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POLICY BRIEF

Designing an EU Methane Performance Standard for Natural Gas

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Highlights

- The largest share of methane emissions footprint from EU gas consumption is estimated to come from upstream emissions in countries supplying gas to the EU.
- A methane performance standard on natural gas can be defined for the upstream segments of the gas supply chain using an existing methane emissions reporting framework (OGMP 2.0) and targets and definitions already developed by industry.
- A methane performance standard could take the form of a mandatory requirement that all natural gas sold on the EU internal market meets a benchmark upstream emission intensity value equivalent to 0.2%.
- To cover both imported and domestically produced gas, the point of obligation for a methane performance standard would likely need to be all EU gas shippers.
- To incentivize shippers to conform with the performance standard, they would need to be penalised for the portion of their gas volumes for which the methane emission intensity exceeds the benchmark value.

1. Introduction

Methane is after carbon dioxide the second largest contributor to climate change. The European Commission (EC) has recognized the importance of tackling methane emissions for the EU 2030 climate targets and the 2050 climate neutrality goal. It has, to this end, launched public consultations on a proposal for a legislative act to reduce methane emissions in the oil, natural gas and coal sectors with a final legislative proposal expected in the last quarter of 2021.[1] In its Methane Strategy, the Commission recognised that minimum methane emission standards or other similar incentives in the energy sector can play an effective role in ensuring methane emissions reductions. A methane intensity-based performance standard applied to the upstream segment of the natural gas supply chain from 2025 has also been proposed by part of industry to support the European Green Deal.[2]

The oil and gas sector is considered to be the area with, potentially, the most cost-effective methane emission reductions. Upstream oil and gas operations, in particular, are considered to offer reduction opportunities at very low cost.[3] Furthermore, based on methane measurement studies in the US, the upstream sector is likely a dominant source of emissions in the oil and gas supply chains. Recent studies estimate that methane emissions from the US oil and natural gas supply chain were roughly 13 Tg CH4/year (equivalent to 2.3% of gross U.S. gas production). Production, gathering, and processing sources accounted for roughly 85% of those emissions.[4]

Natural gas is a starting point when discussing how to design incentives to address methane emissions in the oil and gas sector. According to the OGCI (Oil and Gas Climate Initiative) reporting standard, methane emission intensities for both oil and gas assets are calculated as the share of methane gas emitted to the atmosphere in the volume of gas produced.[5] Furthermore, the EU imported roughly a third of all internationally traded natural gas in 2019 and therefore has significant leverage in the global gas market. The largest share of the EU's methane emissions footprint from its gas consumption is also estimated to come from upstream emissions in countries supplying gas to the EU. Carbon Limits estimates that methane emissions in the natural gas supply chain is three to eight times higher before the gas reaches the EU, than within the EU's borders.[6] There are other relevant ongoing studies on the

1. The consultation period will last until 30 April 2021. For more information see European Commission website, consulted on 08/02/2021.

2. These industry recommendations focus on the full supply chain. They also propose that a performance standard should determine how the supply chain is segmented and how – in addition to the upstream segment – the other segments of the supply chain will establish their respective baselines and set their respective targets. see: Methane policy recommendations for the European Union, 8 May 2020.

3. EC (2020) EU strategy to reduce methane emissions

4. R. A. Alvarez et al. (2018), Assessment of methane emissions from the U.S. oil and gas supply chain. Science 13 Jul 2018: Vol. 361, Issue 6398, pp. 186-188. DOI: 10.1126/science.aar7204

5. See Methodological Note For OGCI Methane Intensity Target And Ambition. This reporting standard means volumes of oil produced do not feature in the denominator, and methane emissions are implicitly attributed to the gas commodity even for fields with co-production of oil and gas. By extension, this means that a methane emissions performance standard applied to natural gas as a commodity and based on this industry metric for methane emission intensity would include methane emissions related to oil production and in particular to the emissions from fields where gas has been co-produced with oil.

6. Carbon Limits (2020) Value chain methane emissions from natural gas imports in Europe.

empirical quantification of methane emissions from global oil and gas supply chains.[7]

This Policy Brief focuses, therefore, on how to design an EU performance standard for natural gas to address upstream emissions from oil and gas production for both imported and domestically produced gas.

2. Defining a Metric for the Upstream Methane Emission Intensity of Natural Gas

Good quality data is a precondition for outcome-based regulations targeting emissions performance such as a methane performance standard. The Oil and Gas Methane Partnership (OGMP) recently launched its methane measurement and reporting standard OGMP 2.0. Over 60 participating companies have already committed to following this standard and thereby to increasing the accuracy and granularity of their methane emissions reporting for both operated and non-operated assets.[8]

The UN Environment Programme (UNEP) with the support of the European Commission and the Climate and Clean Air Coalition (CCAC) is setting up an independent International Methane Emissions Observatory (IMEO). This observatory will collect, compare, verify and publish methane emissions data from sources across the globe and be tasked with compiling and publishing them. Once the IMEO is set up the data reported by the OGMP companies would be reported to and be independently verified by the IMEO. Apart from the OGMP 2.0 data and national greenhouse gas (GHG) inventories, IMEO will have, at its disposal, direct measurement data from scientific studies and from satellite observations (TROPOMI and from 2023, MethaneSAT).

The Commission is now considering making measurement, reporting, and verification (MRV) compulsory for all the supply chain: based on the OGMP 2.0 framework. This would include, note, imports of natural gas.[9] Compulsory MRV reporting on gas imports would facilitate the implementation of a performance standard for all natural gas sold in the EU market since the data reported could be used to evaluate compliance and to avoid reliance on a certification system.[10]

The fundamental basis for an emission performance standard is a robust emission intensity metric. The largest share of the EU's methane emissions footprint from its gas consumption is estimated to come from upstream emissions in the countries supplying gas to the EU. We, therefore, here propose to focus the performance standard and associated emission intensity metric on upstream methane emissions, broadly defined as the emissions "from wellhead to point of sale". More specifically, this refers to the emissions in production, gathering, boosting and processing.[11] Initially, an emission intensity standard would likely be the most straightforward to implement for these segments. But this could, at a later stage, for imports be expanded to include shipping and transmission

7. Oil and Gas Methane Science Studies

8. Oil and Gas Methane Partnership (OGMP) 2.0 Framework

9. Climate change – new rules to prevent methane leakage in the energy sector

10. One option for avoiding certification is also if a regulatory equivalence agreement can be established between the EU and a gas exporting country based on a binding methane performance standard for upstream emissions and an MRV methodology and regulation equivalent to the EU's.

11. This follows the definitions used by the industry-led Oil and Gas Climate Initiative (OGCI) for their methane intensity target.

to the EU border.[12] There is another advantage in initially limiting the scope to the point before entry into the transmission system. Transmission emissions are the responsibility of transmission operators who are typically different entities from those responsible for production-related emissions.[13]

The methane emission intensity metric should be in line with the OGMP 2.0 standard and should capture all sources of methane emissions. This includes emissions due to leaks as well as emissions from process venting, and emissions due to incomplete combustion (flaring). To be a useful metric for the methane emissions performance of natural gas imported into the EU, it would need to be specified as units of methane emissions per unit of gas sold by the producer. The metric would essentially be the methane emission intensity of gas sold, where the volume of gas in the denominator would be verified marketed gas volumes.

To make the measurement-based methane emission intensity metric consistent with the units for the IPCC Tier 1 emission factors for natural gas systems, the emission intensity estimates would ideally be expressed in the same unit (i.e., tonnes of methane emissions per million cubic meter of gas). For reference and common usage, these units can be converted (under standardized atmospheric conditions and methane content) to the corresponding emission rates expressed in % (i.e., volume of methane gas emitted to the atmosphere as a share of volume of methane gas marketed). This is the form, at any rate, commonly used in the oil and gas industry.

A choice would need to be made on how to define the scope of the volume of emissions and for the volume of gas for the purposes of the metric. Different options for scope include:

- Asset level: tonnes of methane emissions from specific oil and gas fields (and associated facilities) belonging to the same asset divided by verified cubic meters of gas marketed from the same asset.
- Company level within a country or region: methane emissions from all assets (under operational control and assets within non-operated joint ventures) in a specific supply region/country divided by verified cubic meters of gas marketed from all assets in the region/country.
- Company level: methane emissions from all assets under operational control and assets within non-operated joint ventures divided by verified cubic meters of gas marketed from all assets across all regions the company is active in.

Company level within a supply country or region is perhaps the most attractive option. An asset-based metric has the risk of leading to more emissions by enabling companies to selectively address methane emissions at assets serving markets where gas buyers and policy makers are concerned about methane emissions, while not addressing methane emissions at other assets in their portfolio.

Note that the gold standard ("Level 5") for emission measurement and reporting in the OGMP 2.0 framework is measurement-based methane emission estimates at the site/facility level, reported by detailed

12. The natural gas transport emissions should include emissions from transmission pipelines, storage and the LNG supply segment (liquefaction, loading and unloading, ocean transport and regasification).

13. Furthermore, domestic methane emissions from transmission and distribution inside the EU are the responsibility of the respective system operators and gas distributors. Hence it is best to separately address those mid- and downstream emissions by setting specific emission intensity targets for those segments and pairing that with improvements in the incentives those revenue regulated entities face for addressing methane leaks from their systems. See e.g., discussion in: Hausman and Muehlenbachs (2019) Price Regulation and Environmental Externalities: Evidence from Methane Leaks, Journal of the Association of Environmental and Resource Economists, 6:1, 73-109.

emission source type. Companies need this granular data on their emissions to be able to identify mitigation opportunities. However, for the regulatory purpose of providing incentives for companies to comprehensively address methane across all their assets, an aggregated metric of the companies' methane emissions would arguably be more effective. Ideally, this aggregate metric used for regulatory purposes would be calculated based on the detailed type of site level data described in the OGMP 2.0 gold standard for all relevant company assets.

Another choice is how frequently the metric should be updated. Yearly measurements-based estimates (based on a sampling approach that is representative of methane emissions over the course of a year) would seem sufficiently granular to track progress and would also be consistent with many other GHG emission reporting systems.

For imports from areas with no equivalent MRV in place a default value for emission intensity could be used. This default value would be applied until a mandatory MRV framework based on the OGMP 2.0 framework were implemented. One option for these default values would be to use the IPCC Tier 1 emission factors for natural gas systems.

3. How to Define and Enforce a Methane Performance Standard?

A methane performance standard could take the form of a mandatory requirement: all natural gas sold on the EU internal market must meet a benchmark emission intensity value for the methane emission intensity metric previously specified. To cover both imported and domestically produced gas, the point of obligation (i.e., the market participants subject to the compliance obligation) for a methane performance standard would likely need to be all EU gas shippers, i.e., those entities holding title to the gas transported within the EU gas transmission system. [14]

To incentivize shippers to conform to the performance standard, they would need to be subject to a proportional penalty for the portion of their gas volumes for which the value of the methane emission intensity metric exceeds the benchmark value. This penalty would also apply to gas from companies without an MRV system in place, which are assigned the default emission intensity value.[15]

A relevant reference point for a benchmark value that could serve as a methane performance standard in the EU is the **2025 methane intensity target** of the Oil and Gas Climate Initiative (OGCI). The target is 0.25-0.2% by 2025, and covers all emission sources from operated assets within the upstream sector, including fugitive emissions, and emissions from venting and incomplete combustion. Similarly, the **Global Methane Alliance** also recommends a target intensity of 0.25% or below.

The 0.2% target could be used as the emission intensity level initially required for complying with an EU methane performance standard for the oil and gas industry. For reference, an 0.2% target corresponds to 1.2 tonnes of methane emissions per million cubic meters of gas.[16]

14. In this policy brief, we define a performance standard as a standard that applies specifically to emissions from the upstream segment of the gas supply chain and where the point of obligation is gas shippers. Other definitions of performance standards also exist. The term can for example refer to emission intensity standards where the point of obligation is domestic oil and gas production facilities or other segments of the supply chain.

15. There would also need to be separate "backstop" non-compliance penalties for not complying with the relevant regulations such as penalties for the entities not reporting according to the MRV regulation and for shippers not paying the proportional penalties for buying gas with emission intensity above the benchmark.

16. Based on a 90% share of methane in each unit volume of gas marketed and a methane gas density of 0.671 kg per cubic meter (at 15 degree C and sea level atmospheric pressure).

The target should be dynamic over time so as to incentivize the industry to apply the newest available technological solutions to limit methane emissions.

To incentivize methane mitigation, the ultimate cost to the producer from the penalty passed through from the shipper would need to exceed the cost of emissions abatement. Based on the IEA's 2020 Methane Tracker, 75% of upstream methane emissions would be cost-effective to abate at methane emission prices at or above 600 euro per tonne of methane. Using a Global Warming Potential of 28,[17] this translates to a price of 21 euro per tonne of CO2e.

Another reference point for methane penalties is the tax Norway charges on methane emitted into air from its offshore oil and gas facilities. This tax is currently equivalent to around 1000 euros per tonne of methane,[18] but the Norwegian government has recently suggested increasing this tax as part of a proposal to increase taxes on emissions not covered by GHG emission trading.[19]

Other relevant reference points for methane penalties are estimates of the social damages from methane emissions. In 2016, the Interagency Working Group, appointed by the Obama administration, estimated a social cost of methane (SCM) of 1500 (2020) dollars per tonne of methane emitted in 2020 (IWG, 2016).[20] This is considered a lower bound on the SCM because many climate damage categories are still missing in the integrated assessment modelling used to develop these estimates.[21] The German Federal Environment Agency has instead estimated a significantly higher SCM at around €4800 per tonne of methane emitted in 2016.[22]

A system of tradable certificates is a potential complement to a methane performance standard.[23] The tradable certificates would be generated for each unit of gas with empirically-verified emission intensity below the benchmark value. Demand for these certificates could, for example, be created through an option for EU shippers to buy certificates for each unit volume of gas in their portfolio with methane emission intensity above the benchmark value. This could then be an alternative to paying the proportional penalties for those gas volumes.

The incentive provided through a tradable certificate system would be the additional revenue that gas producing companies could generate by selling certificates for gas produced with emission intensity below the benchmark. This policy option has weaknesses since the companies that are most likely to certify will be the ones that are already doing a good job of managing their methane emissions. In other words, there is a risk of an undesirable selection effect if good performers potentially already meet the benchmark intensity for their gas production without further mitigation. For bad performers, this "carrot" may not provide sufficient incentives for them to change their methane mitigation practices.

17. IPCC AR5
18. Methane Tracker 2020
19. Norway's comprehensive climate action plan
20. Addendum to Technical Support Document on Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866: Application of the Methodology to Estimate the Social Cost of Methane and the Social Cost of Nitrous Oxide
21. Omitted Damages: What's Missing from the Social Cost of Carbon
22. Methodological Convention 3.0 for the Assessment of Environmental Costs. This SCM is based on a GWP of 25 and a social cost of carbon of 190 euro per tonne in 2020-euros.
23. There are already some independent certification system initiatives such as MiQ's standard (consulted on 05/02/2021).

4. Designing a Methane Supply Index

To improve information about the methane emission footprint of fossil energy sources, the Commission has also introduced the idea of a "Methane Supply Index" (MSI). The MSI is "a concept for an indicator that is able to describe and compare the 'methane footprint' of different gas supply corridors from their source to the EU border / the grid that can be applied for both international and domestic gas supply chains, as well as for renewable gas supply chains. The formula(s) for such an index is not yet defined".[24] The MSI would be provided by the IMEO, with the objective of empowering buyers to make informed choices when purchasing fuels. The support for such international initiatives aimed at reductions in methane emissions is one of key priorities of the EU Climate and Energy Diplomacy.[25] Also prof. Stern suggests focusing on the methane emission intensities of export supply chains measured from the point of production to the EU Member States borders, instead of applying a national-level methane supply index.[26]

A potentially useful example for how the MSI could work is the Clean Shipping Index. The CSI is a Swedish initiative, which provides an independent labelling system of shipping vessels' environmental performance. The CSI collects information on a several different pollutants (SOx, NOx, CO2, particular matter as well as chemical, water and waste discharge) and assigns an index score in five different classes based on performances across these environmental dimensions. The CSI is coordinated by a non-profit secretariat and overseen by an independent board with its methodology reviewed by a technical committee of experts and researchers and the data is third party verified. Participation in the CSI is voluntary but shipping companies serving Swedish and Canadian routes are incentivized to participate and share data on their environmental performance. A good score on the index gives access to reduced fairway dues by the Swedish Maritime Administration (SMA) and reduced port fees at several Swedish ports and at two ports in British Columbia.[27]

5. Conclusions

The legislative proposals aimed at the achievement of the European Green Deal objectives could create incentives to reduce global methane emissions. A methane emissions performance standard on natural gas would be a useful first step in this direction. The industry has made a call to introduce such standards from 2025. The recently published consultation on legislation to measure and mitigate methane emissions in the energy sector considers the option of extending obligations to companies importing fossil energy to the EU.[28]

A similar approach could also be applied to coal. Performance standards might include methane

24. Call for tenders ENER/B4/2018-578, "Limiting methane emissions in the energy sector". Please note that independently from the developments in the EU, a few years ago similar efforts were undertaken to compare the GHG emissions through the oil supply chain. For more information see Breaking Down the Barrel: Tracing GHG Emissions Through the Oil Supply Chain.

25. Council conclusions on Climate and Energy Diplomacy - Delivering on the external dimension of the European Green Deal. Brussels, 25 January 2021.

26. J. Stern, Methane Emissions from Natural Gas and LNG Imports: an increasingly urgent issue for the future of gas in Europe. OIES Paper NG 165. November 2020. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2020/11/Methane-Emissions-from-Natural-Gas-and-LNG-Imports-an-increasingly-urgent-issue-for-the-future-of-gas-in-Europe-NG-165.pdf

27. Clean Shipping Index

28. COM(2021) Consultation on legislation to measure and mitigate methane emissions in the energy sector

emissions from the extraction of natural resources and steps might also be taken to include emissions from the transportation of fuels to the EU border. In that way the legislative proposal would cover all of the energy sector.

The legislative proposal could be presented as a part of legislation introducing a Carbon Border Adjustment Mechanism expected in the second quarter of 2021. Alternatively, it might be included as part of the proposal for a legislative act to reduce methane emissions in the oil, gas and coal sectors which is to be finalised by end of this year.

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