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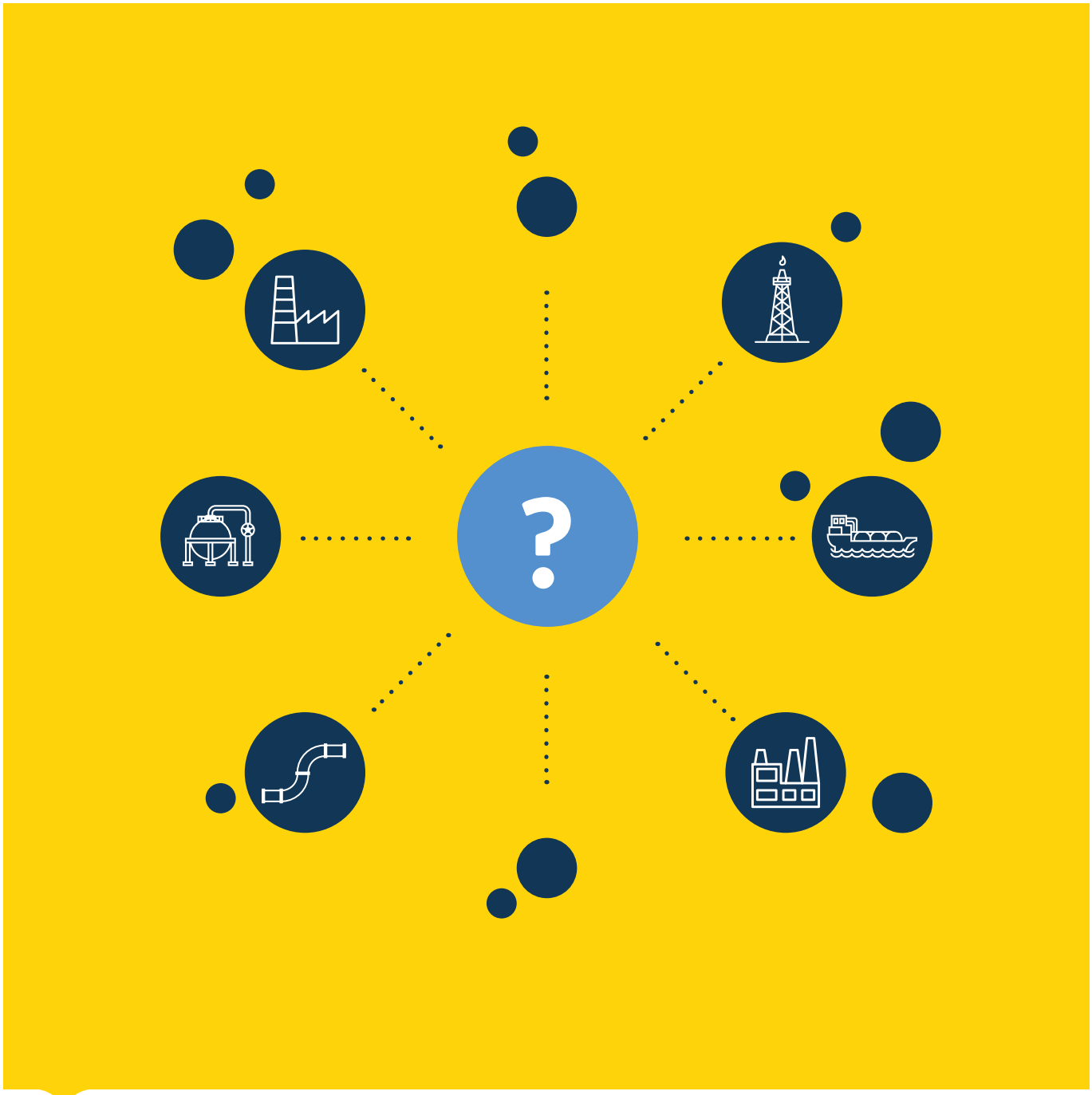


Market survey:

methane emissions from natural gas companies

Introduction

Methane is an extremely climate-damaging greenhouse gas. Over 20 years, it is about 86 times more harmful to the climate than CO_2, leaking along the entire natural gas value chain.[1] Recent scientific findings show that these methane leakages are much higher than previously assumed.[2] The industry seems to be increasingly recognising the relevance of the problem in the face of social and political pressure. But what are individual companies in the natural gas industry doing specifically to stop methane leakages - and what exactly do they know about them?

In order to get answers to these questions, Deutsche Umwelthilfe together with urgewald prepared a questionnaire on methane emissions from the natural gas value chain and sent it to 19 companies active in the natural gas industry. Based on various questions, we wanted to know from the companies:

1. **Are you living up to your product responsibility?**
2. **Do you know the level of your emissions?**
3. **Are you taking measures to reduce emissions?**

The results of the survey are presented and evaluated below.

Transparency: what do companies in the natural gas industry disclose?

The survey of the 19 contacted companies reveals that the industry cannot provide sufficient transparency on the level of emissions and reduction measures. Of the companies requested, 7 responded, but only 2 of them completed the questionnaire. Another 5 companies did not complete the questionnaire but sent a general response (e.g. in the form of their sustainability report or in the form of an abbreviated response based on the questionnaire). 12 companies did not respond despite being individually approached and reminded.[3]

Selection of the companies

» The companies surveyed are major players in the European natural gas industry and can exert considerable influence on the entire natural gas value chain due to their high market power.

Classification: the size of the problem

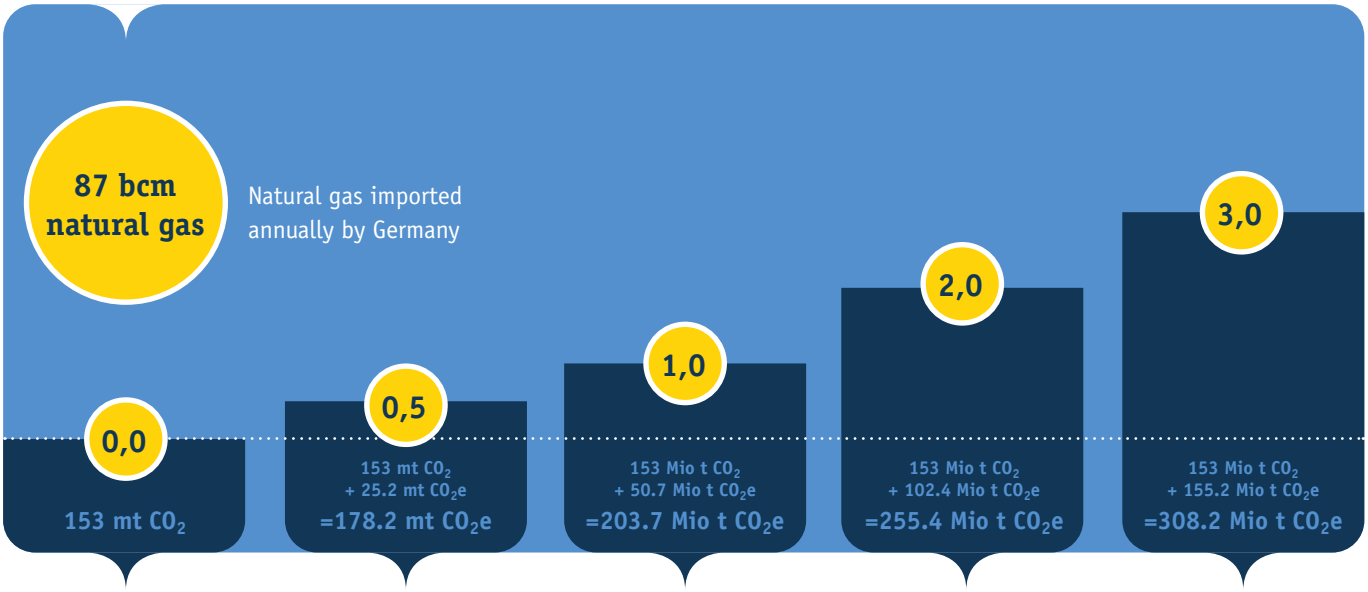
Of the seven companies that provided answers, four indicated their current gas demand or gas consumption. Their numbers reveal that the companies continue to purchase massive amounts of fossil raw materials. This natural gas not only causes CO_2 during its use, but also leads to the emission of greenhouse gases along the entire value chain from extraction, processing and transport to storage and consumption. In this context, the release of methane, the main component of natural gas, plays a particularly important role.

Recent scientific research suggests that these so-called methane leakages are much higher than previously assumed. They must be included in any greenhouse gas balance report to realistically reflect the climate impact of natural gas. Natural gas loses its climate advantage over coal as soon as between 2.4 and 3.2% of the total production escapes into the atmosphere (the so-called leakages). Measurements from the USA, for example, show leakage rates of 2.3 % to 9 %. But what relevance do different leakage rates have for the overall greenhouse gas balance of a company or even a state? In the following, this problem is illustrated using the sum of natural gas imports to Germany.[4]

Example:

» Germany imports about 87 billion cubic metres (bcm) of natural gas annually.[5] Burning this quantity for heating purposes would produce about 153 million tonnes (mt) of CO_2.[6] However, if leakages in the upstream chain are added, the total value increases accordingly. For example, assuming an average leakage rate of 2.3% for Germany's natural gas supply, methane leakages increase emissions by about 117 million metric tons of CO_2 equivalents (CO_2e) from the original 153 million metric tons to a total of about 270 million tonnes of CO_2e.[7] Assuming a leakage rate of 4%, emissions already increase by 209 million tonnes of CO_2e to a total of 362 million tonnes, i.e. more than twice the emissions that would occur without any leakages.[8]

The amount of leakages in the upstream chain is therefore crucial to correctly determine the climate impact caused by the use of natural gas. Unfortunately, the magnitude of this problem is unknown in most cases. For countries like Russia, where much of our natural



- 87 bcm release about 153 mt of CO_2 when burned, if no emissions ouccuring in the value chain are considered
- Total emissions in case of an assumed leakage rate of 0.5%
- GWP of 86 over 20 years
- Total emissions in case of an assumed leakage rate of 1.0%
- GWP of 86 over 20 years
- Total emissions in case of an assumed leakage rate of 2.0%
- GWP of 86 over 20 years
- Total emissions in case of an assumed leakage rate of 3.0%
- GWP of 86 over 20 years

gas comes from, there is little independent data.[9] However, the data that does exist, as well as the findings from the US, show: The problem is much bigger than previously thought and more transparency is urgently needed.

Results of the survey

1. Reduction targets and strategies of the companies surveyed

All companies that responded have set targets to become climate neutral by mid-century at the latest. Some would like to reach the goal of climate neutrality earlier, e.g. by 2025 or 2035. In addition, companies are setting themselves intermediate targets along the way. However, what climate neutrality actually means differs. For example, the conversion to biomethane or Bio-LNG[10] or the use of CCS technology[11], but also offsetting[12] are being considered to achieve decarbonisation [e.g. mentioned by Uniper].

Some companies are also considering a partial switch from coal to natural gas on the way to carbon neutrality before they want to use CO_2-free gases such as hydrogen [EnBW]. It is pointed out that switching from coal to natural gas avoids emissions and enables additional investments in wind and solar energy [Fortum]. Some companies want to use natural gas where conversion to sustainable biomass is not possible [Ørsted]. One company also stated that they are tied to the purchase of natural gas due to long-term contracts, with no new contracts of this kind to be signed [Ørsted]. In general, the companies see the area of „climate neutral gases“ as a growth factor [Fortum].

The use of hydrogen is seen as an important means of decarbonising companies' processes in the medium to long term. In this context, both green hydrogen, produced from renewable electricity, and blue or turquoise hydrogen, produced from natural gas, are mentioned. This use of different types of hydrogen is justified by the need to enable a market ramp-up of the technology.

Despite the measures mentioned, however, none of the companies presents a concrete date for a phase-out of fossil natural gas. Although some of the companies recognise that natural gas as a fossil energy should no longer be used in the energy system after a certain point, they do not specify when exactly this should be the case for their businesses. Instead, in many places, long-term purchase contracts, wrong political framework conditions, missing economic viability of alternatives or an alleged lack thereof are cited. Therefore, even though some companies have already set interim targets for reducing emissions from their natural gas business, there is a lack of concrete phase-out roadmaps that would make the often-mentioned goal of climate neutrality credible.

2. Information provided by surveyed companies on their methane emissions

The responses show that the companies mostly include so-called Scope 1 and Scope 2 emissions in their considerations, but do not consider Scope 3 sources to the same extent. Scope 1 covers the direct emissions of a company from its own or direct sources. This includes, for example, emissions from the combustion of natural

gas for heating purposes or the generation of electricity. Scope 2, on the other hand, refers to indirect emissions from the generation of electricity, steam, heat or cooling that the company in question purchases and consumes.

Scope 3 includes all other indirect emissions that occur in the company's value chain. This also includes emissions that occur during the transport and delivery of a purchased energy carrier (such as natural gas).[13] This part therefore includes methane leakages that occur, for example, at drilling sites, pipelines, valves or compressor stations on the way to the purchasing company. Precisely because these leakages are so decisive for the overall balance of the respective energy carrier, they must be rigorously included and tracked.

Some of the surveyed companies already include Scope 3 emissions in their considerations, while others announce a timely target for their reduction. However, it becomes clear here that a lack of data and willingness to act all too often prevents the actual emissions from being recorded and classified. Instead, reference is made to standard values and calculations of emissions are based on the GHG Protocol.[14] However, this methodological standard recommends that companies use the GWP value over 100 years for the greenhouse gas under consideration.[15] This approach does not do justice to reality in many instances. A reduction in emissions that is compatible with climate protection targets must, be based on a realistic picture of the starting situation. Here, measurements must take the place of estimates. In addition, for many companies it is not clear which GWP value they base their calculations and targets on.

Summary of the companies' statements on the level of their methane emissions:

EDP: Reference to Sustainability Report. Emissions listed according to Scope 1-3. Figures are estimated or calculated, no own measurements.

EnBW: Concrete data on methane emissions are difficult to determine due to inconsistent calculation models, therefore the standard upstream[16] factors in CO_2 per Tera Joule (TJ) of natural gas (German natural gas mix[17]) are still used. Plan to gradually improve the reporting and monitoring of gas. Reporting on gas procurement (including methane) is to be expanded in the future.

Enel: Reference to Sustainability Report: Overview of Scope 1-3 emissions. For methane, an outdated and too low value is used, furthermore only consideration of the effect over 100 years. Estimate of methane emissions included in report, but only concerning the gas trading market in Europe. Methane from gas pre-chain not in focus.

Fortum: Use of country-specific emission factors. According to Fortum, the group's methane emissions in 2019 corresponded to approximately 0.06% of Scope 1 GHG emissions and approximately 10% of Scope 1-3 emissions. Methane emissions are therefore considered rather low, no focus on this. The company does not carry out its own measurements. Fortum obtains 99% of its natural gas from Russia.

Ørsted: No concrete information on the amount of Scope 3 emissions, own measurements not available. However, an estimate of the level of emissions can be found in the sustainability report.

Uniper: Most of the LNG (liquefied natural gas) purchased comes from the USA. With the current reporting obligations, it is not possible to trace the exact origin of the gas. According to the company, it must be assumed that natural gas from fracking sources is a relevant part of the portfolio.[18] Until a concept is implemented by the Oil and Gas Methane Partnership (OGMP, see below „Excursus: global initiatives and OGMP"), only estimates, not sufficiently precise data on the amount of resulting emissions can be given. Information on the quality and type of data for Russia (Gazprom) and the US (Freeport LNG) is provided. Verification of the Gazprom figures is not possible for Uniper. Data quality and reporting are to be improved within the framework of OGMP. With regard to Russian natural gas deliveries, the company refers to Gazprom's official figures. These assume a leakage rate of only 0.29% of the gas transported and 0.02% of the gas produced by the company.

Vattenfall: Methane emissions from gas turbines and boilers are below reporting threshold for European E-PRTR reporting.[19] No further information provided.

3. Information from the companies on reduction measures

EDP: Reference to sustainability report. No content on the topic of methane emissions can be found there.

EnBW: Own infrastructure is regularly checked and reduction measures are taken, e.g. through intelligent network management to avoid venting of gas, e.g. during maintenance work on pipelines.

Enel: Reference to sustainability report. No content on the reduction of methane emissions can be found there.

Fortum: No improvements planned, i.e. no independent measurements in the future. No plans to obtain information on methane leakage through partners. No targets to reduce methane emissions beyond legal requirements. Maintenance and servicing is carried out regularly („predictive and preventive") to proactively avoid leakages of methane and other greenhouse gases.

Ørsted: Several long-term supply contracts obligate the company to continue purchasing natural gas further in the future. No new long-term gas supply contracts planned. Conversion of CHP plants to biomass has taken place. No construction of new biomass CHP plants. Continued use of natural gas where conversion to biomass

is not possible. The company is obliged by partners to hold natural gas in reserve for energy supply. The company has decided to stop purchasing and supplying natural gas in the future.

Uniper: Application of best practice methods for prevention of emissions in the natural gas storage facilities. Within the framework of OGMP, it is planned to develop a uniform emission reporting standard across the entire natural gas value chain. This will be followed by the exchange of best practice applications with partners and joint action against identified emissions. Uniper and its partners have set themselves targets that go beyond legal regulations. Unnecessary emissions are reduced, for example, through an LDAR[20]-campaign. So far, there has been one bilateral exchange with a strategic supplier on the topic of methane emissions.

Vattenfall: The company wants to engage in dialogue on measuring and reducing upstream and midstream emissions. Currently there is no standard for responsible management of the gas supply chain, this is recognised as a problem and the company has started initiatives but wants to learn more about the issue. Vattenfall encourages partners to join relevant initiatives or share data with the Carbon Disclosure Project[21] (CDP). Renewable gases are to be used where electrification is not possible.

Excursus: global initiatives and OGMP

In recent years, a number of voluntary industry initiatives have been founded to help reduce methane emissions. One of the best-known associations is the Oil and Gas Methane Partnership (OGMP), which was launched in 2014 under the auspices of the UN. Companies that want to become members must, among other things, check their facilities for methane emissions according to defined criteria, analyse cost-effective measures to reduce emissions and report annually on their progress. In 2020, the reporting framework was revised; OGMP 2.0 was launched.

Participating companies aim to reduce their methane emissions by 45% by 2025 and by 60-70% by 2030 - starting from 2015 levels. However, the baseline can only be estimated due to lack of data. The goal is to reach „near zero“ by 2050. OGMP 2.0 is particularly characterised by the fact that future reporting is to be based on actual measured reduction data and no longer on estimates.

In recent years, the range of measurement methods available to detect leaks more accurately has increased. For example, several satellite projects hold the potential to detect methane emissions more effectively than ever before. The intensive use of these modern instruments should therefore be pursued by all actors. This is a prerequisite for detecting and eliminating leaks.

However, the most important measure for reducing methane emissions is and remains the reduction of natural gas consumption. If no more natural gas is extracted and transported, no unintentional emissions occur. Initiatives such as OGMP 2.0 can help to reduce methane emissions. However, it must always be clear that natural gas remains a fossil fuel that the world must phase out as soon as possible. If the clear goal of phasing out natural gas is not envisaged, voluntary initiatives risk becoming a fig leaf that continues to legitimise and perpetuate fossil fuel business models instead of contributing to climate protection goals.

Experience also shows that voluntary initiatives alone are not enough to tackle these and similar environmental problems - legal standards must be created to combat methane emissions as effectively as possible. The EU methane strategy presented in 2020 is a first step in this direction. The issue of voluntarism is also reflected in the results of the survey: Of the seven companies that responded to our enquiry, only Uniper is a member of OGMP 2.0.

Evaluation

From the responses received, it appears that overall there is a shocking lack of knowledge among the participating companies about their upstream emissions and especially about methane leakages. Many companies simply refer to their sustainability reports instead of answering the questionnaire. However, the reports only contain fractions of the information requested.

The answers of the companies surveyed reveal: the companies are still dealing with the issue too superficially and are not yet taking sufficient responsibility for the emissions that arise from their business model. Indeed, all companies that answered the questions have the goal of becoming climate neutral by 2050 at the latest. However, many of the measures needed to achieve this are not yet being implemented. The companies argue that although more effective avoidance of emissions is being strived for, this is currently still not possible to the desired extent due to a lack of measurement data.

Within their own operational business, the companies use regular and partly proactive checks of their infrastructure to detect and

eliminate methane leaks at an early stage. Intentional flaring and venting of natural gas, e.g. during maintenance work, is also increasingly identified as a problem and avoided. From the point of view of DUH and urgewald, this is welcome.

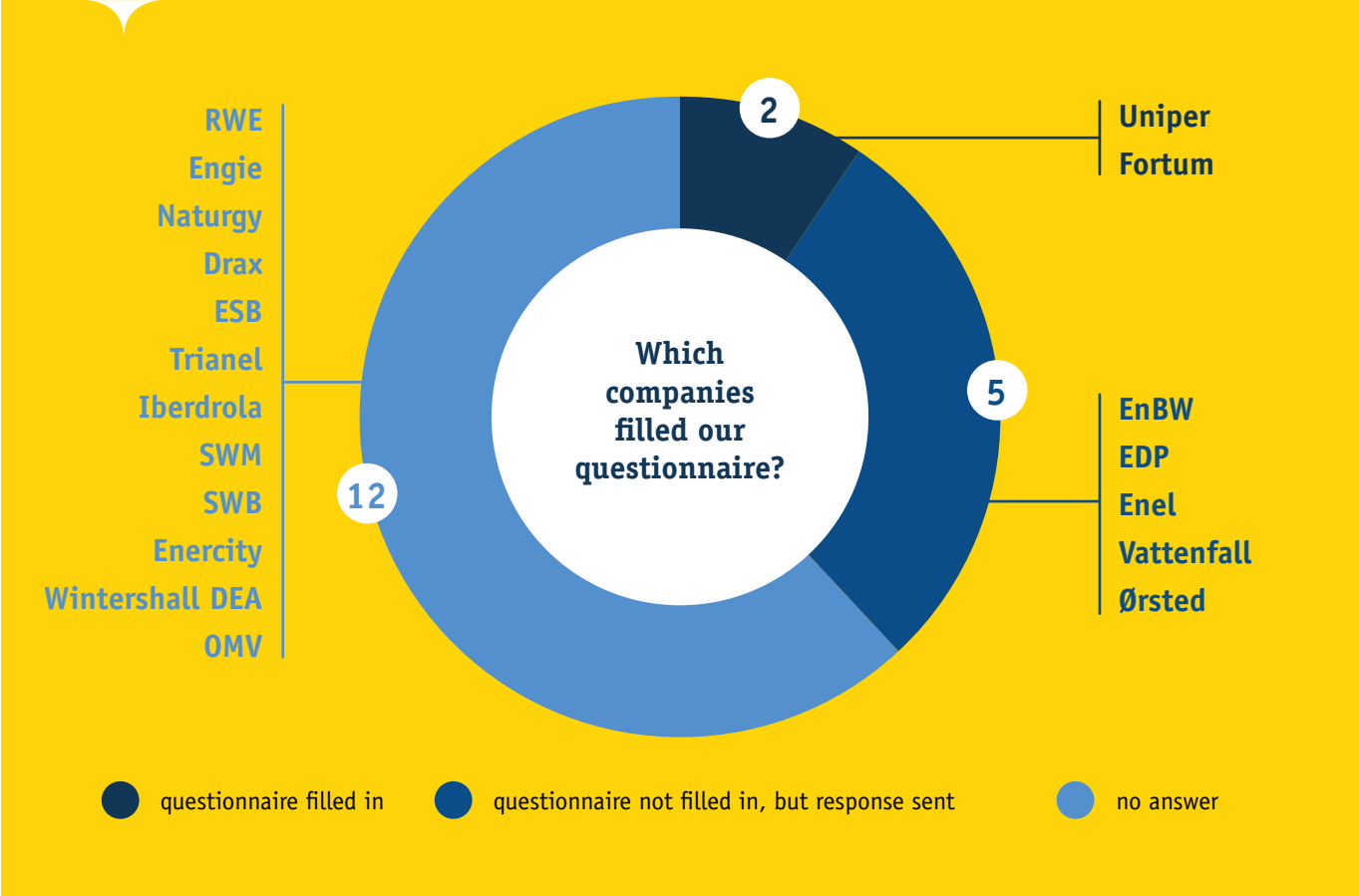
For most companies, however, the responsibility they take on ends at the boundaries of their own business operations. This is fatal: on the one hand, methane emissions from this part of the value chain are probably many times higher than the direct methane emissions of the companies. On the other hand, as purchasers of natural gas, companies could influence their suppliers and trading partners by making independent measurements and the verifiable implementation of reduction measures a condition for a cooperation.

Only one of the companies surveyed states that it is working towards improving the data basis together with partners by replacing the currently used estimates of methane emissions with real measurements in the future in order to obtain information on emissions in the upstream chain. However, again, reference is made to the implementation of voluntary initiatives to address the lack of measurements. A more active approach and the use of already existing methods for measuring upstream emissions, e.g. by means of satellite data, is hardly, if at all, discernible.

Overall, many companies rely on technologies that are either not climate-neutral or are currently only available to a very limited extent. Blue or turquoise hydrogen, for example, continue to be based on the extraction and processing of natural gas, which is inevitably linked to climate-damaging methane leakages. Moreover, these options only work in combination with the controversial CCS technology, which continues to leak some of the CO_2 meant to be compressed into the atmosphere and involves high costs.[22] In addition, projects for turquoise hydrogen are still in the experimental laboratory phase. Whether and when an economic application will be possible is completely uncertain.

DUH and urgewald reject the use of offsetting because it allows companies to continue emitting greenhouse gases by compensating them elsewhere. This does not solve the basic problem of emissions and prevents avoidance and efficiency strategies from being developed and implemented. DUH and urgewald also reject the simple conversion from coal to natural gas without the use of renewable energies. The use or conversion to biomass, biomethane or Bio-LNG is typically not sustainable either and can lead to unforeseen damages, e.g. if monocultures for these fuels compete with food production.

List of companies



Summary

The evaluation of the questionnaires reveals three core problems:

1. Too few companies are dealing with the issue. Of the 19 companies surveyed, the 12 that did not respond at all to the DUH and urgewald enquiry stand out. Here, it seems that there is not even the willingness to deal with the issue. This shows that voluntary approaches alone will not be enough to get the industry to act. Regulatory requirements are needed to create transparency and implement reduction measures.

2. The credo is all too often: „announce instead of act". Companies cite a lack of data and use this as an excuse to justify their inaction. Yet the possibilities to carry out their own measurements or to demand them from suppliers are already available today - what is missing is their consequential use. Where companies are members of voluntary initiatives, reference is made to future goals and catalogues of measures that are yet to be implemented. Here, too much hiding behind memberships instead of real action is taking place.

3. No recognition of the urgency of a determined phase-out of natural gas. There is no realistic assessment of how the reduction of total emissions on the way to climate neutrality is supposed to work. For example, many companies are announcing offsetting or pseudo-solutions such as blue and turquoise hydrogen to shape the transition to climate neutrality and enable the market ramp-up. Thereby, blue or turquoise hydrogen are falsely presented as climate neutral, methane emissions from natural gas production remain unmentioned; instead of a targeted effort to avoid emissions completely, offsetting is presented as an alleged solution. None of the companies currently present a credible exit strategy from natural gas that is backed up with concrete steps.

Conclusion

The companies considered are currently doing too little to live up to their responsibility in the climate crisis. It is extremely time-critical that the companies immediately use all available means to identify and, if possible, eliminate not only their direct but also their indirect methane emissions, as it is already technically possible today to avoid three-quarters of the emissions occurring in the oil and gas industry.[23] Modern satellite technology, among other things, can be used to do this. In addition, companies must tie the quantities of natural gas they still wish to use to the Paris climate protection target, which is not yet happening consistently. Problematic technologies such as blue hydrogen and offsetting are also given too much space; hydrogen is seen by many as a panacea. There is also a lack of clear commitment to green hydrogen. Moreover, many companies still rely on the switch from coal to natural gas instead of investing directly into renewable gases. The fact that only a fraction of the questionnaires were returned and only two companies even answered the questionnaire in its original form shows that the industry still does not take the topic seriously enough.

In addition to voluntary commitments, further measures are therefore needed to prevent the global phase-out of coal from turning into an increased use of fossil natural gas and to ensure compliance with the Paris climate protection targets. DUH and urgewald therefore demand:

- Regulatory requirements for transparency and reduction measures must be adopted and implemented. The EU Commission must quickly establish a legislative framework with corresponding requirements as part of the implementation of its methane strategy.
- Companies must present clear strategies for the phase-out of natural gas and the reduction of methane emissions. These must be reported on regularly and transparently.
- Companies must carry out their own measurements of methane emissions along the supply chain, involving their suppliers and trading partners, instead of relying on estimates and calculations. The data collected must be freely available and verifiable by independent bodies.
- Companies must assume product responsibility. They must not ignore emissions from their supply or upstream chain.
- Companies rely too much on pseudo-climate policy solutions such as blue and turquoise hydrogen, CCS and offsetting. These technologies are rejected by DUH and urgewald - instead, a real transformation towards a completely decarbonised energy supply must now be undertaken.

NOTES

1 *The effect of a greenhouse gas on global heating (the so-called Global Warming Potential, GWP) depends on the chosen period of observation. Because our climate system threatens to exceed critical climate tipping points within the next one to two decades and because methane has a comparatively short residence time in the atmosphere of about 12 years, it is particularly important to consider the period of 20 years (GWP20) in this case. If tipping points were to be exceeded, such as the collapse of the West Antarctic Ice Sheet, global heating would take on a life of its own and continue to increase without human intervention („runaway climate change"). For a period of 100 years, the GWP of methane is 36 (see* https://www.epa.gov/ghgemissions/understanding-global-warming-potentials*, last visited on 02.03.2021).*

2 *See* https://www.duh.de/fileadmin/user_upload/download/Projektinformation/Energiewende/FAQ_Methanemissionen_EN.pdf

3 *The company Uniper, which answered our questionnaire, is a subsidiary of the Finnish group Fortum, which was also surveyed. Both companies responded independently of each other. For example, in the information on the purchase of natural gas by Fortum, Uniper's figures are excluded. However, Fortum explicitly refers to Uniper in some parts of its answer, for example when referring to the joint strategy of the two companies, which was presented at the end of 2020 and includes joint climate protection targets.*

4 *See* https://www.duh.de/fileadmin/user_upload/download/Projektinformation/Energiewende/FAQ_Methanemissionen_EN.pdf

5 *See* https://www.bmwi.de/Redaktion/DE/Artikel/Energie/gas-erdgasversorgung-in-deutschland.html*, last visited on 02.03.2021*

6 *Calculation: 87 billion m³/a [quantity of natural gas] * 8.8 kWh/m³ [calorific value of natural gas] * 0.2 kg CO_2/kWh [carbon content of natural gas] = 153.12 million tonnes CO_2/a.*

7 *In the calculation, it is assumed that the natural gas imported by Germany represents the total production volume minus the emissions that occurred in the upstream chain due to leakage. Assuming a leakage rate of 2.3%, the total production volume here would accordingly be 89.04 billion m³ of natural gas, of which 87 billion m³ (97.7 percent) arrive in Germany. 2.04 billion m³, or 2.3 percent of the total production volume, escaped along the upstream chain as leakage. Since natural gas consists largely of methane, the effect of this release must be converted into CO_2 equivalents (CO_2e). Under normal pressure of one bar and 15°C, the climate impact of the released methane is calculated as follows: 2,040,000,000 m³ [methane leakage, here 2.3 % of total production] * 0.6709 kg/m³ [density of methane] = 1,368,636,000 kg = 1,368,636 t methane. Over 20 years, methane has about 86 times the effect of CO_2 (GWP=86): 1,368,636 t methane * 86 = 117.7 mt. CO_2e. Results in the graph are approximate.*

8 *The approach used here to calculate total emissions is highly simplistic and conservative, because methane does not only escape along the upstream chain due to unintentional leakage or intentional discharge. CO_2 is also emitted, for example when natural gas is flared along the way or consumed at gas-powered compressor stations. Emissions also occur with electrically powered compressors due to the electricity grid, which has not yet been decarbonised. These emissions are not taken into account here; accordingly, the calculations tend to represent the lower limit of the spectrum of emissions that actually occur.*

9 *See* https://www.iass-potsdam.de/de/ergebnisse/publikationen/2016/uncertain-climate-cost-natural-gas-assessment-methane-leakage*, last visited on 02.03.2021*

10 *LNG = Liquefied Natural Gas*

11 *CCS = Carbon Capture and Storage, capturing and injecting CO_2 underground.*

12 *urchase of certificates via which the avoidance of emissions at another location is to be triggered and verified*

13 *See* https://www.carbontrust.com/de/ressourcen/briefing-was-sind-scope-3-emissionen*, last visited on 26.02.2021*

14 *The GHG Protocol is the most widely used methodological standard for determining emission levels, see* https://www.umweltpakt.bayern.de/energie_klima/fachwissen/374/klimamanagement*, last visited on 26.02.2021.*

15 *See* https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf*, last visited on 26.02.2021*

16 *The oil and gas sector is generally divided into three areas: „upstream", „midstream" and „downstream". Upstream includes exploration and production of oil and gas, midstream transport, storage and processing, and downstream marketing and supply. See also* https://energyhq.com/2017/04/upstream-midstream-downstream-whats-the-difference/*, last visited on 26.02.2021.*

17 *230 g CO_2e/kWh, including 11 g CO_2e/kWh methane leakage and 18 g CO_2e/kWh energy input for extraction and transport - company refers to figures of the Federal Environmental Agency (UBA)*

18 *The extraction of natural gas via the fracking method is associated with above-average methane emissions, especially in the USA. See, for example,* https://www.vox.com/energy-and-environment/2019/8/15/20805136/climate-change-fracking-methane-emissions*, last visited on 02.03.2021*

19 *Stands for „European Pollutant Release and Transfer Register", see* https://prtr.eea.europa.eu/#/home*, last visited on 02.03.2021*

20 *hort for „Leak Detection and Repair".*

21 *See* https://www.cdp.net/en*, last visited on 02.03.2021*

22 *See* https://theicct.org/blog/staff/carbon-capture-storage-and-leakage*, last visited on 02.03.2021*

23 *See* https://www.iea.org/reports/sustainable-recovery/fuels*, last visited on 02.03.2021*