potential over 100 years (GWP100), which compares the warming effect of a gas over 100 years with the effect of CO₂. This metric is also used for greenhouse gas inventories under the United Nations Framework Convention on Climate Change and under the Paris Agreement.
- In the current discussion, the global warming potential of methane over a period of 20 years (GWP20) is sometimes used. In addition, other metrics for comparing the impact of different greenhouse gases have been proposed in the relevant literature. The contribution of various greenhouse gases to total emissions, and thus the need to reduce emissions, can change substantially depending on the choice of metric.
- A comparison of various metrics shows that GWP100 is well suited to prioritising measures as it is designed for the long term and has a robust scientific foundation. If metrics with a shorter time horizon – such as GWP20 – are used, the long-term effect of greenhouse gases beyond the 20-year period is not taken into account. This would limit the informative value of total emissions for the periods under consideration, such as the middle of the century.
- Another metric, the global temperature change potential (GTP), addresses the effect of a greenhouse gas on temperature at the end of a defined time period. It is associated with higher uncertainties than GWP; when using this metric, it is important to align the chosen time horizon with that of the temperature target.
- A variation of the global warming potential, which is referred to as the GWP*, focuses on the change in emissions of short-lived substances compared to historical emissions. Negative GWP* values represent a reduction in emissions compared to the past. However, even with negative GWP*, there may be significant greenhouse gas emissions. This makes it difficult to use this metric in planning climate change mitigation.
- Overall, GWP100 constitutes a good choice for prioritising climate change mitigation measures. The use of other metrics can be useful for various issues, but it should be made clear when quantifications of greenhouse gas emissions differ from those set out in the Paris Agreement, and what sectors or parties involved would benefit from what metrics.

Source: Moosmann und Herold (2023)

While the adoption of the EU Methane Regulation marks an important milestone in tackling methane emissions in the EU but with potentially global impacts on the supply chains, its effectiveness will depend on the precise definitions and admissible thresholds that will be further detailed in associated delegated acts that are yet to be developed. **In this paper we assess the GHG reduction potential**

natural gas production in the USA is applied (~0.94%), this would imply a markup of 0.7 EUR/MWh natural gas LHV produced.

of the EU Methane regulation on oil and gas imports using a hypothetical threshold in the range of 0.2%-0.4%⁶. To be able to compare actions taken on methane emissions with other measures, we apply Global Warming Potential (GWP) 100. The infobox on GWP of methane, based on Moosmann und Herold (2023) specifies the reasons for this choice, providing more details on different metrics and associated advantages and disadvantages. The analysis aims at offering a valuable contribution to inform assessments that precede the determination of the threshold value in a delegated act pursuant to the current regulation. The impact of the regulation on coal imports is beyond scope of this paper. However, others, e.g., Sabina Assan (2024) have looked into this in more detail.

The remainder of the paper is structured as follows:

Section 2 provides a short summary of the key provisions of the EU Methane Regulation. Next, section 3 explains the input data used and the methodology applied in order to assess status quo emissions and potential GHG emission reduction, which are detailed in section 4. Section 5 discusses some desired on undesired side-effects of the regulation. Finally, section 6 concludes.

⁶ At this point we deliberately do not detail where the percentage is volume-, energy-, or mass-based. This will be discussed in detail in Infobox 2.

2 The EU Methane Regulation at a Glance

The EU Methane Regulation (Regulation (EU) 2024/1787) entered into force on 4 August 2024 as the first EU binding legislation to specifically target the reduction of methane emissions across the fossil energy sector (European Parliament (EP), European Council (EC) 2024). It establishes rules for monitoring, reporting, and verification (MRV), as well as for leak detection and repair (LDAR), venting and flaring restrictions, and transparency obligations along the fossil fuel supply chain. As defined in Art. 1 of the regulation, its stipulations only apply to methane emissions and include Scope 1 emissions, i.e. direct GHG emissions from sources that are owned or controlled by the reporting entity, including emissions from stationary and mobile combustion as well as process and fugitive emissions (World Business Council For Sustainable Development (WBCSD) und World Resource Institute (WRI) 2004, 2025).

Precisely, the regulation's scope covers (Art. 1):

- **the oil and gas sector** (upstream: exploration and production, gathering, processing, inactive and abandoned wells; midstream: transmission pipelines, underground storage and operations in LNG facilities; downstream: distribution networks),
- **the coal sector** (active underground and surface mines as well as closed and abandoned mines with monitoring obligations),
- **imports⁷** of oil, gas, and coal into the EU, irrespective of their origin.

The regulation thereby does not cover emissions associated with maritime transport of fossil fuels, and most importantly, does not cover methane slip from LNG vessels. Analyses flag this as a gap in the regulation (Climate Action Network (CAN) Europe 2024; Talus et al. 2025; Olczak und Piebalgs 2024). While methane emissions maritime transport are partly covered under the EU ETS, it primarily targets methane released through the incomplete combustion of LNG, known as methane slip. Thus, several LNG-related emission sources are likely to remain unaddressed, such as fugitive or vented emissions occurring during LNG shipping, loading and unloading. However, recent measurements of methane leaks during LNG shipping suggest that methane slip contributes 99% to total voyage methane emissions (Balcombe et al. 2022).

To promote global methane emission reductions for the covered fossil fuels, the regulation foresees to define a **maximum methane intensity threshold** which is, however, not yet specified in the current regulation. Instead, it shall be determined in a subsequent delegated act, setting a maximum methane intensity threshold that will apply to both domestic sectors and imports. This threshold will be informed by an assessment of potential impact on emissions, energy security, and competitiveness, due by **5 August 2029** (Art. 29(5)). A precise threshold definition could therefore be adopted by late 2029 at the earliest.

As part of the amendments to Regulation (EU) 2019/942 (establishing a European Union Agency for the Cooperation of Energy Regulators), a maximum threshold was already discussed in Parliament

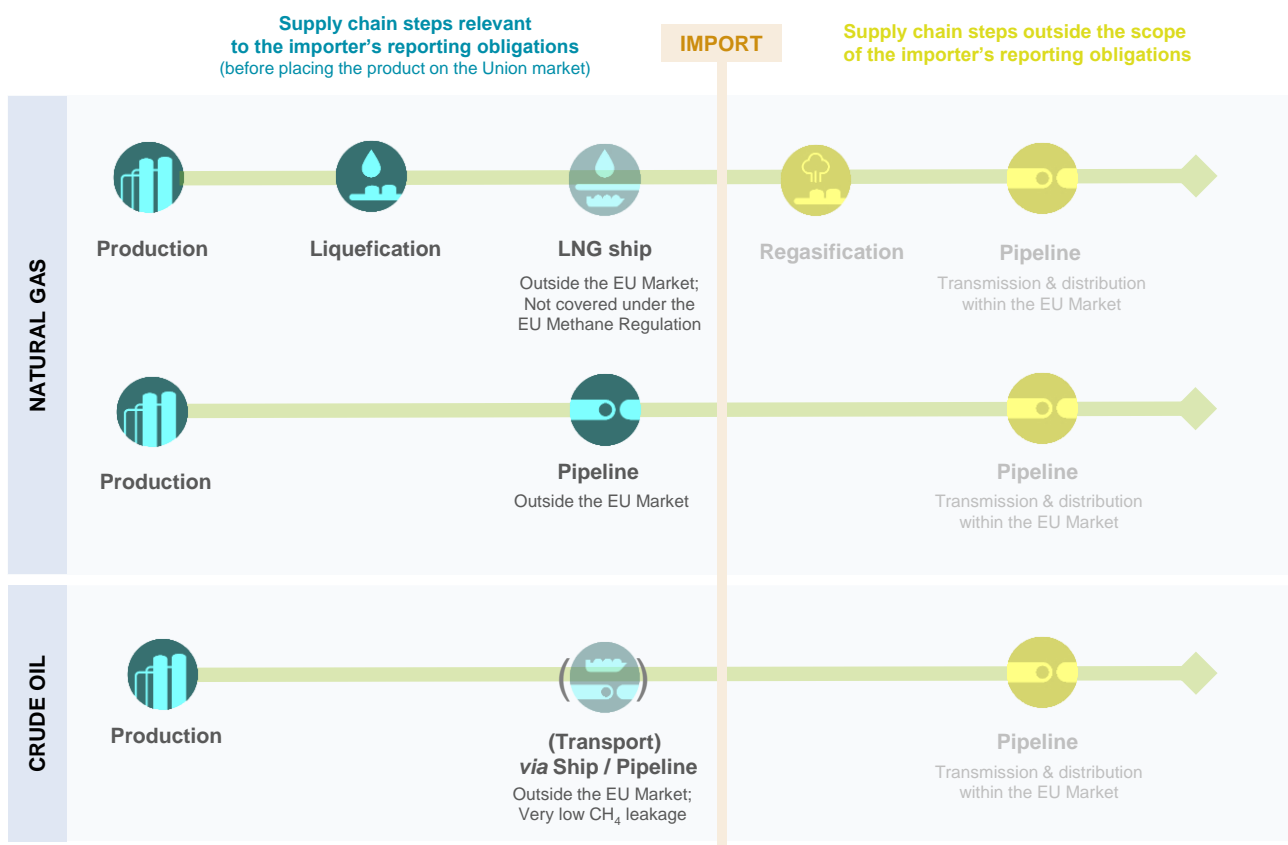
⁷ The term 'importer' is pivotal for the scope of the regulation as it defines which process steps fall under the reporting obligations under Chapter 5. Art. 2(59) defines an 'importer' as 'a natural or legal person who, in the course of a commercial activity places crude oil, natural gas or coal originating from a third country on the Union market' European Parliament (EP), European Council (EC) 2024. As the EU Commission specifies, 'placing on the Union market' means making a product physically available on the Union market for free circulation, in the moment of completing required customs formalities European Commission (EC) 2024. Hence, the point of import is linked to the custom process, not to capacity bookings. Reporting obligations for importers thus only apply to those process steps which occur before the importer makes the payment of tariffs, and other taxes or levies, if applicable (for further information on Custom clearance requirements see European Commission (EC) 2026).

in 2023 (Amendment 23, European Parliament (EP) 2023). The Parliament's proposal put forward a **threshold of 0.2%**, based on insights from the Oil and Gas Climate Initiative (OGCI). This is the benchmark that OGCI had committed itself to reach by 2025 – a goal they had already surpassed in 2021. However, the proposal did not make it into the final regulation as of 2023 and it remains insufficiently elaborated to be applied to the current EU Methane Regulation: the OGCI target is a volume-based measure, linked to the quantity of natural gas marketed, whereas the current regulation's objective is to curb methane emissions from the production of natural gas, crude oil, and coal. Setting fuel-specific intensity limits for each fossil fuel would therefore be more consistent with the regulation's scope. In addition, the OGCI target is defined as an aggregate company-level benchmark, limited to assets directly owned by participating companies. This approach excludes significant emission sources such as liquefaction facilities (often outside company ownership) or compression and transmission, meaning that substantial parts of the methane footprint are not captured. With these shortcomings in mind, the threshold proposed by the Parliament can nevertheless inform the forthcoming discussion on the maximum threshold under the EU Methane Regulation, which will be defined in a supplementary delegated act.

3 Methodology and Input Data

As discussed above, the proposed threshold applies to the total leakage that occurs up until the imported natural gas or crude oil is ‘placed on the Union market’, either at the port or at the transfer point in transit network⁸. As the Commission specifies, ‘placing on the Union market’ means making a product physically available on the Union market for free circulation, in the moment of completing required customs formalities (European Commission (EC) 2024). To assess current leakage levels and potential effects of the regulation, one thus needs to assess both leakage and own fuel use along the supply chain from the production site until the port or transfer point where importing requirements apply. Figure 1 details which process steps fall within and outside the importer’s reporting obligations and correspondingly feed into the calculation or not. It furthermore specifies which process steps were neglected in the calculation due to very low methane leakage or as they are not covered in the EU Methane Regulation. In general, the calculation reflects the fact that, due to leakage, the amount of natural gas or crude oil decreases along the supply chain from the production site to the port or transfer point. The calculation logics thus accounts for the larger initial volumes required in upstream processes to deliver a given amount of natural gas and oil at the point of entry to the EU.

Figure 1: Supply chain steps considered in the calculation



Source: Own illustration by Oeko-Institut Consult GmbH. Supply chain steps relevant to the importers reporting obligations are marked in light blue; steps not covered by EU Methane Regulation, but included to assess effects of possible scope extension are gray-shaded,

⁸ The regulation also applies to coal, and therefore also coal imports. However, in this paper we focus on the potential impact of on methane emissions from oil and gas, only.

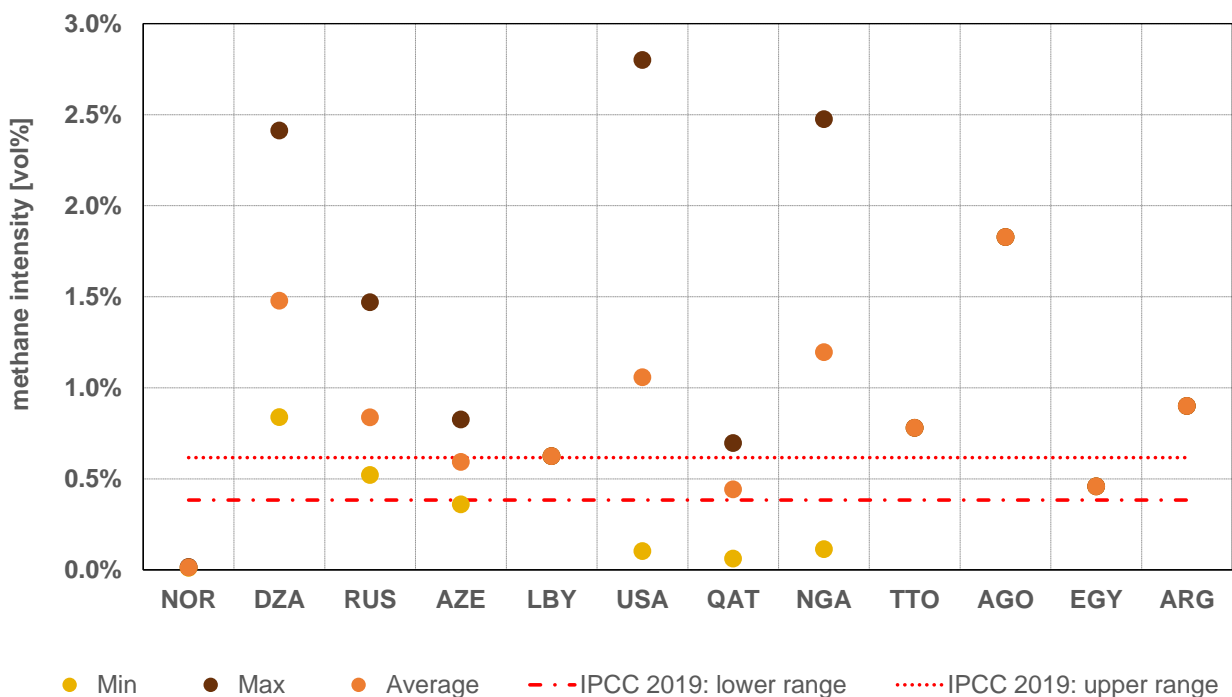
Steps not included in calculations due to insignificant contribution are marked with (...). Steps outside the scope of the importer's reporting obligations – and therefore also excluded from the calculation – are in yellow.

For each step, methane leakage and own fuel consumption are taken into account. Four main data sources provide country-level data on methane emissions for natural gas production: Charlotte Große et al. (2025), RystadEnergy (2023), Institut für Energie- und Umweltforschung (IFEU) (2023) and International Energy Agency (IEA) (2025a). In addition, data for the USA was added from Howarth (2024). The different sources provide leakage rates in different units, with mass-based, energy content-based, and volume-based values.

Different sources were harmonized using data on energy contents and methane contents of natural gas from different production regions provided in Kuczyński et al. (2020). Missing data was gap-filled with data from neighbouring countries assuming similar production and geological conditions.

Figure 2 shows the range of leakage rates of natural gas production collected in the dataset by reporting the minimum, maximum and average values. Figure 3 does the same for crude oil production. For natural gas, values for Algeria, Russia, the USA and Nigeria show a high variation, while other estimates are relatively consistent. This is due to: (1) some countries are looked into in more detail; (2) some countries have high variation in their production practices: with both on- and offshore resources and/or conventional and unconventional production, and (3) values for some countries were only available from one data source. For crude oil, values for Kazakhstan and Libya show high variation. The two figures also show suggested standard values for methane leakage in natural gas and crude oil production from Intergovernmental Panel on Climate Change (IPCC) (2019). For the majority of countries, the average value in our database is significantly higher than values suggested by Intergovernmental Panel on Climate Change (IPCC) (2019). For natural gas, Norway is the one very significant exception, with values close to zero for both natural gas and crude oil production.

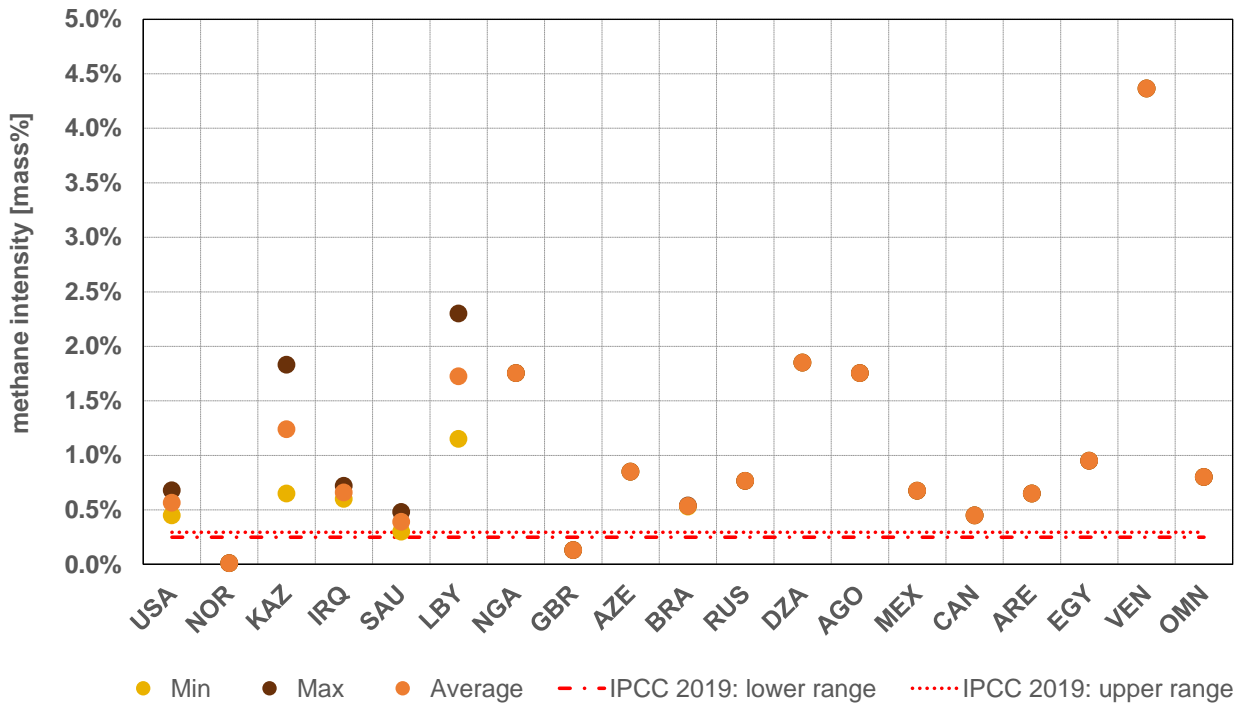
Figure 2: Minimum, maximum and average methane intensity of natural gas production for main import countries to the EU in the input data set in vol%



AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR= Norway, QAT =

Qatar, RUS= Russian Federation, TTO = Trinidad and Tobago and USA= The United States of America
 Source: Own illustration by Oeko-Institut Consult GmbH based on Charlotte Große et al. (2025), RystadEnergy (2023), Institut für Energie- und Umweltforschung (IFEU) (2023) and International Energy Agency (IEA) (2025a), Howarth (2024) and from Intergovernmental Panel on Climate Change (IPCC) (2019).

Figure 3: Minimum, maximum and average methane intensity of crude oil production for main import countries to the EU in the input data set in mass%



AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR= Norway, QAT = Qatar, RUS= Russian Federation, TTO = Trinidad and Tobago and USA= the United States of America
 Source: Own illustration by Oeko-Institut Consult GmbH based on Charlotte Große et al. (2025), RystadEnergy (2023), Institut für Energie- und Umweltforschung (IFEU) (2023) and International Energy Agency (IEA) (2025a), Howarth (2024) and from Intergovernmental Panel on Climate Change (IPCC) (2019).

Note that in many operations crude oil, natural gas, and several other co-products like natural gas liquids (NGL) are produced in the same site. The emission factors for the different products are highly sensitive to the allocation method that is chosen and can vary substantially (Olczak 2025).

Institut für Energie- und Umweltforschung (IFEU) (2023) also provide values on energy inputs and leakage for the other steps in the natural gas supply chain for selected countries. Where available, these values were used, otherwise values of one country were assumed as standard values. Although the EU Methane Regulation currently does not cover emissions from LNG⁹ shipping, we have included methane slip in the engines of the vessels in order to assess its relative significance compared to other steps. While natural boil-off from the tanks of the LNG ship, typically in the order of 0.1%-0.15%/day, is unavoidable, modern LNG vessels are equipped with gas management systems (European Commission (EC) 2025b). Venting of the gas into the air is just a tool of last

⁹ LNG is not pure methane but a mix of C-gases. Pretreatment of LNG cleans it from water vapor (which can form ice during cooling), CO₂ and hydrogen sulphide (which can freeze and cause blockages), as well as mercury and other contaminants (which can damage equipment) PCCS 2025. This means that the energy content and the share of methane in the natural gas is preserved if it is shipped via LNG.

resort, and not typically performed under normal circumstances. Rather, boil-off gas is sent to the burners of steam turbines or to the ignition engines. Where insufficient natural boil-off gas volumes are available for propulsion, forced vaporization of LNG can be employed or other liquid fuel can supplement the additional energy demand. Engines have become much more common than steam turbines for modern vessels. Engines that run on natural gas or on dual fuel have slip, where some of the gas is not burned but released into the air with the exhaust gas stream. The EU ETS for maritime transport covers methane emissions from this slip and provides standard values in the range of 0.2%-3.1% methane slip of the natural gas used as fuel, depending on average vessel speed and engine type (European Commission (EC) 2025a). Based on typical boil-off and medium step Otto engine, this corresponding leakage rate is 0.01%/tkm.

Due to very low methane leakage associated with crude oil transportation (c.f. IPCC standard factors, Intergovernmental Panel on Climate Change (IPCC) 2019), only production is accounted for in this case.

Infobox 2

Different units of measurement and system boundaries for the methane intensity threshold

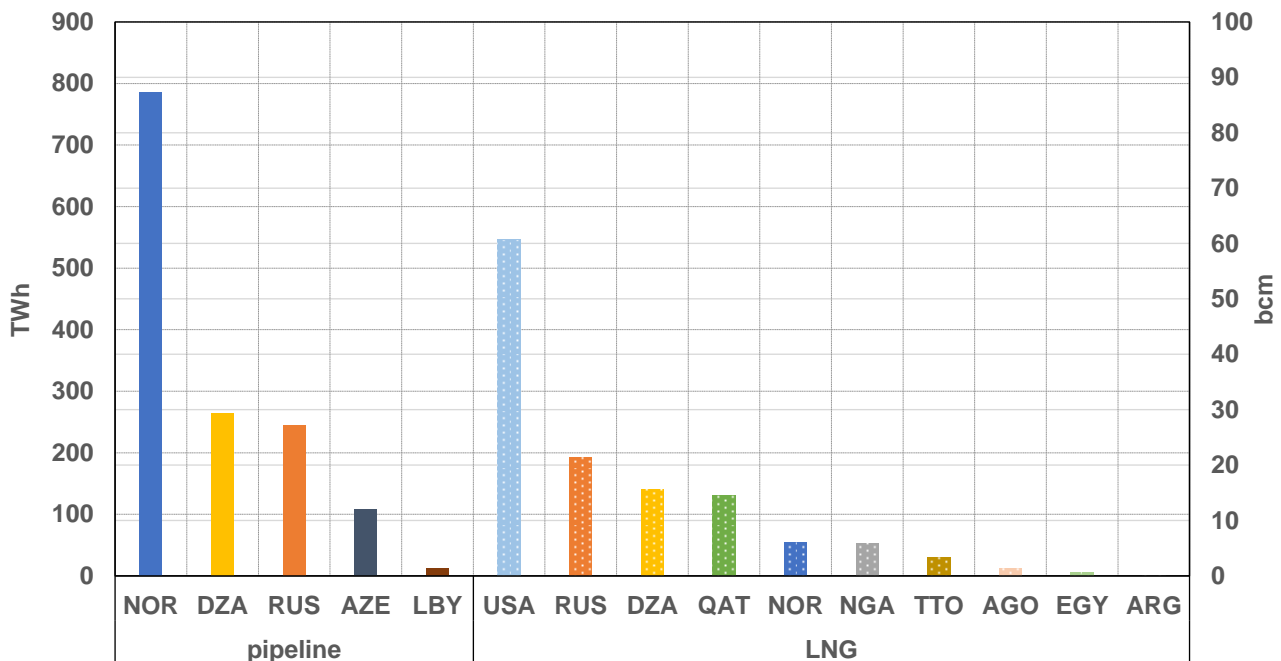
There are different options for defining the admissible methane intensity level and setting the respective threshold. In the initial EU Parliament proposal, the threshold was defined in terms of %vol, i.e., volume of methane emitted per volume of natural gas or oil imported. While such a threshold might make it easy to operationalize measuring volumes and supply respective certification, it could be an unfair treatment: natural gas with high methane concentration has lower heating values than natural gas with significant fractions of longer-chain hydrocarbons. Thus, if the former leaks, more methane is released into the atmosphere while less useful energy is delivered to the consumer. A mass-based definition of the threshold (mass of methane per mass of natural gas or crude oil) would implicitly address this issue, as higher heating value is linked to higher mass of respective natural gas. The most precise approach would be a threshold in terms of mass of methane released per unit of energy delivered. Also see Olczak (2025) for a detailed discussion of this issue. They also highlight the issue of allocating methane emissions to various (co)-products which can lead to very different emission intensities.

Another issue arises when specifying the system boundaries to which the threshold applies. The often-cited OGCI target of 0.2% applies on the company level, rather than on the level of facilities used along the supply chain, as foreseen in the EU Regulation. Companies committed under the OGCI, apply the threshold only to those parts of the supply chain that are owned by them. Hence, in the OGCI metric another reason behind the decrease in intensity can be divestment, allowing a company to decrease its emissions by selling its assets. If assets are sold to companies not part of OGCI, associated methane emissions are no longer subject to the target threshold. E.g., Olczak (2025) finds that out of 28 assets divested by the OGCI companies in 2023, only five of them (18%) were divested to other OGCI members.

Data on 2024 production and imports of natural gas was taken from Energy Institute (2025). Figure 4 shows the total import of natural gas into the EU by country for pipeline gas and LNG in TWh. In total almost 2600 TWh were imported from 12 different countries in 2024. Norway was the largest pipeline-based supplier with almost 800 TWh. The largest LNG-based imports came from the United States, at around 550 TWh. Together, these two countries alone accounted for 54% of natural gas

imports into the EU in 2024 (including about 50 TWh of LNG-based imports from Norway). Russia still ranks third in 2024 with total natural gas imports of around 440 TWh (comprising 250 TWh imported via pipeline and 190 TWh via LNG). The next largest exporter of natural gas to the EU was Algeria with 400 TWh (comprising about 260 TWh imported via pipeline and 140 TWh via LNG). Further natural gas imports were supplied from Qatar (130 TWh via LNG) and Azerbaijan (110 TWh via pipeline), followed by smaller quantities from Nigeria, Trinidad and Tobago, Angola, Libya, Egypt and Argentina.

Figure 4: Import of natural gas into the EU by country (2024)

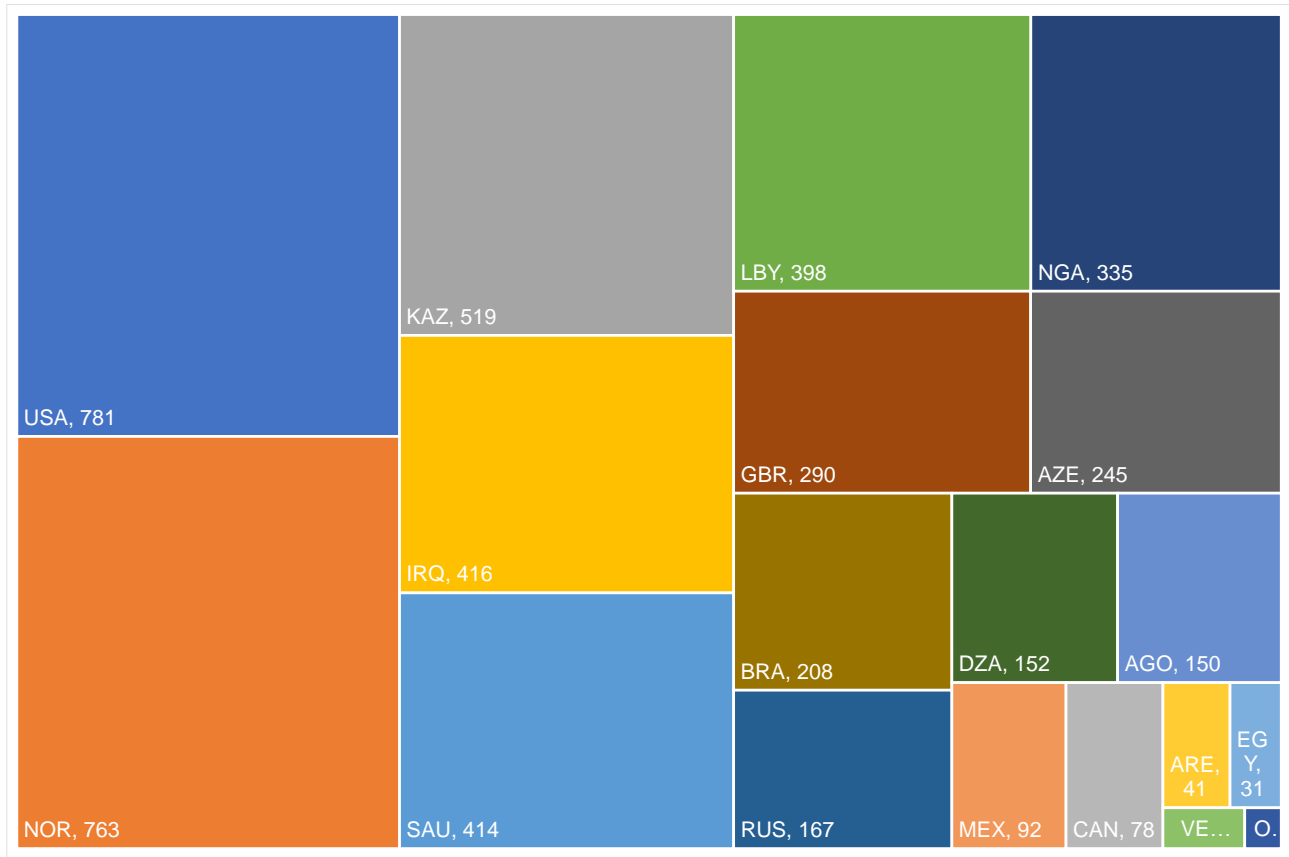


AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR= Norway, QAT = Qatar, RUS= Russian Federation, TTO = Trinidad and Tobago and USA= United States
 Source: Own illustration based by Oeko-Institut Consult GmbH based on data from Energy Institute (2025).

Data on 2023 crude oil imports is taken from Eurostat (2025). Figure 5 shows the major crude oil importers to the EU in 2023. The sources of supply are much more diverse than for natural gas. Again, the USA and Norway are among the most important suppliers.

All GHG emissions are expressed in CO₂e and 29.8 is used as GWP100 for methane based on AR6 (Intergovernmental Panel on Climate Change (IPCC) 2021, see also Infobox on GWP of methane in Chapter 1 for further information). Data on transportation distances is based on an own compilation of data. Detailed information on the data sets employed and the methodological approach can be found in supplementary material available upon request .

Figure 5: Import of crude oil into the EU by country (2023)



AGO = Angola, ARE = United Arab Emirates, AZE = Azerbaijan, BRA = Brazil, CAN = Canada, DZA = Algeria, EGY = Egypt, GBR = Great Britain, IRQ = Iraq, KAZ = Kazakhstan, LIBY = Libya, MEX = Mexico, NGA = Nigeria, NOR = Norway, OMN = Oman, RUS = Russian Federation, SAU = Saudi Arabia, USA = the United States of America, and VEN = Venezuela.

Source: Own illustration by Oeko-Institut e.V. / Oeko-Institut Consult based on data from Eurostat (2025).

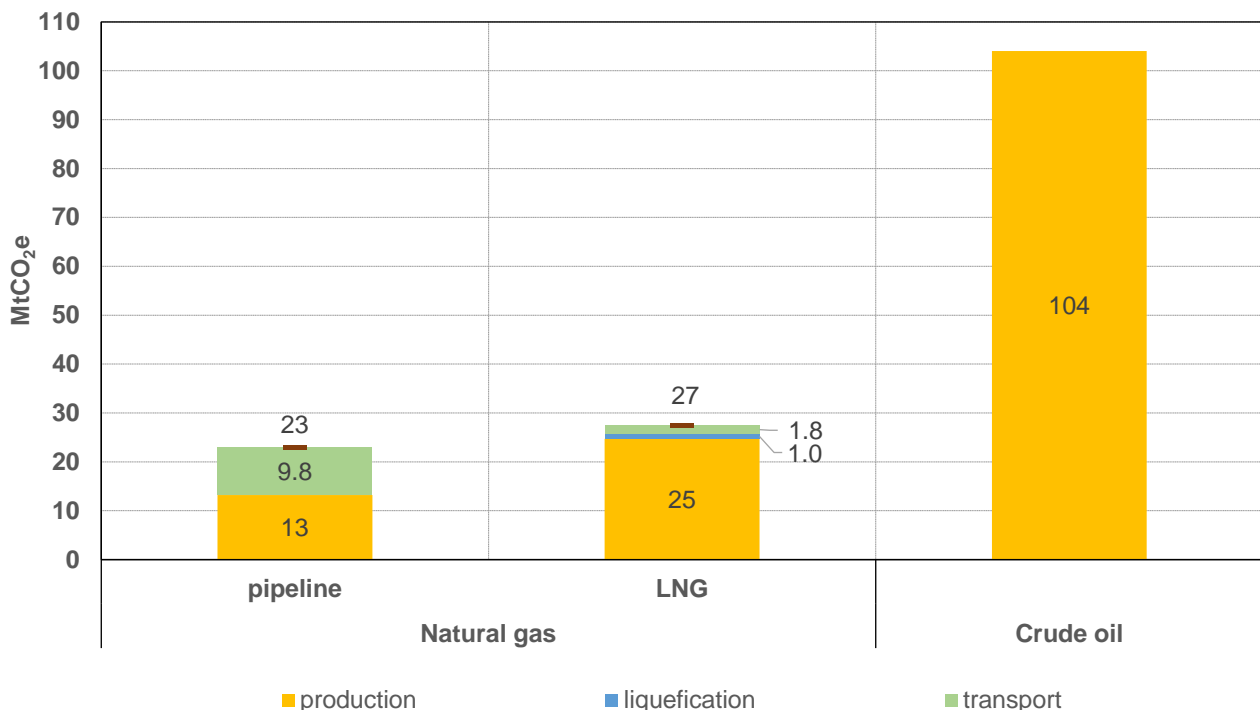
4 Status Quo Emissions Level and Estimated GHG Reduction

4.1 Status quo emission levels and current methane intensities

The methodology described above is used to calculate the total methane emissions from production, transport and liquefaction for imports of natural gas and crude oil into the EU. The data for natural gas is based on imports in 2024 (Energy Institute 2025). The data for crude oil is based on imports in 2023 (Eurostat 2025). Total methane emissions, converted into MtCO_{2e}, are shown in Figure 6.

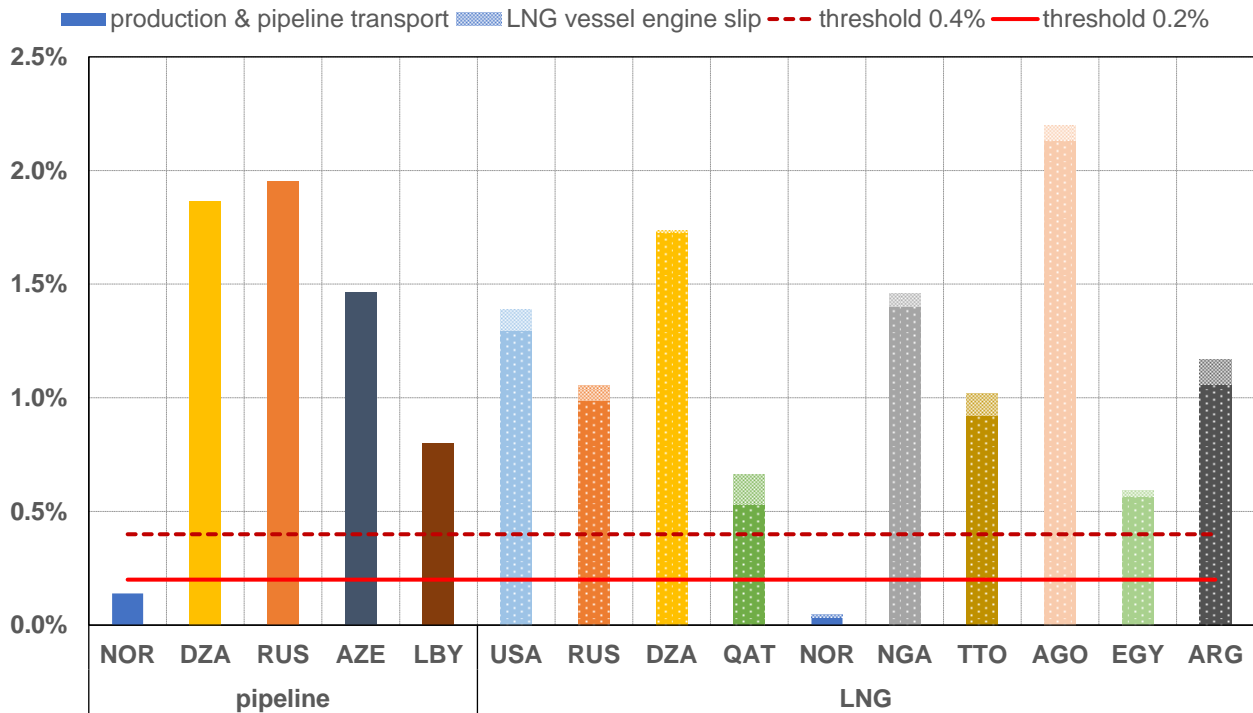
Based on our calculations about 155 MtCO_{2e} emissions can be attributed to crude oil and natural gas imports to the EU, assuming average methane leakage rates from production. Of these, about 2 MtCO_{2e} come from methane slip on LNG-fuelled vessels, which is currently not covered by the EU Methane Regulation. The production of crude oil for imports into the EU caused the highest methane emissions, at more than 100 MtCO_{2e}. LNG-bound natural gas imports rank second with 27 MtCO_{2e} with the largest share attributable to production (25 MtCO_{2e}), followed by transport (1.8 MtCO_{2e}), and liquefaction with only 1.0 MtCO_{2e}. Pipeline natural gas has the lowest absolute methane emissions at 23 MtCO_{2e} (production 13 MtCO_{2e} and transport 10 MtCO_{2e}). These numbers show that production plays the most significant role in methane emissions and that emissions from the transport of LNG are lower than those from the transport of pipeline gas: while the split between pipeline and LNG-based is about half-half, pipeline transport is associated with 5 times higher methane emissions.

Figure 6: Total methane emissions from natural gas (2024) and crude oil (2023) imports into the EU, expressed as CO_{2e} using GWP100



Source: own figure, Oeko-Institut Consult GmbH

Figure 7: Calculated absolute volume-based methane intensities for natural gas imports into the EU by country (2024) compared with lower (0.2%) and upper (0.4%) threshold

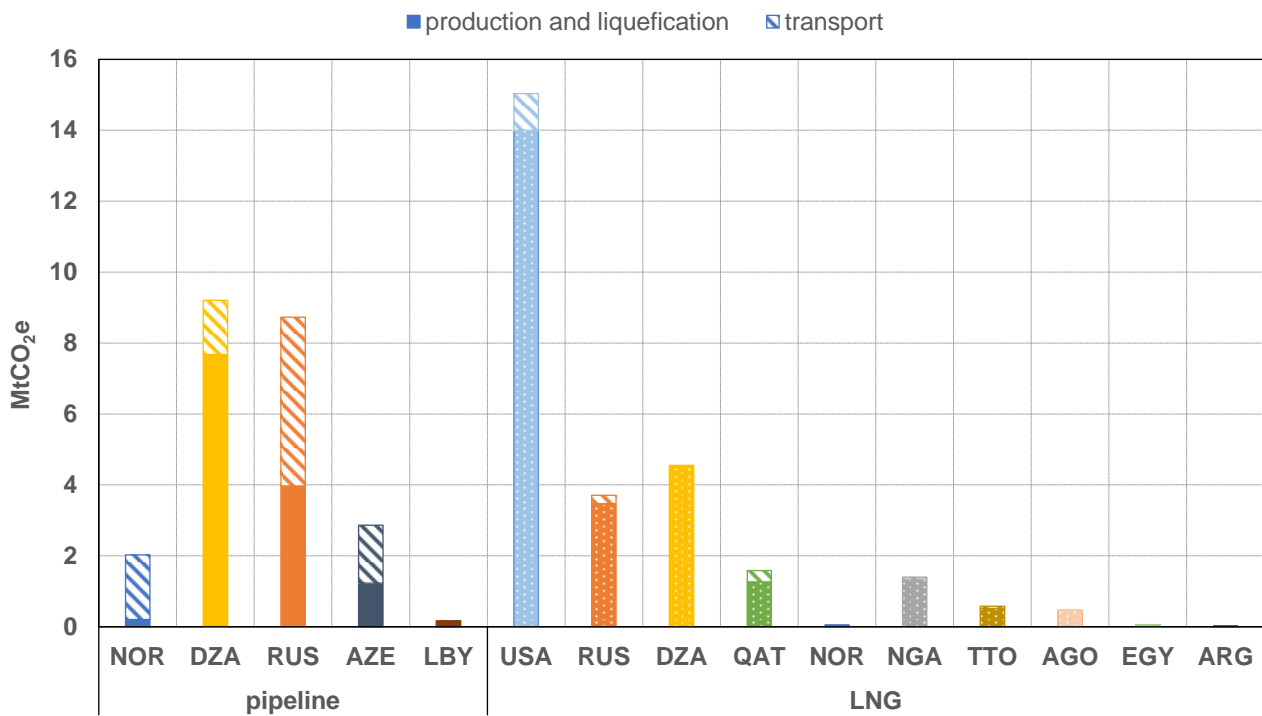


Source: own figure, Oeko-Institut Consult GmbH

AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR= Norway, QAT = Qatar, RUS= Russian Federation, TTO = Trinidad and Tobago and USA= the United States of America.

Figure 7 shows the absolute volume-based methane intensities as calculated with the methodology described above for the relevant import countries. The figure also includes a threshold of 0.2% and of 0.4% methane intensity as a range for a possible maximum methane intensity to be adopted by the EU COM for the Methane Regulation (EU) 2024/1787; with the former value derived from the 0.2% proposal of the European Parliament, and the latter value equal to the threshold level for LNG-based supply as it was implicitly established in the US Waste Emission Charge (0.35%, cf. Table 1) plus a reservation for methane slip of the vessels. Of all twelve importing countries, only Norway has a lower methane intensity for both pipeline-based and LNG-based supply. The methane intensity of all other countries varies between 0.6% (LNG from Egypt) and 2.2% (LNG from Angola). Countries that both supply high imports to the EU and have high methane intensity are relevant for total methane emissions, which are shown in Figure 8.

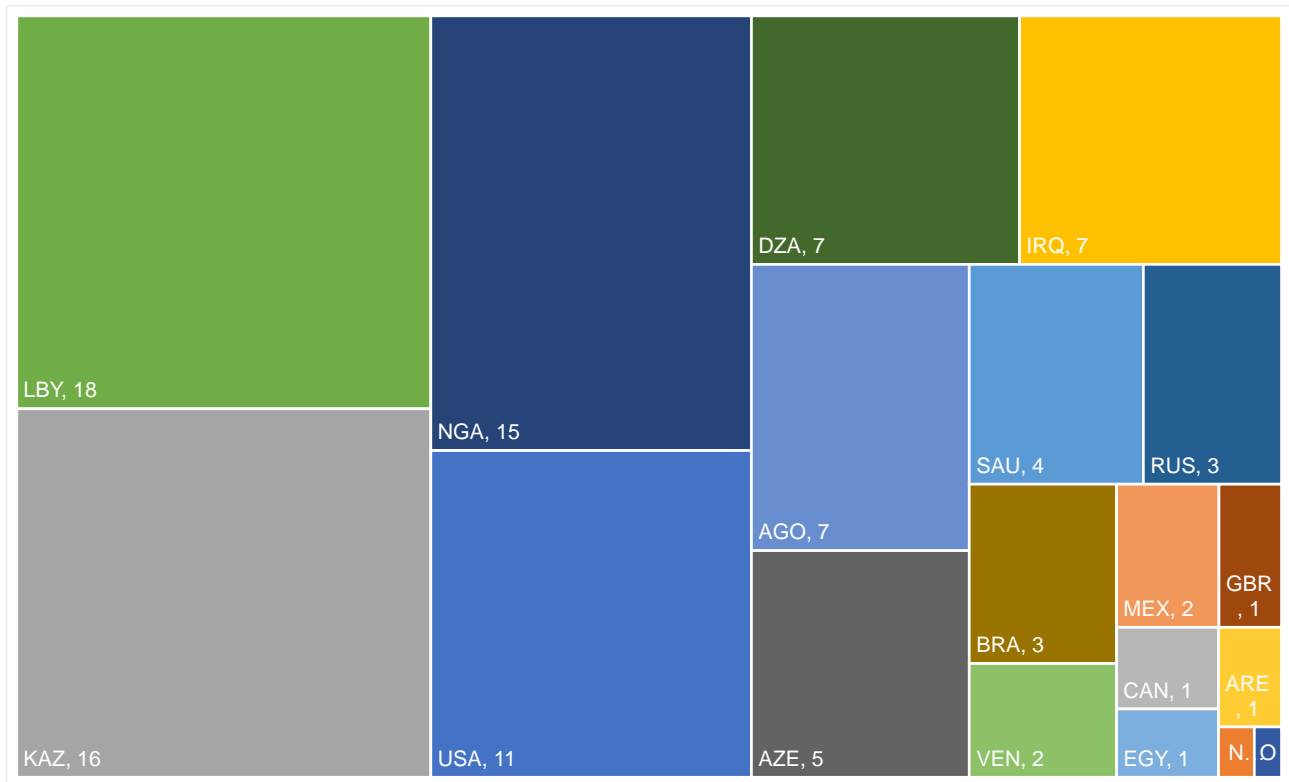
Figure 8: Calculated total methane emissions expressed as MtCO₂e using GWP100 from natural gas imports into the EU (2024) based on average Methane leakage rates



AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR= Norway, QAT = Qatar, RUS= Russian Federation, TTO = Trinidad and Tobago and USA= the United States of America
 Stripped bars represent the respective GHG emissions from the transport lag.
 Source: Oeko-Institut Consult GmbH

The highest absolute methane emissions (expressed in MtCO₂e) in 2024 are calculated to be caused by LNG imports from the USA at around 15 MtCO₂e, with 14 MtCO₂e attributable to production and liquefaction and 1 MtCO₂e to transport. In second place are natural gas imports via pipelines from Algeria and Russia each accounting for around 9 MtCO₂e, including emissions from transport. These are followed by LNG from Algeria and Russia with around 5 MtCO₂e and 4 MtCO₂e, respectively. Imports from Azerbaijan via pipeline cause around 3 MtCO₂e. LNG imports from Nigeria, Trinidad and Tobago, Angola, Egypt and Argentina account for less than 2 MtCO₂e each due to low import flows, not necessarily due to low methane intensity, as the comparison with Figure 4 and Figure 7 shows. Natural gas imports via pipeline from Norway cause only 2 MtCO₂e due to low leakage rates (Figure 7) even though import flows are high (Figure 4). LNG from Norway accounts for 0.2 MtCO₂e.

Figure 9: Calculated total methane emissions expressed as MtCO₂e using GWP100 from crude oil imports into the EU (2023)



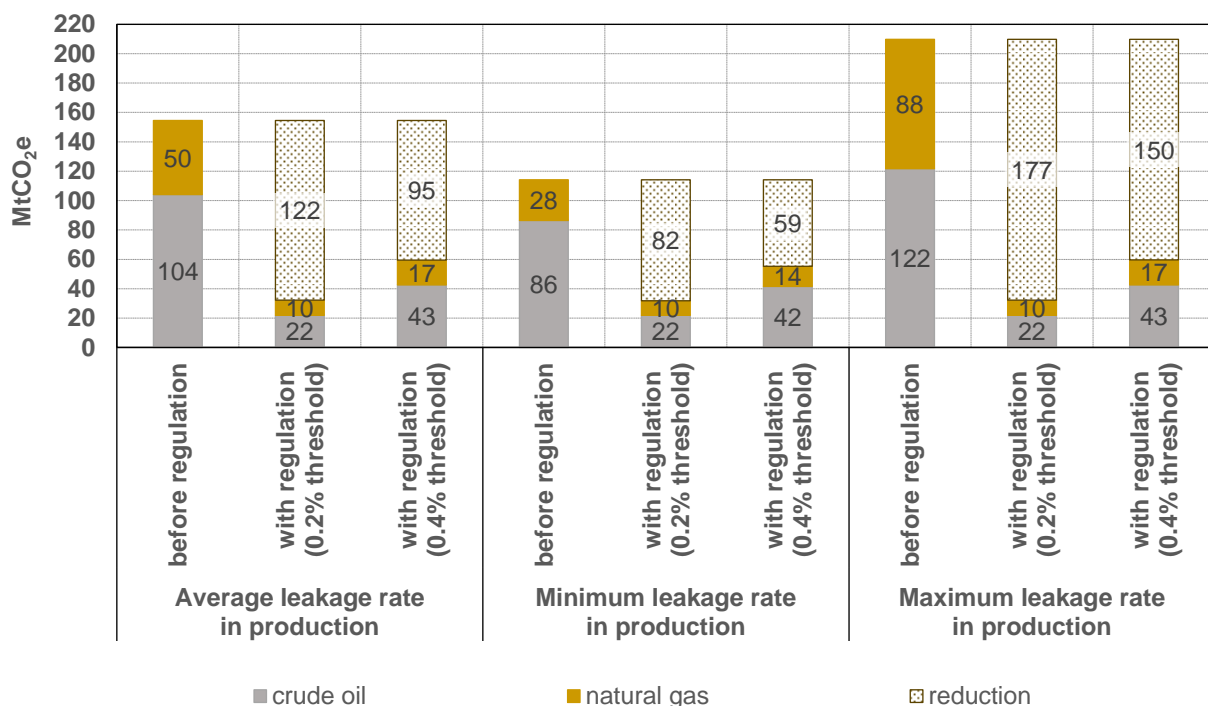
AGO = Angola, ARE = United Arab Emirates, AZE = Azerbaijan, BRA = Brazil, CAN = Canada, DZA = Algeria, EGY = Egypt, GBR = Great Britain, IRQ = Iraq, KAZ = Kazakhstan, LBY = Libya, MEX = Mexico, NGA = Nigeria, NOR= Norway, OMN = Oman, RUS= Russian Federation, SAU = Saudi Arabia, USA= the United States of America, and VEN = Venezuela
 Source: own figure, Oeko-Institut Consult GmbH

Figure 9 shows the calculated total methane emissions (expressed as MtCO₂e) caused by crude oil imports into the EU in 2023. In total 104 MtCO₂e were caused by crude oil imports. Imports from four countries – Libya, Kazakhstan, Nigeria and the United States – account for 58% of total methane emissions from crude oil imports. The highest methane emissions (18 MtCO₂e or 17% of all crude oil import-induced methane emissions) are associated with crude oil imports from Libya, although imports from Libya rank sixth, accounting for 8% of total EU crude oil imports. Methane emissions caused by oil imports from Kazakhstan were in second place at 16 MtCO₂e. Kazakhstan is the EU's third largest oil supplier, accounting for 10% of total imports. Nigeria causes the third highest methane emissions at 15 Mt. By comparison, only 7% of all oil imports in 2023 come from Nigeria, which is the seventh largest oil supplier to the EU. Crude oil imports from the United States account for 16% of total crude oil imports in 2023, making the USA to the largest single crude oil supplier to the EU. However, the associated methane emissions rank only fourth, at 11 MtCO₂e. Methane emissions from Nigeria, Iraq and Angola follow with 7 MtCO₂e each, with Iraq being the fourth largest supplier of crude oil to the EU with 8%, while Nigeria and Angola each cover only 3% of European crude oil imports. Crude oil imports from Azerbaijan, Saudi Arabia, the Russian Federation, Brazil, Venezuela, Mexico, Great Britain, Canada, Egypt, the United Arab Emirates, Norway and Oman are associated with 5 MtCO₂e or less. Although Norway was the second largest supplier of crude oil to the EU in 2023 with 15% of total crude oil imports (compare Figure 5), the associated total methane emissions are the second lowest with 0.2 MtCO₂e.

4.2 Estimated GHG emission reductions from crude oil and natural gas imports

As noted above, there is currently no proposal for a methane intensity threshold except for the 0.2% proposed during the parliamentary process. While this proposal did not make it into the final regulation, it is nonetheless a prominent value that has been regularly picked up in the debate. While none of the importing countries to the EU could hold this threshold under current production practices, except for Norway, a threshold of 0.4% would be in reach for some key importers to the EU. This alternative threshold level is motivated by the threshold for LNG-based supply as it was implicitly established in the US Waste Emission Charge (0.35%, cf. Table 1) plus a reservation for methane slip of the vessels. To estimate the potential effect of the EU Methane Regulation on natural gas and crude oil imports, we calculate potential GHG reductions for these two thresholds. On the one hand, leakage rates during production are the most important determinates of supply chain methane emissions, on the other hand, they are subject to substantial uncertainty. In order to show the possible range of GHG emission reduction potential we examine the effect of imposing the respective threshold for minimum, average and maximum leakage rates reported in the literature and compiled in our dataset for each country.

Figure 10: Calculated total methane emissions expressed as CO₂e using GWP100 from crude oil and natural gas imports into the EU (2023-2024) compared to reduced methane emissions with assumed regulation (threshold 0.2% or 0.4% leakage rate for different production leakage rates of natural gas)



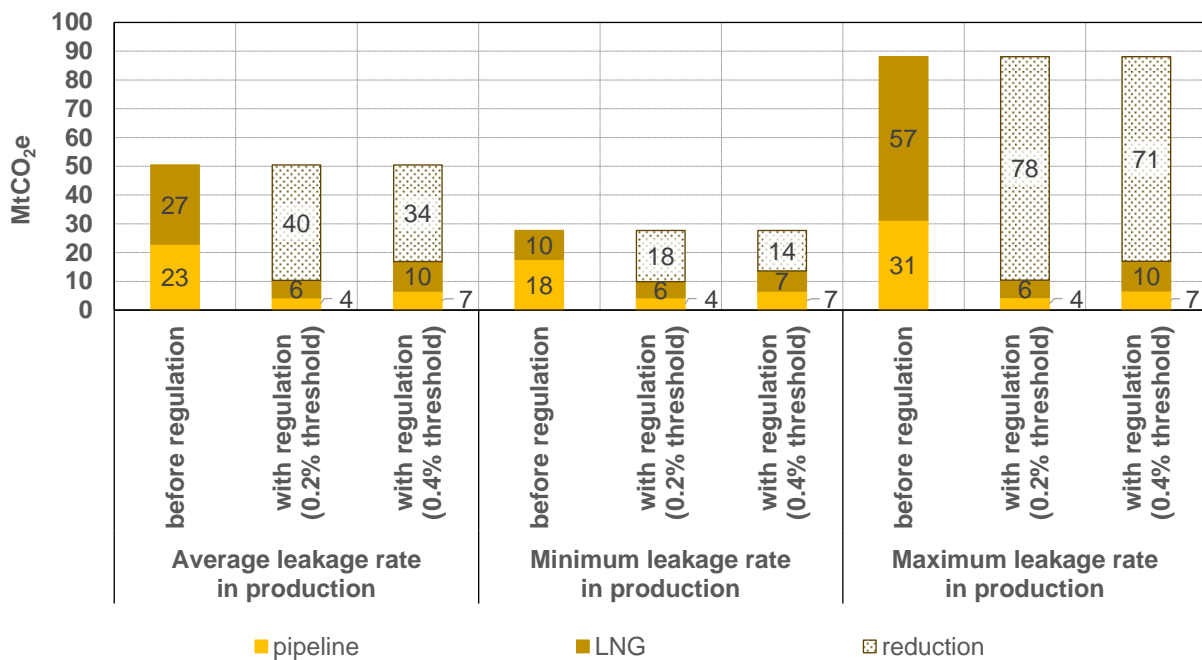
Source: own figure, Oeko-Institut Consult GmbH

As shown in Figure 10, we estimate that introducing a methane intensity threshold of 0.2vol% for natural gas and 0.2%mass for crude oil for the entire supply chains up until delivery to EU ports or entry points, could reduce GHG emissions by about 120 MtCO₂e per year, holding trade relations and volumes constant and assuming average leakage rates for production. Still about a 100 MtCO₂e reduction in emissions can be achieved if setting the respective thresholds at 0.4%. For both threshold levels, crude oil contributes about two-thirds to total reduction. As shown in Figure 2 and Figure 3, variations in production leakage rates are higher for natural gas than for crude oil.

Accordingly, total baseline emissions from crude oil vary only by little more than 15%, while variation for natural gas is in the range of -45% to +75%. With minimum leakage rates assumed, baseline emissions reduce to about 115 MtCO₂e, with is about 25% less than baseline emissions for the average production leakage rates case. Total reduction decreases to 50-80 MtCO₂e, while crude oil contributes three quarters to total reduction. If maximum production leakage rates are assumed instead, total baseline emissions increase to about 210 MtCO₂e. In this case, total reduction is between 150-180 MtCO₂e, based on the two threshold levels. The relative contribution of crude oil decreases to little more than 50%.

Figure 11 shows the effect of a threshold value of 0.2vol% and 0.4vol% on methane emissions from natural gas imports, assuming constant trade relations and volumes compared to 2024. Assuming average production leakage rates, a threshold of 0.2vol% could reduce methane emissions by 40 MtCO₂e.

Figure 11: Calculated total methane emissions expressed as CO₂e using GWP100 from natural gas imports into the EU (2024) compared to reduced methane emission with assumed regulation (threshold 0.2% or 0.4% leakage rate)



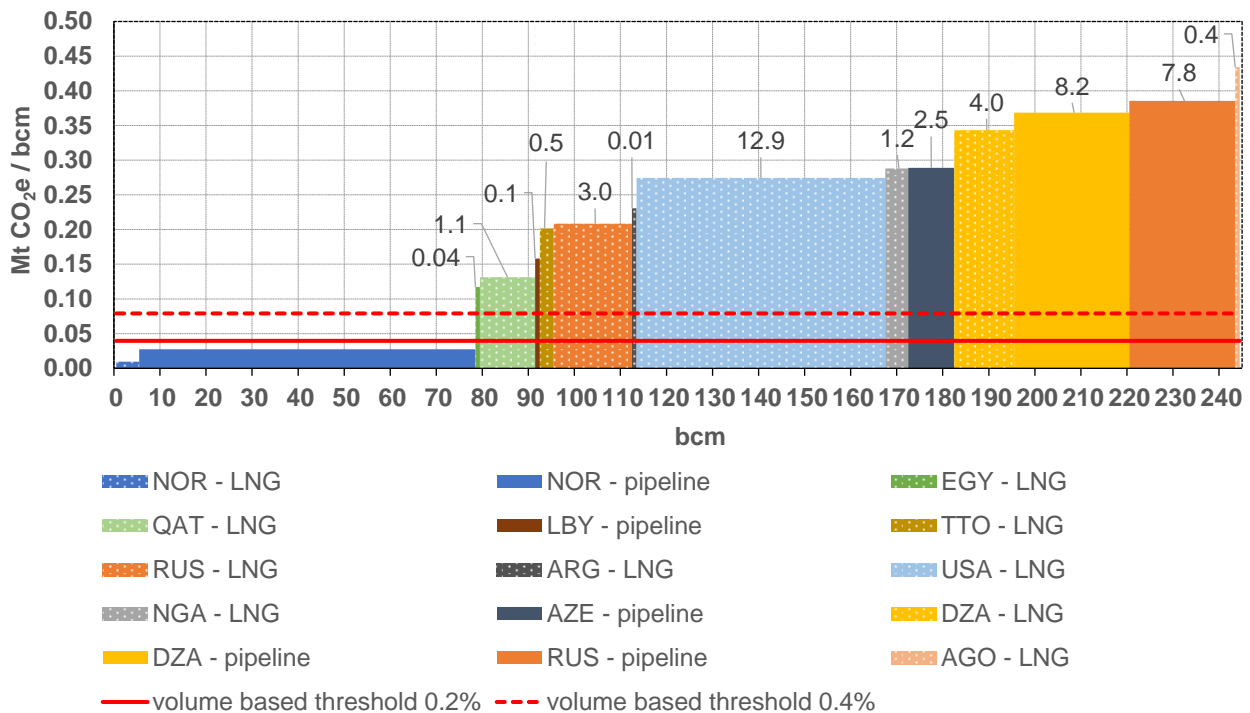
Source: own figure, Oeko-Institut Consult GmbH

A threshold of 0.4vol% would still reduce methane emissions by more than 30 MtCO₂e. If minimum leakage rates are assumed, baseline emissions reduce to about 30 MtCO₂e. Regulation would reduce emissions by 14-18 MtCO₂e, depending on the threshold level. If instead maximum threshold levels are assumed, baseline emissions increase to about 90 MtCO₂e and achievable reduction is in the range between 70-80 MtCO₂e, depending on the chosen threshold level. Uncertainty in emissions from production is larger for countries that deliver natural gas via LNG, than for those that provide pipeline-bound supply.

Figure 12 shows the ordered contribution to total methane emissions from natural gas imports by export country based on calculated specific methane emissions and import volumes for 2024. LNG imports from the USA account for 22% of total imports and are the single largest contributor to total

emissions (30%). If the strict threshold is imposed, emissions from the USA would reduce by about 13 MtCO₂e. LNG and pipeline-based imports from Algeria together are the second largest contributor and regulation would reduce emissions by about 12 MtCO₂e. Imports from Russia via LNG and pipeline had a share of 17% in 2024, while the share in emissions is 25%. With regulation, emissions would decrease by about 11 MtCO₂e. These three countries make up more than 85% of emission reduction due to the regulation. Norway is the only importer that already complies with the threshold.

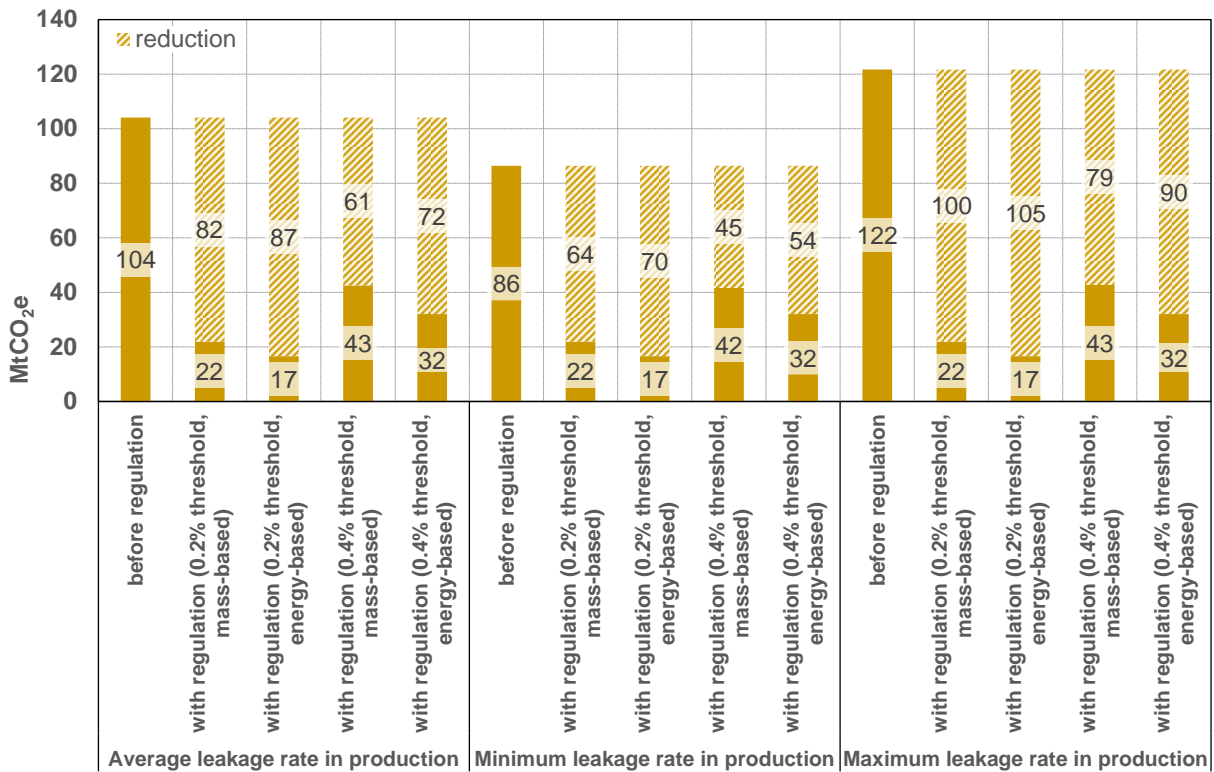
Figure 12: Ordered contribution to total methane emissions from natural gas imports based on calculated *specific* methane emissions and import volumes for 2024 of expressed as MtCO₂e per bn cubic meters (using GWP100 and average leakage factors)



Note: Displayed numbers show *absolute* reduction in MtCO₂e with regulation (volume based threshold 0.2%) by country; AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR= Norway, QAT = Qatar, RUS= Russian Federation, TTO = Trinidad and Tobago and USA= the United States of America.
Source: Oeko-Institut Consult GmbH

Figure 13 shows the impact of an assumed threshold of 0.2% or 0.4% leakage rate on the calculated total methane emissions (expressed as MtCO₂e) from crude oil imports into the EU assuming constant trade relations and volumes compared to 2023. We assess two possible implementations of the threshold: mass-based and energy-based. Assuming average production leakage rates, possible reductions range from around 45 MtCO₂e (mass based 0.4%) to almost 90 MtCO₂e (energy based 0.2%). With minimal leakage rates, possible emission reduction is in the range of 45-70 MtCO₂e, while maximum leakage rates for production yield possible emission reduction in the range of 80-105 MtCO₂e. Changing the basis from mass to energy-based increases possible reductions by 5-10 MtCO₂e.

Figure 13: Calculated total methane emissions expressed as CO₂e using GWP100 from crude oil imports into the EU (2023) compared to reduced methane emission with assumed regulation (threshold 0.2% or 0.4% leakage rate)



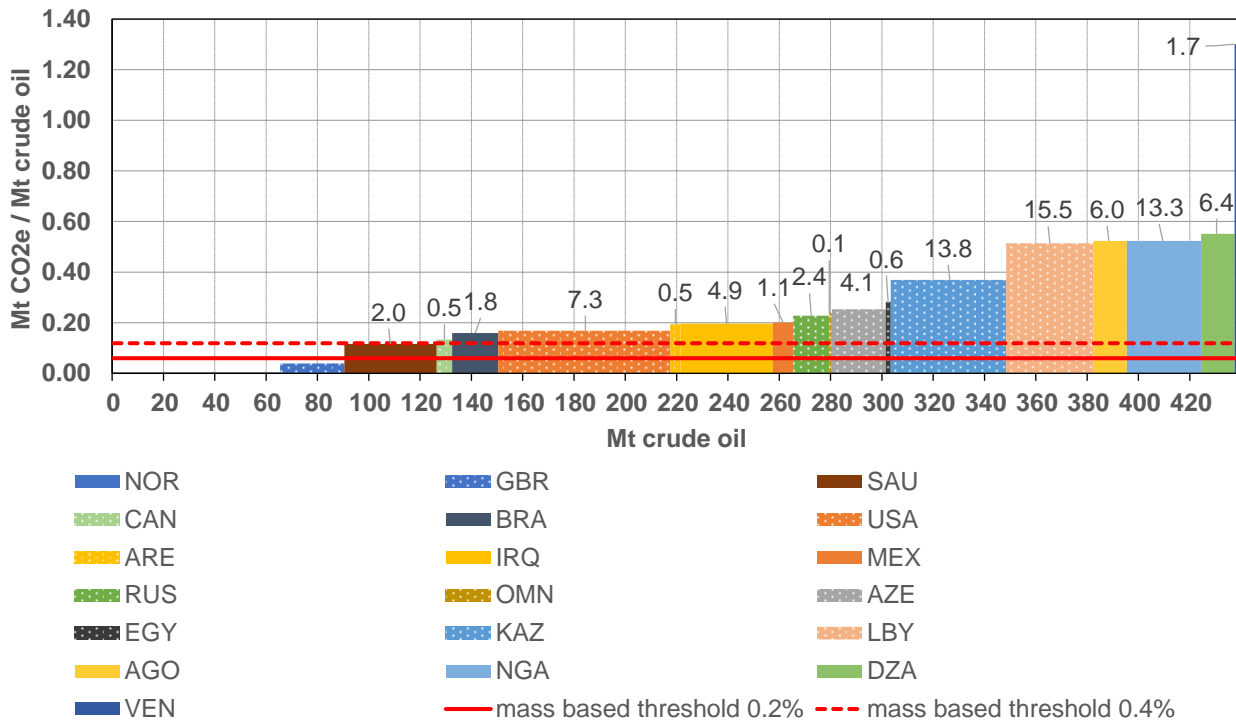
AGO = Angola, ARG = Argentina, AZE = Azerbaijan, DZA = Algeria, EGY = Egypt, LBY = Libya, NGA = Nigeria, NOR = Norway, QAT = Qatar, RUS = Russian Federation, TTO = Trinidad and Tobago and USA = the United States of America.
 Source: Oeko-Institut Consult GmbH

Figure 14 shows the ordered contribution to total methane emissions from crude oil imports by export country based on calculated specific methane emissions (mass-based) and import volumes for 2023, assuming average production leakage rates. Crude oil imports are much more diversified than natural gas, hence, no import country’s share exceeds 15%. Emissions from crude oil imports from Norway and Great Britain would not be affected by a threshold regulation. The largest contributors to emission reduction would be Libya, Kazakhstan, and Nigeria, accounting for 16 MtCO₂e, 14 MtCO₂e, and 13 MtCO₂e, respectively, if the strict threshold is imposed on a mass-base. Together, these three countries contribute slightly more than 50% to total emission reduction.

Notably, holding the 0.2 % threshold for crude oil and natural gas imports from the USA would reduce emissions by 20 MtCO₂e. Total contribution of Algeria contribution adds up to 18 MtCO₂e. These two countries alone make up about 25% of the total emission reduction potential of the regulation.

Figure 14: Ordered contribution to total methane emissions (mass-based) from crude oil imports based on calculated specific methane emissions and import

volumes for 2023, expressed as MtCO₂e per Mt of crude oil (using GWP100 and average leakage factors)



AGO = Angola, ARE = United Arab Emirates, AZE = Azerbaijan, BRA = Brazil, CAN = Canada, DZA = Algeria, EGY = Egypt, GBR = Great Britain, IRQ = Iraq, KAZ = Kazakhstan, LBY = Libya, MEX = Mexico, NGA = Nigeria, NOR = Norway, OMN = Oman, RUS = Russian Federation, SAU = Saudi Arabia, USA = the United States of America, and VEN = Venezuela
 Source: Oeko-Institut Consult GmbH

4.3 Limitations and comparison with other studies

Our estimates come with a number of limitations: Our calculations are based on trade patterns as of 2023-2024 and LDAR technology levels as of 2025. Both can change quite substantially, until a uniform calculation method for methane emissions under the EU Methane Regulation becomes effective in 2027, and until a threshold is set after completion of the impact assessment due in 2029. Moreover, it is not clear whether taking imports as a basis for calculating the regulation’s impact under- or overestimated the effect. Besides possibly changing trade patterns, the regulation could also well have spillover effects meaning that the existence of the regulation would incentivize producers to reduce their emissions of the entire production and not only the production dedicated for the EU. In addition, calculations are based on average, minimum and maximum methane intensities found in the literature. However, production processes can be quite different within one country leading to large variations in methane intensities. A further analysis of which production is typical directed towards exports could further enhance the analysis.

Normally, the Commission provides an in-depth assessment of the potential effects of their proposed regulation. However, for the leakage rate threshold, this assessment is missing. This is due to the fact that imports were not part of the initial proposal but were added to the regulation in the later process. However, estimates of the impact of a leakage rate threshold are available from other sources. Clean Air Task Force (CATF) (2023) propose the introduction of a 0.2% methane intensity threshold based on energy units. They calculated a potential methane emissions reduction of 24 Mt, equivalent to 715 MtCO₂e, based on GWP100. Yet, the methodology is not clear. It seems that they have assumed that a country’s production will comply with the threshold, if more than 5% of their natural gas production or 10% of their crude oil production is currently dedicated for the EU.

Compared to this, we took a much more conservative approach, assuming that only imports into the EU will comply with the regulation. It is not clear, whether the regulation will lead to spillover effects on the entire production of a country, or it will only lead to a segregation of markets with products complying to the threshold directed to the EU, and other, more emissions intensive products directed to other consumers that lack similar regulation. This highlights the important of defining accounting and allocation rules to ensure the effectiveness of the regulation.

RystadEnergy (2023) assess the effect of introducing an energy-based methane intensity threshold of 0.2%. They estimate a baseline of 4.9 Mt methane emissions for 2031, equivalent to 146 MtCO_{2e} based on GWP100, based on 2022 emission intensities but with adapted trade patterns for 2031. This is very close to the 154 MtCO_{2e} that we calculate as average baseline emissions. Regardless of the EU regulation, methane emissions will be reduced by 1.2 Mt, or 36 MtCO_{2e}, according to their analysis, due to available net-zero cost abatement options. Another 1.9 Mt or 57 MtCO_{2e} will be reduced due to the introduction of a methane intensity threshold under the EU Methane Regulation. We estimate 122 MtCO_{2e} reduction for a 0.2% threshold. However, they also assume a change in trade patterns, which mitigates the effect of the regulation. Accounting for abatement measures which they assume to occur regardless of regulation until 2031, the difference in the estimates imply that about 33% of emissions will leak to other destinations due to change in trade patterns.

Charlotte Große et al. (2025) estimate methane emissions associated with natural gas imports to the EU27. They report a value of 5.4 ktCH₄/bcm based on 2023 values. With a total of 293 bcm of import, this corresponds to about 47 MtCO_{2e}. From the documentation it is not entirely clear, if leakage from methane slip in LNG vessels is included or not. If not, then these values correspond well with our estimates above.

5 Other Desired or Undesired Effects

Setting a maximum threshold for methane emissions of oil and natural gas imports under the EU Methane Regulation will impact current global oil and natural gas trade. Yet, the extent and form of these impacts remain uncertain. For international natural gas trade, so far only Norway falls below a possible threshold of 0.2% leakage rate and would therefore be compliant with EU regulation (see Figure 6). Non-compliant cargos may be diverted to other markets than the EU with no, or less strict methane regulation (Talus et al. 2025). This would be true not only for volumes from new contracts and the spot market but also for deliveries under existing contracts subject to substantial changes, including price reviews¹⁰. As some sellers may be reluctant to bear the additional costs of compliance, they could demand more favourable terms from EU buyers or export non-compliant cargos to other regions. Analyses such as of Talus et al. (2025) thus paint the picture of two gas markets: one for low-methane LNG compliant with EU standards and another for LNG diverted and sold in less regulated jurisdictions. This bifurcation would introduce a price premium for compliant LNG, meaning that European consumers would face higher prices for gas imports in the future. Moreover, a comparison of our estimates that do not account for a change in trade patterns with estimates from RystadEnergy (2023) that do take this effect into account, yields a diversion potential of about 33% of total methane emissions associated with natural gas and crude oil imports to the EU.

Although this concern is valid, it rests on main assumptions that can be questioned, leading to a different scenario, i.e. where the EU Methane Regulation would have little or no diversionary impact on global natural gas trade:

1. **Assumption:** Methane abatement costs inevitably translate into higher final gas prices.

However, this assumption might not be valid. Analyses such as the International Energy Agency's (IEA) *Global Methane Tracker* (International Energy Agency (IEA) 2024, 2025b) indicate that half of global methane emissions from oil and gas operations could be avoided at no net cost (based on average energy prices in 2023). This is because, first, technologies and measures to prevent methane emissions – such as leak detection and repair (LDAR) or improved venting and flaring practices – are well established and can be implemented relatively easily and cost-effectively. Second, methane abatement often results in additional natural gas being captured and made available for sale or use. Consequently, the required investments for abatement are frequently offset, at least in part, by the market value of the captured methane. Nevertheless, certain abatement measures entail significant upfront costs, and in some cases, the captured gas cannot be readily transported or monetized without additional investment in infrastructure. Despite these constraints, many abatement options remain economically viable with short-term payback periods (IEA 2025a). Still, gas suppliers do not pursue abatement measures, even when they offer attractive returns. Reasons for that found in the literature include: Competing investment priorities and a lack of financial incentives, the perception that abatement is more costly or complex than it is in practice or split incentives, where equipment owners or operators do not directly benefit from reduced leaks (International Energy Agency (IEA) 2025b; Palacios et al. 2025). Another reason might be an overall uncertain outlook for future natural gas markets where gas producers are clinging on to the profits of an expiring business model until the very end. At the global scale, a review of more than 30 recent modelling projections reveals that in almost all scenarios compatible with keeping global warming below

¹⁰ Reporting obligations as specified in Annex IX will apply from January 2027 onwards for supply contracts concluded or renewed on or after 4 August 2024 (Art. 29 (1)). Since 'renewed contracts', as defined in the regulation, also include price reviews European Commission (EC) 2024, a large proportion of contracts will be affected Talus et al. 2025.

2°C, the share of natural gas in the energy mix significantly decreases by 2050, with a demonstrable shift towards carbon-free energy carriers (Deloitte und Öko-Institut 2023). For industrialized economies, 1.5°C compatible pathways show a 20% to 40% decline in natural gas use by 2030 compared with 2020 levels, followed by a strong phase-out down until 2050. Suppliers in this fossil fuel endgame might be reluctant to take on new investments all together, but rather pursue a strategy of sit and wait – and shut-down.

RystadEnergy (2023) supports the conclusion that the price impact of a potential maximum methane emission threshold¹¹ on natural gas imports to the EU would be minimal. Their study estimates that additional costs would average only around EUR 0.07 per MMBtu gas by 2031, including possible non-compliance fees¹². Accordingly, compliance costs with the EU Methane Regulation are likely to remain limited and may partially be offset by the value of additional gas made available via abatement measures. Furthermore, existing analyses point to the heterogeneity of gas supply (RystadEnergy 2023) and competition among suppliers compliant with the regulation (Olczak 2025), seconding that price impacts are likely to be moderate.

2. Assumption: The picture of a two-tiered global gas market that suggests traders forego arbitrage opportunities.

In such a world, two disconnected markets emerge: one with products compliant with EU regulation and one with non-compliant natural gas or crude oil, with no or very limited overall effect on reducing methane emissions from fossil fuel supply chains on a global scale. The products on the latter market lack the option of diverting cargos to the EU, even when a price premium for compliant products would make rerouting to the EU profitable. As Olczak (2025) highlights, in such a scenario it is more probable that LNG and crude oil buyers and traders under Free on Board (FOB) arrangements will increasingly demand that sellers or exporters show compliance with the EU Methane Regulation's stipulations to maintain this option, even if the cargos are ultimately delivered elsewhere. Therefore, EU standards would spill over and integrate the non-compliant market. Yet, this only applies to FOB arrangements free of destination restrictions, where buyers retain the flexibility to redirect shipments. Also, RystadEnergy (2023) underline that for some key EU suppliers such as Algeria (connected via pipeline), alternative, efficient trade routes options (in this case most probably via LNG) are limited. Therefore, even in a segregated markets scenario, the EU Methane Regulation would substantially contribute to reducing methane emissions.

Methane emissions may increase in other process steps not covered in the regulation, notably shipping. As mentioned before, the EU Methane Regulation does not cover methane emissions from maritime transport. Yet, as this analysis illustrates, particularly methane emissions associated with methane slip are significant and make up more than 15% of total methane leakage rates for imports of certain producer countries, like e.g. Qatar (see Figure 7). For such cases, i.e. producers with low upstream emissions but long voyages for the LNG vessel, the regulation reveals a loophole to effectively reduce overall methane emissions. However, the loophole is partially closed by recent EU ETS regulation, where methane emissions from maritime transport, including methane slip, are covered from 2026 onwards. Here, emission allowances need to be surrendered for 50% of the emissions from a voyage departing or ending in an EU port, which create a clear incentive to further reduce associated emissions, e.g. via slow steaming and the use of dual-fuel diesel engines instead of otto motors.

¹¹ Rystad analyzed a Methane Intensity Performance Standard (MIPS) threshold of 1.6 Gg methane per Mtoe, equal to a 0.2% leak rate for natural gas.

¹² Assumptions of the per-ton-of-methane fees: 300 EUR in 2027 rising to 1500 EUR in 2031.

Specification of penalties due to non-compliance with the EU Methane Regulation is delegated to the level of the individual EU Member States. In contrast to other methane reduction incentives such as the Norwegian carbon tax, where excess methane emissions merely trigger additional charges, the EU regulation ultimately establishes a maximum methane intensity threshold for eligible imports and imposes penalties for non-compliance (Talus et al. 2025). However, failing to meet reporting obligations or exceeding methane intensity limits does not lead to a ban on imports but will result in fines. As stipulated in Art. 30 of the EU Methane Regulation, these are to be determined by the competent authority of the Member State in which the importer is established (European Parliament (EP), European Council (EC) 2024) leaving Member States broad discretion in defining and applying sanctions. As criticised by Climate Action Network (CAN) Europe (2024), this penalty design thus potentially undermines consistency, as importers may face divergent enforcement practices. Moreover, the regulation does not clarify whether emission offsets can be part of abatement measures to show compliance with a maximum methane emissions threshold. Article 13 of the EU Methane Regulation requires operators to “take all appropriate mitigation measures to prevent or minimise methane emissions during their operations” (European Parliament (EP), European Council (EC) 2024). While this specification suggests that abatement measures are focused on adjustments in gas operations, the Commission itself states that the regulation does not prescribe a 'system of compliance', but primarily defines the information importers must provide (European Commission (EC) 2024). Authors such as Talus et al. (2025) pinpoint this absence of clear rules on offsetting and underscore the need for an EU-level guidance to ensure uniform implementation and meaningful methane reductions.

6 Conclusions

Methane is the most important anthropogenic greenhouse gas after CO₂. To meet ambitious climate change mitigation targets, it is crucial to effectively reduce the emissions of methane along with other greenhouse gases. We find that in 2023-2024 methane emissions from oil and natural gas imports in the EU accounted for about 155 MtCO₂e, assuming average production leakage rates. This is more than emissions from all iron and steelmaking installations or from refining of mineral oil covered by the EU ETS in 2024, and more than emissions from both aviation and maritime transport covered by EU ETS (European Environment Agency (EEA) 2025). Emissions are also larger than total GHG emissions of 164 out of 210 countries and independent territories listed in the EDGAR data base (Crippa et al. 2025). The EU has introduced the Methane Regulation (Regulation (EU) 2024/1787), ultimately aimed at setting methane intensity thresholds for domestic production and imports of oil, coal and natural gas. However, the level of the thresholds is to be set in a later stage in a delegated act amending the regulation. In this paper we examine the GHG reduction potential of imposing a methane emissions intensity threshold on imports of crude oil and natural gas. Due to high uncertainty on emissions associated with natural gas and crude oil production, we examine reduction potential based on average, minimum and maximum values. Holding patterns and volumes constant, setting a methane intensity threshold in the range of 0.2%-0.4% can reduce GHG emissions by 95-120 MtCO₂e. Crucially, potential reduction is not evenly distributed between the fuels and the importers. With the exception of natural gas and crude oil deliveries from Norway, none of the current imports comply with a methane intensity threshold of 0.2%, as proposed in numerous publications (see, e.g. European Parliament (EP) 2023). Crude oil contributes about 66% to the total reduction. For crude oil, the largest total reduction with average production leakage rate comes from methane emissions from Libya, Kazakhstan and Nigeria contributing 13-16 MtCO₂e, each, while for natural gas, the USA and Algeria are the largest contributor with 12-13 MtCO₂e, each. Taking crude oil and natural gas together, the USA and Algeria each can contribute 12-13% to total emission reduction, if a 0.2% threshold is imposed.

Our analysis assumes that trade pattern will remain unchanged, but setting a maximum threshold for methane emissions of oil and natural gas imports under the EU Methane Regulation will impact current global oil and natural gas trade. Yet, the extent and form of these impacts remain uncertain. Some scholars, like Talus et al. (2025) argue that sellers may be reluctant to bear the additional costs of compliance, they could demand more favourable terms from EU buyers or export non-compliant cargos to other regions. However, methane abatement costs do not necessarily translate into higher final gas prices. *Global Methane Tracker* (International Energy Agency (IEA) 2024, 2025b) indicate that half of global methane emissions from oil and gas operations could be avoided at no net cost (based on average energy prices in 2023). While currently required measures to reduce leakage might not be taken due to longer payback periods, the EU regulation can in fact help to secure shareholder approval for these investments and align incentives between equipment owners and operators. Furthermore, existing analyses point to the heterogeneity of gas supply (RystadEnergy 2023) and competition among suppliers compliant with the regulation (Olczak 2025), seconding that price impacts are likely to be moderate. In the same spirit, methane regulation will not necessarily lead to a two-tiered oil and gas market with major leakage of emissions. It is more probable that LNG and crude oil buyers and traders under Free on Board (FOB) arrangements will demand exporters show compliance with the EU Methane Regulation to maintain this option (Olczak 2025). Therefore, EU standards would spill over and integrate the non-compliant market.

In a nutshell, the EU Methane Regulation could create a win-win situation and even the announcement of the regulation is likely to create positive anticipation and spillover effects. However, many questions on the concrete implementation and definition of the methane intensity threshold remain.

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Annex

Table 1: Thresholds for different segments of the crude oil and natural gas supply chain under the US Waste Emission Charge

Industry Segments	Unit	Threshold
<ul style="list-style-type: none"> Onshore or offshore natural gas production 	t methane emissions/t natural gas sent to sale	0.20%
<ul style="list-style-type: none"> Onshore or offshore petroleum production¹ 	t methane emissions/mill. barrels of oil sent to sale	10
<ul style="list-style-type: none"> Onshore petroleum and natural gas gathering and boosting Onshore natural gas processing Liquefied natural gas storage Liquefied natural gas import and export equipment 	t methane emissions/t natural gas sent to sale	0.05%
<ul style="list-style-type: none"> Onshore natural gas transmission compression Underground natural gas storage Onshore natural gas transmission pipeline 	t methane emissions/t natural gas sent to sale	0.11%

Note: ¹ Only applicable if no natural gas is sent for sale

Source: U.S. Environmental Protection Agency (EPA) (2024)