International Association of Oil & Gas Producers

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Methane Management in the Upstream Oil and Gas Industry:

Policy recommendations in the context of the EU Methane Strategy

Introduction

The European upstream oil and gas industry shares the world's ambition to reach climate goals in the framework of the Paris Agreement and supports the EU climate neutrality objective by 2050. There are many challenges on the road to meet this objective. The energy transition will require significant investments and behavioral changes, and our industry is ready to contribute to these.

Reaching the climate neutrality objective will require significant reduction of all greenhouse gases (GHGs), beyond carbon dioxide (CO_2) emissions mitigation. Methane (CH_4) is the second most important GHG representing about 10% of total EU GHG emissions in 2017[1], which makes it a source to focus on when it comes to emissions reduction.The upstream oil and gas industry is strongly committed to and has already undertaken a number of steps to minimise GHG emissions, including flaring and venting from its own operations, and to support the mitigation of methane emissions elsewhere along the gas value chain. Oil and gas companies have successfully been working for many years to reduce methane emissions through mandatory and voluntary programmes (including through the World Bank GGFR).

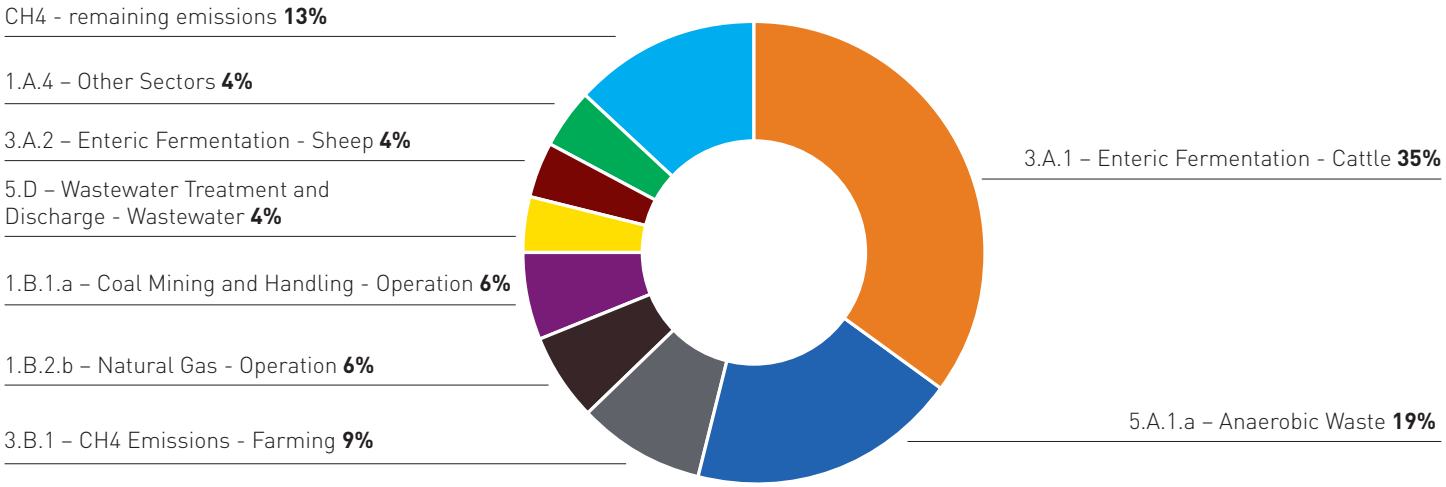
This paper outlines the IOGP (International Association of Oil & Gas Producers) views, including policy recommendations, in the context of the planned EU Methane Strategy. In some areas, the tools of the European gas market – including infrastructure regulation, network planning and sharing of Best Available Techniques (BATs) and equipment - can be leveraged to identify and mitigate emissions from natural gas value chain within Europe.

Why methane?

Methane is the second most abundant anthropogenic GHG after CO_2. Its GHG effect is significantly stronger in the short term, making it more potent than CO_2. However, it has a shorter atmospheric lifespan - on average 8-12 years compared to CO_2 (which persists in the atmosphere for centuries)[2]. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5)[3] estimates that methane is the second largest contributor to total anthropogenic radiative forcing and is equivalent to 58% of the radiative forcing[4] of CO_2. The IPCC AR5, which is recommended to be used, estimates that methane's global warming potential (GWP) is in the range of 28–34 times that of CO_2 on a 100-year timescale[5] and 84-87 that of CO_2 on a 20-year timescale. The ability to lower the near-term rate of global warming through reducing methane emissions provides society with a valuable mitigation option for climate risk management.

[1] Climate change – driving Forces (November 2019), https://ec.europa.eu/eurostat/statistics-explained/pdfscache/9273.pdf
[2] Short-Lived Promise? The Science and Policy of Cumulative and Short-Lived Climate Pollutants, MYLES ALLEN Oxford Martin School, University of Oxford, 2015.
[3] IPCC (2013). Climate Change 2013. The Physical Science Basis. Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). www.ipcc.ch/report/ar5
[4] Radiative forcing, a measure, as defined by the Intergovernmental Panel on Climate Change (IPCC), of the influence a given climatic factor has on the amount of downward-directed radiant energy impinging upon Earth's surface.
[5] The United Nations Framework Convention on Climate Change (UNFCCC) adopted the IPCC AR4 values in 2011. Subsequently, national governments have adopted the same values for consistent reporting to the UNFCCC and also for national regulations.

According to the EEA greenhouse gas inventory for the EU, published in 2018, methane emissions accounted for 11% of total EU GHG emissions in 2016 (457 Mt CO_2-eq), which is a 37% decrease from total methane emissions in 1990[6]. In the EU, the two largest sources of methane emissions are i) enteric fermentation and ii) anaerobic waste. Together, they accounted for 54% of methane emissions **in 2016. In the same year, methane emissions from gas operations represented 6% of the total methane emissions, equivalent to 0.6% of the total EU GHG emissions**[7].



Note: Other is calculated by subtracting the presented categories from the sector total

Figure 1: CH_4 emissions: Share of key source categories and all remaining categories in 2016 for EU-28 and Iceland

Dealing with methane in upstream oil and gas operations

As part of our annual global report "Environmental performance Indicators"[8], IOGP reports the GHG emissions of the upstream oil & gas production sector on a worldwide basis. In order to effectively manage methane emissions, the oil and gas industry identifies the sources of methane emissions through the development of detailed mapping. Within IOGP, methane emissions are classified in the following way:

- **Process vents**: Intentional emissions related to the controlled release of gases directly into the atmosphere resulting from the process design, most typically through a vent pipe, seal or duct[9].
- **Fugitive losses**: Unintentional losses to the atmosphere from leaking equipment (e.g. Valves, Flanges, Fittings).
- **Flare**: Emissions generated by burning of gases (or in some cases liquids) in a thermal destruction device, including E&P flaring of associated gas (and in some cases liquids) from oil production or well testing[10].
- **Energy/Fuel combustion**: Emissions generated through the consumption of fuel[11].
- **Other /Unspecified**: Emissions related to Events/Incidents (e.g., pipeline leak or rupture) or where the reporting company cannot provide a breakdown by category of their emissions data for a given country.

[6] This is based on GWP100.
[7] https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/submissions/national-inventory-submissions-2018
[8] https://www.iogp.org/bookstore/product/iogp-report-2018ee-environmental-performance-indicators-2018-data-executive-summary/
[9] Examples of CH_4 Sources from Oil and Gas E&P activities: Pressure relief vents (i.e., those not directed to flare systems); Process vents (i.e., where not directed to flare systems), potentially including vent gases from natural gas driven pneumatic controllers, natural gas driven pneumatic pumps, compressor seals, dehydration units and gas separation units (e.g. amine units for acid gas removal); Tank Storage (including flashing, loading and unloading, and breathing losses to atmosphere); Produced water treatment; Vessel and Truck/Railcar Loading; Maintenance (compressor blowdowns, etc., if gases not directed to flare); Evaporation ponds (diffuse emissions).
[10] Examples of CH_4 Sources from Oil and Gas E&P activities: Flares, Thermal Oxidizers. For methane, it consists of the methane content resulting from incomplete combustion of flared gas.
[11] Examples of CH_4 Sources from Oil and Gas E&P activities: Turbines (e.g., driving compressors, generators, pumps, etc.), Internal Combustion Engines, Heaters, Boilers / Reboilers.

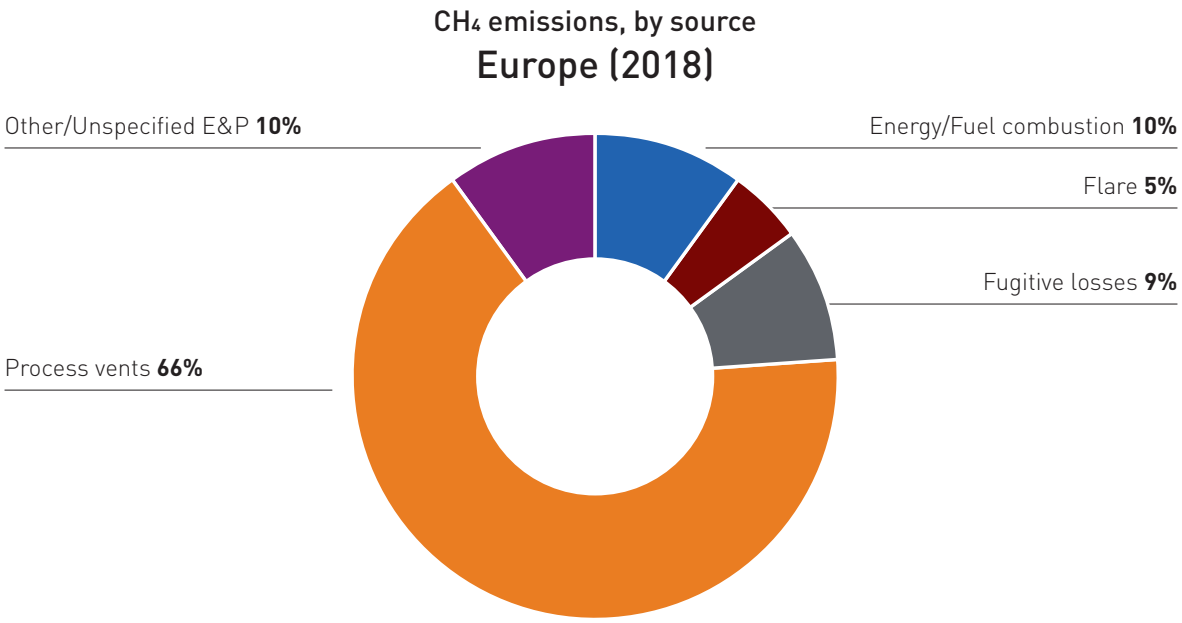


Figure 2: CH_4 emissions: Upstream methane emissions by source in Europe in 2018
Source: IOGP Report – Environmental performance indicators

IOGP data in Europe covers around 83% of the total European oil and gas production. Total European upstream methane emissions in 2018 can be estimated at 109Kt, which if extrapolated to 100%, amounts to 130Kt of methane emissions (Figure 3). As a consequence, in 2018 Europe's average methane intensity was **0.34 tonne CH_4 per thousand tonne hydrocarbon produced**.

There is a difference in the methane intensity between onshore and offshore operations in Europe, with onshore intensity measuring 1.95, while offshore (where operations are much more compact with more dense design of infrastructure) is 0.21.

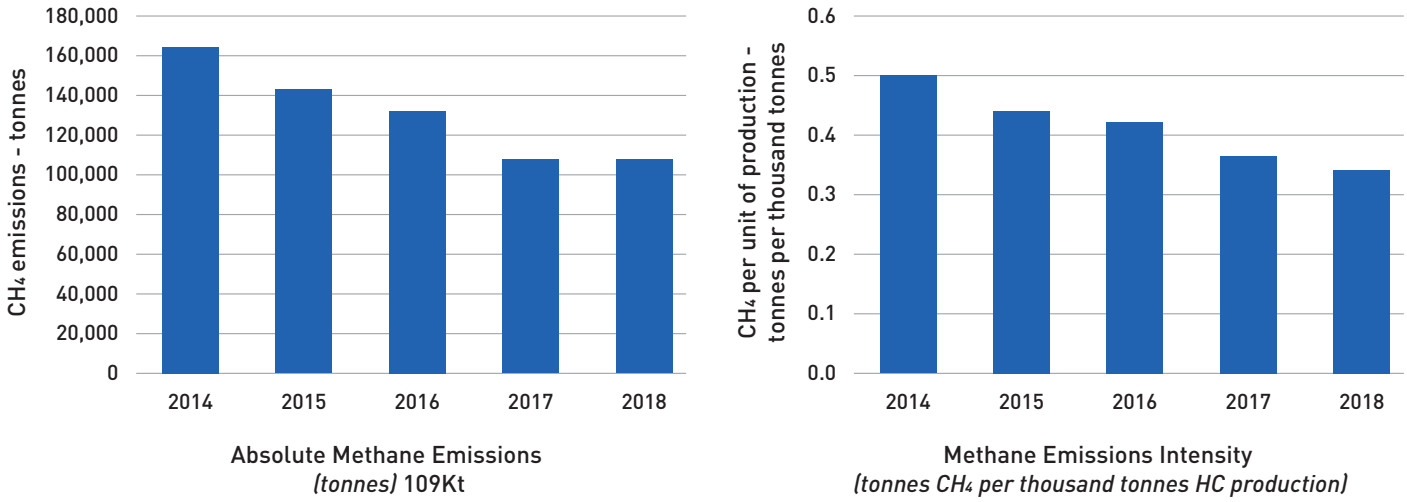


Figure 3: Absolute methane emissions & intensity in Europe in 2018

Incomplete or inefficient combustion in flares, as well as cold vents, are one of the methane point sources on installations. During offshore operations, flaring and venting typically, require consents to be issued by national regulators throughout the project lifecycle, in order to minimise or prevent any unnecessary or wasteful flaring and venting. In Member States that have flaring and venting policies in place, it is the role of Competent Authorities to ensure that flaring and venting requests are technically and economically justified, and that best practices are supported and promoted. When providing

consents, Competent Authorities should consider whether best available technologies and techniques have been considered during the field development planning stage, and whether alternative uses for the gas can be identified. It should be noted that in Europe flaring is a safety critical activity such as well completion, maintenance, and emergency shutdowns.

In Norway, methane emissions have been reduced by avoiding the use of a number of equipment-specific emission sources, e.g. pneumatic devices, chemical injection pumps, and storage tanks without vapour exhaust control, as well as by deploying systems that reroute gas back into the process or send it to the flare[12]. Fugitive emissions are identified and addressed using the "Optical gas imaging (OGI) leak / no leak" method, by which high-sensitivity IR cameras are used to scan for leaks on an annual or semi-annual basis. The results of the OGI leak / no leak method have been verified using a method called "High Flow Sampling" (HFS). HFS measures the flow rate from individual sources and the results indicate that the OGI leak / no leak approach is conservative[13].

Methane Detection

New technologies, such as aircraft, satellite or drone-based measurements, digitalisation, etc., will help to improve methane emissions detection, quantification, measurement and build on the existing methane management efforts that many oil and gas producers have done to date[14]. As the technology develops, such top-down, site-level measurements could be used to reconcile bottom-up approaches. Bottom-up approaches employ source specific methodologies e.g. flow-metering of components, the use of emission factors calculated on the basis of site inventories and/or direct measurement, etc. The bottom-up, source-based approach remains the basis for complying with methane reporting requirements under existing regulation and should therefore remain the key tool by which to achieve regulatory compliance. New data gathered from site-level measurement approaches can be used in combination with source-based emissions quantification, enhancing the overall quality and transparency of available data.

Continuous leak monitoring is implemented on offshore installations for safety reasons and enables quick detection and intervention in the event of larger leaks. The probability of super-emitters on offshore installations is thereby largely eliminated or significantly reduced as a result of such continuous monitoring. Safety inspections, LDAR programmes and other leak detection activities further reduce the presence of smaller leakage. New top-down measurement approaches including continuous, real-time measurement of methane emissions are being developed as part of industry programmes to detect, quantify or measure and reduce methane emissions[15]. Advances in technologies may allow for short and long-distance monitoring approaches with lower detection thresholds and supporting data algorithms to provide complimentary estimates of methane emissions.

Industry in action: what has been done so far?

Oil and gas producers remain strongly committed to, and have already undertaken a number of steps to minimise methane emissions, including from flaring and venting. Many oil and gas companies have voluntarily set emission reduction targets for the next years. Some IOGP members have established methane intensity targets for their upstream operations, typically of around 0.2% of marketed gas volumes.

IOGP member companies also implement Leak Detection and Repair (LDAR) programmes across many of their operations and several participate in the following initiatives:

a) **CCAC OGMP**[16]: The Climate and Clean Air Coalition created a voluntary initiative to help companies reduce methane emissions in the oil and gas sector. The Oil & Gas Methane Partnership was launched at the UN Secretary General's Climate Summit in New York in September 2014. Since the start of OGMP operations, participating companies have avoided 25,000 tonnes of methane emissions over three years: equivalent to removing at least 134,000 passenger cars from the road annually. In January 2020, OGMP members agreed to an updated framework designed to ensure

[12] NEMS, 2019, IEA's Methane Emissions from Norwegian Offshore Oil and Gas Activities.
[13] NEMS, 2019, IEA's Methane Emissions from Norwegian Offshore Oil and Gas Activities.
[14] For example, thanks to the introduction of the optical gas imagining at the Hammerfest LNG liquefaction plant, methane emissions have been reduced by over 80%: https://www.norskeutslipp.no/en/Miscellaneous/Company/?CompanyID=5018
[15] For example, BP deploys continuous methane measurement for new major oil and gas projects.
[16] https://www.ccacoalition.org/en/resources/oil-and-gas-methane-partnership-ogmp-third-year-report

that it fosters and encourages reporting that remains directly connected to strategic action[17]. This improved methane reporting has a performance element that focuses on reduction approaches, technology advancement and policy development, aiding the oil and gas industry in realizing deep reductions in mineral methane emissions over the next decade in a way that is transparent to civil society and governments[18].

b) **OGCI**: The Oil and Gas Climate Initiative (OGCI) is a voluntary CEO-led initiative taking practical actions on climate change. OGCI members leverage our collective strength to lower carbon footprints of energy, industry, transportation value chains via engagements, policies, investments and deployment. The OGCI companies, representing about 30% of global operated oil and gas production set a target to reduce the collective average methane intensity target of their aggregated upstream gas and oil operations to below of 0.25% by 2025, with the ambition to reach 0.20% in the same timeframe[19].

c) **Methane Guiding Principles (MGP)**: The MGP initiative was set up in 2017 to tackle emissions across the entire natural gas value chain. In 2019, masterclasses for Management and Workforce were launched in partnership with the Imperial College London during which the operators share their experience and case studies on the reduction of methane emissions. Additionally, the Best Practice Toolkit was published by MGP. It consists of a set of recommended Guides, Synopses and Tools, which support the uptake and implementation of the Reducing Methane Emissions: Best Practices.

With around 40 signatories, including IOGP, and growing, the Guiding Principles are:

- Continually reduce methane emissions
- Advance strong performance across gas value chains
- Improve accuracy of methane emissions data
- Advocate sound policy and regulations on methane emissions
- Increase transparency

To contribute to the **principle of improving accuracy**, IOGP commissioned a report* comparing the different methane emissions measurement methodologies and emission factors for upstream oil and gas operations proposed by different regulators and countries including the United Kingdom Environmental and Emissions Monitoring System, Norway, Netherlands, the United States Environmental Protection Agency, and Australia. The report aims to help facilitate the understanding of differences in values of emission factors across countries. The largest discrepancies between emission factors methodologies are in relation to combustion with more harmonised emission factor approaches for fugitive leaks and cold venting.

* https://www.iogp.org/bookstore/product/iogp-report-630-comparison-of-methane-reporting-requirements

d) **GGFR**: The World Bank Group has a leadership role in gas flaring reduction through the Global Gas Flaring Reduction Partnership (GGFR), a public-private initiative comprising international and national oil companies, national and regional governments, and international institutions. It is important to consider flaring in the context of methane emission as incomplete combustion at the flare can be a significant source.

e) **Programmes in the US**:

- **Natural Gas STAR & Methane Challenge Programs**: Voluntary programmes established by the US EPA. According to the latest information, in 2017 oil and gas companies that participated in EPA's Natural Gas STAR Methane Challenge Program reduced methane emissions equivalent to nearly 1 million metric tonnes of CO_2.[20]
- **ONE Future** is a group of natural gas companies working together to voluntarily reduce methane emissions across the natural gas supply chain in U.S., with a goal to lower emissions to 1% by 2025.[21]

[17] https://www.ccacoalition.org/en/activity/ccac-oil-gas-methane-partnership
[18] Ibidem.
[19] Methodological-note-for-OGCI-methane-intensity-target-and-ambition https://oilandgasclimateinitiative.com/portfolio/methodological-note-for-ogci-methane-intensity-target-and-ambition/methodological-note-for-ogci-methane-intensity-target-and-ambition/
[20] https://www.oilandgasonline.com/doc/epa-s-methane-challenge-partners-gas-industry-emissions-reductions-0001
[21] https://onefuture.us/

- **The Environmental Partnership**[22] is comprised of companies in the U.S. oil and natural gas industry committed to continuously improve the industry's environmental performance. The Environmental Partnership has developed three separate Environmental Performance Programs for participating companies to implement and phase into their operations beginning January 1, 2018. These programmes were selected based on EPA emissions data and are designed to further reduce emissions of methane and VOCs, using proven cost-effective technologies.

Policy recommendations: What to do to reduce methane emissions?

IOGP supports the development of standards, guidelines and, where appropriate, cost-effective and efficient regulation addressing oil and gas related methane emissions along the value chain. We believe technical and policy dialogue with a wide range of industries will ensure that future proposed measures are workable and effective and will ensure the achievement of near-zero methane emissions in the EU. While voluntary efforts by individual upstream companies are important, they do not on their own drive industry-wide change, and for that, full gas value-chain participation (including imports) is required.

When developing policy frameworks aiming at methane emissions reduction, it should be taken into account that technology to accurately measure methane is – despite some recent progress - in an early development stage and that data on methane emissions is not readily available for all regions, based on different approaches and reporting standards, and is therefore inconsistent across the regions where it is reported. Additionally, It is of key importance to use unified descriptions for the following terms[23]:

TERM	DESCRIPTION
METHANE DETECTION	Can be defined as the **process of identification of methane emissions from potential sources, without the measurement of the mass quantity** (flow rate, e.g. kg/hr). Several devices, screening instruments and methodologies are available to detect methane emissions, including optical gas imaging cameras, laser leak detectors, portable analysers (organic vapor analyser- OVAs, Toxic Vapor Analyzer - TVAs), soap bubble screening and/or AVO methods. Some of these are able to detect and provide a concentration level (volume, e.g. ppmv) that can be used to estimate the mass emission (e.g. by applying specific emission factors or correlation equations available from literature).
METHANE QUANTIFICATION	**Includes methods for determining the size of a methane emission source in terms of customary units of emissions rate, such as mass per time** (e.g. kilograms per hour) or volume per time (e.g. standard cubic metres per hour). This can be accomplished by engineering estimations, direct measurement of the methane source (such as bagging procedures), and from models that use ambient measurements and meteorological data to infer an emission rate ('top-down' or 'bottom-up' approaches).
METHANE MEASUREMENT	**The process of taking a reading of the methane concentration or methane emission rate within an air sample at a specific point in time**. Typical units for a measurement would be parts per million (ppm), parts per billion (ppb) or kilograms per hour. Note that it is important to understand global and local background methane concentrations to contextualize the data. Emissions measurements may be performed as one-time activities, at regular intervals or on a continuous basis, but it is important that the measurements are representative.

[22] https://theenvironmentalpartnership.org/
[23] http://www.ipieca.org/resources/awareness-briefing/methane-glossary/

Taking into account the above challenges in measuring methane emissions, the following policy options are proposed:

a) Methane emission mitigation policies

Mitigation-focused policy mechanisms such as best available techniques (BAT), equipment design standards and technical improvements, as well as working practices standards such as Leak Detection and Repair (LDAR) programmes, have already been implemented in some countries and can be further advanced across the EU in the short-term:

- **For oil & gas production in the EU**: As E&P is regulated at national level, this should be done through working with national legislators and other relevant stakeholders in each producing Member State
- **For regulated natural gas infrastructure**: IOGP recommends that methane emissions, should be brought within the scope of regulated activity, in order that mitigation and repair costs are eligible for cost recovery from National Regulatory Authorities (NRAs). This would require an amendment to the Gas Directive to expand the scope of what constitutes regulated activity as part of network planning.

Under the current gas infrastructure system, transmission system operators (TSO) and distribution system operators (DSO), where these are regulated entities, request authorisation from NRAs before constructing and adding new capacity or implementing operational improvements, such as incremental capacity. However, methane emission detection and repair in relation to gas infrastructure are activities that may fall outside the scope of the allowed revenues of gas infrastructure operators. By enabling infrastructure companies to implement methane emissions reduction programmes as a cost-recoverable activity, the tools of the EU gas market can be extended to methane emissions, thereby helping to deliver a more pro-active, systematic and consistent approach to methane mitigation in the transportation, distribution and infrastructure segments of the gas value chain in the EU. Such a change to the infrastructure funding and network planning rules would also have the effect of establishing methane mitigation as a priority area for DSOs and TSOs, including in their Ten Year Network Development Planning priorities.

It is also important to recognise that TSOs and DSOs possess varying levels of financial and technical capability, potentially reducing the ability of some entities to access new technology or best available techniques. For example, portable compressor units can be - and in some Member States often are - deployed by TSOs and DSOs to capture purged gas following pipeline depressurisation as part of routine maintenance work. Such truck-mounted or portable units – or other examples of methane mitigation technology - could be made available through a sharing platform coordinated by a relevant gas infrastructure body, in order that all relevant gas infrastructure operators have efficient access to these types of techniques and technologies.

b) Improvement of data accuracy and reporting

A robust standard on Monitoring, Reporting, and Verification (MRV) of methane emissions would provide stakeholders with consistency and transparency in the emissions data provided by companies. IOGP regards MRV standard as a vital element in policy frameworks that aim to reduce methane emissions along the natural gas supply chains, including those beyond the EU's borders.

The quality of current emissions data is variable. Differences exist in the way that companies measure and quantify emissions, and greater variety exists in how countries do so, for example in GHG inventory reporting. In order to achieve more consistency, many companies, industry associations, academics, NGOs and other stakeholders are working to develop improvements and consistency in this area:

- The MARCOGAZ pre-standard 'Assessment of methane emissions for gas Transmission and Distribution System Operators' - could become the EU standard for TSOs and DSOs.
- For the upstream oil & gas sector, IPIECA, IOGP and OGCI are starting their work on a common set of industry recommended practices , that may be transformed into standards in the future, on detection and measurement-based quantification technologies.

As technologies continue to evolve and stakeholders continue to understand how to incorporate new types of methane measurements that had not been previously available into methane inventories at the company or national level, methodologies will emerge that can provide more accurate emission information for specific assets or types of assets. The EU institutions could drive toward internal EU consistency and the development of uniform global

consistency as well. Knowing that longer term policy objectives exist should incentivise cooperation by all parties for swift progress. Therefore, we suggest that the EU contemplate the development of a robust MRV standard applicable inside the EU and promotes its use also outside the EU. The scope of the MRV standard may build on the OGMP2.0 (global) scope and approach. This would fit well with the EU Commission's intent to develop an international institute/platform, with other intergovernmental organisations (like the UNEP, the IEA), to develop and execute a consistent standardised approach to detect, measure, report and verify methane emissions applicable to the gas value chain including production, distribution and use. All policies involving third party countries should of course be supported by diplomatic efforts to ensure effective collaboration.

To reduce the administrative and technical burdens on the companies, a single methane emissions reporting framework should be established, as well as a single platform for data collection to increase transparency. In this context, IOGP welcomes the OGMP initiative on the common reporting framework (OGMP 2.0).

c) Improvement of National Inventory Reports

Continuous improvement of national inventories, including by moving to higher tier reporting approaches where appropriate, is key to reducing the data gap on methane emissions and creating a solid basis for methane policies. IOGP believes that improving national inventories for oil and gas methane emissions is key and will benefit from periodic reporting of essential data. Dialogue between companies and national competent authorities is therefore an important means to improve the quality of national oil and gas methane inventories. In this context, we see a role for an institute/platform to improve transparency of information, based on data submitted by the countries and the industry. In this context, development of a set of good practices focusing on national 'inventory reporting' could be considered. The Norwegian NEA reporting framework (updated in 2016) could serve as a good example.

d) Best Available Techniques Guidance or Reference Document

A number of guidance documents covering good practices and Best Available Techniques (BATs) to reduce methane emissions are already available. For example, for the upstream oil & gas sector – the "Best Available Techniques Guidance Document on upstream hydrocarbon exploration and production"[24]. The gas industry, together with the European Commission, could consolidate and develop specific guidance and encourage their uses.

e) Methane Emissions Intensity Incentives

Policy measures which involve the assessment of methane emissions intensity of natural gas supplied into the EU gas system, domestically and internationally require consistent and transparent data on methane emissions. Such data and underlying methodologies are currently lacking for all jurisdictions. The development of such measures may take place in parallel with the MRV standard development.

IOGP believes that, if a methane intensity target-based policy measure was to be contemplated by policymakers, it should aim for incentivising continuous improvement and allow for different levels of performance to recognise different levels of emission reduction, rather than take a binary approach. When standardised methane MRV exists, and if measures addressing the methane intensity of gases are being contemplated, attention should be given to the following aspects:

- Potential methane intensity targets for the gas system should be set per segment of the supply chain to acknowledge operational differences between segments, and data and factors must be independently verifiable;
- The establishment of undue trade barriers should be avoided;
- Any policy measure targeting methane emissions should apply uniformly across all fuels (e.g. coal) to avoid the unintended consequence;
- The complexity and administrative costs of such policy frameworks should be reduced as far as practicable while transparency should be ensured.

[24] https://ec.europa.eu/environment/integration/energy/pdf/hydrocarbons_guidance_doc.pdf

f) International initiatives: a global leader in environmental action

International initiatives focussing on high emission sources can also contribute to methane emissions reductions. As explained above, there are international public-private partnerships and industry initiatives which have already made notable progress. IOGP believes that national and global climate policies can also create important framework conditions for mitigation actions by national authorities and industry. For example, through the establishment of:

- National GHG reduction/intensity targets and related plans for policies and measures to achieve these targets as submitted by national governments as part of the Nationally Determined Contributions (NDCs).
- Market-based mechanisms and climate finance mechanisms which could accelerate mitigation efforts.

Additionally, as a member of the World Bank GGFR, the EU could promote towards third countries the endorsement of the World Bank Initiative "Zero Routine Flaring[25] by 2030". In this context, the Commission should remain active in the global initiatives (such as CCAC and GMI) as they create platforms to exchange the latest information on methane emissions. The success of these initiatives depends on the involvement of governments and companies, and also on the support of development institutions. The Commission could also explore the possibility to join the Methane Guiding Principles.

Collaboration with non-EU countries is key to support them with the improvement of MRV and the mitigation of methane emissions. The upcoming policies should be accompanied by active EU dialogues with the governments of the gas supplying countries.

[25] Routine flaring of gas is flaring during normal oil production operations in the absence of sufficient facilities or amenable geology to re-inject the produced gas, utilize it on-site, or dispatch it to a market. https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030