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Consultation on legislation to measure and mitigate methane emissions in the energy sector

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Introduction

This consultation aims to collect views and suggestions from stakeholders and citizens with respect to a policy proposal for a legislative act to further reduce methane emissions in the energy sector planned for 2021, as announced in the Communication on an EU strategy to reduce methane emissions, adopted on 14 October 2020 (hereafter 'the Communication')[1].

Current policies for non-CO2 emissions are projected to reduce methane emissions in the EU by 29% by 2030 compared to 2005 levels. However, the 2030 climate target plan's impact assessment[2] concluded that stepping up the level of ambition for reductions in greenhouse-gas emissions to at least 55% by 2030 compared to 1990 would also require an accelerated effort to tackle methane emissions. The EU has reduction targets for 2030 for all greenhouse gases, with anthropogenic methane emissions covered by binding national emission reduction targets under the Effort Sharing Regulation (ESR)[3]. However, there is currently no policy dedicated to the reduction of anthropogenic methane emissions from the energy sector.

The specific objectives of the policy proposal are two-fold: i) to improve the availability and accuracy of information on the specific sources of methane emissions associated with energy consumed in the EU, and ii) to put in place EU obligations on companies to mitigate those emissions across different segments of the energy supply chain.

Point i) on improving information relates to the actions outlined in the Communication on the methane strategy on compulsory measurement, reporting, and verification (MRV) for all energy-related methane emissions at company-level, building on the methodology of the existing global voluntary initiative called the Oil and Gas Methane Partnership (OGMP[4]), which covers the upstream oil and gas sectors. As made clear in the Communication, the Commission is actively promoting the widespread implementation of the MRV framework devised by OGMP, considering it the best existing vehicle for improving MRV capability in the energy sector. In addition, the Communication announces that the Commission is working to extend the OGMP framework to more companies in the gas upstream, midstream and downstream (via OGMP 2.0), as well as to the coal sector and closed or abandoned sites.

Point ii) on mitigation relates to the action in the Communication on the methane strategy on an obligation to improve leak detection and repair of leaks (LDAR) on all fossil gas infrastructure, as well as any other production, transport or use of fossil gas, including as a feedstock; and to the action on eliminating routine venting and flaring in the energy sector covering the full supply chain, up to the point of production. The

basis of all policy options to be assessed by the Commission in the area of mitigation will be measures to conduct leakage detection and repair and measures to eliminate routine venting and flaring according to prevailing and emerging best practices, including from industry, across different segments of the supply chain.

Variations in options could be in terms of sectoral scope (thus, going beyond the scope of fossil gas and also including oil, coal and biogas/biomethane) and supply chain coverage (including or not including imports), as well as the types of methodologies and/or some of the key elements of methodologies, such as the frequency of checks, standards, as appropriate.

As also highlighted in the Communication, methane emission standards, targets or other such incentives based on robust scientific analysis can play an effective role to ensure methane emission reductions in the EU and globally. The Communication announces that the Commission will examine all the options available, informed by the work of the foreseen independent international methane emissions observatory - building on the methane supply index, and that in the absence of significant commitments from international partners on methane emissions reductions, the Commission will consider proposing legislation on targets, standards or other incentives to reduce methane emissions from fossil energy consumed and imported in the EU.

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an EU strategy to reduce methane emissions (COM(2020) 663 final) https://ec.europa.eu/energy/sites/ener/files/eu_methane_strategy.pdf

[2] EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF

[3] Regulation, (EU) 2018/842.

[4] 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. https://www.ccacoalition.org/en/activity/ccac-oil-gas-methane-partnership

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frm@iogp.org

* Organisation name

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IOGP Europe

* Organisation size

- (○) Micro (1 to 9 employees)
- (●) Small (10 to 49 employees)
- (○) Medium (50 to 249 employees)
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- Qatar
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- Togo
- Tokelau
- Tonga
- Trinidad and Tobago
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1. Types of instruments

Most jurisdictions with methane-specific oil and natural gas regulations have relied heavily on prescriptive requirements (such as MRV, LDAR or restrictions on flaring or venting) to achieve emissions reductions. An alternative approach to regulating methane emissions in the energy sector is via performance-based requirements, which establish a mandatory performance standard on regulated entities (such as targets set at the level of individual companies for a specific piece of equipment or facility, or a flaring efficiency standard) but do not dictate how the target must be achieved.

In a recent report delivering recommendations on methane regulations[5], the IEA states that while performance-based requirements can produce more economically efficient outcomes, such approaches often require thorough methane estimates or measurements requirements and a developed and robust measurement and reporting scheme. This is particularly the case for performance-based requirements applied at a wide-scale, such as a company-wide or facility-wide performance target. The IEA therefore recommends that prescriptive requirements (such as MRV, LDAR and restrictions on venting and flaring) can serve as a useful first step on the path to more flexible and economically efficient regulations because they are relatively simple to administer for both the regulator and the firms as it is clear what must be done to comply and it is relatively easy for regulators to determine if the standard has been met. The IEA adds that such requirements have the potential for a significant impact on overall emissions but do not require an accurate baseline understanding of the level of emissions or a robust measurement and estimation regime.

[5] Driving Down Methane Leaks from the Oil and Gas Industry: A Regulatory Roadmap and Toolkit, January 2021. https://www.iea.org/reports/driving-down-methane-leaks-from-the-oil-and-gas-industry.

1.1 Do you agree with the policy design approach described above, notably to start off with prescriptive measuring and mitigation requirements in order to establish a robust measurement and reporting scheme, then consider performance-based requirements in a second step?

at most 1 choice(s)

☑ Yes, this is the correct way to develop effective methane regulations in the energy sector.

- [ ] No, this is not the correct way to develop effective methane regulation in the energy sector.
- [ ] Other answer.

Please justify your answer

IOGP supports the development of direct and cost-effective regulation addressing oil & gas-related methane emissions along the value chains. For this reason, IOGP conceptually supports the development of EU MRV regulation based on the OGMP 2.0 framework and the establishment of an International Methane Emissions Observatory (IMEO) which – amongst others - compiles and publishes a methane-supply index at the international level. The implementation of flexible performance-based requirements can only come in the second step once the regulatory baseline has been established.

1.2 Do you consider that prescriptive mitigation requirements, in and of themselves, can be sufficient to drive further decreases in methane emissions in the energy sector in the EU?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

We believe that EU policy should target both, methane emissions prevention and mitigation (including the finding and fixing) to achieve reductions of methane emissions. While achieving transparency about methane emissions is important, transparency in itself does not reduce emissions. A prescriptive mitigation requirement needs to remain flexible to accommodate new technology and innovation. Furthermore, performance-based requirements should be a second step informed by the collection of data under a prescriptive regulation.

1.3 Do you consider that performance-based requirements are necessary to achieve significant methane emissions reductions in the energy sector?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer

Methane emission measurement and globally comparable reporting can be expected to improve over time, given the rapid innovation that the industry is steering. In this context, the implementation of flexible performance-based regulation that establishes overarching requirements on operators is expected to become increasingly feasible in the future. This suggests that any new EU regulatory framework should remain flexible to accommodate such innovation.

1.4 Do you agree that company or facility wide performance-based requirements need a robust measurement and reporting regime to function properly and that they require an accurate baseline understanding of the level of emissions?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

> Company or facility-wide performance-based requirements need a robust measurement and reporting regime to function properly. We believe that given the industry's commitment to improving the understanding of baseline data and technological innovation that such performance-based requirements will be increasingly effective and feasible in the future.

Another type of instrument that could be used to regulate methane emissions in the energy sector in the EU is an economic type of instrument, which induces action by providing a financial incentive, such as a subsidy or a tax deduction. For instance reduced taxes or targeted financial and fiscal incentives have already been put in place in some jurisdictions to stimulate abandoned mine methane projects[6].

[6] Legal and Regulatory Status of Abandoned Mine Methane in Selected Countries: Considerations for Decision Makers. US EPA. December 2018.

1.5 For each of the following sectors, do you think that such instruments should have a part to play to incentivise utilisation of methane in certain specific situations, such as when the incentives are lacking? Please justify your answer.

	Please provide your response here.
Oil	Unclear to the IOGP what 'utilization' means in this context.
Fossil gas	Unclear to the IOGP what 'utilization' means in this context.
Coal	Unclear to the IOGP what 'utilization' means in this context.
Biogas/biomethane	Unclear to the IOGP what 'utilization' means in this context.

Further questions related to the types of instruments are also included in section 3, in the case of a wider scope including fossil energy importers to the EU.

2. Identifying models for an EU regulation on methane emissions in the energy sector

There are many regulations in place across the world which impose specific requirements with regard to methane emissions in the energy sector. Proposals for EU regulations should seek inspiration from tried and tested regulations which are considered as best practice and have delivered significant methane emission reductions over time. The Commission announced in the Communication that it intends to base its legislative proposals on MRV on the methodology of the OGMP, the already existing global voluntary oil and gas industry initiative, considering it the best existing vehicle for improving MRV capabilities of companies in the energy sector. There are however no comparable international or indeed European joint industry initiatives that companies have signed up to which commit those companies (albeit on a voluntary basis) to conduct LDAR campaigns or to limits on venting or flaring.

2.1 Do you support the intention of the Commission to base its legislative proposals on MRV for oil and/or gas on the methodology of the OGMP?

at most 1 choice(s)

- [x] Yes
- [ ] No

If no, please justify your answer

Using the OGMP 2.0 reporting framework as a basis for the development of an EU-wide MRV methodology for O&G methane emissions appears to be a pragmatic approach. Currently, methane emission data are reported under various nationally determined formats possibly using different emission sources, assumptions, and factors when emissions are quantified, therefore a more harmonized approach appears needed and justified. The Commission should drive toward not only European harmonization but the development of global harmonization as well. Therefore, IOGP supports the EU to develop a credible MRV standard in cooperation with key global partners.

2.2 Are there any elements of the OGMP framework which you think the Commission should not replicate in its proposals/any elements not contained in the OGMP framework which the Commission should consider?

Quantification technologies are still emerging and, in some cases, may not be currently sufficient to provide consistent, repeatable results at site / point-source level. Consequently, we deem that in addition to the OGMP level 4 and 5 reporting requirements, EU should make provision for a staged approach taking into account technological developments.

We believe it will be important to avoid any potential conflict of laws between local third-party requirements

and EU legislation. It may therefore be necessary to avoid requiring entities to report data associated with joint venture partners in third countries, as it may be difficult to obtain such data given contractual or local legal requirements or other barriers to data access and/ or publication.

2.3 Are there any other methodologies/standards/voluntary frameworks on MRV relevant to oil and/or gas which the Commission should pay close attention to, and why? Please state.

Some examples of other methodologies, standards, and frameworks are listed below:

1. Existing national systems in the Netherlands, United Kingdom, Norway, and other oil and gas producing the Member States should be considered: E&P companies report already according to national legislation and/or agreements. These systems contain valuable experience over decades. Using such elements will avoid duplication of work. The EC should make sure that national, EU, regional, and international requirements are aligned as much as possible. Diverging obligations will lead to an increased administrative burden for authorities and industry. It also leads to an increased risk of publication of diverging figures on the same type of emissions. That is damaging for the credibility of emission data. OGMP refers to IEA as a reliable source of methane emission data. Industry, including NOGEPA, has noted that the emission data published by IEA deviates significantly from the official reports (assessed and approved by national authorities). There is a need for a common set of emission data, preferably based on official reports from the Member States.
2. Whilst some good practices can be taken from the US (EPA), It is important NOT to draw detailed inferences from the onshore gas market in the US. Whilst heavily regulated the nature of emissions and steps to control them are substantially different from most other producing facilities. Moreover, steps taken to define precise management processes (e.g. method-21) are overly prescriptive on the selection of technology and could be counter-productive in reducing emissions by stifling innovation.
3. There are jurisdictions like the US and Australia that have had GHG reporting (including methane) for many years. There are some nice features of the programs (all reporters having the same requirements, public release of almost all of the data, and very transparent methodologies) that make the systems useful.
4. The Norwegian experience reflects a systematic and comprehensive approach for identifying/detecting, quantifying, reporting, and assessing mitigation opportunities for methane emissions.
5. There is a document called: “International Approaches for Regulating Methane Emissions in the Oil and Gas sector” that relates regulations for Norway, Canada, the United States, and Mexico, including LDAR, which is being taken as the basis for regulation in Colombia.

2.4 Which existing regulations on MRV for oil and/or gas should the Commission also take into account, and why? Please state.

Rather than adapting various EU Member States and international, possibly inconsistent regulations, we suggest that the EU should use OGMP2.0 as a basis to better ensure a coherent framework. However, relevant MRV regulations in EU member states should be looked into when developing an EU-wide MRV regulation. The EU regulation should avoid creating unnecessary complexity and data inconsistency arising from the potential integration of various additional elements from other MRV regulatory frameworks.

2.5 Are there any standards/ voluntary frameworks/ methodologies/ regulations on MRV relevant for coal methane emissions which the Commission should pay close attention to, and why? Please state.

2.6 Are there any industry standards/ voluntary frameworks/ regulations on MRV relevant for methane emissions from biogas and biomethane production which the Commission should pay close attention to, and why? Please state.

2.7 Which existing regulations on LDAR for oil and/or gas should the Commission also take into account, and why? Please state.

1. LDAR is historically a safety-driven activity, and – while of increasing importance - no measures to improve LDAR for emissions control should compromise the safety requirements. Quantification of emissions continues to improve and without accurate quantification, it will be difficult to prove accurate emission reduction benefits through LDAR.
2. The EU best available techniques guidance document on upstream hydrocarbon exploration and production (27 February 2019) provides useful information (e.g. paragraph 16.2, 16.3, 26.2, 26.3).
3. There have been requirements in the US and Federally for LDAR programs at sites for several years. There is the potential to gain insight on what has worked and not worked from those programs. Namely, one of the main critiques of the US Federal program is that it is based on OGI technology and not clear about how new approaches can play into it. Methane detection technology options are expanding due to public and company investment in technology and deployment. Regulations should have the flexibility to adapt to new approaches as they become available.
4. National industry associations such as NOROG in Norway and NOGEPA in the Netherlands have issued relevant guidelines.
5. Law 2018 from the Canadian Ministry of Environment Protection issued the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil & Gas Sector-CAN 2018). The CAN 2018 has two modalities of LDAR programs for Onshore facilities: 1. Regulatory LDAR Program and ii) Alternative LDAR Program.
6. Gas Detection System and Repair of Leaks: Newfoundland/Nova Scotia Offshore Petroleum Installations Regulations (Section 32). It may be interesting because of the experience they already have with regulation and its implementation.

2.8 Are there any methodologies/standards/voluntary frameworks on LDAR relevant to oil and/or gas which the Commission should pay close attention to, and why? Please state.

1. The technological capabilities of accurately quantifying methane emissions continue to improve but no globally harmonized standards currently exist.
2. Member States have legislation in place. In the Netherlands, a dedicated protocol for the determination of methane emissions from all sources - including fugitive emissions - was published in 2018. This protocol was agreed with relevant authorities. Independent offshore emission measurements by TNO revealed that the emissions reported by operators, based on this protocol, match with measurements in the field.
3. The NOROG Optical Gas Imaging (OGI) Leak/no leak document describes an LDAR-like approach that is used specifically as a basis for leak documentation and quantification, as well as emission reductions.
4. The California Regulations says: “The regulation requires regulated entities to take actions to limit intentional (vented) and unintentional (leaked or fugitive) emissions from active and idle equipment and

operations. Finally, its leak detection, and Repair provisions, require daily inspections and quarterly leak testing, as well as its requirements for vapor control and collection system, equipment replacement, and enhanced monitoring and reporting".

2.9 Which existing regulations on limiting venting and flaring for oil and/or gas should the Commission also take into account, and why? Please state.

1. Care needs to be taken in adopting the 98% destruction assumption for flaring. The research upon which this assumption is based is very old (1980s) and does not have modern standards of uncertainty assigned to it. Given that direct measurement of flares is a new area of technology steps should be taken to improve guidance on the application of DE figures.
2. Efforts to stop routine flaring by 2030. No routine flaring has been the premise for oil and gas production at the Norwegian Continental Self since 1971. Oil and gas production at the Norwegian Continental Shelf has been subject to a CO2 tax since 1991 and EU ETS since 2008, which has led to oil and gas production in Norway being one of the regions in the world with lowest carbon footprint. In addition to CO2 tax and EU ETS for flaring, there is a tax on natural gas released to air. This includes direct methane emissions from the production process (venting) and not fugitive emissions (small leakages) (see also question 1.5)
3. The NL mining regulations provide generic regulations on the prevention of emissions from venting and flaring. In the Netherlands, a dedicated protocol for the determination of methane emissions from all sources was published in 2018. A covenant between the Dutch offshore sector and the Netherland's authorities (August 2018) contains quantified reduction targets for offshore methane emissions: -50% by the end of 2020 compared to 2017 emissions.

2.10 Are there any methodologies/standards/voluntary frameworks on limiting venting and flaring relevant to oil and/or gas which the Commission should pay close attention to, and why? Please state.

• Flares and vents are safety features and this should not be compromised when considering new standards. Safety standards should therefore be paramount in any new standards developed.
• Reference materials include GGFR Technical guidance (associated gas utilisation), Zero Routine Flaring as well as Industry best practice guides e.g. IPIECA, IOGP
• Caution as to focusing too much on designing for zero flaring versus risk to safety e.g. fast reacting valves, auto-ignition systems
• The World Bank Global Gas Flaring Reduction Partnership (GGFR) and the Methane Guiding Principles are examples of voluntary frameworks that have very good knowledge and experience working with reductions of flaring and methane emissions. GGFR, in collaboration with IOGP and IPIECA, are currently revising their Flaring Management Guideline, expected to be finalized before the summer of 2021. While the GGFR facilitates flaring reduction activities, the "Zero Routine Flaring by 2030" Initiative sets clear targets for the future.
• IOGP – OGCI – IPIECA Recommended practices for Methane Emissions Detection and Quantification Technologies Task Force, project underway.
• The approach in the Netherlands covenant mentioned in 2.9 entails a platform-specific approach, focusing on the most cost-effective measures, thus yielding the largest emission reductions. This approach has proven very successful. NB: Here definitions are of crucial importance. E.g.: what is the definition of routine flaring and venting? What sources and/or events are in/out of scope of this definition? The EU guidance document also provides useful information.

Example of Industrial Standard with more quantification:

1. New design: Provide equipment/facilities to export, re-inject or use the produced associated gas. (Applies to Major Installations, Sources and projects that extract associated gas equivalent to more than 10,000 tones of Carbon Dioxide equivalent (CO_2e) per year, if this gas were flared).
2. Modify existing: to less than 10,000 tones of CO_2e per year; or - less than 1% by mass of hydrocarbon throughput; or As Low As Reasonably Practicable (ALARP). (Applies to Major Installations, Sources and projects, where: Flaring And Venting Intensity exceeds 1% by mass (mass of hydrocarbon flared and vented /mass of hydrocarbon throughput); and combined Flaring And Venting exceeds 10,000 tones of CO_2e per year). Exceptions: flare pilot gas, vent purge, flaring or venting required for start-up and shut-down, emergency releases, well flow test conducted as part of exploration or appraisal to gather field data to a maximum of three months.

2.11 Are there any methodologies/ standards/ voluntary frameworks/ methodologies/ regulations on mitigation of coalmine methane emissions which the Commission should pay close attention to, and why? Please state.

2.12 Are there any methodologies/ standards/ voluntary frameworks/ regulations on mitigation of methane emissions from biogas & biomethane production which the Commission should pay close attention to, and why? Please state.

3. Sectoral, emissions and supply chain coverage and/or scope

Sectoral scope

Other than the methane emissions occurring at the various stages of the oil and gas chain (as included, and described below, in the OGMP scope), other significant or non-negligible direct sources of methane emissions in the EU energy sector and which can clearly be attributed to specific activities include methane emissions from coal production and from biogas production/biogas upgrading into biomethane. For this reason, the Commission intends to assess the case for including those areas of the energy sector in its policy proposals on both MRV and methane emissions mitigation.

3.1 Are you supportive of the intention of the Commission to assess the case for including coal in its policy proposals on MRV?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

The inclusion of coal in MRV would allow creating a level playing field across the European energy sector. IOGP supports the development of standards, guidelines, and, where appropriate, cost-effective, and

efficient regulation reducing methane emissions along the full energy (gas and oil, coal, and biogas/bio-methane) chains.

3.2 Are you supportive of the intention of the Commission to assess the case for including biogas/biomethane in its policy proposals on MRV?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

The inclusion of biogas/ biomethane in MRV would allow creating a level playing field across the European energy sector. IOGP supports the development of standards, guidelines, and, where appropriate, cost-effective, and efficient regulation reducing methane emissions along the full energy (gas and oil, coal, and biogas/biomethane) chains.

3.3 Are you supportive of the intention of the Commission to assess the case for including coal in its policy proposals on methane emissions mitigation?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

Methane emissions from coal mining operations are significant and justify mitigation. IOGP supports the development of standards, guidelines, and regulation reducing methane emissions along the full energy (gas and oil, coal and biogas/biomethane) chains.

3.4 Are you supportive of the intention of the Commission to assess the case for including biogas/biomethane in its policy proposals on methane emissions mitigation?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

IOGP supports the development of standards, guidelines and, regulation reducing methane emissions along the full energy (gas and oil, coal and biogas/biomethane) chains.

3.5 Are there any other forms of energy which you think that the Commission should consider including in its policy proposals on MRV? Please state and justify your answer.

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

3.6 Are there any other forms of energy which you think that the Commission should consider including in its policy proposals on mitigation of methane emissions? Please state and justify your answer.

While the initial OGMP voluntary initiative framework that the Commission has committed to basing its MRV obligations on exists for oil and gas upstream, the new OGMP framework (OGMP 2.0[7]) which was launched in October 2020 has an extended scope. Specifically, the new framework includes all segments of the oil and gas sector where “material” quantities of methane can be emitted. This includes upstream exploration and production, gathering and processing, liquefaction and regasification terminals, gas transmission, underground gas storage and distribution (gas downstream). This includes all assets and facilities along the gas value chain as well as oil exploration and production facilities where associated gas is co-produced, whether used, marketed or re-injected.

[7] Mineral Methane Initiative OGMP 2.0 Framework” https://ccacoalition.org/en/files/ogmp-20-reporting-framework-finalpdf

3.7 Do you consider that the scope of the EU regulation on MRV as regards oil and gas should at least cover the same scope as OGMP 2.0?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

We note that end-user appliances do not fall under the scope of OGMP 2.0 but are and/or should be covered by separate standards and regulations. In addition, we believe that mandatory reporting of emissions of joint venture partners outside the EU jurisdiction might not always be achievable in the EU MRV given the potential local legal/ contractual challenges related to access of data. If mandatory reporting requirements of emissions of joint venture partners outside the EU nevertheless be contemplated, sufficient lead time and appropriate flexibility should be provided for companies to adapt.

3.8 Do you consider that the framework of OGMP 2.0 could serve as a good basis for developing obligations for MRV in the coal sector?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

In order to ensure better comparability and harmonisation of methane emission reporting data between different energies, we believe OGMP 2.0 should be the basis when developing EU MRV regulation for all energies.

3.9 Do you consider that the framework of OGMP 2.0 could serve as a good basis for developing obligations for MRV in the biogas/biomethane sector?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

In order to ensure better comparability and harmonization of methane emission reporting data between different energies, we believe OGMP 2.0 should be the basis when developing EU MRV regulation for all energies.

Scope of emissions

The OGMP 2.0 framework applies to direct emissions of methane that occur from sources that are owned or controlled by the reporting company (also called scope 1 emissions as defined by the GHG Protocol Corporate Standard). The OGMP 2.0 framework does not cover end users. For example, methane emissions associated with oil refining and chemical manufacture (both considered by the OGMP methodology as ends users) as well as gas end use are currently not within the OGMP framework reporting scope.

3.10 Should the scope of the policy proposals on methane extend coverage to end users?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer

We note that end user appliances do not fall under the scope of OGMP 2.0, but are and/or should be covered by separate standards and regulations, such as industrial emissions directive.

Methane emissions can be categorised into three scopes. Scope 1 covers direct emissions. Scope 2 emissions (which are indirect emissions from the generation of purchased energy consumed by the reporting company) and scope 3 emissions (includes the indirect emissions resulting from the consumption and use of the reporting company's products) are not within the scope of the OGMP 2.0 framework. Scope 1, 2 and 3 emissions together cover the total emissions from a company's activities.

IPIECA (the global oil and gas industry association for advancing environmental and social performance) recommends the GHG Protocol scope 3 standard[8] to companies in the oil and gas industry wishing to report scope 3 emissions, advising that category 11 'Use of sold products' is the most relevant to the oil and gas industry and noting that there is a growing stakeholder interest related to scope 3 disclosures[9] . Some oil and gas companies are already reporting scope 3 emissions voluntarily.

[8] GHG Protocol establishes global standardized frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions. https://ghgprotocol.org/standards/scope-3-standard

[9] IPIECA Sustainability reporting guidance for the oil and gas industry, March 2020.

3.11 Would you consider the Greenhouse gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard as an appropriate standard to serve as basis for EU legislation for scope 3 methane emissions?

at most 1 choice(s)

- ☐ Yes
- ☑ No

If no, why not, and which alternative standard could be considered?

• Corporate and governmental emission counting have different purposes, if people wish to consider corporate accounting there is guidance available such as IPIECA-API document on scope 3 emissions.
• Scope 3 emission factors from this source generally rely on emission factors associated with high level amounts of products sold and are not tracking the flow of products through the value chain. Scope 3 methane emissions under this protocol would be de minimis. In theory, the Scope 3 emissions from say a gas transmission company should be covered by the Scope 1 emissions from the distribution companies receiving the gas or the end-users of the emissions.
• Scope 1 emissions (assuming wide sectoral coverage) should result in governments receiving complete supply chain information within areas under their jurisdiction.
• While scope 3 CO2 emissions can be relatively easily calculated based upon product types and the physics of combustion; methane emission (associated with e.g., use of sold products, i.e., final combustion) cannot be estimated in this way.

3.12 In which end-use sectors do you consider that better information on methane emissions is necessary?

- ☐ Industry
- ☐ Power generation
- ☐ District heating
- ☐

Transport (e.g. maritime, please specify below)

- [ ] Residential
- [ ] Other

Please provide details if possible.

3.13 On which of the following appliances below do you think that better information on methane emissions would be welcome?

- [ ] Gas turbines
- [ ] Gas engines
- [ ] Gas boilers (industrial)
- [ ] Gas boilers (residential)
- [ ] Other, please specify below

Please provide details if possible.

3.14 Are you aware of national requirements (measurement and/or mitigation) regarding methane emissions from the following appliances?

- [ ] Gas turbines
- [ ] Gas engines
- [ ] Gas boilers (industrial)
- [ ] Gas boilers (residential)
- [ ] Other, please specify below

Please provide details if possible.

3.15 Should the provision of information on expected methane emissions by end-use appliances be mandated from manufacturers?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer

3.16 For power generation, should methane emissions be part of the emission threshold for generation under capacity market mechanisms?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer

Including exporters to the EU in the scope

The Communication highlights that the external carbon or methane emissions associated with EU fossil gas consumption (i.e. the emissions released outside the EU to produce and deliver fossil gas to the EU) are between three to eight times the quantity of emissions occurring within the EU. For oil, possibly even more of the emissions linked to oil consumed in the EU are occurring outside of the EU borders given that the largest share of methane emissions in the oil sector are occurring in the upstream segment whereas the largest share of methane emissions in the fossil gas sector are occurring in the downstream segment.

This means that if the EU wants to include in the scope of its regulation all of the methane emissions linked to its oil and gas consumption, it must consider either imposing obligations directly also on exporting companies of gas and oil to the EU or it could obligate importers of gas and oil into the EU. For instance, it could be examined whether obligations on MRV, LDAR and venting and flaring could somehow be extended to cover exporting companies of oil and gas, or even all fossil energy, to the EU.

3.17 Do you think that EU legislation on methane emissions in the energy sector should extend obligations to companies importing fossil energy into the EU /companies exporting fossil energy to the EU?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

IOGP supports a robust MRV standard for methane emissions as a vital element in policy frameworks that aim to reduce methane emissions along the supply chains, including for companies importing energy from third-party jurisdictions.

Complementing regulation, IOGP also supports targeted diplomatic EU outreach aiming to achieve ambitious methane emission reduction in countries supplying the EU with natural gas. Increased transparency about (major) international methane emission sources may effectively support significant methane emission mitigation actions in these countries.

3.18 Specifically, do you think it is feasible to impose the same obligations on MRV, LDAR and venting and flaring equally on all actors of the oil and gas value chain for oil and gas consumed in the EU, including actors from outside of the EU?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

This would be desirable but appears not to be feasible within the short/mid-term. EU should push for, and be able to recognize the equivalence of regulatory regimes designed in other states. For this reason, IOGP conceptually supports the establishment of the IMEO.

In this context, and with reference again to performance-based requirements (see previous section) the Communication states that in the absence of significant commitments from international partners on methane emissions reductions, the Commission will consider proposing legislation on targets, standards or other incentives to reduce methane emissions from fossil energy not only consumed but also imported into the EU.

3.19 Would you be supportive of EU legislation imposing performance requirements on companies exporting fossil energy to the EU?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

If performance-based policy requirements were to be imposed on companies with regards to their methane emissions along the value chain up to the wholesale level, then such requirements would have to be equally imposed upon companies who operate outside the EU along the same segment and export gas into the EU.

Accurate methane emissions data on a global scale are scarce and therefore it is first and foremost important to agree upon a robust MRV that standardises the way to quantify, report and verify methane emissions.

When contemplating the development of performance-based policy requirements multiple issues need to be considered, including the design of an appropriate implementation framework for possibly adapting existing long-term supply agreements. Performance-based instruments need to target those players in the value chain who have control over the methane emissions of the product being exported/imported. For example, gas importers under existing supply contracts do not have any contractual leverage to reduce the methane emissions along the value chain.

Another means of incentivising methane emissions reductions from fossil energy imported into the EU which could either work in addition to extending MRV, LDAR and venting and flaring regulations to exporters or in isolation, could be to use market transparency tools which provide information on important

emissions sources from around the globe, developed using available information from technologies that can provide accurate estimations or measurements of methane emissions such as satellite data, as well as emission data from bottom-up sources, such as inventory data.

The Communication highlights the contribution of the EU's Copernicus programme for earth observation towards improved indirect air surveillance and the monitoring of methane emissions, and suggests that Copernicus could contribute to an EU-coordinated capability for detecting and monitoring global super-emitters, which refer to a specific site or facility with disproportionately high-emissions for a site or facility of that kind. Globally, 5% of methane leaks in the coal, oil and fossil gas sectors contribute 50% of the energy sector's emissions. Satellite technology is key to identifying these hotspots and guiding leak detection and repair on the ground as well as reconciling bottom-up data from company reporting.

The Communication also highlights that when launched in 2025, the Copernicus CO2-monitoring (CO2M) mission, which involves a constellation of three satellites, will support the identification of smaller and more prevalent sources of emissions.

The government funded International Methane Emissions Observatory, which the European Commission is currently in the process of setting up together with the United Nations Environmental Programme (UNEP), the Climate and Clean Air Coalition (CCAC) and the International Energy Agency, will be tasked with collecting, reconciling, verifying and publishing anthropogenic methane emissions data at a global level. It will also be tasked with compiling and publishing a methane-supply index (MSI) at EU and international level, composed using existing and reported data from countries' emissions inventories as well as satellite data and, in time, global data processed and published by the IMEO. The intention with this MSI would be to empower buyers to make informed choices on the methane intensity of fossil energy sources before the purchasing decision.

The MSI developed by the IMEO would be an example of such a market transparency instrument.

There seems to be an increasing need for such instruments, as interest in the environmental credentials of fossil energy companies increases, in particular as regards oil and fossil gas, in order to determine what role they could play in the transition towards carbon neutrality. There are recent examples of such an interest, specifically regarding the methane intensity of certain sources of fossil gas.

How such information could be used would then have to be explored. At the very least, coupled with data on imports of fossil fuels into individual Member States, it would allow purchasers, governments, citizens and consumers to have transparency on the methane intensity of fossil fuel imports, and would likely incentivise markets for low methane intensity fossil energy. At its most extreme, it could form the basis for conditioning imports of fossil energy into the EU according to a certain methane intensity. The widespread publication and recognition of such data could act as a strong incentive for operators to put in place effective regulations and to reduce their methane emissions.

Readings from Copernicus Sentinel 5P satellites of methane concentrations from across the globe are currently being processed to identify large sources of emissions such as from oil, gas and coal operations, and the results are being published in the media. This recently revealed for instance that the number of large methane leaks from the oil and gas industry globally rose by nearly a third in the first eight months of 2020[10]. Providing a platform for public access to such sources information, such as via the future web-

site of the IMEO, in cooperation with satellites and data processing firms, and an instrument such as the MSI enabling purchasers of fossil energy to make more informed choices, could be considered very useful [11].

[10] https://www.reuters.com/article/us-climate-change-energy-methane/despite-green-plans-energy-sectors-methane-leaks-are-up-kayrros-idUSKBN26Z1DA

[11] Other transparency tools exist. For instance, the Canadian State of Alberta publishes an annual report that includes a list of oil and gas operators ranked by their flaring and venting emissions.

3.20 Are you generally supportive of the development of such methane transparency tools and the announced intentions of the Commission in this area, regarding the setting up of the IMEO and the development of a methane supply index?

at most 1 choice(s)

- [x] Yes
- [ ] No

If no, please justify your answer

3.21 How prominently do you think that such transparency tools should play a role in the future?

at most 1 choice(s)

- [ ] They should play a central role, and be the key instrument to provide the energy sector the incentives to reduce their methane emissions;
- [ ] They should play a role alongside and together with obligations on MRV, LDAR and limits on venting and flaring on exporters of fossil energy into the EU;
- [ ] They should play a role together with methane intensity standards on exporters of fossil energy into the EU;
- [ ] They should play a key role, alongside both prescriptive and performance based requirements on exporters of fossil energy into the EU;
- [ ] They should play no role.

Please justify your answer

IOGP supports increased transparency of methane emissions along the value chain. However, consistent and harmonized measurement, quantification, and validation of methane emissions along the value chain are a necessary basis upon which the development of performance-based measures can be contemplated.

4. Legislating on leakage detection and repair

Fugitive (unintentional) leaks represent one of the main sources of methane emissions from the gas and oil sectors.

It is widely considered that the main mitigation strategy for reducing emissions from fugitive methane leaks from pressurized equipment used in the oil and gas industry is a leakage detection and repair (LDAR) program.

Key elements of LDAR programs of importance for devising LDAR regulations are widely considered to be:

1. Instruments used for leak detection;
2. Frequency of LDAR campaigns;
3. Quantification of emissions;
4. Leak repair considerations, such as time taken between leak detection and repair.

4.1 Are there any other elements which should be considered key elements of LDAR programmes of importance for devising LDAR regulations?

at most 1 choice(s)

- [x] Yes
- [ ] No

If yes, please justify your answer

• LDAR programs have historically been developed to address safety requirements; emissions control requirements – while increasingly of high importance - should not compromise such safety requirements. Technology to accurately quantify methane emissions is improving rapidly but no global standards currently exist.

Directed Inspection and Maintenance (as per OGMP TGD #1) moves the focus on LDAR to one that is an approach where there is both flexibility and targeting of the surveys i.e. do more inspections where the survey results highlight more leaks - and less elsewhere.

Be technology agnostic (subject to minimum standards/quality) - this supports innovation.

Accuracy and quantifying is less important than finding and fixing (amount helps prioritizing).

The ability to fix a leak quickly may be dependent on a number of factors so should again set broad expectation when determining the success of a program.

• A risk-based approach should be a main pillar of LDAR, both onshore and offshore. Particularly in the context of offshore operations, where a number of continuous barriers are in place, we recommend such a risk-based approach, meaning that those areas with a higher risk of leaks should be checked more frequently. In an offshore context, high frequency is annual, while low-risk areas could be subject to every third year. Campaigns need to be performed outside of -stormy seasons with trained personnel. All leaks need to be logged as small leaks can develop to larger ones, and this has to be monitored.

• Quantification of emissions is not typically an element of LDAR programs worldwide. Quantification as an element of LDAR programs typically delays the repair of leaks and hence should be an element of distinct, separate MRV programs/activities. The accurate quantification of methane emissions typically requires different measurement equipment and differently trained staff than for LDAR programs. Existing LDAR programs require fixing leaks that are either visible on OGI cameras on the camera's typical setting or exceed a concentration threshold.

One element of an LDAR program that is missing here is verification that leak repairs are effective.

• The definition of fugitive emission needs to be specified. Unintentional leaks can be fugitive, but not all are. In NL, the definition of "fugitive emissions" is related to whether an emission is channeled or not. Again, what emissions/events are in/out of the scope of the definition of fugitive emissions? Under this NL definition, the contribution of fugitive emissions is very low in NL. If "leaks" are so high as stated, the site cannot be safe. In practice, if a seal really starts to leak due to a failure, the gas detection will pick it up and the plant will shut down automatically. LDAR is there to support the quality of the maintenance and to determine which equipment has the best performance, but over the last decades it did not contribute significantly to emission reduction.

LDAR should be risk-based: the most attention should be focused on those sources/installations where the risk of emissions are highest.

Definitions are important:

Leak Detection and Repair (LDAR) is a program that identifies - unintended - fugitive emissions from equipment in an oil and gas, chemical, or petrochemical installation.

What's included:

Unintentional releases of natural gas (≥10 wt.% methane). Unintentional releases of any hydrocarbon streams (with ≥10 wt.% volatile organic compounds). Intentional releases (as per equipment design) of natural gas and hydrocarbon vapors in excess of normal operating specifications (e.g. due to component failure, malfunction, or excessive wear and tear).

What's excluded:

Intentional releases (as per equipment design) of natural gas and hydrocarbon vapors within their normal operating specifications – this is venting. Releases of non-hydrocarbon gases (e.g. instrument air, steam, water vapor, N2, CO2).

• Definition of a fugitive equipment leak threshold, Sampling size, Flow rate are all important features.

• It could be useful for companies to have a best practice guide for LDAR programs, with some indications of best practices around Safety, monitoring technology, component identification, monitoring schedule, etc.

Instruments used for leak detection

While there are many instruments used for leak detection in the oil and gas industry, the use of optical gas imaging (OGI) cameras has become common. These are infrared imaging devices with optics, filters and cooled sensors made specifically for detecting methane which are used at close range during inspections carried out on foot. These devices produce an image that allows an otherwise invisible plume of leaked gas

to be seen. Several types of these cameras are available with different minimum detection capabilities. OGI devices have become the standard leak detection device used by the regulatory LDAR programs required in North America in the upstream and midstream (i.e: gas processing plants) segments and are also recognised by many other jurisdictions [12][13]. In some jurisdictions, OGI cameras are equally recommended both in offshore and onshore facilities.

Other portable leak detectors such as Flame Ionisation Detectors are also sometimes used and allowed in regulations but tend to be used much less for a number of reasons[14].

Methane detectors more sensitive than OGI cameras are usually used in downstream industry segments because distribution system leaks are often smaller, and generally below the OGI detection threshold[15]. For small leaks, ultrasound detectors are recommended in some jurisdictions.

While close-range instruments using handheld Instruments are indispensable for identifying and documenting component-level fugitive sources, they are relatively labour intensive. Rather than relying exclusively on handheld instruments, regulations in Canada and the US are moving towards the integration of screening technologies. For instance, fixed sensors, mobile ground labs, unmanned aerial vehicles, manned aircraft and satellites, which until now have been used for research-based applications and for monitoring other air pollutants are gaining interest as tools for LDAR[16].

[12] Potential ways the gas industry can contribute to the reduction of methane emissions, Report for the Madrid Forum (5 - 6 June 2019)

[13] Methane Guiding principles: Reducing Methane Emissions: Best Practice Guide on equipment leaks, November 2019

[14] Methane Guiding principles: Reducing Methane Emissions: Best Practice Guide on equipment leaks, November 2019

[15] Methane Guiding principles: Reducing Methane Emissions: Best Practice Guide on equipment leaks, November 2019

[16] A review of close-range and screening technologies for mitigating fugitive methane emissions in upstream oil and gas. Thomas A Fox et al 2019 Environ. Res. Lett. 14

4.2 Should EU legislation on LDAR include the type of device to be used for detecting leaks?

at most 1 choice(s)

- ☐ Yes
- ☑ No

Please justify your answer

• No, it should specify the sensitivity threshold and define the quality standard. We prefer to follow an outcomes-based strategy in which performance standards are defined (limits of detection etc.) but technology is not. Limiting technology choices has the potential to stifle future innovation. It is incumbent upon new technology to demonstrate equivalency to existing system performances based on outcomes – e. g. moving rapidly between sites may reduce sensitivity but increase response time to larger emissions, thus lowering overall methane losses. LDAR needs will vary for different types of assets; this would get too complicated/prescriptive
• We would suggest that the program be based largely on performance-based outcomes and not prescriptive tools. The alternative technology program run by USEPA and states implementing the Clean Air Act in the US slow innovation. Operators should be encouraged to adopt innovations, so the program should limit how prescriptive it is and allow for flexible pathways to demonstrate or evaluate innovation.
• European legislation should be technology-independent. The type of device can easily be outdated since

there is an incredible development among instruments and devices. In addition, different parts of the value chain may require different technologies. (e.g for refineries screening technologies are preferred, to cope with a large number (>100 000) of potential leak sources.
• Regulations should be goal setting and allow for innovation rather than prescribing methods that shall be applied. The NOGEPA methane protocol lists methods for each source and puts them in the order of preference. This contributes to the comparability of results, without dictating methods to be applied. Thus, it avoids the application of methods in the field which, under specific circumstances, are not suitable for a source. NL experience has shown that the strategy for quantification of leaks depends on specific circumstances on an installation/leak source. It should be left to experts to determine what method is applied for specific leaks. Prescribing specific methods could lead to inefficient, costly, and/or unreliable quantification of sources, that could have been assessed much better if other methods would have been applied. Technology, despite recent progress, is in the development stage and is therefore not readily consistently available for all regions.
• The technology is in permanent innovation, we think it does not apply, maybe some kind of guideline on the expected result from the device for detecting leaks could guide on the type of technology to use from the companies.

4.3 Among the following devices, which should be recommended as the devices of choice in the following sectors and to what extent? – specify:

1. For highly recommended,
2. For recommended depending on the type of leak or other factor,
3. Not appropriate

	Production	Processing	LNG terminals	Transmission pipelines	Transmission compressor stations	Underground storage	Distribution pipelines	Distribution pressure regulating and metering stations
Optical gas imaging								
Flame ionisation detectors								
Ultrasonic detectors								
Fixed detectors								
Soap spray /soap bubble screening								
Bagging								
High flow sampler								
Mass flow meters								

Laser detectors								
Catalytic bead sensors;								
Semiconductor detectors								
Electrochemical detectors								
Cavity ring down spectroscopy								
Radial plume mapping								
Mobile gas chromatography								
Tracer gas release								
Mobile ground labs								
Unmanned aerial vehicles								
Manned aircraft								
Satellites								

Other (please specify)

We do not support using a table of this kind, because:

• Satellites can only detect high levels of methane emissions, that is not LDAR where the leak rates are much lower additionally satellites over the sea do not work properly. In cooperation with KNMI, it was determined that no methane emissions from Dutch offshore installations are detected by means of satellites. Since fugitive emissions are only a small fraction of the total methane emissions, satellites will not be suitable for detecting fugitives. Any CH4 emission that would be picked up by a satellite would clearly be caused by an incident. Again, any regulations on devices should allow for innovation and developments. Perhaps, the EU could develop a BAT document, which will be updated on the basis of developments.
• The technologies mentioned include technologies that may be relevant for measurement, but which would not be used for detection. It is very important to differentiate between technologies that can be used to detect emissions, to measure emissions or to detect and measure emissions. Bagging and HFS would, for example be used to measure emissions that were identified with Flame ionization detectors or optical gas imaging or soap bubbles but bagging and HFS would typically not be used to detect.
• Different technologies will be used as part of an LDAR campaign as opposed to the identification of e.g super emitters. For example, an IR camera is appropriate for identifying a fugitive leak from a valve, whereas a satellite might allow for the identification of emissions from an unignited flare. But a satellite would never be used to detect a fugitive leak from a valve.
• While some technologies can be highly recommended, they may only be useful in very specific frame conditions (e.g satellites need clear skies (no cloud cover) and have very limited capabilities for methane detection above oceans).
• Not all of the items in this list are “devices”. List should not be considered exclusive.

Frequency of LDAR campaigns

The frequency of LDAR campaigns is an important determining factor for reducing fugitive emission. The more often they are carried out, the lower the release of fugitive emissions[17]. According to the Methane Guiding Principles[18], the US Environment Protection Agency considers that detection and repair in upstream and midstream operations can produce a 40% reduction in emissions from fugitive leaks if carried out once a year, a 60% reduction if carried out once every three months, and an 80% reduction if carried out once a month[19].

[17] Potential ways the gas industry can contribute to the reduction of methane emissions, Report for the Madrid Forum (5 - 6 June 2019), GIE-Marcogaz, page 108

[18] A voluntary, international multi-stakeholder partnership between industry and non-industry organisations with a focus on priority areas for action across the natural gas supply chain, from production to the final consumer. https://methaneguidingprinciples.org/who-we-are/

[19] Methane Guiding principles: Reducing Methane Emissions: Best Practice Guide on equipment leaks, November 2019

4.4 Should EU legislation on LDAR determine the frequency of LDAR campaigns?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

• Please consult question 4.2. We prefer to see an outcomes-based approach with guidance but flexibility and recognition of the variation in assets and complexity therein
• The frequency should be guided by the operative context. In an offshore context on the Norwegian Continental Shelf, a whole suite of flanking measures are in place aimed at detecting leaks (a large number of gas detectors, weekly inspection rounds, pressure monitoring, emergency routines…). A risk-based approach is therefore recommended, meaning that areas, where there is a higher risk of leaks, should be checked more often. National authorities and asset owners are best placed to inform on appropriate frequencies. Over time the results of multiple LDAR campaigns can be used to help dictate the frequency for specific assets.
• Annual surveys are likely sufficient for upstream sites; however, data suggests that different frequencies of inspections may have different effectiveness depending on the technology chosen, as such, and in line with the comment on technology flexibility an outcome-based approach would be preferable.
• We could recommend a reasonable frequency of LDAR campaigns based on local circumstances.
• In NL, the criterion for the measurement obligation is an emission of leakage losses greater than 10 tones of hydrocarbons per year with a vapour pressure1 of 1 kPa (1000 Pa) at 293,15 K or more, or under the specific conditions of using similar volatility. The emission threshold refers to the leakage losses of the entire establishment (Ref. NL Meetprotocol voor lekverliezen). NL permits require an approved plan. This allows for focus on the basis of the significance of emissions. Frequency should be defined as risk-based, i.e. installation by installation. (EU should strive for a level playing field). LDAR starts with an “initial” phase: is not a clear cut, but usually sufficient time to establish a baseline, implement survey/repair processes and gather data on existing performance. In the “production and maintain” phase the frequency may be 'risk based' revised at facility/unit/equipment/component level, based on learnings ('bad actors') and business objectives.
• In general, it could be flexible and agreed with the different companies, perhaps at least once a year.

NB: We attach some examples of frequency used in some countries in the accompanying document.

4.5 If you consider that EU legislation on LDAR should determine the frequency of LDAR campaigns, which of the following parameters are important to take into account and set into legislation? For each, please state the level of importance.

	Highly important	Moderately important	Neutral	Relatively unimportant	Completely unimportant	No opinion
The leak detection device/approach used	○	◉	○	○	○	○
The type of potentially leaking component concerned	○	○	◉	○	○	○
The results of previous LDAR campaigns	○	◉	○	○	○	○
The cost-effectiveness of LDAR campaigns	◉	○	○	○	○	○
The safety risk evaluation	○	○	◉	○	○	○
The environmental risk evaluation	○	○	◉	○	○	○
The operating pressure	○	○	◉	○	○	○

Other? Please specify and rate the importance in the same terms as provided in the table.

Only factors that are practical to monitor should be considered. For instance - operating pressures are variable in time and spatially at a facility - seems hard to implement, so we would recommend against that. Tracking previous LDAR campaign results in scheduling is also fairly onerous. Safety risk (i.e. higher frequency nearer occupied structures) has been already implemented in some countries and seems to make sense. Also, types of components don't make sense as you would want a single frequency for your entire facility, not disparate ones.

Please note: More than 1 decade of LDAR in NL shows that the overall contribution of LDAR is very modest. Also, despite all work, the level stays at a certain (very low) level of emissions. It is difficult to see how this can contribute at a cost-effective level. The frequency of LDAR should be risk-based.

4.6 Please specify the recommended frequency of LDAR campaigns according to the following type of potentially leaking component (in terms of frequency per year):

	Frequency per year
Valves	
Connectors	
Open-ended lines	
Flanges	
Control valves	
Pressure relief valves	
Pumps	
Compressor stations	
Regulating / reduction / metering stations	
Valve stations	
Measurement stations	
Gas delivery station	
Pressure regulating stations	
Metering stations	
City gate stations	
Other (please specify)	NB: Please find response in the accompanying document.

Quantification of emissions

Emissions from fugitive leaks can be quantified either via models (using emission factors), via engineering estimations, or by direct measurement. To effectively estimate and reduce fugitive methane emissions, direct measurements via field surveys are considered of paramount importance[20].

[20] Potential ways the gas industry can contribute to the reduction of methane emissions, Report for the Madrid Forum (5 - 6 June 2019), GIE-Marcogaz, page 105

4.7 Should EU legislation on LDAR determine the methods to be used to quantify fugitive leaks?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

Technology, despite recent progress, is in the development stage and is therefore not readily consistently available for all regions. Quantification is not necessary in all cases to repair, only the definition of threshold equipment leak is essential. If the EU provides any guidance on methods for quantification, that guidance should not be considered exclusive. Quant-LDAR is an emergent technology with little data on performance from which to build approved methods.

European legislation could develop a methodology and inspiration can be found in the “OGI Leak/No Leak” industry template developed by NOROG, which describes how the results of LDAR campaigns can be used for the quantification of small fugitive emissions. Allowed methods should however be technology-neutral to ensure inclusion of new technologies, preventing advantages to selected/existing vendors. In addition, as the purpose of LDAR is to detect and repair leaks, the establishment of overly burdensome quantification methods should be avoided. The NOROG template, for example, describes a method by which a statistically representative leak/no leak figure for an installation subject to an LDAR-type inspection campaign using OGI can be calculated and utilized within emissions reporting context.

Developments in methodology are ongoing. Better to approve the plan with authorities and refer to for example EPA. NL: NTA 8399 Quantifying is NOT the main goal of LDAR surveys. The focus must be on repairing the - unintended - fugitive emissions. The mass leak information is - NOT - significant compared to the overall methane emissions. Quantification of leaks is technically challenging, and quantified leaks during inspections may not give an accurate picture of site leak emissions. Consider how long have leaks been leaking? The largest leaks are difficult to quantify quickly and are expensive. Regulations should encourage operators to repair leaks rather than waiting for quantification. The LDAR (OGI) techniques can be used as a standalone service to provide ‘leak’ or ‘no-leak' information. Less relevant is OGI to be integrated into existing LDAR programs to process the limited information expressed in ‘leak’ or ‘no-leak’ into mass leak information kg per year (to check/modify report based on emission factors per source type. EU should make a clear statement on quantification either by factors or by adequate measurement.

4.8 If you consider that EU legislation on LDAR should determine the methods to be used to quantify fugitive leaks used in LDAR campaigns, would you recommend that direct measurements via field surveys are used in all instances when it is technically feasible to do so?

at most 1 choice(s)

- [ ] Yes
- [x] No

If no, please justify your answer

This is a developing space and existing field study data should be used at this time.

A site may be technically feasible to measure, but only represent a minor contribution to the materiality of emissions from a company.

The purpose of LDAR technology is to Detect and Repair unplanned leaks. Emission rate measurements are less important for detection technologies and therefore unsuited to leverage as the mainstream way to quantify methane emissions (see also 4.9).

This would depend on the method (and related costs) required. Again, risk-based. The cost must be relevant also, technically everything is possible. Not cost-effective at all. Bagging methods with high volume sampling can be used in exceptional cases. The focus must be on repairing the - unintended or avoidable - fugitive emissions. The mass leak information is not significant compared to the overall methane emissions.

4.9 Can you list instances in which it is acceptable to estimate fugitive leaks via modelling or engineering estimations instead of direct measurements? Please specify.

All measurements of fugitive leaks will require some level of estimation alongside or in development or application of the measurement (i.e., duration of a leak). In some cases, the use of emission factors and engineering calculation can be more accurate than a direct measurement.

The estimation of fugitives is acceptable where it represents a small percentage of total emissions from a site. In this instance, the uncertainty of the main components (e.g., flares) would be greater than any biases introduced by the use of calculations. Placing a large uncertainty on a minor component would have a marginal impact upon final combined uncertainty figures.

That is already specified in EPA methods, safety is important. But also, a critical view on the costs per ton methane reduced via LDAR is necessary. Leak detection is also mainly done to ensure that after opening equipment, all is correct and no gas escapes.

Direct measurement of fugitive component emissions is a burdensome process that is likely not appropriate in most circumstances. It appears there may be some confusion in this document w.r.t. what quantification means. For OGMP it may mean site-level rectification. The OGMP2.0 tools will not be useful for giving an emissions rate from an individual valve/flange.

In the context of detection and repair (of unplanned leaks), where the purpose is to detect and repair (mitigate) leaks, the need for emission rate measurement may be less necessary, and certain modeling /estimation options may be suitable for estimating the magnitude of emissions from identified leaks using e. g., OGI methods (ref. Leak / no leak OGI methodology).

In the context of detection and repair (of unplanned leaks), the challenge with fugitive leaks is that they are unplanned, and the leakage rates may vary significantly, though larger gas leaks will typically be detected quickly as part of safety monitoring activities/devices. A historical leak (that is significant) will then be

quantified by engineering estimates. As such, modeling may be useful in identifying types of assets or equipment and process configurations that are statistically more susceptible to leaks. This information may then be used to inform the LDAR process (e.g., focus areas and frequency).

All those difficult to measure or difficult to obtain data, as long as it is duly justified. And those in which leaks represent a small percentage of total emissions.

4.10 Are there any cases in which direct measurements can never be used?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please specify.

• In cases where it is unsafe to directly monitor and measure.
• Direct measurement solutions are not available for some environments e.g. subsea. The technology available to directly measure methane from flares is still developing.
• Non-accessible sources.
• In the context of detection and repair (of unplanned leaks), where the purpose is to detect and repair (mitigate) leaks, the need for emission rate measurement may be less necessary. Where measurement is used as a basis for the prioritization of leaks for repair, there may be cases where conducting measurement may not be possible from a safety perspective. E.g. in cases where a leak is considered large and measurement would expose the technicians to gas exposure risks or the facility to explosion risk (in these cases the process would be immediately shut down anyway, further complicating measurement). There may also be cases where an identified leak source is challenging to access for the purpose of measurement (e.g at height, under insulation).
• Depending on the characteristics of the measuring equipment to be used and the risk classification of the area.

4.11 If there are cases in which it is acceptable to estimate fugitive leaks via modelling or engineering estimations instead of direct measurements, do you agree that some harmonization in approaches used should be included in legislation?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

• Harmonization should be included to ensure that operators and reporting parties have comparable data.
• Harmonization should be sought between modeling and engineering estimations. Harmonization should not be required between direct measurement and modeling or engineering estimations.
• Improvements are needed in the detail of emission factors. At present, two components in two different jurisdictions could be assigned different methane emissions.
• Quantification methodologies should be considered in the MRV section of this document rather than the LDAR section.

4.12 If you answered yes above (to 4.11), please specify what elements of such approaches should be harmonized.

• Point sources where estimation can be used, recommended/default emission factors for calculation and estimation. Harmonization via modelling or engineering estimates is a cost-effective method when applying to multiple assets under control of individual operator, rather than measurements for all installations and point sources.
• New empirically derived emission factors that reflect modern standards for valves etc.
• US EPA has implemented a leaker/non-leaker factor that can be implemented to better estimate emissions when LDAR programs are in place. This also allows for improved performance over time to be documented.
• Leakage threshold.

Leak repair considerations

The time taken between leak detection and repair in LDAR campaigns has some bearing on the amount of methane emissions from fugitive leaks. It depends on many factors, including safety, environmental concerns, leak size, accessibility and cost-effectiveness considerations. In all segments of the gas and oil chains where LDAR campaigns are carried out, such considerations lead to a categorisation of urgency of actual repair following inspection and detection which spans from immediate repair to repair only after several years. For leaks that are not or cannot be repaired immediately, typically as part of LDAR campaigns, a number of details on the leak needs to be recorded which together will be used to determine when the leak should be repaired. After the repair, leaks can also be measured to verify the effectiveness of the repair, after which periodic controls can also be carried out, depending on the circumstances.

Safety considerations are often the key consideration, and both the frequency of leak monitoring and speed of action of leak repair are typically determined by elements which have a bearing on risk to safety. To take the example of gas distribution networks, this would include maximum operating pressure, location of leaking/potentially leaking component (characterised in terms of whether the leaking component is in a rural, urban/industrial location, or close to a building), numbers of leak (per km of pipeline), the risk of the leak leading to intoxication, burning or explosion. It is not clear whether there are requirements to repair all detected leaks across all EU jurisdictions. It is certainly at least theoretically feasible to imagine, given the traditional focus in the case of distribution networks on safety considerations, that very low risk leaks are left unrepaired for many years or indefinitely, leading to high levels of actual methane fugitive emissions over time.

4.13 Should EU legislation on LDAR impose a requirement to repair all detected leaks?

at most 1 choice(s)

- ☐ Yes
- ☑ No

If no, please justify your answer

Materiality matters – a minor leak should form part of a repair schedule that has to take into consideration other work. We would not wish to see minor leaks prioritized over safety-critical work.

Leaks that require system shutdown to perform work should be allowed to be delayed. The concept of

“Delay of Repair” lists has been used successfully in many US jurisdictions. The list is maintained for regulator review and the amount of time a repair may be delivered is ultimately finite. If large volumes of gas must be blown down in order to perform a repair an operator should have the flexibility to demonstrate it makes sense to wait until maintenance allows for emissions to be minimized.

Repairs should only be carried out if the overall HSE benefit avoided environmental emission, and safety (fire, explosion hazard) is greater due to the repair than by any additional venting/flaring activity possible, but will take place at the latest at the next maintenance stop.

A repair shall be considered successful if it is found that the hydrocarbon concentration of the leak is less than 500 ppmv (by means of an eligible portable monitoring instrument).
If a leak is detected using non-quantitative measurement methods and then the hydrocarbon concentration of the leak is set at less than 500 ppmv using an eligible portable monitoring instrument, it does not need to be repaired.

There must be a minimum threshold. All leaks that can be repaired on the spot should be and material leaks should be repaired as soon as possible. Small leaks (“sweating”) should be recorded and monitored to ensure that they don’t grow.

4.14 Should EU legislation on LDAR determine the time taken for leaks to be repaired, according to a classification of leaks, after detection?

at most 1 choice(s)

- ☐ Yes
- ☑ No

Please justify your answer

With the considerations enumerated in 4.13, it is reasonable to determine a time window for repairs. That being said, classification of a leak is difficult without direct measurement and highly dependent on weather conditions at the time of monitoring if done using concentration. Unsure how this would work in practice. Not as a rule but could consider using different leak survey frequencies. A guideline/threshold should set a de minimis which can be left to a convenient time.

4.15 What elements should be taken into consideration in a classification of leaks? Please provide a ranking for your answers, from highly important, important to unimportant.

	Highly important	Moderately important	Neutral	Relatively unimportant	Completely unimportant	No opinion
Safety	◉	○	○	○	○	○
Environmental concerns	○	◉	○	○	○	○
Leak size	◉	○	○	○	○	○
Accessibility/ease of repair	○	○	◉	○	○	○
Cost effectiveness	○	○	◉	○	○	○

Other? Please specify at which level of importance.

The principal consideration for categorization is to enable effective find and fix approaches; safety, environment and size in particular.

There are already a number of definitions which could be referred to: EU Common Regulation 112/2015: 'Major gas leaks' (> 300 kg), between moment of discovery and remedying the leakage, safety threatening) must be reported to regulator within 10 working days per CDR form (EU Common Regulation 112/2015). ‘Significant gas leaks’ (> 1kg – 300 kg between the moment of discovery and remedying), must be reported to regulator within 10 working days per CDR form (EU Common Regulation 112/2015). The Sniffers method: Fugitive emissions: A device where a concentration equal to or higher than the leakage limit is measured is considered a leak. The leakage limit is 500 ppm for currents with an average concentration of 5% or more of substances with a minimization obligation. For all other currents, the leakage limit is 1000 ppm, regardless of the nature of the device. Fugitive emissions to be repaired: > 500 ppmv Guidance document on Commission Implementing Regulation (EU) No1112/2014 of 13 October 2014.: < 3 kg/hr or < 20% LEL at 50 cm distance, do not need to be reported to the regulator.

4.16 Should EU legislation on LDAR campaigns include provisions for fines if repair delays are not respected?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

In some European countries, upstream operations already face a range of punitive sanctions in the events methane emissions are not addressed or repaired, including permitting and financial sanctions. We believe that EU-wide penalties should apply across the entire European gas value chain.

As described in 4.13, repairs shall be carried out according to materiality (considering only leaks below a critical threshold for safety reasons) and to the overall HSE benefits (risk assessment – costs benefits analysis) rather than fixed time; fines and penalties should not be defined only based on a pre-defined timing schedule but evaluating the site maintenance plan and how the site operator manage the fugitives and if there is in place a management framework for these situations. In case it is missing, penalties should be foreseen.

5. Legislating on venting and flaring

Excess gasses in oil, gas and coal production and processing can be a safety hazard and must therefore be processed, either by trapping and utilisation or by flaring or venting. Flaring is the process of burning associated, unwanted or excess gases and liquids released during normal or unplanned processes in, inter alia, oil-gas extraction, refineries, chemical plants, and coal mining. Venting is the process of directly releasing gasses into the atmosphere, often for the same reasons as listed previously for flaring, as well as to balance pressure within gas infrastructure throughout the supply chain. While flaring is sometimes seen as a suitable substitute for venting, it can only ever be regarded as poor second best to full emission

abatement.

As announced in the Communication, venting and routine flaring should be restricted to unavoidable circumstances, for example for safety reasons, and recorded for verification purposes. Venting and flaring need to be approached both from a within-EU perspective on domestic production, transmission, and distribution as well as from the perspective of the EU being a large-scale importer of fossil gas for which venting and flaring represent major upstream greenhouse gas emission sources.

Venting is the single largest source of methane emissions in the oil and gas sector, responsible for as much as 4.7Bt CO2eq globally. In addition to releasing waste gas, venting is also used to balance pressure within gas infrastructure, particularly in distribution and transmission.

While venting is an important contributor to emissions of both the oil and gas sectors, most flaring that takes place today is known as routine flaring and occurs during normal oil production operations. An estimated 145 bcm of gas is flared globally every year, which represents around 30% of the European Union's annual gas consumption.

The proportion of gas burnt during flaring is referred to as 'flare efficiency', i.e. the ratio between the mass flow rate of methane in the exhaust gas of the flare and the mass flow rate of methane in residual gas stream that is flared. In theory, more than 99% of the gas is combusted when flaring is done in optimal conditions. In real-world conditions, however, flaring can be significantly less efficient due to sub-optimal combustion dynamics (e.g. variable heat content, flame instability). As a result, substantial volumes of methane can be released (so called methane slip), along with other potent GHGs. The Communication on an EU to reduce methane emissions, further announces that flaring efficiency will be tackled as a priority.

Flaring in the EU accounts for only 0.17% of total global flaring, as such this is overwhelmingly an issue as regards supply chains linked to the EU rather than within the EU.

Nevertheless, addressing emissions from both venting and flaring in the EU can help towards domestic greenhouse gas reduction objectives and improve local air quality.

5.1 How far do you agree/ disagree with this statement: 'It is feasible to eliminate routine venting and flaring associated with energy produced and consumed in the EU'?

at most 1 choice(s)

- ☐ Fully agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Totally disagree
- ☐ No opinion

Comment (optional)

An important consideration for the whole of this section is that “venting” needs to be clearly defined. We have some concerns that if improperly defined it could include emission events that would go beyond both the intent and the scope of possible solutions.

An additional consideration is a definition of what is "routine"? We would recommend alignment with GGFR. By definition, venting during gas production is always safety venting/non-routine venting, as gas vented cannot be sold and is a loss. Routine venting and flaring apply to Major Installations, Sources, and projects, where: Flaring And Venting Intensity exceeds 1% by mass (mass of hydrocarbon flared and vented/mass of hydrocarbon throughput); and combined Flaring And Venting exceeds 10,000 tones of CO2e per year). Exceptions: flare pilot gas, vent purge, flaring or venting required for start-up and shut-down, emergency releases, well flow test conducted as part of exploration or appraisal to gather field data to a maximum of three months.

Legacy infrastructure, particularly outside of Europe may be a challenge. But as has been demonstrated in Norway, it is possible to implement legislation that requires a solution for the management of associated gas, be it marketing, utilization or injection. Such existing regulations must be taken into account when developing EU-wide regulations and care should be taken when defining the term “routine” and that new measures should proceed in support of, and alignment with, the World Bank’s flaring reduction initiatives.

5.2 Should there be a phase-out period for routine venting and flaring? If yes, how long should it be?

- [ ] None
- [ ] 1 year
- [ ] 2 years
- [ ] 3 years
- [ ] 4 years
- [ ] 5 years
- [x] More than 5 years

Please justify your answer

More than 5 years and aligned with the existing Zero Routine Flaring Initiative. Cost-effectiveness should be an additional driver, taking into account the difference between onshore and offshore and the expected end date of the operation. This should be based on ex-ante criteria. As an example: Action plan to deliver Flaring and Venting performance that is any one of the following: - less than 10,000 tones of CO2e per year; or - less than 1% by mass of hydrocarbon throughput; or - As Low As Reasonably Practicable (ALARP).

Definitions

Venting and flaring can occur as a response to unexpected incidents to preserve health and safety, or as part of operations in what is often referred to as ‘routine’. Terms such as ‘non-routine’, ‘safety circumstances’, and ‘testing circumstances’ are commonplace in regulatory frameworks globally to indicate circumstances where venting and flaring can be carried out without a permit. Although there are common understandings of how each form of venting and flaring can be defined, there are no widely held standards defining the parameters within which venting and flaring can take place in these circumstances. If not

clearly defined and monitored, these circumstances provide loopholes for companies to avoid acquiring permits or utilising associated gas.

5.3 Do you think a common set of definitions and parameters for venting and flaring is necessary?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

We would highlight that some EU member state regulations address routine venting and flaring already in detail taking into account complex safety and environmental aspects. Such existing regulations must be taken into account when developing EU-wide regulations and care should be taken when defining the term “routine” and that new measures should proceed in support of, and alignment with, the World Bank’s GGFR flaring reduction initiatives.

GGFR definitions should be used as a basis, as they are already being used. And especially "routine" should be defined for gas production both for flaring and venting. For example, continuous routine Venting and Flaring equals the continuous routine disposal of hydrocarbons under controlled conditions through a point source of discharge, vent or flare; not flare pilot gas, vent purge, flaring or venting required for start-up and shut-down, emergency releases, well flow test conducted as part of exploration or appraisal to gather field data to a maximum of three months.

If the intent is to eliminate routine venting and flaring, yes a consistent set of definitions will be important. Venting and flaring are understood as activities and also material streams in many different ways depending on the application. A recent case study would be the COGCC rulemaking in CO (USA) where they intend to regulate routine venting and flaring; however, defining what they meant was problematic. Is tank control flaring? Does routine mean anything other than upsets? Does a backup flare that combusts gas when a VRU fails considered routine? Etc.

5.4 Should the EU devise a common set of definitions and parameters for venting and flaring?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer

Where definitions already exist, such as GGFR, then should use these. For new definitions and parameters, these should be developed in conjunction with stakeholders in the industry.

A practical example of methane as a topic is the recently published joint glossary from IPIECA and other organisations.

5.5 Should the EU establish an inventory of clearly defined circumstances under which venting and flaring is necessary to provide a better monitoring frame?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

There is a risk that this would be overly prescriptive and not outcome-focused. However, guidance would be useful. EU could contribute to providing clarity regarding situations in which flaring/venting may be permissible by working with existing initiatives (e.g. GGFR). As it will not be possible to describe all situations, an option could be to require installations to have a flaring management plan which shall be utilized when situations arise under which material levels of non-routine flaring occur. It may also be easier to be specific as to when flaring should not be allowed.

5.6 In your opinion, what can be considered routine/non-routine venting and flaring? Would you subscribe to any existing definitions? If so, please name them. Please specify.

We would subscribe to the existing GGFR definition of routine flaring, as defined in the Zero Routine Flaring by 2030 initiative: “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. Venting is not an acceptable substitute for flaring.”

Voluntary Initiatives

Increasing visibility on the issues of venting, flaring and methane slip (the emission of unburned methane from a flare or the use of gas) can help to change industry norms and bring global attention. This visibility can incentivise accountability at the national and company level. Voluntary initiatives can play an important role in developing new approaches to abatement and in demonstrating what is possible and practicable. There are a number of voluntary, including industry-led, efforts to reduce methane emissions from oil and gas operations, including the Methane Guiding Principles (MGP - a multi-stakeholder collaborative platform aiming to advance understanding and best practices for methane emissions reduction) and the World Bank’ s Global Gas Flaring Reduction Partnership (GGFR - a Multi-Donor Trust Fund composed of governments, oil companies, and multilateral organizations) works to end routine gas flaring at oil production sites across the world with its Zero Routine Flaring by 2030 initiative.

5.7 Which of the above voluntary initiatives would you consider as an important basis on which to base EU legislation on venting and/or flaring to be imposed as obligations on companies? Please list and indicate the importance you attach to them.

The role of governments in the GGFR Zero Routine Flaring by 2030 is described as follows:

Governments that endorse the Initiative will provide a legal, regulatory, investment, and operating

environment that is conducive to upstream investments and to the development of viable markets for utilization of the gas and the infrastructure necessary to deliver the gas to these markets. This will provide companies the confidence and incentive as a basis for investing in flare elimination solutions. Governments will require, and stipulate in their new prospect offers, that field development plans for new oil fields incorporate sustainable utilization or conservation of the field's associated gas without routine flaring. Furthermore, governments will make every effort to ensure that routine flaring at existing oil fields ends as soon as possible, and no later than 2030."

The MGP is concerned with methane. MGP will therefore be more concerned with incomplete combustion, than avoiding flaring in general.

5.8 Specifically, should the EU adopt and further develop the current World Bank Global Gas Flaring Reduction Partnership (GGFR) definitions of routine, non-routine and safety flaring and further extend the terminology?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

Without clear definitions, it is not possible to accurately report and implement legislation. It is better to build upon existing frameworks than to create new ones. This ensures global alignment which will help with gas imports from outside the EU. The GGFR definitions are well-known and sufficiently accurate. The examples that are documented together with the definitions should be re-evaluated to ensure a sufficiently strict interpretation. For safety flaring and non-routine flaring, the examples offer good guidance, without being exhaustive. For routine flaring, the examples are, with the exception of "Flaring of gas production that exceeds existing gas infrastructure capacity" not as good. To be very concrete, the examples for routine flaring include sources of flaring which are by-products of a process, which could be continuous but constitute small volumes. This type of flaring can occur even when a management solution for the associated gas is in place, thus being non-routine flaring.

5.9 Can you recommend any other voluntary initiatives or existing regulations on venting and/or flaring that you think should be considered best practice and a basis for EU legislation?

at most 1 choice(s)

- [x] Yes
- [ ] No

If yes, which initiative or regulation?

• Recommend considering the NL offshore methane covenant.
• The EU Hydrocarbon BAT Guidance document background provides useful information (see 2.7).
• The Norwegian regulations: plans for handling associated gas without flaring (or venting) is required in new field development plans according to the Petroleum Act (implying routine flaring being banned since 1970). Flaring gas and cold venting, beyond what is necessary to ensure normal operations, is not permitted pursuant to the Petroleum Act without approval from the Ministry of Petroleum and Energy. Gas-to-fuel and

to flare is required to be metered and reported. Vented gas is also required to be metered, or sufficiently quantified, and reported. Fiscal incentives exist to reduce non-routine/safety gas flaring and venting (CO2 tax since 1991).

Verification of reporting

Reporting accuracy is an important aspect to the tracking and elimination of venting and flaring. Where regulatory frameworks exist at a national or subnational level, they often lack independent auditing and verification of data. Significant discrepancies between reported data and satellite data on methane emissions have been identified, which undermines the scope for regulators to hold companies accountable for underreported or unreported emissions. For example, the National Oceanic and Atmospheric Administration (NOAA) satellite data systematically indicates a greater volume of flaring than the data collected by states and the US Energy Information Administration (EIA). Also according to the IEA, venting, flaring and methane slip are all potentially underestimated in company reporting, partially as a result of an absence of independent verification but also frequent use of estimations in place of specific measurement.

5.10 Do you think industry can be relied on to accurately report venting and flaring activities without third party verification?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer

IOGP supports the development of cost-effective and efficient regulation addressing venting and flaring across the whole industry, including third-party verification. Such regulation should also serve as the basis for criteria when assessing regulatory equivalence with countries exporting gas to the EU.

5.11 Should voluntary industry initiatives be encouraged to create own auditing and verification systems?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

When building on voluntary initiatives, it is important that they function in conjunction with existing regulatory systems where they exist. One should avoid multiple auditing and verification processes that may result in different conclusions.

5.12 Should voluntary industry initiatives be encouraged to create harmonised methods for measuring, data handling, estimation, and use of specific models?

at most 1 choice(s)

- [x] Yes

☐ No

Please justify your answer

IOGP is ready and more than willing to support and is already participating in such initiatives working with relevant stakeholders.

5.13 Would you consider the establishment of independent third-party auditing and verification necessary?

Yes, third-party auditing is typically required to ensure high-level performance. This auditing could either be done by internal or external auditors.

5.14 At which level (national, regional, global, other) should auditing and verification be organised?

First, reporting should be audited at the national level in accordance with relevant global standards. This should be followed by a process of reconciliation and consolidation at the global level to achieve consistency and understanding of trends.

5.15 Should the EU commission consider setting up an independent global auditing authority to verify company data?

at most 1 choice(s)

☐ Yes

☑ No

Please justify your answer

Global auditing authority seems to be a difficult endeavor, however, any verification of methane emissions along the global value chains would need to be based on globally consistent standards and criteria. The IMEO could play a role in establishing such standards and criteria.

5.16 Should the EU Commission consider adoption of harmonised methods for measuring, data handling, estimation, and use of specific models?

at most 1 choice(s)

☑ Yes

☐ No

Please justify your answer

Any such approach should be open to any new methods and technologies that meet the required objectives and lead to increased confidence in methane emission data.

5.17 If independent monitoring and verification identifies misreporting of emissions from venting and flaring by companies within EU jurisdiction, should EU legislation include provisions on fines?

- ☐ Yes
- ☐ No

Please justify your answer

IOGP supports the development of stringent EU regulation addressing methane emissions, including incentives and penalties (ensuring full industry participation), to also support the establishment of criteria that enable the assessment of regulatory equivalence between the EU legislation and third-country legislation. IOGP suggests that EC consider and develop equivalence criteria as part of the policy-making process.

As IOGP understands it, EU Member States' national legislation already makes provision for fines arising from non-compliance with environmental requirements, including methane emissions. Where such penalties do not exist in Europe, the EU legislation should provide for it.

5.18 If independent monitoring and verification identifies misreporting of emissions from venting and flaring by companies outside EU jurisdiction, should EU legislation include provisions on restricted access to EU markets?

- ☐ Yes
- ☐ No

Please justify your answer

IOGP believes that equivalence should be the primary mechanism by which to achieve methane emission reduction in third countries.

5.19 Which of the following measures should be taken to achieve reductions in venting and flaring associated with energy produced in the EU? Please mark your rating with an 'X'.

	Very appropriate	Appropriate	Neutral	Not very appropriate	Inappropriate	No opinion	**Please explain your choice. If you consider it very appropriate or appropriate, please describe possible implementation.**
Encourage sharing of best practices on avoiding venting and flaring	X						Good practice sharing occurs in industry associations incl. IOGP, IPIECA.
Encourage company participation in global voluntary initiatives to share best practices and work towards the elimination of routine venting and flaring	X						Statistics from IOGP and the zero routine flaring initiative show better flaring performance from participating companies.

Mandate company participation in global voluntary initiatives to share best practices and work towards the elimination of routine venting and flaring							Forcing companies into initiatives that they are not ready for may have adverse effect. National authorities can play a key role to force industry best practices adoption. Furthermore, not clear how you can mandate something that is voluntary?
Developing a database of all routine vents and flares			X				Already in place in Norway. Need to ensure that the definitions are in line with GGFR. Typically, there is only one flare system on an offshore platform which is used for multiple purposes. Additionally, not all vents and flares are of equal size or significance – databases of rarely used emergency non continuous vents would be time consuming and potentially counter-productive.
							Already in place in Norway. Need to ensure

Developing a database of all routine vents and flares, cross-referencing this information with databases of permits and exemptions			X				that the definitions are in line with GGFR. Typically, there is only one flare system on an offshore platform which is used for multiple purposes. Additionally, not all vents and flares are of equal size or significance – databases of rarely used emergency non continuous vents would be time consuming and potentially counter-productive.
Set a total cap on venting and flaring activities for the entire EU				X			
Mandate detailed environmental impact assessments of new oil and gas operations that account for the	X						Is already in place in Norway and the UK as part of the production permit.

potential emissions from venting and flaring							
Introduction of financial incentives for reductions in emissions from venting and flaring (taxes/penalties or allowances).	X						Is already in place as part of the Norwegian offshore legislative framework.
Outright ban on venting and flaring (except where no other ramification is available for health and safety reasons).	X						For as long as GGFR definitions are followed, and this is already in place for Norway.

Others (please elaborate)

Venting

This section focuses specifically on venting, which is the process of directly releasing associated, unwanted or excess gases into the atmosphere, during normal or unplanned processes, such as in oil-gas extraction, refineries, chemical plants and coal mining, as well as to balance pressure within gas infrastructure throughout the supply chain.

5.20 In which parts of the value chain do you consider Venting most relevant? (multiple answers possible)

	Gas	Oil	Coal (active and abandoned mines)
Exploration	☐	☐	☐
Production	☑	☑	☐
LNG	☑	☑	☐
Transmisison	☐	☐	☐
Storage	☑	☑	☐
Distribution	☐	☐	☐
Use (industrial)	☐	☐	☐

Please elaborate.

Routine venting (i.e. venting as a disposal method for associated gas), while rare, would likely be the type of venting that would result in the greatest level of emissions. Venting in all other cases is more a by-product of a planned process, rather than a disposal method for associated gas.

Note: Natural gas processing does not appear to be included among these options, though it should be.

Quantification methods for methane emissions deliver a rate, such as mass per time (e.g. kilograms per hour) or volume per time (e.g. standard cubic meters per hour), and can be produced by engineering estimations, by direct measurement of the methane sources, or by use of models. Recording of venting requires appropriate measurement and verification. This is in part an issue of the quality of data from companies, as many companies do not measure their emissions from venting but rather estimate them based on emission factors.

5.21 In your opinion, is the use of emission factors a sufficient approach to the quantification of venting?

at most 1 choice(s)

☐ Yes

☐ No

Please justify your answer

• NL experience shows that a combination of measuring, modelling and emission factors provides good quality data, as demonstrated by independent measurements. But is heavily dependent upon the size of the vent. Large continuous vents should be measured. Small non-continuous vents could be adequately reported using calculations.
• Emission factors and parametric calculations are appropriate for many instances of venting. If a vent is continuously operating, then it would be appropriate to measure. Emission factors and engineering calculations are often sufficient and, in some instances, may be more accurate than direct measurement. (E. g., planned blowdowns). Emission Factors are a very important element of the solution space to quantify emissions. They can be very suitable if they are determined effectively, i.e. source and context specific and reflect the operational parameters present, ideally supported by relevant activity factors. It is not possible to meter/measure all emission sources and in those instances appropriate Emission Factors can be the best available technology. (see response 4.9)
• But if the questions is: “are generic Emission Factors sufficient”, the answer would be no. Not in all cases it is enough since the level of uncertainty may be higher in some cases than in others.

5.22 In your opinion, are there situations in which the use of emission factors is the only feasible approach to the quantification of emissions from Venting?

at most 1 choice(s)

☑ Yes

☐ No

Please justify your answer

• Maintenance venting and other small, non-continuous venting.
• Some sources can best be calculated, e.g. blowdown, flash gas and gas from produced water.
• For some types of equipment or processes EFs (when properly established) will represent the best and sometimes only option. For example, accessing vents to conduct measurement may not be possible for safety reasons or measurement may not provide an accurate picture of emissions due to temporal variations.

5.23 Can you list instances in which it is acceptable to estimate venting emissions via modelling or engineering estimations instead of direct measurements? Please specify.

• In case of (very) small discontinuous vents and for maintenance venting.
• Vent emissions are normally low, it is difficult to accurately measure these streams. Also composition measurement is required, because in a central vent stream with a different methane content are gathered. And in the blow down scenario, the volume can be much more accurate calculated based on system pressure and volume than on a flow meter that cannot handle the high peaks.
• There may be many cases where it is appropriate to use modeling, simulation and/or engineering calculations, as opposed to direct measurements, to estimate emissions from venting. In some cases this will be dictated by the source type and in other cases it will be dictated by the operational conditions and/or process design. Some sources, such as glycol dehydrators, hydrocarbon liquid storage tanks and produced water discharge caissons, are known to be challenging to measure accurately and for this reason the EPA /

Natural Gas Star, the OGMP, the Norwegian oil and gas association, recommend the use of simulation software (GRI-GLYCalc, TankEP) or specific engineering calculations. For other sources it may be possible to measure elements of the input data and then apply simulation or engineering estimation approaches in order to estimate the emissions. Example may include the loss of gas via primary and secondary seals in centrifugal compressors with dry gas seals. In still other cases multiple gases (including N2, H2O, CO2) originating from a variety of sources may be emitted via a single vent. In these cases measurement from the vent will neither differentiate between sources nor, more importantly correctly account for the composition of the emitted gas.
• There are still other sources and processes with emissions that vary significantly over time. Direct measurement will typically not sufficiently account for these temporal variations, making alternative quantification methodologies relevant and appropriate.

5.24 Are there any cases in which direct measurements can never be used? Please specify.

Yes, in cases where the source is inaccessible or unsafe to directly measure or monitor.

It is impractical to measure vented emissions associated with many maintenance activities. Oftentimes small volumes of equipment are isolated in order to perform maintenance or repair an LDAR discovered leak. This blowdown is typically at low pressure, for short duration and directly into the atmosphere, all factors that make accurate measurement impractical.

There will be many cases, but this will depend on not only the source and context, but also what is meant by direct measurement, both in terms of frequency and measurement technologies. Some technologies will not be suitable from a technical standpoint (frequency, gas composition analysis) or from a safety standpoint (hard to access, heat exposure, etc.), whereas others will be suitable.

It is important to remember despite anything being possible, not everything is reasonable or cost effective nor would it contribute to the goal of methane reduction. The cost of installing direct measurement to discontinuous vents is disproportionate to the impact they have on total emissions.

5.25 Are there appropriate technological solutions available for the direct measurement and quantification of venting along the different parts of the oil and gas (and coal) value chains? Please name them. Do you consider them cost-effective?

	Available technologies	Level of quantification	Cost-efficiency
Exploration	Flow meters and ultrasonic sensors. (NB: Please find response in the accompanying document)		
Production	Flow meters and ultrasonic sensors. (NB: Please find response in the accompanying document)		
Transmission			
LNG			
Storage			
Distribution			
Use (industrial)			

The ‘Best Practice Guidance for Methane Management in the Oil and Gas Sector’ (United Nations Economic Commission for Europe) specifies several accepted and recommended methods of direct measurement for venting. Those methods include using a calibrated vent bag, a high-volume sampler, flow meters, or anemometers.

5.26 Do you consider these and other available best practices as comprehensive enough to enable companies to accurately measure and quantify methane emissions from venting?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

Not direct measurement systems, but independent (top-down) measurement campaigns have shown that emission quantification by NL operators through emission registration systems (measurements, modeling, and emission factors) correspond quite well to measurements in the field. Therefore, the answer is yes.

In principle, the UNECE document lists relevant measurement technologies. However, the application of a measurement technology will need to be evaluated on a case-by-case basis, taking into account variations in emission rates and gas composition and how these variations impact the frequency and need for gas composition analysis in each case. Even if the technology is suitable, if it is not used to measure a representative flow rate or if the flow being measured contains significant amounts of other gases, the measured result will not be representative of the rate and composition of methane emissions, making a statistically appropriate emissions figure challenging to establish.

Important to note is that further innovation could simplify installation and reduce costs.

5.27 Should the EU mandate direct emission measurement for venting within the EU supply chain?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

IOGP believes that an integrated approach taking into account both source-based quantification and direct measurement would enable a better understanding of methane emissions from venting, compared to a direct measurement approach alone.

5.28 Should the EU mandate the use of specific approaches for the measurement and quantification of venting?

at most 1 choice(s)

- [ ] Yes

☑ No

Please justify your answer

No, there are many possibilities to determine vent emissions, and more are under development. It is better to mandate performance standards or that an operator should have a monitoring plan, which details how the vent emissions are determined per source, including accuracy, rather than mandating the use of specific approaches. This will allow for better and quicker adoption of best practice technologies and methods. A one-size-fits-all regulation can actually discourage innovation.

5.29 Would you consider the available best practices referred to above as sufficient basis for such mandates?

at most 1 choice(s)

☐ Yes

☐ No

Please justify your answer

Best practices will typically be quite general in scope. If they shall form the basis for mandated action, they should be more prescriptive as to exactly what shall be done and also describe what shall be done when the best practice is not applicable for a certain source/situation.

If best practices shall be mandated, one option would be to refer to the best practice and ask operators to describe where they have deviated from the use and why, though this would add additional reporting burden for the operators and also for the regulator.

5.30 Would you consider the Clean Development Mechanism methodologies as a feasible basis for mandates on measurement of venting emissions?

at most 1 choice(s)

☐ Yes

☑ No

If yes, which?

There is no definition of "on site Measurement", therefore the question cannot be answered. As already demonstrated in the NL approach, a combination of measurements, modelling and emission factors works fine.

The applicability of measurement as a way to quantify emissions will vary across sites and sources. Measurement of a statistically representative population of sources, may be prudent for informing the development of specific Emission Factors for that type of source and that type of context. It is better to set performance standards than mandate for specific technology choices.

5.31 If you consider that EU legislation on Venting should determine the means of quantifying emissions, would you recommend that on site measurement is used in all instances?

at most 1 choice(s)

- [ ] Yes
- [x] No

If no, please justify your answer

There is no definition of "on-site Measurement", therefore the question cannot be answered. As already demonstrated in the NL approach, a combination of measurements, modeling, and emission factors works fine.

The applicability of measurement as a way to quantify emissions will vary across sites and sources. Measurement of a statistically representative population of sources may be prudent for informing the development of specific Emission Factors for that type of source and that type of context. It is better to set performance standards than a mandate for specific technology choices.

5.32 If you consider that there are instances in which such determination is not feasible or proportionate, please name them.

Determination is always possible by using emission factors. There are emissions that cannot be determined without the use of emission factors, e.g.:

- non-constant composition of vent gas;
- methane slip from flares and other combustion processes (normally factors are used for this);
- small discontinuous vents.

Assuming that all sources could be directly measured, which they cannot, the amount of measurement that would be required for each source, for each site, necessary to obtain an accurate methane emissions flow rate for each source would be huge. The focus should be on quantifying material sources. The use of measurement may be suitable for establishing appropriate EFs that can be utilized on not only the sites where the measurement has taken place but on similar sites with similar source configurations.

5.33 Should the EU mandate the use of specific intervals or continuous measurement of venting?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

The EU should not mandate any specific timeframes, either interval or continuous, for the measurement of venting. There are technical limitations to continuous metering of venting, and while the technology exists to accomplish this task, those methods are not necessarily cost-effective and are often highly uncertain (e.g.,

low flow conditions will often lead to poor quality measurements). Additionally, the application of metering technologies may result in flow limitations that can increase risk, especially if emergency relief is required.

If the desired result is representative emission estimates, then the suitability of measurement, as well as the necessary frequency will be highly dependent on the sources being measured, their configuration, and process parameters. The EU should be concerned with representative emissions quantification rather than the way in which this is done or with what frequency (in the case of measurement).

5.34 How appropriate do you think the following measures would be in reducing venting associated with energy produced in the EU?

	Very appropriate	Appropriate	Neutral	Not very appropriate	Inappropriate	No opinion	**Please explain your choice. If you consider it very appropriate or appropriate, please describe possible implementation.**
							Can be appropriate in some instances however a case-by-case analysis is required that looks at not only the financials, but also the overall carbon footprint associated with the solution. If technology is widely available and shown to operate equally safely and effectively such that a venting source could be replaced with a non-venting source, then that may be appropriate with a thoughtful rollout.

Mandating the replacement of pieces of equipment known to cause emission from venting with non-emitting substitutes.		X					However, if a solution to reduce methane venting of a few tones per year required the installation of a compressor then such a replacement would likely not be deemed as financially feasible due to cost and also carbon effective if the compressor was powered by fossil fuels. Furthermore, it is also important to consider that the main source of venting is process and safety related. There is no opportunity for replacement (like replacing equipment that uses instrument gas) – EU best available techniques guidance document on upstream hydrocarbon exploration and production (27 February 2019).

An industry report from GIE and Marcogaz presented at the 2019 Madrid Forum highlighted, among other, solutions to avoid venting in the EU gas system.[21]

[21] GIE Marcogaz, (2019). Potential ways the gas industry can contribute to the reduction of methane emissions, Retrieved on 16.12.2020 from https://ec.europa.eu/info/sites/info/files/gie-marcogaz_-_report_-_reduction_of_methane_emissions.pdf

5.35 How appropriate do you think the following measures would be in reducing venting in the EU?

	Very appropriate	Appropriate	Neutral	Not very appropriate	Inappropriate	No opinion	**Please explain your choice. If you consider it very appropriate or appropriate, please describe possible implementation.**
UPSTREAM							
Implement Gas to Power units to use the vented or flared gas at remote production sites (avoid venting the associated gas).				x			We prefer to advocate a systems level approach in which all emissions are managed collectively – focusing on the largest sources per site. Implement Gas to Power units to use the vented or flared gas at remote production sites (avoid venting the associated gas). Only appropriate if the volume of gas being vented or flared is large enough, this could be an appropriate utilization solution – if there is a need at the facility or in

							the surrounding area for the additional power this solution would provide (i. e. don't mandate power generation if there is no one to use it).
Minimise venting of hydrocarbons from purges and pilots, without compromising safety, through measures including installation of purge gas reduction devices, flare gas recovery units and inert purge gas.			X				Depends on cost-effectiveness. Where it is safe and technically feasible to do so, such solutions can be quite appropriate, as can be seen with some of the closed-flare solutions utilised in Norway.
TRANSMISSION, STORAGE, DISTRIBUTION							
Implement minimising vents programmes.							

Recompression instead of venting							
Use of vacuum pressure pumps during commissioning of distribution networks.							
Replacing natural gas starters with electric engine starters at compressors, hence reducing operational venting							

Please provide any other measures you would deem appropriate for the reduction of venting and flaring in the EU gas system

All measures described in the table may be appropriate, but need to be evaluated from a safety, cost, and total carbon emissions perspective. The economics/accounting, both as relates to the financials and total emissions must be considered.

Refer to EU best available techniques guidance document on upstream hydrocarbon exploration and production (27 February 2019).

Flaring

This section focuses specifically on Flaring, which is the process of burning associated, unwanted or excess gases and liquids released during normal or unplanned industrial processes, such as oil-gas extraction, at refineries or chemical plants.

5.36 In which parts of the value chain do you consider Flaring most relevant?

	Gas	Oil
Exploration	☑	☑
Production	☑	☑
LNG	☐	☐
Transmisison	☐	☐
Storage	☑	☑
Distribution	☐	☐
Use (industrial)	☐	☐

Quantification methods for methane emissions deliver a rate, such as mass per time (e.g. kilograms per hour) or volume per time (e.g. standard cubic meters per hour), and can be produced by engineering estimations, by direct measurement of the methane sources, or by use of models. Recording of Flaring requires appropriate measurement and verification. Independent studies have consistently found company data to underreport flaring activities. [22] [23] [24] This is in part an issue of the quality of data from companies, as many companies do not measure their emissions from flaring but rather estimate them based on emission factors. In the below questions, measurement of flaring refers to the amount of burnt gases and liquids, flare efficiency will be addressed separately in the next section.

[22] IEA estimate 80Mtoe of flaring compared to 15Mtoe on the basis of flaring efficiency claims by companies (i.e. they estimate there is far more flaring than what is reported by companies). (IEA, (2020), Flaring Efficiency).

[23] EDF, (2020). Permian Methane Analysis Project, Retrieved on 17.12.2020 from https://data.permianmap.org/pages/flaring

[24] Leyden, (2020). Satellite data confirms Permian gas flaring is double what companies report, EDF, http://blogs.edf.org/energyexchange/2019/01/24/satellite-data-confirms-permian-gas-flaring-is-double-what-companies-report/

5.37 In your opinion, is the use of emission factors a sufficient approach to the quantification of flaring?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer

Emission factors are appropriate if paired with appropriate parametric monitoring (such as volumetric flow of gas or liquid with a known GOR). In some cases, emission factors and engineering calculations can be more accurate than direct measurements. Direct measurement of methane from flares is not currently cost-effective or proven, and so reliance on emission factors presents a cost-effective alternative that is well developed when a flare is properly managed.

When discussing the use of emissions factors and measurement within the context of flaring, it is important to differentiate between the measurement of the gas being flared and the measurement of the emissions. If the gas going to flare is measured, and combustion is confirmed, then the uncertainty associated with the methane emissions resulting from incomplete combustion is far less than if the amount of gas going to the flare was not known. As such, emission factors may be suitable, if measurement forms the basis for the activity factor (i.e. gas being flared).

5.38 In your opinion, are there situations in which the use of emission factors is the only feasible approach to the quantification of emissions from Flaring?

at most 1 choice(s)

- [x] Yes
- [ ] No

If yes, please specify

• Very short-lived flares installed during exploration drilling and/or as part of a maintenance programme.
• If the flare cannot be accessed or monitored safely.
• Emergency flaring.
• Other techniques are possible, but emissions factor will provide a minimum quantifiable baseline.

5.39 Can you list instances in which it is acceptable to estimate flaring emissions via modelling or engineering estimations instead of direct measurements? Please specify

Flares should be metered and should be the preferred route but allowance for alternative approaches in cases where:

• There is intermittency or a large number of dispersed smaller flares.
• There is low pressure, small volume flares (tank controls) it may be impractical to accurately measure using a flare meter and it would be appropriate to perform GOR estimates and tie emissions to liquid volume throughput.

• Emergency blowdowns at production facilities or at onshore industrial plants.
It is very important to differentiate between the measurement of gas to flare and the measurement of emissions from flare. If the amount of gas going to flare is known (e.g. because it is measured), and the combustion process is relatively stable, the application of emission factors reflecting the combustion efficiency of the flare may be acceptable. And particularly so, where these factors have been developed based upon measurement or detailed simulations for similar flare operations.

5.40 Are there any cases in which direct measurements can never be used? Please specify

Yes, if the flare cannot be accessed or monitored safely.

Assuming that this question refers to direct emissions measurement, then direct measurements may not be suitable if they do not reflect the nature of the flaring in terms of amounts and frequency. If the purpose of the direct measurements is to establish an average emissions rate that can then be extrapolated to estimate the total emissions for a specific period of time, then it is very important that the measurement or measurements are representative of the average emissions for that period of time. This is why it may be more useful to continuously measure the volume of gas going to the flare.

Important to understand is that the issue may be around cost not the availability of the technology. So, alternatives will need to be properly justified and demonstrate a degree of equivalence. (Please see 5.39.)

5.41 Do you consider appropriate technological solutions for the direct measurement and quantification of flaring along the different parts of the oil and gas value chains are available? Please name them. Do you consider them cost-effective?

	Available technologies	Level of quantification	Cost-efficiency
Exploration	1. Metering (ultrasonic etc.). 2. Direct measurement (eg radiometry). 3. Thermal radiance. NB: Please find response in the accompanying document.	1. High levels of quantification – can be scaled to different sizes of flare. 2. High. 3. Poor.	2. Low. 3. High.
Production	1. Metering (ultrasonic etc.). 2. Direct measurement (eg radiometry). 3. Thermal radiance. NB: (Please find response in the accompanying document.	1. High levels of quantification – can be scaled to different sizes of flare. 2. High. 3. Poor.	2. Low. 3. High.
Transmission			
LNG			
Storage			
Distribution			
Use (industrial)			

5.42 Should the EU mandate direct emission measurement for flaring within the EU supply chain?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

Standards for metering are highly established (e.g. API 14.10). It is important to consider however if the EU is going to mandate the reporting of methane emissions from incomplete combustion in flares, then the EU should mandate that the quantification approach is representative. In some cases, this will necessitate the use of direct emissions measurement, in other cases, the direct measurement may form the basis for the establishment of relevant factors for emissions quantification, and in still other cases, direct measurement, either directly, or indirectly may not be suitable, if the rate of flaring and the composition of the flare gas is highly variable.

5.43 Should the EU mandate the use of specific approaches for the measurement and quantification of flaring?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

The EU should set performance standards (e.g. accuracy and uncertainty) but not specific technology choices. If the EU mandates reporting of methane emissions from incomplete combustion in flares, then the expectation should be that appropriate methods/technologies are used by those doing the reporting to sufficiently estimate the emissions. Efforts should be made to avoid locking in reporters to one method or technology, that may not be seen as best practice in the future or that may not be suitable for certain types of flaring activities.

5.44 Would you consider the Clean Development Mechanism methodologies as a feasible basis for mandates on measurement of flaring emissions?

at most 1 choice(s)

- [ ] Yes
- [ ] No

If yes, which?

5.45 If you consider that EU legislation on flaring should determine the means of quantifying emissions, would you recommend that on-site measurement is used in all instances?

at most 1 choice(s)

- [ ] Yes
- [x] No

If no, please justify your answer

It depends on the cost versus the amount flared. Also flaring might be very occasional and therefore can't be measured, except for the fuel amount.

Onsite measurements of actual methane flared is largely not possible to monitor. There could be a requirement to have a flowmeter monitor gas flared, and estimate/calculate based on flared volumes using e. g. emission factors.

The specific site context will likely determine not only the applicability of measurement but also whether or not methane emissions measured at one site can form the basis for the utilisation of emissions factors for similar types of sites/operations. (see also 5.39).

5.46 If you consider that there are instances in which such determination is not feasible or proportionate, please name them.

Please consult 5.45.

5.47 Should the EU mandate the use of specific intervals or continuous measurement of flaring?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer

This does however depend on costs and effectiveness and what is meant by measurement; fuel amount can be continuously measured however efficiency and composition of the flue gas cannot.

“Continuous” measurement in terms of the volume of gas flow to the flare but more tolerant of reduced frequency for complimentary data such as gas composition and destruction efficiency.

Should also consider there may be low pressure flaring (tank control, etc.) that may not be measured at all and that parametric monitoring should not be limited only to gas flow measurement but allow for liquid flow measurement with a parametric determination of GOR as an option.

If emissions measurements were to be mandated by the EU, the focus should be on getting representative results that allow for suitable emission estimates to be made. If specific intervals are sufficient for a specific

asset or group of assets, then that would be appropriate. If the flaring and associated emissions from an asset are so dynamic in nature that interval measurement is not possible, then continuous measurement OR other quantification methodologies should be utilised.

5.48 How appropriate do you think the following measures would be in reducing flaring associated with energy produced in the EU?

	Very appropriate	Appropriate	Neutral	Not very appropriate	Inappropriate	No opinion	**Please explain your choice. If you consider it very appropriate or appropriate, please describe possible implementation.**
Mandate equipment standards and conditions for flaring in the EU		x					Since over time all companies must tend to have better technology that allows lower emissions.

Others (please elaborate)

Operators should also consider BAT.

Flare efficiency

Flaring is often seen as a favourable substitute to venting and therefore there is the possibility that in an effort to minimise venting there can be an increase in flaring. With a high-level of combustion efficiency, this can make significant reductions in methane emissions, but will still generate other environmentally and socially damaging by-products. In the case of low combustion efficiency, it can mean relatively little greenhouse gas emission reductions versus venting. It is also suboptimal to other options for the abatement of emissions. Where flaring is strictly necessary, it should be under optimal burning conditions and to high standards to minimise the release of methane and other harmful pollutants.

Flaring efficiency has been shown to be largely determined by wind velocity, gas exit velocity at the tip of the flare, flare tip diameter (tip size), and the energy content of flare gas. The best flares can achieve high efficiencies, 99% or better, but in the worst cases efficiencies could be as low as 50%, even 0% if the flame extinguishes. It is often assumed that flares on average operate at 98% efficiency, meaning that 2% of the waste gas is not burned, and approximately 2 million metric tons per year of methane is released into the atmosphere as unburned gas. However, some stakeholders estimate average flare efficiency to be substantially lower. In its methodology for estimating flare efficiency (defined as methane destruction efficiency) for open flares and enclosed flares, and subject to conditions, the UNFCCC recommends using a default 50% efficiency for open flares and a 90% default efficiency for enclosed flares[25].

In most countries with large-scale flaring activity, flaring is associated with conventional oil and gas production. However, flaring may also be associated with unconventional oil and gas production. Flow rates of flared gas can vary widely between locations. A small fraction of sites can account for the majority of the flared gas. This distribution may affect the economic viability of mitigation strategies. Flow rates of flared gas can also vary over time, particularly for unconventional oil production (where production declines rapidly), or in regions where the infrastructure for using gas is being constructed. The duration of flaring may also influence how economically viable certain mitigation strategies are.

Accurate monitoring of methane slip in flaring operations and its mitigation can provide at least a second-best advance towards emission reductions.

[25] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v1.pdf/history_view
Note that the methodology is designed for flare gases that contain only methane, hydrogen and carbon monoxide. It is designed to be used for gas from organic decomposition such as anaerobic digesters or for gas vented in coalmines. Nonetheless, it may be used to derive estimates of flaring efficiency in the oil and gas sector. In any case, the 90% flare efficiency default can be considered as conservative estimate.

5.49 Should EU regulation address flare efficiency?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please specify.

Current estimates and reporting requirements (98% destruction) are based upon research conducted in the 1980s since when technology in flare design has moved forwards.

Better guidance would be beneficial on:

• Common flare design efficiency criteria. It should be noted that the efficiency of flares is not optimal on start-up and can be influenced by weather conditions and/or feed (gas composition).
• The use of efficiency values in the reporting process.
• Record-keeping of proper vapour capture and destruction system design.
See State of Colorado Storage Tank and vapor control system Guidelines for smaller flare systems. For larger systems, it would be appropriate to document that systems are designed to flare within the design flowrate window for flare installed.

Need to ensure that any proposals are technology agnostic as the technology is still developing.

5.50 How appropriate do you think the following measures would be in reducing emissions from inefficient flaring?

	Very appropriate	Appropriate	Neutral	Not very appropriate	Inappropriate	No opinion	**Please explain your choice. If you consider it very appropriate or appropriate, please describe possible implementation.**
Transparency requirements on reporting of flaring efficiency by EU companies		x					
Prescriptive provisions on the monitoring of flare efficiency				x			
Prescriptive provisions /methodology for the quantification of flare efficiency					x		
Prescriptive							

provisions on technical configuration of flares					X		
Establish flaring efficiency targets for oil and gas companies in the EU		X					

Other, please specify.

It seems that these measures are more focused on the diagnostic part (quantification of emissions) and not on the reduction of the emission as such, that is, it does not correspond to measures for reducing flare emissions, although it is important to know the starting point to from which the reduction is made. For other measures, please consult 5.49.

To directly measure and monitor flaring efficiency, a number of instrumentation techniques can be used. These techniques are classified into two groups – extractive and non-extractive. In extractive technique, samples are removed from the flare plumes and analysed using combined Gas Chromatography and Mass Spectroscopy. Extractive techniques are shown to provide reliable estimates of flaring efficiency. In non-extractive technique, instead of removing samples from the flare plumes, chemicals present in the flare are identified and quantified using infrared spectroscopy. Remote sensing techniques have been shown to provide slightly less accurate but still acceptable estimates of flaring efficiency. In these techniques, instruments are mounted on the ground or aerial platforms and are located close to the flare sites.

5.51 Do you consider the available technological solutions for the direct measurement of flaring efficiency to be technically sufficient for accurate monitoring and quantification of methane emissions?

at most 1 choice(s)

- [ ] Yes
- [x] No

If no, please justify your answer.

Direct measurement can be supplemented by models therefore, the EU should allow flexible approaches as long as the methodologies can be detailed, documented, and meet certain quality criteria. The emphasis however should be on the use of BAT. Different solutions will provide different results. BAT will ensure that measurements are done to as high a standard as possible, in the most cost-effective way. Please consult 5.39.

5.52 Do you consider the available technological solutions for the direct measurement of flaring efficiency to be cost effective? Are you aware of relevant methods which should be considered best practice for the direct monitoring and quantification of flaring efficiency?

No, current methods for direct measurement are not cost-effective. Not aware of best practices. Radiometry techniques provide very valuable insights – but are costly and difficult to operate and are only provided by a very small number of companies A number of approaches are being actively tested by industry but too early to draw conclusions as to suitability and cost. Emphasis should be on the adoption of BAT (See also 5.51).

5.53 Are there any cases in which direct measurements can never be used? Please specify.

Regarding flaring, the most accurate methodology is likely to be based on the measured input of flow gas to the flare not a direct measurement of flaring emissions in the flare stack exhaust. “Direct” measurement is a confusing term for flaring. The most appropriate technology for this application at this time is likely gas volume measurement upstream with either sampling or modeling support for the influent concentrations.

Other methods such as satellite can report flared gas volumes but with a lower confidence level. Satellites are not currently capable of direct measurement of methane from flares (more suitable for site level). Please consult 5.40.

5.54 Should direct measurement and quantification of flaring efficiency be mandated for flaring activities within the EU?

No, because:
• It is not yet clear how to measure flaring efficiency;
• Non-continuous flaring should remain an option;
• Focus on outcomes, not process – modelling can also provide this in some circumstances;
• If other best practices are followed, measuring flare efficiency is a very costly step that will do very little to reduce emissions.

Please consult questions 5.42 and 5.49.

5.55 Should such a mandate include intervals for measurement? Please specify.

No, intervals are less important than understanding core influences on efficiency – such as wind patterns.

Please consult question 5.49.

Besides optimisation of flare conditions, flaring efficiency can be improved by steam injection and air injection, also known as steam-assist and air-assist. Steam-assisted and air-assisted flares produce smokeless flares by adding steam or air into the combustion zone, which creates turbulence for mixing and provides more air for combustion. However, too much steam or air has been to shown to have detrimental effects on flaring efficiency.

5.56 Are you aware of industry best practices for the improvement of flare efficiency? Please specify.

• Methane Guiding Principles, Reducing Methane Emissions: Best Practice Guide Flaring (Nov 2019).
• BAT (EU Guidance).

Additionally, consult question 5.47.

5.57 Should EU regulation stipulate technical requirements for the operation of flares with regard to optimisation of efficiency?

at most 1 choice(s)

- [ ] Yes
- [x] No

Please justify your answer.

No, flares vary in design and continue to improve – technical requirements would struggle to cope with the broad range of circumstances in which they are operated. EU should focus on outcomes, not operational decisions. It is appropriate to require operators to operate flares as they were designed to be operated, mandating decisions outside of that space is not appropriate.

Consult questions 5.49 and 5.56.

5.58 Should EU regulation stipulate technical inspection requirements for the setup of flares?

at most 1 choice(s)

- ☐ Yes
- ☑ No

Please justify your answer.

Please, consult question 5.49.

Satellite technology allows the monitoring of global oil and gas sector flaring. Already current satellites can provide daily coverage of flaring activities globally. However, to accurately estimate flare efficiencies through satellite observation, accurate information on quantity and composition of the gas passing through flares is necessary.

5.59 Should the provision of information on quantities and composition of gas sent through flares be mandated to enable efficiency monitoring?

- ☐ Yes
- ☑ No

Please justify your answer.

No, the gas composition varies in time, dependent on well systems, glycol, etc. Again, flare design efficiency should be point of departure.

Composition and quantity are not the only considerations in assessing whether a flare is performing adequately – issues such as maintenance are just as important. Variability will necessitate flexibility /pragmatism.

Super-emitters and energy imports

As satellite data improves, it could be viable to create a detection protocol for particularly problematic venting and flaring sources globally. This could be absorbed into the ‘super emitter detection service’ envisaged for the International Methane Emission Observatory (IMEO). The Methane Guiding Principles advocate creating an inventory of venting activities, for example.[26]

[26] Methane Guiding Principles, (2019). Reducing Methane Emissions: Best Practice Guide Venting, Retrieved on 17.12.2020 from https://methaneguidingprinciples.org/wp-content/uploads/2019/11/Reducing-Methane-Emissions-Venting-Guide.pdf

5.60 Would you support the creation of an inventory of venting activities?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

As per MGP guidelines - but the performance capabilities of the technology used need to be fully understood and made public.

5.61 Which data sources should such an inventory comprise?

This shall need to be driven by remote sensing technologies.

5.62 Do you consider effective verification of data feasible?

Some of the largest super-emitters found have been in parts of the world that are inaccessible for verification.

5.63 Where would you see such an inventory best hosted?

Such an inventory should have global coverage and be hosted by an independent international organization. It could be based within the United Nations Environment Programme, and/or indeed be part of the new responsibilities provided to IMEO.

5.64 How appropriate do you think the following measures would be in reducing venting and flaring associated with energy imported into the EU?

	Very appropriate	Appropriate	Neutral	Not very appropriate	Inappropriate	No opinion	**Please explain your choice. If you consider it very appropriate or appropriate, please describe possible implementation.**
Supporting emission abatement from venting and flaring through financial aid in developing countries						x	unreasonably onerous or stretch beyond a reasonable consideration of the EU's jurisdiction.
Supporting emission abatement from venting and flaring through sharing of best practices and regulatory support	x						

in developing countries							
Require certification of associated venting and flaring for energy imported into the EU			X				We are hopeful that the EU would recognize the value of the US reporting system, which is far more reliable and informative than reporting programs relied upon elsewhere.
Set a target for EU companies importing energy into the EU for associated venting and flaring						X	unreasonably onerous or stretch beyond a reasonable consideration of the EU's jurisdiction.
Ban imports of energy for which absence of associated venting and flaring cannot credibly be demonstrated.						X	unreasonably onerous or stretch beyond a reasonable consideration of the EU's jurisdiction.
Impose carbon border pricing on imports into the EU							

for countries that do not apply effective or enforceable venting and flaring penalties						X	unreasonably onerous or stretch beyond a reasonable consideration of the EU's jurisdiction.

Other, please specify.

6. Mitigation costs and benefits

The benefits from improved measuring and reporting of methane emissions through EU legislation would be an increased understanding of where and how emissions occur in the energy sector. This understanding can form the basis for effective mitigation and would lead to the achievement of larger reductions in methane emissions in that sector, with all the associated beneficial consequences in environmental, health and safety terms.

Fugitive emissions from leaking equipment, infrastructure or closed and abandoned sites as well as emissions from venting and incomplete combustion of methane represent the majority of methane emissions in the energy sector, so enshrining into EU law mitigation measures based on best practices targeting those areas of methane emissions could potentially lead to significant methane emission reductions in the energy sector.

For owners of the energy, mitigation techniques such as leak detection and repair or reduced venting and flaring can lead to benefits in terms of extra revenues from the gas saved and subsequently sold. Technologies that can prevent vented and fugitive emissions are reasonably well-known. In many cases, investment in abatement technologies is economic, as the gas saved quickly pays for the installation of better equipment or the implementation of new operating procedures. That said, the economic incentives are not always there, even when the business case seems to be apparent. Companies may decide to prioritise on more lucrative investments and/or they may not be taking into account environmental costs into their investment calculations. And there are certainly a number of cases where it could be considered that the business case for emission abatement is simply not there, such as in the case of closed or abandoned sites, or of unprofitable operations.

Information on the magnitude and distribution of costs associated with measuring, reporting and mitigation of methane emissions would be helpful to ensure the prioritisation of cost-effective measures where feasible, as well as to attempt to strike the right balance between regulatory, compliance (direct and indirect, e.g. through loss of competitiveness), social, environmental costs and other relevant costs, in order to effectively inform policy-making.

For the moment, the only known publically available source of information on the costs of mitigation of methane emissions in the energy sector is the International Energy Agency (IEA), which publishes a methane tracker database which contains country and regional estimates for methane emissions as well as abatement costs for oil- and fossil gas-related methane emissions by mitigation measure[27]. It indicates that 73% of global methane emissions can be abated with available technologies and methods and 40% at no net cost (at 2019 natural gas prices). For Europe the estimates are similar, 72% of methane emissions can be abated in total, 37% at no net cost. This includes a range of mitigation measures targeted at different parts of energy supply chains. The IEA estimations are focussed on oil and fossil gas-related abatement costs. The Commission’s own modelling shows a cost-effective mitigation potential for methane

emissions of 37% by 2030 from 2005 levels, a substantial part of which is in the energy sector[28].

However, there are no known publically available sources of actual costs of emission abatement in the energy sector reflecting actual costs at the level of companies/operators. For example, there is no public knowledge available today of the costs of achieving OGMP (or indeed IPCC GHG inventories) higher tier standard of measurement and reporting of emissions even for a standard company oil and/or gas company. Nor are there any such sources of cost information for leak detection and repair in the EU or elsewhere, or of the cost-implications of introducing legislation limiting flaring to safety reasons.

[27] https://www.iea.org/articles/methane-tracker-database

[28] Climate Target Plan impact assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF

6.1 Do you generally consider that the overall benefits – including economic, social, environmental and other relevant benefits - of putting in place legislative measures to ensure robust and effective measurement, reporting and mitigation of methane emissions in the energy sector generally outweigh the costs to industry?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

IOGP believes that direct and cost-effective legislative measures are required to measure, report, and mitigate methane emissions along the natural gas value chains. Priority action should focus on tackling the highest emission sources first. There may be additional costs, however, given the importance to the industry of mitigating methane emissions, the overall benefits outweigh additional costs.

6.2 Please specify below for the following cases whether you would consider generally, that the benefits of putting in place legislative measures to ensure robust and effective measurement, reporting and mitigating of methane emissions outweigh the costs? Please indicate yes/no and provide details where possible.

	Benefits outweigh costs?
Upstream gas	Depends on the costs to mitigate the possibly residual emissions. In Europe, oil and gas production tend to operate under sophisticated regulation and with declining methane intensity, and hence costs to mitigate residual emissions tend to be high.
Upstream oil	Depends on the costs to mitigate the possibly residual emissions. In Europe, oil and gas production tend to operate under sophisticated regulation and with declining methane intensity,

	and hence costs to mitigate residual emissions tend to be high.
Midstream gas	
Midstream oil	
Downstream gas	
Downstream oil	
Operating coal mines	
Closed/abandoned coal mines	
Biogas/biomethane plants	

6.3 Other than the IEA data, what sources can you point to which provide what you would consider useful information on the levels of costs and/or benefits of putting in place legislative measures to ensure robust and effective measurement, reporting and mitigating of methane emissions in any of the above areas of the energy sector?

IOGP found significant discrepancies in IEA high-level emission factor estimations and related abatement curves (for example in the Netherlands, UK, Germany, and Norway). IOGP is not aware of other reliable assessments of cost. The IEA data should be supplemented with other public sources when compared to industry data reported in Europe under national regulation/ procedures.

In the context specifically of fossil gas, contrary to producers, transmission, storage, and distribution systems operators (including many LNG terminals) are regulated businesses and do not own the gas they handle. They do not benefit directly from methane emission abatement, as the value of the saved gas would not accrue to them. The treatment of costs related to methane emission monitoring and abatement by National Regulatory Authorities determines the incentives (i.e. revenue) of regulated entities.

6.4 In the EU, are there any instances whereby regulated entities are required by law to monitor and abate their methane emissions and yet that these costs are not included as allowed costs and considered as part of the general duties of the operator to maintain the infrastructure?

at most 1 choice(s)

- ☐ Yes
- ☐ No

If yes, please state the Member State(s).

6.5 In such Member States, are there any other incentives to monitor and abate methane emissions?

at most 1 choice(s)

- [ ] Yes
- [ ] No

If yes, please specify.

6.6 If such costs have so far not been recognised by the National Regulatory Authority, has this substantially impacted the level of monitoring and abatement activities of regulated entities?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please elaborate.

6.7 If such costs have so far not been recognised, why should EU legislation require that they be recognised in the future?

7. Legislating mitigation of emissions from biogas/biomethane

Fugitive emissions from processing biogas/biomethane (as in biogas upgrading) plants from anaerobic digestion of biomass represent one of the non-negligible sources of methane emissions from the EU energy sector, and it should therefore be considered whether further obligations to measure, report and mitigate such emissions shouldn’t also be included in the policy proposals to regulate methane emissions in the energy sector. Currently, methane emissions from biogas/biomethane facilities (incl. leakage, venting and flaring) are being reported in the EU GHG inventory, and as such are subject to the overall reduction requirement of the EU effort sharing legislation.

While regulation of measurement and reporting of such emissions could be included together in the upcoming regulation of methane emissions in the energy sector, at least parts of the requirements on the mitigation of methane leakage in biogas/biomethane plants could also be included in the Renewable Energy Directive (RED).

In order to be counted towards the RED targets, biogas/biomethane has to demonstrate compliance with the RED sustainability criteria - which includes minimum greenhouse gas savings thresholds - either via the use of default greenhouse gas savings values contained in the RED for different substrates or when these are insufficient for demonstrating compliance, operators have the opportunity to deliver calculations of

actual greenhouse gas emissions savings of their production, following a strictl and detailed methodology defined in the RED and subject to a specific system of sustainability compliance which includes sustainability certification, also defined in the RED.

The RED's methodology to calculate actual values includes the requirement to take into account emissions from leakages occurring during the processing stage. The default values of the RED also already have some incentives for minimising methane leaks by offering higher default savings values for closed rather than open digestates.

What is not shown in the RED however is default methane leakage values broken down by source of emission and for different types of anaerobic digestion plants. Explicitly including such default values in the RED would enable operators to incorporate them in their overall greenhouse gas emissions calculations as part of the existing requirement in the RED to include leakage (of methane) as part of process emissions, and to do so without having to calculate actual values corresponding to their specific production process. The methane loss values assumed in the RED's default values should also be reviewed to ensure that they are in line with the most recent estimations available, and also to ensure that they are set at relatively conservative levels so that they can incentivise operators to put in place more effective technologies or leak mitigation measures leading to less leakage than those default values, and to deliver evidence of those actual values according to a specific methodology, which would also need to be developed.

Regulating in the RED has the additional advantage of being applicable equally to all producers of biogas /biomethane – whether based in the EU and elsewhere - wishing to have their production counted towards the renewable energy targets of the RED.

7.1 Do you consider that biogas/biomethane producers should be obligated by law to reduce their fugitive methane emissions?

at most 1 choice(s)

- [x] Yes
- [ ] No

If no, please justify your answer.

In order to allow biomethane to fulfill its potential as a decarbonised energy source, it will be important that methane emissions from its value chain are measured, reported, and verified to the same standard as for the oil and gas sector. Failure to do so could offset some of the environmental gains associated with greater deployment of biogas and biomethane in the European gas system.

7.2 Do you agree that the RED should be further developed as suggested above, thereby complementing any reporting and/or mitigation measures also included in the methane energy sector regulation?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

RED should make provision to include greater transparency of the methane emissions from biogas /biomethane since such emissions determine their overall GHG intensity. Not including such information may lead to distortions or unintended consequences relating to meeting the renewable energy targets under RED.

7.3 Do you consider that separate mitigation measures should also be developed in the upcoming regulation on methane in the energy sector in complement to the RED?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

Methane emissions mitigations measures relating to biomethane should also be provided for in the methane regulation, in order to create consistency and a level playing field across the European gas system as a whole.

7.4 Are you supportive of the idea to regulate such emissions in the RED by explicitly including default values for processing methane leakages at conservative levels to incentivise mitigation and the delivery of lower actual values?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

Default values that are standardised will help to create transparency and consistency in the approach to biogas/biomethane under RED, including potential integration into the Guarantees of Origin where default values would be necessary in order to facilitate the trading of these certificates.

7.5 Are you supportive of the idea to develop a methodology to estimate actual values of methane losses in biogas/biomethane plants, and to be included as part of sustainability compliance in the RED?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

Such a methodology can assist biomethane producers with establishing consistent and transparent data relating to emissions. This methodology under RED should reflect and integrate the main elements of OGMP2.0.

8. Legislating mitigation of emissions from coal

The IEA Methane Tracker estimates the global total of methane emissions from the coal sector at 39Mt per year, representing 9% of global methane emissions. In Europe specifically, 34% of methane emissions in the energy sector are fugitive emissions from the coal sector[29], amounting to some 1.1Mt of reported emissions for the EU-27 (57% of which come from Poland).[30] These fugitive emissions come from surface mines, underground mines, post-mining activities, and abandoned mines. Underground mines represent the largest source of reported emissions from the coal sector (87%)[31].

In underground mines, methane leakage is an important health and safety issue as it can lead to explosions for certain concentrations of methane in the air. Production releases methane trapped in coal seams, called coalmine methane (CMM). Once production is halted and the mine is abandoned, it continues to release methane, referred to as abandoned mine methane (AMM), over a long period of time.

Since 1990, certain EU countries have massively reduced methane emissions from coal mining, such as Germany, the UK and also the Czech Republic. In comparison, no changes have been recorded in Romania, while in Poland, methane emissions from coal have been reduced by only around 17%[32]. Some projections consider that the decrease in coal production will lead to a decrease in coal-related methane emissions[33]. However, recent studies have shown that these emissions might be currently underestimated, and are likely to increase in the future because of continued abandoned mine methane emissions, and exploitation of deeper and gassier deposits due to the exhaustion of shallow coal reserves [34].

Mitigating coalmine methane can be challenging as methane concentration of emissions in operating mines is often very low and can fluctuate in quality and quantity. The lower the concentration of methane, the more technically difficult and costly it is to abate[35].

At present, there are no EU-wide specific regulations limiting coalmine methane emissions, in operation or after their closure. In some Member States, national legislation is in place to reduce the fugitive methane losses from coal production[36]. In Germany, coal mine methane and abandoned mine methane are treated as a renewable resource and are eligible for feed-in-tariffs when used to generate electricity. In the UK, legislation has provided tax breaks for CMM projects[37]. In France, mine methane is also used for electricity generation and benefits from renewable energy tariffs[38].

The EU has funded a number of research and development projects to introduce improved tools for methane emissions control[39]. The forthcoming Commission proposal to reform the Research Fund for Coal and Steel also supports research in this field. In addition, the initiative for Coal Regions in Transition, now part of the Just Transition Platform, can serve as a forum for discussing good practices and best available techniques.

[29] Climate and Clean Air Coalition (CCAC) Scientific Advisory Panel, (2020), UNFCCC 2017

[30] Ember, Poland's second BEŁCHATÓW, 2020; UNFCCC 2018 data

[31] UNFCCC 2017 reported data on greenhouse gas emissions: EEA Report No 6/2019, Annual European Union greenhouse gas inventory 1990–2017 and inventory report 2019, Submission under the United Nations Framework Convention on Climate Change and the Kyoto Protocol, 27 May 2019

[32] Ibid

[33] Global Non-CO2 Greenhouse Gas Emission Projections & Mitigation Potential: 2015-2050, EPA, 2019

[34] Global methane emissions from coal mining to continue growing even with declining coal production, N. Kholod et al, Journal of Cleaner Production, 2020,

[35] IEA, World Energy Outlook 2019

[36] Global Methane Initiative (2013). European Commission Global Methane Reduction Actions, Ref. Ares (2013)2843722-06/08/2013.

[37] N. Kholod et al., Legal and Regulatory Status of Abandoned Mine Methane in Selected Countries: Considerations for Decision Makers, 2018

[38] French Electricity Act 2000

[39] Global Methane Initiative (2013). European Commission Global Methane Reduction Actions, Ref. Ares (2013)2843722-06/08/2013.

8.1 In light of the above, do you consider that the EU regulation to reduce methane emissions in the energy sector should cover coalmine methane?

at most 1 choice(s)

- ☐ Yes and it should cover both CMM from operating and closed/abandoned mines;
- ☑ Yes and it should cover only CMM from operating mines;
- ☐ No

If no, please justify your answer.

Coal mine methane is a significant source of methane emissions and should be addressed as part of the EU methane legislation.

Certain EU Member States are currently already measuring and reporting fugitive methane emissions in the coal sector using higher tier methods based on mine-specific measurements and calculations. According to IPCC Guidelines however, it is not yet feasible to collect mine-specific higher tier measurement data for surface mines. But there are still a number of EU Member States that do not report their data according to direct measurements, and rely instead on estimations.

8.2 Do you consider that the current levels of reporting of coalmine methane and abandoned mine methane emissions in the EU are sufficient?

8.3 Should all EU Member States be obligated to achieve highest tier levels of reporting for all underground mines within a certain time schedule?

8.4 Are there any reasons why full ‘higher tier’ reporting for all underground mines may not be feasible?

8.5 In the interest of more accurate estimation of emissions, should reporting on underground mine methane emissions include details on coal rank, extraction method and depth?

at most 1 choice(s)

- [x] Yes
- [ ] No

Please justify your answer.

Data collections should focus on methane emissions footprint, rather than operational matters that in themselves do not relate to volume or source of methane.

Coalmine methane mitigation

In active underground mines, atmospheric methane concentration is continuously controlled. Methane drainage can be used to lower the percentage of methane in the air: capturing the gas to prevent it from entering mine airways. Methane can be captured before, during and after mining by pre- and post-mining drainage techniques, respectively.

The recovered methane can be used (most commonly for power generation, direct thermal, and pipeline injection), vented or flared when utilisation is not possible. Ventilation air from underground mines contains diluted concentrations of methane and is referred to as ventilation air methane (VAM). It can be mitigated by oxidation, with or without energy recovery (methane molecules are broken down in an exothermic reaction), or used as a supplementary fuel (i.e: combustion air for boilers, turbines)[40].

Although CMM activities would increase local and regional NOx emissions near project sites, at the EU-wide scale the overall effects of grid electricity displacement result in net reductions in overall NOx emissions[41].

[40] Ventilation Air Methane (VAM) Utilization Technologies, EPA, July 2019 https://www.epa.gov/sites/production/files/2017-01/documents/vam_technologies-1-2017.pdf.pdf

[41] Karl H. Schultz & Linus M. Adler for the Joint Research Centre, Environmental and Sustainability Assessment of Current and Prospective Status of Coal Mine Methane Production and Use in the European Union, 2015 https://publications.jrc.ec.europa.eu/repository/bitstream/JRC96133/lb-na-27402-en-n%20.pdf

8.6 Which of the following factors are important considerations which explain why methane from operating mines cannot be systematically recovered and used?

- [ ] Safety requirements for ventilation
- [ ] Safety requirements for mine drainage
- [ ] Cost of abatement
- [ ] Insufficient concentration of methane
- [ ] Lack of infrastructure for methane use (proximity to pipelines)

Other, please specify.

8.7 Are there instances whereby venting of CMM is unavoidable? If so, what instances? [

8.8 For instances in which release of methane is unavoidable, should EU legislation specify obligations to prevent direct venting from active coalmines? Please describe feasibility of available prevention techniques (e.g. capture, flaring, other).

8.9 Should the EU require the use of technologies to mitigate ventilation air methane emissions?

at most 1 choice(s)

- ☐ Yes, with a recovery of its energy value
- ☐ Yes, even without recovery of its energy value
- ☐ No

Please explain your choice.

Abandoned mine methane mitigation

In most parts of the EU, underground coal mining activities have been declining considerably for a number of years, principally due to the closure of coalmines for economic reasons.

Technologies to recover methane from closed or abandoned mines are available and already operational in certain parts of the EU such as flaring of excess drained gas, exploitation of drained gas for power generation, pipeline gas, chemical feedstock and others, and use or abatement by oxidation of ventilation air methane.

Emissions from abandoned mines are estimated rather than measured (with IPCC or EPA methodologies). Direct measurement of total AMM is not technically feasible[42]. Satellites such as GHGSat are able to monitor and quantify (with 40–45% precision) emissions from mine vents[43].

[42] Global methane emissions from coal mining to continue growing even with declining coal production, N. Kholod et al, Journal of Cleaner Production, 2020,

[43] Quantifying Time-Averaged Methane Emissions from Individual Coal Mine Vents with GHGSat-D Satellite Observations, D. J. Varon et al, Environmental Science & Technology, 2020, https://pubs.acs.org/doi/10.1021/acs.est.0c01213

8.10 What would you consider appropriate measures to enable AMM mitigation? Please described possible barriers to implementation.

8.11 How important would you consider the following factors to be in the decision to engage in AMM mitigation:

	Highly important	Important	Unimportant	No opinion
Public health	○	○	○	○
Technological innovation	○	○	○	○
Social benefits (e.g. employment)	○	○	○	○
Environmental benefits (local and global)	○	○	○	○
Regional development	○	○	○	○

Other, please specify.

Uncertainty about the ownership rights for methane emitted from abandoned sites can be a regulatory barrier to its capture and utilisation. Clearly defined ownership rights can help companies mitigate risks in their contractual arrangements. Countries with successful AMM projects have created an enabling environment by eliminating restrictions on transferring rights to the gas, regardless of where the gas is used.

8.12 Should AMM ownership rights be addressed in EU legislation?

at most 1 choice(s)

- ☐ Yes
- ☐ No

Please justify your answer.

8.13 Are you aware of existing frameworks for AMM ownership that the Commission should take into account?

8.14 Should EU methane legislation set an obligation on mine operators to install recovery systems for future gas recovery after abandonment/closure?

at most 1 choice(s)

- [ ] Yes
- [ ] No

Please justify your answer.

9. Synergies with other sectors

The main sources of anthropogenic methane emissions in the EU are from the agriculture, waste and energy sectors. The Communication on the Methane Strategy indicated that while the most cost-effective methane emission savings can be achieved in the energy sector, there are potential synergies and trade-offs for mitigating the cost of emission reductions in agriculture and waste via energy-sector based measures. The Communication for instance highlights the production of biogas from non-recyclable, sustainable, sources of human and agricultural waste (e.x. manure) and residue streams as such an example.

9.1 Can you provide other examples of initiatives or regulatory measures in the energy sector which could also contribute to cost-effective methane emissions mitigation in other high methane emitting sectors such as agriculture and waste?

In the upstream energy sector, methane emissions are typically part of the scope of discussions between the relevant national regulator and the operator. Operators are expected to demonstrate an understanding of potential sources of methane emissions from their installations, in addition to proposing and implementing mitigation measures. Permitting decisions by regulators can be influenced by the detection and mitigation plans proposed by operators.

IOGP suggests that such direct discussions between operators (in waste and agriculture) and their respective regulators should also be required, in order to trigger targeted and appropriate mitigation action in respect of individual installations in these sectors.

Thank you for your participation.

Contact

Contact Form

Accompanying document: IOGP response to public consultation (questionnaire) on legislation to measure and mitigate methane emissions in the energy sector

The International Association of Oil & Gas Producers' (IOGP) member companies account for approximately 70% of the oil and gas produced in Europe. IOGP shares the world's ambition to reach the Paris Agreement's goals and supports the EU's objective of climate neutrality by 2050 upon the implementation of enabling measures.

This document contains additional comments which accompany IOGP's response to the public consultation (questionnaire) on legislation to measure and mitigate methane emissions in the energy sector.

- Continuation of response to Question 4.4.
  Should EU legislation on LDAR determine the frequency of LDAR campaigns?
  - **IOGP response:** We attach some examples of frequency used in some countries.

Table 4. Leak Detection and Repair Program

Topic	Mexico	Canada	United States	Norway
Frequency	Every 3 months	60 days after the day on which production at the facility first began and subsequently at least 3 times per year and at least 60 days after previous inspection	Semiannual for well sites. Quarterly for compressor stations. Monthly to Annually on Natural Gas Processing Plants, depending on time in use of the equipment.	According to the Plan for Development and Operation

- Continuation of response to Question 4.6.
  Please specify the recommended frequency of LDAR campaigns according to the following type of potentially leaking component (in terms of frequency per year)
  - **IOGP response:** The premise of this question is wrong – the frequency of LDAR is dictated both by type of equipment, its use and location. As stated above it does not make sense to vary frequency by component type. Once personnel or technology is deployed on a location it makes sense to perform monitoring of all component types. Current experience in NL shows that once every 3 to 5 years is sufficient for a formal program. After opening equipment, target checks to leaks must be carried out. In current practice, NL operators do repairs during shutdowns. After repairs, checks are performed by means of a leak-no leak approach (simple ultrasonic devices or soap). Thus, the approach is risk / event based.

- **Continuation of response to Question 5.25.**
  Are there appropriate technological solutions available for the direct measurement and quantification of venting along the different parts of the oil and gas (and coal) value chains? Please name them. Do you consider them cost-effective?
  - **IOGP response:** UNECE and OGMP Technical Guidance Documents provide guidance as each solution needs to be evaluated on a case-by-case basis, taking into account variation in emission rates, gas composition and how these variations impact the frequency and need for gas composition analysis in each case. It is to be noted that conditions during venting can differ significantly, making measurement difficult. This is especially noticeable at very low flow conditions and at the extreme flow conditions during blow down. To determine the methane emission, the composition of the vented gas must be known, which is not always a constant.

- **Continuation of response to Question 5.36.**
  Are there appropriate technological solutions available for the direct measurement and quantification of venting along the different parts of the oil and gas (and coal) value chains? Please name them. Do you consider them cost-effective?
  - **IOGP response**: All depends on the site specifics. Note that table does not appear to include natural gas processing.

- **Continuation of response to Question 5.41.**
  Do you consider appropriate technological solutions for the direct measurement and quantification of flaring along the different parts of the oil and gas value chains are available? Please name them. Do you consider them cost- effective?
  - **IOGP response:** Cross reference to API14.10 for different design and performance specifications. (see also 5.39).