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An Eye on Methane

International Methane Emissions Observatory

2021 Report

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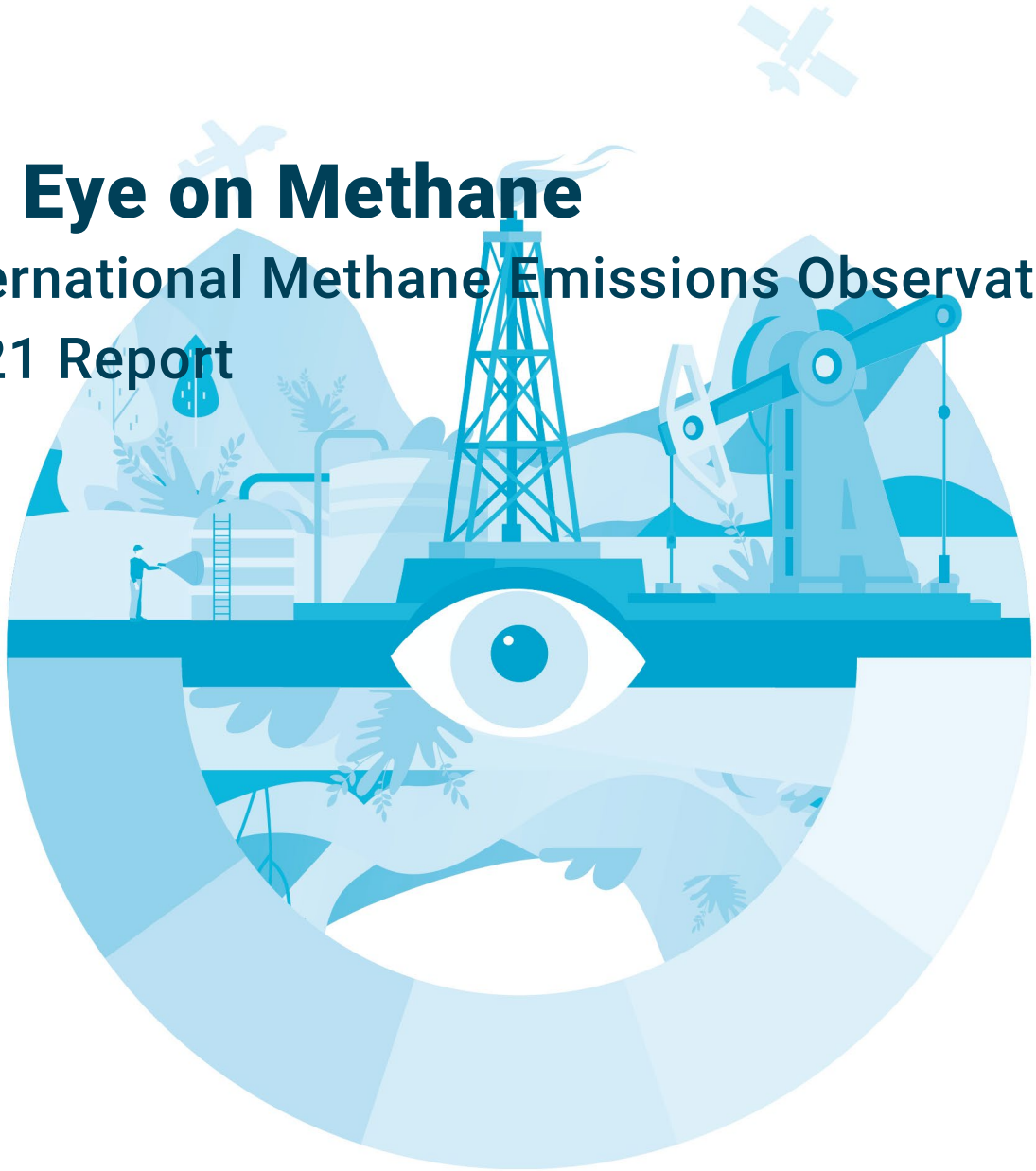

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Executive Summary

Methane Matters - Curbing methane emissions from fossil fuels matters. And it matters under any plausible decarbonisation scenario. UNEP promotes a rapid transition away from fossil fuels but recognizes the climate importance of curbing methane emissions during the transition. This first annual report from the International Methane Emissions Observatory (IMEO) describes how this can be done and what progress has been made, particularly in the energy sector.

Methane contributes to at least a quarter of today's climate warming, and its concentration continues to rise rapidly in large part from anthropogenic sources. In particular, emissions from oil, gas, and coal are the most amenable to be cost effectively abated by actors who have sufficient agency to act promptly.

The other two main sources of agriculture and waste are also in IMEO's scope, but they will require a different Theory of Change and the creation of frameworks to collect data. Consequently, IMEO's initial focus is on emissions from the fossil sector.

IMEO's Theory of Change - IMEO has a clear proposition to catalyze change in the reality of the political economy. At the heart of IMEO's Theory of Change is the need for an independent and trusted entity to integrate data from multiple sources, such as companies, satellites, scientific studies and national inventories. Using scientific insights, IMEO will integrate these multiple sources of heterogeneous data into a coherent and policy relevant dataset that highlights the confidence of each data element.

However, no individual component can deliver the required change by itself. Better data does not deliver change by itself; better reporting does not deliver change by itself; and better regulation alone cannot deliver everything needed. While each of these is required, it is the interaction between them—allowing them to build on each other—that drives change and delivers results. And crucially, it is not IMEO by itself that will deliver emission reductions. It is its engagement at the heart of an ecosystem of organisations focusing on the problem, catalysed by IMEO's activities and in partnership with each member, that will deliver. IMEO builds on the important methane work of Climate and Clean Air Coalition (CCAC), Global Methane Initiative (GMI), International Energy Agency (IEA), Environmental Defense Fund (EDF) and many others, and it looks forward to continuing this collaboration.

Ultimately action will need to be taken at the plant level to reduce emissions; that is where the agency lies. The Theory of Change aims to create the contextual drivers that will catalyse action by plant managers.

Industry transparency – IMEO has access to data reported by industry through the Oil and Gas Methane Partnership 2.0 (OGMP 2.0) developed under the framework of CCAC. Its 74 member companies already cover a third of the world's production. Companies commit to move from using generic emission factors to empirical measurements and reconciling source and site level data in a defined timeframe, against announced performance targets. OGMP 2.0 leverages the industry's networked structure by including reporting on non-operated assets, extending its reach well beyond direct membership.

During the first year of reporting, most companies put significant effort into reporting. Generally, companies submitted agreed-upon templates, included reduction targets and provided an inventory of assets, both operated and non-operated. As expected, the quality of data in most cases is limited, as the majority of companies have not yet ventured into higher reporting levels for the majority of assets. Operators have begun the journey of incorporating actual measurements of emissions. Those that have a credible plan to do so are tagged as Gold Standard. Gold Standard is granted initially for the thoroughness of a company's plan and later for results delivered. It can be revoked for deviation from either.

Methane science and data integration – IMEO's methane science program builds on CCAC's earlier studies and will expand studies by independent academic institutions. It is overseen by IMEO's Scientific Oversight Committee. The program will extend studies to South America, Asia and Africa and the Middle East, and will add a work-stream

on coal methane science. Satellites hold the potential to be a game changer for methane emission reduction, and IMEO has close partnerships with the satellite operators. However integrating their data with ground based measurements and operational understanding will be essential to drive change.

IMEO will ingest data principally from four streams: OGMP 2.0 reporting, direct measurement data from scientific studies, remote sensing data (i.e., TROPOMI, GoSat, MethaneSAT) and from national inventories. The early investments in Europe's Copernicus and in Japan's GoSat methane satellites have proven visionary. Through these early efforts, first steps have been taken to provide a public dataset on fossil methane emissions, with clear delineations of its uncertainty. This uncertainty will be an opportunity for input from industry, policy makers and inventories. Characterizing the degree of uncertainty in the data is essential to be able to make it policy relevant. Reconciling source and site measurement is well understood, but being technically advanced, IMEO's science work will continue to provide guidance for industry action.

Together IMEO's activities will provide the means to implement and monitor the commitments made by state actors in the Global Methane Pledge.

Five-year outlook – IMEO's plan for 2022 is to continue to grow OGMP 2.0 membership and to initiate scoping a parallel partnership for metallurgical coal producers. Sponsored science studies will help fill in gaps in our understanding of emissions, help validate evolving remote sensing data and provide insight into differences among and within data sets. The science will be delivered through peer–reviewed papers in 2022 and 2023, and the first version of the integrated data platform will be delivered in a similar timeframe. Founding OGMP 2.0 member companies have committed to achieve the highest level of reporting (Gold Standard) for operated assets by 2024, based on 2023 data, and in 2026 for non-operated assets based on 2025 data.

Introductions

Foreword from the President of the European Commission

Curbing methane emissions is an imperative to significantly limit climate warming. Methane is a potent greenhouse gas and, according to the latest report of the Intergovernmental Panel on Climate Change, accounts for about half of the 1.0 degrees Celsius net rise in global average temperature since the pre-industrial era.

Under the European Green Deal, and to support the European Union's commitment to climate neutrality by 2050, the European Union adopted in October 2020 a strategy to reduce methane emissions in all key sectors covering energy, agriculture and waste. The reduction of methane emissions in the current decade is an important part of the European Union's ambition for reducing net greenhouse-gas emissions by at least 55% by 2030. The European Commission is also working on a legislative proposal to measure, report and verify methane emissions, put limits on venting and flaring, and impose requirements to detect leaks, and repair them.

However, as climate change is a global challenge, the response also requires a global dimension. For the EU it means working with partners, whether in North or South America, Asia, Africa - indeed everywhere. We can work jointly to reduce methane emissions in global trade, whether it be raw materials such as fossil gas, oil, or coal, or embodied in manufactured goods. We can work on waste streams, first to reduce and then to make good use of the methane that comes from unavoidable wastes. We can finally modify and moderate our agriculture, putting the emphasis on traditional and low-impact farming, rewarding those that show good stewardship for landscape and livestock. In this regard, the European Commission is working to accelerate the uptake of mitigation technologies through the wider deployment of 'carbon farming' in European Union Member States and through their Common Agricultural Policy Strategic Plans, and to promote biomethane production from agricultural waste and residues.

To do this successfully we need good data. Currently existing systems for collecting and reconciling methane data do not allow to identify with high precision where emissions happen, and in what volumes. Every chance to reinforce our capability to have reliable and independent numbers will translate into more focused, better targeted actions.

That is why the International Methane Emissions Observatory (IMEO) is a crucial instrument in tackling methane emissions globally, as it plays a fundamental role in addressing the global data gap. It will have a key role in guiding, and undertaking, scientific actions to make methane emissions transparent, and those that emit, responsible.

The Commission strongly supports United Nations Environment Programme in creating the Observatory. No other entity can play this role in creating a sound and independent scientific basis for methane emissions calculations and reductions based on data. The international community needs to catalyse support for the Observatory to ensure effective actions in reducing emissions. Moreover, with the announcement of the Global Methane Pledge on 17 September this year, the EU and the US have committed to bring down those emissions by 30 per cent on a global basis. At EU level, we are working to increase this ambition further. But only joint efforts on global level will make a true difference.

Ursula von der Leyen
President of the European Commission

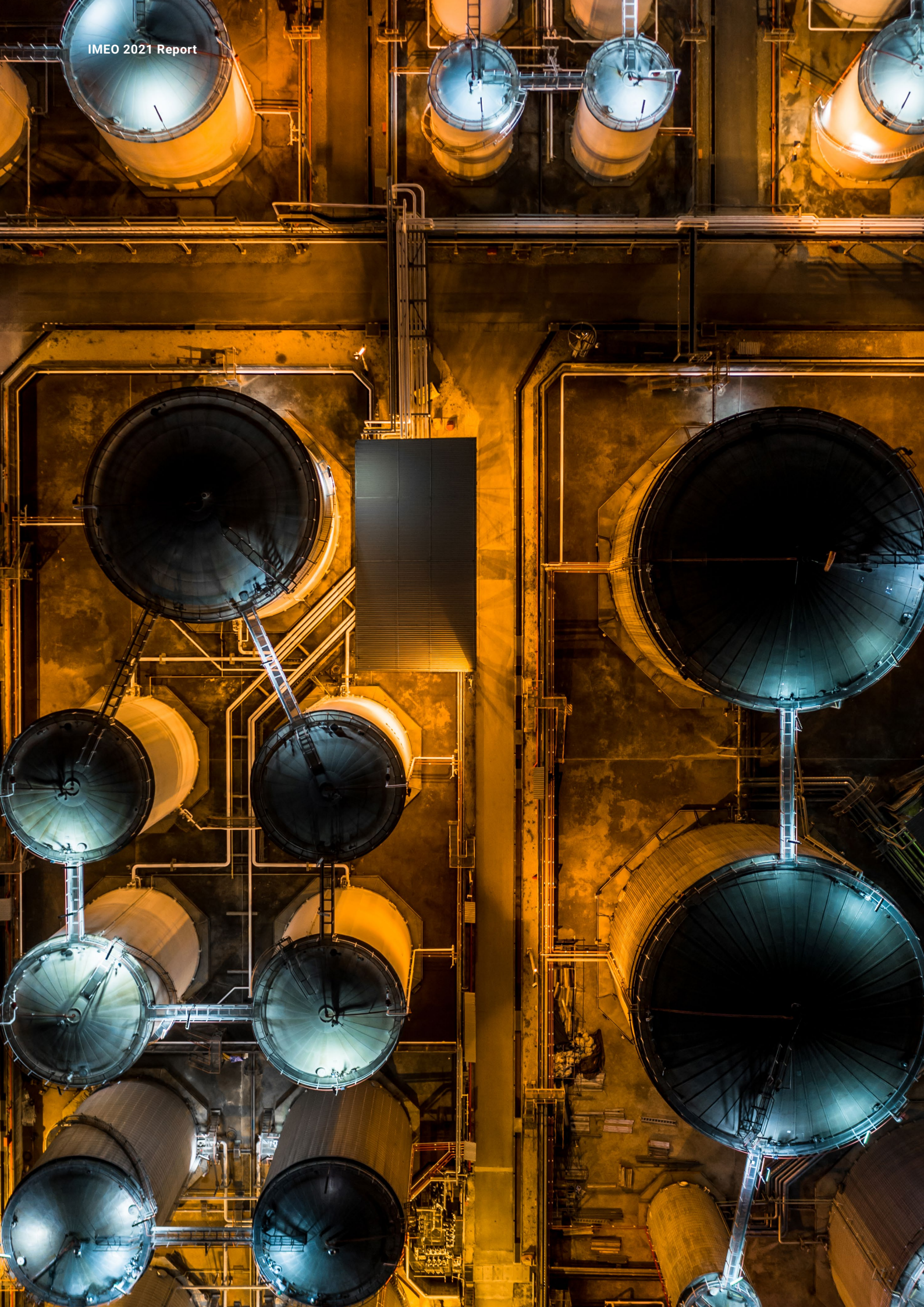
Foreword from UNEP Executive Director

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change serves as a crucial reminder that climate change is already affecting our lives today, and that the damages are widespread, rapid and intensifying. A swift global transition away from fossil fuels is paramount to stabilizing the climate system. This report highlights the imperative for deep reduction in non-CO_2 emissions, most prominently for methane, and that most of the immediate reduction potential lies within the energy sector. Deep methane emissions reductions from the fossil fuel industry are necessary to avoid the worst effects of climate change in the short term, and they have the potential to prevent up to a quarter of a degree of warming. In short, we need both deep CO_2 and methane reductions to limit the warming to 1.5 °C as called for in the Paris Agreement.

UNEP's International Methane Emissions Observatory (IMEO) was launched in 2021 to catalyze dramatic reductions of methane emissions, starting with the energy sector, through the integration of diverse data streams. IMEO's industry partners have committed to report their emissions based on measurements. IMEO will integrate company data with other sources, such as that from satellite observations and scientific measurement campaigns, to establish a global public record of methane emissions from fossil sources at an unprecedented level of accuracy and granularity.

This first report describes IMEO's Theory of Change and presents initial results on a five-year journey to 2025. We must act collaboratively to achieve the deep emissions reductions called for the scientific community. IMEO intends to work with the larger ecosystem of partners engaged in the methane challenge, building on high-level commitments by state actors to catalyze deep methane reduction at the speed and scale required by the climate crisis.

Inger Andersen
Executive Director
United Nations Environment Programme



0. Vision and Theory of Change

A. IMEO's Theory of Change

Fossil methane is an environmental issue that can be solved promptly

Methane matters.

Methane contributes to at least a quarter of today's climate warming, and its concentration in the atmosphere continues to rise rapidly, in large part from anthropogenic sources (GMA 2021). The recently published Sixth Assessment from The Intergovernmental Panel on Climate Change (AR6) highlights the role of short-lived climate pollutants like methane in current man-made warming. The report emphasizes the urgency of reducing methane emissions, which it rightly points out is the fastest way to slow down the rate of warming (IPCC 2021). The issue has gained widespread prominence relatively recently, but action sufficient to reduce the rate of emissions and thus avert the most significant impacts of climate change has not followed.

Full deployment of technically feasible emission reduction actions could cut emissions in half across all sectors by 2030, yielding a potential avoidance of 0.28 degrees Celsius of warming by mid-century (GMA 2021). Yet immediate mitigation opportunities are not equal across sectors. Reductions of methane emissions from the production, transport and distribution of fossil fuels can be implemented quickly, while other sectors are likely to take longer. In the case of the global oil and gas industry, addressing the challenge involves a limited number of companies. What is more, these companies possess economic and political agency to act, are well organized and resourced and in fact derive little or no benefit from the emissions. And these emissions can, for the most part, be mitigated cost-effectively (IEA 2021).

Signs of early action are evident but still insufficient. As of August 2021, 149 countries out of 197 UNFCCC parties have included methane emissions in the scope of their Nationally Determined Contributions (NDCs), but only 12 mentioned methane actions in the oil and gas sector. Recently, a number of countries, led by the European Union. and the United States, have pledged to collectively reduce global methane emissions by 30 per cent by 2030 [1]. As noted, the vast majority of those reductions will come from the fossil fuel sector. Similarly, numerous oil and gas industry operators have announced methane emissions reduction targets (OGCI 2020). But it does not suffice to identify an urgent issue and simply pledge to address it; the harder task is articulating a plausible theory of change that can resolve it.

In short, fossil methane emissions are an issue that is at the same time highly material, solvable and that has historically received less priority than CO_2. Reducing methane emissions is an imperative short-term action that can yield substantial climate benefits while societies act to swiftly decarbonize their economies. Immediate methane mitigation minimizes climate-induced damages over all timescales when paired with reductions in CO_2. It is realistic and necessary to eliminate emissions that are economically and technically feasible by 2030, in any decarbonization scenario. By far the greatest potential to achieve rapid methane emissions reductions is in the fossil fuel sector.

Recognizing that both methane or CO_2 emissions need to be reduced (Schoemaker, Schrag *et al.* 2013), IMEO has a clear proposition to drive change in the reality of the political economy by offering the data required to pursue an effective path for methane mitigation.

Methane from waste and agriculture represent 65% of the total anthropogenic emissions (GMA 2021). They are the result of systems with very different characteristics than the fossil sector, with less agency from the core actors, less interconnectivity and fewer global governance mechanisms. Also, mitigation is more economically challenging. As a result emissions from waste and agriculture will require the development of frameworks

1 https://ec.europa.eu/commission/presscorner/detail/en/IP_21_4785 and https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/18/joint-us-eu-press-release-on-the-global-methane-pledge/

to collect data first, followed by engaging stakeholders to develop a credible theory of change. IMEO's initial focus is therefore on emissions from the energy sector.

A reference point for better global emissions data is required to accelerate mitigation action

For global commons issues such as methane emissions, it is well established (Berge and van Laerhoven 2011) that effective action requires a trusted, transparent and shared source of information. IMEO aims to be that source. It accomplishes this by leveraging the neutrality and reputation of the United Nations, combined with a rigorous program of data integration from multiple sources, including company reports through the Oil and Gas Methane Partnership 2.0 Reporting Framework (OGMP 2.0).

IMEO offers a unique and confidential repository for granular methane emissions data for OGMP 2.0 members. Data includes detailed source-level emission data reported for every asset, which is then aggregated and made public. These data will be linked with the science studies program, sponsored by IMEO, which will deliver policy relevant emissions data through commissioned academic-led research projects focused on regions and sources with limited or no data. Filling these knowledge gaps is critical to ensuring that a robust geographically diverse picture of emissions patterns can be created. Furthermore, IMEO will leverage remote sensing data from the newest generation of satellite instruments, as well as national inventory data. IMEO will synthesize all these sources, providing public, transparent and empirically verified methane emissions data on a global basis, with increasing levels of accuracy and granularity. IMEO integrates corporate transparency, enhanced science and country engagement to provide actionable, policy relevant data in order to accelerate global methane reductions at a scale that will positively impact climate outcomes.

However better data alone does not deliver change, and neither does better company reporting by itself. Furthermore, experience shows that regulation in the oil and gas sector is a slow process, with impact often blunted by the power dynamics between state and industry.

IMEO's Theory of Change is to deliver a step change improvement across the three dimensions of transparency, science and implementation, at the scale and speed required to meet the challenge of climate change. The goal is to help put in place all the factors that will drive those who ultimately mitigate emissions, essentially the operational staff at the plant. By linking them with engagement and participation in a relatively limited community of actors, IMEO will catalyse decisive change over time.

The oil and gas industry's networked structure is critical to engaging the whole industry

The industry has a uniquely interconnected structure. Investments are largely front- loaded. This leads to a high degree of risk sharing between upstream players through joint ventures, as well as to deeply committal long-term contractual arrangements to share risk across the value chain. It also leads to strong political or state involvement, due to the strategic nature of the resource and its geopolitical implications.

This high degree of interconnection is a feature of the industry that IMEO leverages in its Theory of Change. The OGMP 2.0 framework requires companies to report emissions across their entire portfolio, including non-operated joint ventures, which in turn engages companies well beyond the immediate membership. Its framework is purposefully principle-based and not rule-based, to allow for innovation and to accommodate the diverse operational practices and cultures in the industry. OGMP 1.0 was limited to upstream companies, but OGMP 2.0 extends to the entire supply chain, further leveraging interconnections. OGMP 2.0 membership by state-owned oil and gas companies as well as IMEO's outreach programs to governments, in partnership with the UNEP-CCAC Global Methane Alliance and others, engages state actors.

The extensive IMEO science program is designed to deliver policy relevant science while building capacity, new knowledge and connections in countries where limited capacity to accurately measure methane emissions is currently available. IMEO will expand the science work initially coordinated by UNEP under the CCAC Methane Science Studies. These studies have already fostered a robust research network engaging more than 100 researchers from 20 institutions across 14 countries.

Together IMEO's activities will provide the means to implement and monitor the commitments made by state actors in the Global Methane Pledge.

Systematic measurement of emissions is required – instead of estimating

The urgency of reducing methane pollution cannot wait for perfect data, and there are proven mitigation options readily available for global oil and gas infrastructure. However, improved emissions data will accelerate action while also allowing enhanced tracking of progress against commitments. Recent methane science studies (Alvarez *et al.* 2018, Johnson *et al.* 2017, Zavala-Araiza *et al.* 2021) show that emissions are often either underestimated or allocated to the wrong source. For the most part, this situation is not the result of obfuscation but the

consequence of overly simplistic assumptions. Most emissions are estimated using outdated emission factors that in turn are used in relatively simple calculations to estimate methane emissions. These estimates are largely divorced from the realities of actual operations and the responsible staff. The OGMP 2.0 changes that. As part of their pursuit of the "Gold Standard," companies commit to increasing the quality of their reporting from Level 1 (i.e. a generic emission estimate derived from an unspecified methodology) to Level 4/5 (i.e. an empirical reconciliation of measurement-based estimates at source and site level).

This approach accomplishes two things: it increases the accuracy of the data and allows for a better understanding of emissions sources, therefore allowing companies to target mitigation actions and capital resources more effectively. It also allows for better and more targeted regulatory interventions (IEA 2021). Importantly for IMEO's Theory of Change, the approach directly involves operational staff, which may lead to behavioural changes and changes in company values. Decades-long programs in the oil and gas industry to increase safety have relied on similar engagement processes to deliver results beyond what a mere compliance framework could achieve.

Company performance targets, ratcheted up over time, form part of a collective goal

To reach the Gold Standard status of reporting under OGMP 2.0, companies need to announce absolute reduction or 'near zero' intensity targets to achieve by 2025, within the context of the UNEP goals of 45 per cent reduction in emissions over global 2015 levels. It is natural that companies would initially be conservative. However, as their measurements become more comprehensive, representative and accurate, and as methane emission mitigation becomes better integrated into their operations, it is much more likely that companies will commit to stricter targets. As pressure from investors, the general public and the international community at large mounts to meet the Paris Agreement's temperature goals, companies are encouraged to ratchet their initial targets, much like the country targets of the Paris Agreement.

The OGMP 2.0 framework companies are not expected to have targets for non-operated ventures. However, from the perspective of collective action, it is clearly highly desirable, and they are strongly encouraged to do so.

It is not only the collective performance of the industry that will deliver relevant climate benefits. No societal improvements are made if a company divests its most polluting assets to meet its targets to non-OGMP 2.0 members or when only those operators with lower emissions report to IMEO. Fortunately, a great diversity of leading companies is already represented in OGMP 2.0, and the extension to non-operated joint ventures ensures a broad reach. However, the good performance of one company can be offset by those who lag behind. The reputation and social license to continue operating will be driven as much by the collective performance of the industry as by a single company. As such, companies have a vested interest in their collective performance. This is typical of commons problems that require collective action to resolve. Natural gas with low emission rates may also increasingly convey a short-term competitive advantage, such as in the context of Europe's envisaged Carbon Border Adjustment Mechanism (CBAM).

B. IMEO first steps

Rapid progress on IMEO organization, processes and partnerships

IMEO was first announced at the OGMP 2.0 launch in November 2020. Building directly on the track record and experience of the CCAC's Mineral Methane Initiative[2], which began in 2014, IMEO is rapidly being operationalized. Seed funding has been secured from the European Commission, and other governments and foundations are being engaged.

An Implementation Committee is currently managing the process in this initial phase, while an Executive Board comprised of representatives of governments engaged in IMEO activities is established. A Scientific Oversight Committee has been installed, and an Advisory Council will be created before the end of 2021, with representatives from relevant non-governmental organizations, OGMP 2.0 member companies, international organizations and research organizations. Further detail is provided in the next chapter.

Many organisations are already involved in research on and advocacy for fossil methane mitigation. IMEO will leverage and connect to the wider methane mitigation ecosystem. As a result, much attention has been given to engaging directly in discussions with scientists, remote sensing data providers, intergovernmental organisations such as the IEA, World Meteorological Organization (WMO), United Nations Economic Commission for Europe (UNECE), and World Bank), nongovernmental organizations, regional development banks, the CCAC, governments and regulators. An inclusive and engaging approach leveraging, encouraging and sometimes helping to fund the contribution of all is at the core of IMEO's Theory of Change.

2 https://www.ccacoalition.org/en/initiatives/oil-gas

OGMP 2.0 company recruitment is on track and needs to be accelerated further

OGMP 2.0 is IMEO's primary vehicle for engaging the oil and gas industry to measure, report and then reduce its methane emissions. As described in the Theory of Change above, it has been structured to leverage the networked nature of the industry by using a combination of performance standards and improved measurements to foster values and behaviours that help to build a culture of methane management. Currently OGMP 2.0 companies will be reporting on assets accounting for a third of global oil and gas production, we plan to work to continue to expand the number of companies involved.

The IMEO science plan is progressing

The objective of the IMEO Methane Science Studies is to improve the understanding of where and how much methane is emitted from fossil fuel supply chains. This fills in the gaps that exist in current public datasets by gathering additional data that are also needed to contextualise the reported emissions under OGMP 2.0. IMEO is starting with the oil and gas sector because of its high reduction potential. The objective is to close knowledge gaps, which in turn can accelerate methane mitigation by identifying patterns and identifying effective actions. IMEO's studies utilise peer-reviewed science to measure methane emissions, providing publicly available data and improved, well-documented methods. This approach is a continuation of the CCAC Methane Science Studies, which originally prioritized regions and activities with limited available data.

In a second set of initiatives, IMEO is also developing the capacity to address methane emissions from coal mining. The approach will build on the successful methods used to build the Methane Science Studies and the Oil and Gas Methane Partnership. An initial focus will be on metallurgical coal for three reasons: i) it has few immediate substitutes; ii) mitigation technologies exist, though they are not necessarily economical, and iii) there are a limited number of companies and countries involved, allowing for the articulation of a more effective theory of change. Engaging with the existing organisations involved in coal methane emissions is a high priority.

Support for implementation is in progress

Despite an increased global focus on climate change, international climate commitments fall significantly short of necessary reductions to avoid the worst impacts of climate change (UNEP 2020). Recognizing the opportunity represented by methane emissions reductions, IMEO is engaging with partners from fossil fuel producing and consuming countries to raise awareness of this important issue and to promote an effective governmental-level science-policy interface.

As an initial effort, a suite of online modules, available in the six official languages of the UN, was developed for policy makers to increase awareness and skills in managing methane emissions.

C. IMEO roadmap

Integrating multiple data sources

To complete its objectives, IMEO will combine a wide variety of methane emissions data from a diversity of sources into a single data platform to allow for integration, transparency and comparison among types of data and to catalyse identification of effective methane mitigation policies and regulation. IMEO will gather data principally from four streams: OGMP 2.0 reporting, measurements of emissions through scientific studies, remote sensing data (e.g., TROPOMI, GHGSat, MethaneSAT, GoSat and potentially others) and from national inventories submitted to the UNFCCC.

Leading to a public data product

IMEO will create a data platform designed to collect, integrate, store, analyse and visualize data from the diversity of data streams. It will enable meaningful, efficient cross comparisons of data at an inter- and intra-company and national level. Clear understanding of the relationship among datasets can more readily foster change, reducing the chances of duelling datasets. To enable interpretation of the data, the platform will offer accessible graphics, charts, map-based presentations and other interactive visualization options. To ensure that this platform serves the wide range of constituents interested in using the data, IMEO will reach out to stakeholders to gain their insights regarding how they would expect to use the integrated data products, (e.g. scientists, government agencies, policymakers, regulators and civil society organizations).

In addition, IMEO will explore the possibility of compiling and publishing a Methane Supply Index (MSI), reflecting the methane emissions embedded in oil and gas in different jurisdictions.

Enhanced characterization of emissions: identifying patterns and mitigation

The scientific literature has consistently identified that bottom-up methane emissions inventories tend to underestimate emissions when compared to site-level and regional measurement-based estimates (Alvarez *et*

al. 2018, Johnson *et al.* 2017). Bottom-up emission estimates often do not account for high emissions related to abnormal process conditions. Some of these unexpected emissions are associated with a 'fat tail'—where a small fraction of sources or sites have disproportionate contribution to total emissions. The proportion of total emissions represented by the fat tail can be expected to vary widely. Current inventories—based on emission factors—can be characterized as largely average emissions associated with normal operating conditions that are used to build large regional or national emissions inventories. They do not provide a good characterization of emissions for any individual site and it is spurious to use them as a basis to drive emissions reductions at specific assets.

Another source of under-reporting of emissions is due to under-counting equipment or the overlooking of certain types of sources. Companies' reconciliation between site and source measurement-based estimates can expose these differences, allowing them to resolve differences in top-down and bottom-up emissions estimates and offer more effective emissions mitigation.

The data platform within IMEO unlocks the ability to mine data to identify patterns of emissions, which will inform more reliable emissions inventories and reduction strategies. Having access to a larger database of emissions from companies will allow the data to be probed for regional, source or company correlations. Similarly, with enough source-level granular data, root cause analysis becomes feasible, which can translate into more effective prevention and more effective response to emissions related to abnormal process conditions. To this date, these emissions are are considered stochastic.

Methane Fat Tails

Methane's black swans: Fat tails and super-emitters

▸ A common characteristic across the oil and gas supply chain is the presence of a subset of sources or facilities with a disproportionate contribution to total emissions. Recent scientific literature has referred to this subset of super-emitter sites as the "fat tail" of the emissions distribution (Brandt, *Heath and Cooley* 2016; Zavala-Araiza *et al.* 2021; Alvarez *et al.* 2018).

▸ The presence of a fat tailed distributions has been found across geographies and types of production (Robertson *et al.* ; Zavala-Araiza *et al.* 2021; Negron Gorchov, Kort, Conley and Smith 2020), and across segments of the supply chain: upstream (Robertson *et al.*), midstream (Mitchell *et al.*), and downstream (Weller *et al.* and Maazallahi *et al.*). They are also present at the source level ((Brandt, Heath and Cooley 2016, Allen *et al.*) as well as site level (Alvarez *et al.* 2018).

▸ Characterisation of these high-emitting sources and sites is essential for improving emissions estimates. The population of high-emitters (e.g. 10-20 per cent of sites that account for 80-90 per cent of the emissions) varies both in time and location. As a consequence, sampling and estimation methods must accurately represent their frequency and magnitude. For example, the number of samples taken should be large enough to capture the presence of these low probability, high emitting sources. OGMP 2.0 guidelines provide a protocol for operators to demonstrate that these skewed distributions are adequately captured.

▸ Specific sites could be affected by abnormal process conditions that result in high emissions at varying points in time. As a consequence, rather than monitoring emissions from a few sites, approaches should consider this stochastic nature of when and where a super-emitter will be located.

▸ Fat tail distributions also have important implications for mitigating emissions. Addressing super-emitters is a necessary but not sufficient condition for emission reduction. Super-emitting sources and sites are not always the dominant contribution. It remains essential to understand what fraction of total emissions they represent. This is why IMEO focuses on a thorough characterization of the full emissions distributions across its data streams and avoids a sole focus on super-emitters.

▸ Collection of robust, granular emissions data through OGMP 2.0 will allow producers to eventually perform root cause analysis, providing the knowledge to improve equipment, system design and operations that would reduce the frequency of large emission events.

Photo credit: Dr Stephen Andrews (University of York)

I. Methane Action Today

A. Methane reporting

Global oil and gas methane emissions baseline range is 80-140 MMt/yr

While there is considerable uncertainty in the baseline of emissions, there is no doubt that methane concentrations in the atmosphere are rising rapidly (WMO 2019) and that oil and gas related emissions are the most accessible reductions. This implies that actual reductions are of primary importance. At the same time, a framework is required to track progress.

Following the IPCC Special Report on Global Warming of 1.5 ° C, UNEP-CACC and other leading organizations articulated a 45 per cent reduction target by 2025 and 60-75 per cent by 2030 over 2015 oil and gas methane emissions. But what does that mean exactly? Recently published studies like Saunois *et al.* 2020, Hmiel *et al.* 2020, and Schwietzke *et al.* 2016 set the estimate between 80-140 million tonnes (MMt)/year, based on a combination of atmospheric inverse modeling and isotope source apportionment. The IEA methane tracker estimates emissions at the lower end of this range (International Energy Agency 2021). Consequently the 45 per cent reduction target would take emissions down from the 80-140 MMt to roughly 40-80 MMt. The Global Methane Assessment lists a similar ranger of emissions (GMA 2021).

The OGMP 2.0 companies represent a third of the world's oil and gas production, both operated and non-operated. That does not imply that these assets represent a third of emissions. Just as source- and site-level emissions are fat tailed, there are strong indications that asset and company emissions are also not evenly distributed. This can be explained by a number of factors, including site configurations, level of sector integration and heterogenous operating practices. Since company data reported this year to OGMP 2.0 is overwhelmingly at Level 1 and Level 2, it is not yet possible to establish a baseline.

OGMP 2.0 Reporting Levels

▸ **Level 1** – Emissions reported for a venture at asset or country level (*i.e. one methane emissions figure for all operations in an asset or all assets within a region or country*)

▸ **Level 2** – Emissions reported in consolidated, simplified sources categories (based on IOGP's five emissions categories), using a variety of quantification methodologies, progressively up to the asset level, when available

▸ **Level 3** – Emissions reported by detailed source type and using generic emission factors (EFs)

▸ **Level 4** – Emissions reported by detailed source type and using specific EFs and activity factors (AFs)
• Source-level measurement and sampling may be used as the basis for establishing these specific EFs and AFs, though other source type specific quantification methodologies can be used. This includes simulation tools and detailed engineering calculations (e.g. as referenced in existing OGMP TGDs, and Marcogaz assessment of methane emissions for gas Transmission and Distribution system operators.)

▸ **Level 5** – Emissions reported similarly to Level 4, but with the addition of site-level measurements (measurements that characterize site-level emissions distribution for statistically representative population)

Company targets should be ambitious enough to match or exceed the industry-wide 45 per cent reduction target. To achieve this, a few critical ingredients have already been identified that can have a number of consequences for company emissions targets:

1. While OGMP 2.0 provides the option for both absolute reduction or intensity targets, an evolution towards near-zero intensity targets should be encouraged over time, as companies become familiar with their emissions patterns, mitigation actions are implemented and operators start managing towards near zero emission levels. Ultimately it will alleviate the uncertainty over the baseline year and provide a guideline for performance.

2. OGMP 2.0 requires a performance target for operated assets, but it does not automatically expect it for non-operated assets. Clearly from a climate perspective, a performance target for the latter is desirable.

3. Achieving reductions through divestment of high-polluting assets does not provide any meaningful climate mitigation. Adjustments are required to ensure these are excluded from reported reductions.

OGMP 2.0 performance targets will ratchet and evolve

The OGMP 2.0 framework agreement specifies that company performance targets are expected to evolve and be ratcheted up from year to year. For example, reported emissions are expected to vary over time. Studies such as Zavala-Araiza *et al*. 2021 suggest that emissions estimates tend to reduce from Level 1/2 towards Level 3, and then increase again as measurement-based Level 4/5 reports are available and emissions not reported historically (e.g. fat tail distribution) are included.

What the first OGMP 2.0 report tells us

– *Top Line Assessment*

During the first year of reporting, most companies appear to have put significant effort into the process. Generally, companies submitted required templates, included reduction targets and provided an inventory of assets, both operated and non-operated. The quality of data in most cases is low (Level 1 to Level 3), as expected, because the majority of companies have not yet completed the work required to report at higher levels for the majority of assets. Several operators have begun the journey of incorporating measurements. These early ventures into measurement will help ensure that future guidelines reflect operational realities encountered during measurement campaigns and subsequent reconciliation.

– *Targets*

To reach Gold Standard, companies were requested to provide reduction or performance targets for operated assets at a minimum. These will be assessed in the context of an industry-wide target of a 45 per cent absolute reduction or a near-zero intensity target by 2025. The majority of reporting companies also indicate that their existing emissions are already below their corporate targets. In the case of intensity targets, we expect that the higher level of reporting, which includes measurements and ultimately site- and source-level reconciliation, will result in changes to corporate emissions intensities. This is expected. For those with absolute targets, we would encourage companies to be prepared to set ratcheted targets once they have established a measurement-based baseline.

– *Implementation Plans*

Implementation plans ranged from non-existent to exhaustive. We acknowledge the significant effort that is required to transition from current reporting practices (generally Levels 1-3) to Level 4/5. Operators that have committed to the Gold Standard are generally operators that hold themselves to a high level of rigor with respect to large project execution. We anticipate that achievement of Level 4/5 will require a similar level of effort and management alignment. Companies should anticipate the work required to procure and apply measurement technologies, resources to interpret results as well as challenges working with a variety of partners. Senior management will need to ensure alignment to achieve this outcome.

– *Reporting Insights*

In this first year of reporting, and with guidelines still under development, some areas of improvement have been identified. This is an anticipated part of the learning curve for companies. IMEO fully expects company reports to be more consistent and accurate in future reporting cycles. Towards that end we offer the following insights garnered to date:

- Operators should report the highest level available. For example, a company that operates in the United States already details emissions to Level 3 per regulatory requirements.

- Level 4 and Level 4/5 require specific details regarding the measurements' methodologies. It is not sufficient to simply say "direct measurement."

- Level 5 is not expected to be reported in isolation. While top-down measurements are critical to fully assessing measurements from oil and gas assets, they must be reconciled with a bottom up inventory, ideally collected at Level 4. This reconciliation defines reaching Level 4/5.

- Generic/non-company specific emission factors are Level 3. There were several cases where leak detection programs that allowed an operator to use a set of generic/non-company specific leak/no-leak emission factors were reported as a Level 4 measurement. Those generic/non-company specific leak/no-leak factors are Level 3, as there is no way to validate the data or its representativeness for the assets for which they are utilized.

B. Company targets

Collective and individual company performance

The relationship between individual company performance targets and collective outcomes is complex. For the climate what matters is collective impact, reflected in the 2025 goal for the entire oil and gas sector of 45 per cent reduction over a 2015 baseline or near zero emissions intensity. However, the collective outcome is not simply the sum of the individual company targets, and is also heavily dependent on how the baseline is defined.

Global commons problems such as climate change require collective action of a connected community (Berge and Van Laerhoven 2011), which implies that unless companies take some ownership for the performance of the entire industry, not just of their own assets, effective reductions of the scale required are unlikely to happen. A coalition of the willing is necessary but not sufficient to achieve the emissions reductions both possible and desirable. In OGMP 2.0 this is already reflected in reporting emissions for non-operated joint ventures. Industry initiatives such as OGCI and Methane Guiding Principles (MGP) are evidence that this interdependence is increasingly accepted.

If companies could meet their targets by shedding assets to non-OGMP 2.0 member companies, the industry would be no closer to addressing its impact on climate change. Similarly, failing to hold non-operated joint ventures to performance targets also erodes collective performance. And while companies compete with each other, they also have a shared interest in their industry's reputation, which will determine the acceptability of gas as a fuel during the transition to a low-carbon economy.

C. IMEO and the methane mitigation ecosystem

Setting up IMEO

UNEP is a natural convener of the methane ecosystem, given its mandate, global reach, credibility and legal status. The continuity provided by building on the prior experience, expertise and relationships of UNEP as implementer and lead partner of the CCAC Mineral Methane Initiative will also be invaluable for a rapid ramp-up.

During 2021 IMEO has been in a rapid start-up mode. It has engaged widely with stakeholders, such as the G20 (Energy Transition and Climate Sustainability Working Groups 2021) as well as potential donor governments, recruiting new companies into OGMP 2.0, setting up its governance structure, building out its methane science network, recruiting and on boarding staff and, of course, publishing this first annual report. All of this will provide a solid foundation for further development and influence in 2022.

Table 1. IMEO Core Functions

International Methane Emissions Observatory Core Functions	
Transparency	Provide accurate, unbiased and up-to-date information on methane emissions attributable to fossil fuel operations at different levels of aggregation.
Science	Close the knowledge gap in the location and magnitude of methane emissions along fossil fuel value chains through peer-reviewed studies and the reconciliation among observational data.
Implementation	Raise awareness and increase the capacity of governments to pursue science based-policy options to manage methane emissions from the fossil fuel sector.

UNEP has been relying on an "Implementation Committee," chaired by the former EU Energy and Development Cooperation Commissioner Andris Piebalgs, to guide the early activities of IMEO. This Implementation Committee will be discontinued when more governments engage in the activities of IMEO, and an Executive Board has been established.

Independent advice is essential for the functioning of IMEO. The advisory functions of IMEO are realized through the Scientific Oversight Committee and Advisory Council, with the following membership:

– *IMEO Scientific Oversight Committee*

The Scientific Oversight Committee is formed by prominent methane scientists, and it will be complemented by data experts. It guides and oversees the scientific activities of the Observatory, including, but not limited to, overseeing estimation methodologies, recommending which studies are necessary and ensuring there are no key data gaps across the studies.

Furthermore, the Scientific Oversight Committee will guide efforts to develop new analytical methods that produce data products that are more effective, more easily deployed or more accurate than existing products.

– *IMEO Advisory Council*

International organisations, civil society and industry representatives will be engaged in the work of the Observatory through the Advisory Council, which will provide the Executive Board with relevant information, data and other considerations. Organisations and companies working in the methane ecosystem on issues related to transparency, science and implementation will be invited to join the Advisory Council to ensure synergies with relevant activities independent of IMEO.

IMEO partnership model for a fertile mitigation ecosystem

Many organisations have expertise, data, local knowledge, technology, media savvy, access or other resources on fossil methane emissions. IMEO aspires to be a catalyst for this wider ecosystem of organisations and people by partnering, connecting and providing funding to catalyse useful results.

For example, IMEO will provide shared standardised language, such as the OGMP 2.0 levels of reporting quality, and will engage with relevant organisations in the methane ecosystem to develop a common data confidence taxonomy.

Table 2. Members of IMEO's Scientific Oversight Committee

IMEO Scientific Oversight Committee	
Chair:	
Steven Hamburg	Chief Scientist, Environmental Defense Fund
Members:	
Euan Nisbet	Professor of Earth Sciences at Royal Holloway, University of London
Graciela Raga	Senior scientist at the Atmospheric Sciences Centre at the National Autonomous University of Mexico
Lena Höglund Isaksson	Senior Research Scholar, International Institute for Applied Systems Analysis
Paul Wennberg	Director, Linde Center for Global Environmental Science, California Institute of Technology
Shamil Maksyutov	Expert, National Institute for Environmental Studies, Japan

IMEO will develop data tiers and requirements to guide the integration of additional datasets into IMEO's data platform. These data tiers provide a systematic way to evaluate integrity, transparency and relevance of data. IMEO data tiers classify datasets based on:

- **Transparency:** Emission estimation and quantification methods are fully disclosed.
- **Empirically-based estimates:** Emission estimates are based on measurements at different spatial scales (e.g., source-level, site-level and regional-level)
- **Verifiable methodologies:** Emission estimates have been compared to independent measurement-based quantifications and validated. Uncertainty is robustly characterized, and there is the necessary level of precision and accuracy to characterize the emissions for a given spatial/temporal/source scale.

IMEO will provide a shared and public knowledge base for emissions globally, clearly indicating the level of confidence for each data element. IMEO will be able to sponsor focussed new studies and expand the knowledge base and increase confidence levels.

Through its advisory council, IMEO will involve a wide range of stakeholders in its governance in an inclusive way, synthesizing their views in service of delivering on the IMEO mission.

Implementation support tools in progress

As part of its Theory of Change, IMEO intends to provide support to foster capacity for methane mitigation. The first action is the delivery of training modules, developed in partnership with the Environmental Defense Fund (EDF) and Carbon Limits, in collaboration with the International Energy Agency (IEA), in the framework of the UNEP-CCAC Global Methane Alliance. These modules cover topics related to: i) methane emissions sources, ii) detection, measurement and quantification technologies; mitigation options, and iii) policy and regulatory approaches. They were designed to equip participants with the understanding needed to pursue effective methane mitigation actions. To date 10 trainings have been delivered to over 100 representatives from Mexico, Argentina, Colombia, Malaysia, Thailand, Oman, Angola and Iraq.

Table 3. Virtual Methane Mitigation Training Series Modules

Module	Description
Overview Module	Provides a high-level summary of the contents of modules 1-3.
Module 1: Methane emissions in the oil and gas sector	As an overview of methane emissions, this module defines terminology related to methane and identifies major emissions sources from the oil and gas sector. It further explores how countries and companies can reduce emissions in pursuit of ambitious NDCs.
Module 2: Methane detection, measurement and quantification.	This module provides an overview of the currently available technologies to detect and measure emissions, demonstrates how total emissions can be quantified and explains why there is a need for better quantification technology and methodologies.
Module 3: Methane mitigation	In this module, participants will learn about the major sources of methane emissions and cost-effective abatement potential and mitigation activities through the efforts of governments, regulators and operating companies.
Module 4: Advanced Upstream Methane Emissions	For those with a science or engineering background there will be an optional module that provides a deeper understanding of existing best practices and technologies for detection, measurement, quantification and mitigation of upstream methane emissions.
Module 5: Regulatory approaches for methane emissions from oil and gas	This module will explore how countries can develop policies and regulations to reduce oil and gas methane emissions, learning from the experience of jurisdictions in order to design frameworks that are adapted and tailored to local circumstances. The module will cover the main variables that should be taken into account when establishing new regulations, different existing regulatory approaches and a set of essential elements of methane policies.

D. The dual challenge of data integration and uncertainty

IMEO's data integration approach

IMEO will ingest data principally from four streams: OGMP 2.0 reporting, direct measurement data from scientific studies, remote sensing data (e.g., TROPOMI, MethaneSAT) and from national inventories. The challenge is to integrate these multiple sources of heterogenous data into a coherent and policy relevant integrated platform that highlights the confidence of each data element.

Initial efforts under data integration focus on two main work streams:

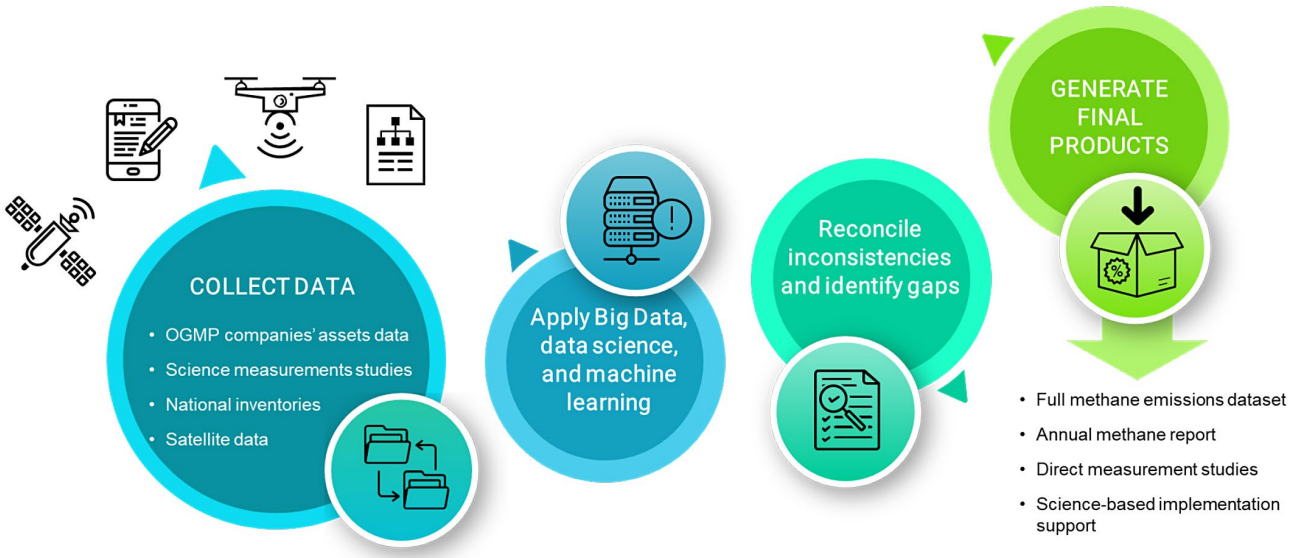
- **Data integration within the company reported data (OGMP 2.0).** With the OGMP 2.0 data, IMEO's initial focus will be on assessing integrity, completeness of reported data and identifying inconsistencies among and between operators, regions and facility type and source type.

- **Overall integration between datastreams.** Under this second work stream, IMEO will focus on designing a data framework that allows merging and aggregating data from the diversity of sources beyond company reported data. Methane emissions data comes with a very wide range of confidence, quality and granularity, including operator-wide reported emissions with no transparency on the methodology deployed, all the way to reconciled source and site measurement-based estimates published in peer-reviewed journals (e.g. Alvarez *et al.* 2018).

Characterizing the degree of uncertainty is essential to be able to make data policy relevant

Assessing methane emissions can be done with a diversity of approaches, which can create confusion if the fusion of data is not curated effectively and transparently. Data comes with a wide variety of of confidence and uncertainty levels attached to it. Much of the emissions data is currently computed using default emissions factors on a source basis that were first deployed three decades ago, when there was much less concern and focus on methane's climate change impacts. Today the degree of confidence one should have will vary widely among potential data sources. Indeed, one of IMEO's primary goals is to improve confidence through its various programs and initiatives in methane emissions data. To help clarify communication about the quality of data, IMEO will introduce a taxonomy of confidence in data sources. This applies equally to OGMP 2.0 data as to other sources, such as satellites or third-party data providers.

Figure 1. Data Flow of IMEO



E. Outlook for the next five years

2022	Increase of OGMP 2.0 company membership
	Phase 1 Coal Studies
	Beta version of the OGMP 2.0 reporting tool
	IMEO has commissioned 4 science studies focusing on the identified gaps in geographies and sources
2022 / 2023	Beta version of IMEO integrated data platform
2024	Founding member companies achieve Gold Standard for operated assets based on 2023 data
2026	Founding member companies achieve Gold Standard for non-operated assets based on 2025 data

II. The Oil and Gas Methane Partnership 2.0

A. The OGMP 2.0 framework

Building on CCAC's leadership

The OGMP 1.0 was designed and launched in 2014 at the UN General Assembly by the Climate and Clean Air Coalition, which, along with its partners, identified the need for such framework early on. This in turn catalyzed interest in industry and contributed to the launch of industry platforms such as the Oil and Gas Climate Initiative (OGCI) and the Methane Guiding Principles (MGP). In 2018 the Methane Science Studies (MSS) were added, with funding from OGCI, the European Commission and the Environmental Defense Fund. In 2020 the Global Methane Alliance was jointly launched by UNEP and the CCAC as a platform to support and encourage countries to include specific pledges on methane mitigation from oil and gas in their Nationally Determined Contributions (NDC). These initiatives have been managed by UNEP as implementer and lead partner.

In 2019 an extensive strategic review led to the conclusion that the level of ambition of OGMP 1.0 was no longer high enough to meet the challenge of climate change. This led to the design and negotiation of OGMP 2.0. The OGMP 2.0 Reporting Framework, agreed amongst partners, defines the role of IMEO in processing and disclosing the reported data, as a section in its annual report.

The OGMP 2.0 framework offers a shared language for methane emission mitigation

The five OGMP 2.0 levels for the quality of emissions reporting introduce a shared and standardized language in the industry. A shared language is essential to make rapid progress in reducing emissions, as it allows for focused policy discussions in board meetings and between joint venture partners.

The OGMP 2.0 Reporting Framework intends to link data to strategic action in a transparent, verifiable manner. It aims to broaden the understanding of methane emissions across all oil and gas sector segments and improve the credibility of methane reporting, with the goal of better informing solutions and sharing best practices across the industry. By creating a robust, measurement-based, consistent reporting framework with a clear roadmap to compliance, OGMP 2.0 also aims to stimulate growth in membership.

A rapidly expanding membership

At its launch in November 2020, OGMP 2.0 had 62 companies from up-, mid- and downstream, with assets spanning every continent. OGMP 2.0 member companies submit annual reports detailing emissions from each of their assets, both for operated and non-operated, laid out by source, and corroborated by the applicable measurement-based assessment methodology under the OGMP 2.0 reporting framework. The asset level data is confidential and will not be disclosed, but suitably aggregated analyses will be reported annually. As of August 2021, 74 leading oil and gas companies from the full supply chain and with operations on all continents, with assets representing 30 per cent of global oil and gas production, have signed an MOU with UNEP and committed to the OGMP 2.0 reporting framework and to sharing data confidentially with IMEO.

Active recruitment is ongoing with additional companies. For most companies the case for action is clear enough, and the greatest recruitment challenge has been access to the appropriate decision makers. As with OGMP 1.0, recruitment would be further accelerated through involvement of state actors and direct actions by member companies.

Data linked to strategic action

Improved reporting includes performance measures focusing on reduction approaches, technological advancement in measurement and policy development that help the oil and gas industry realize deep reductions in methane emissions over the next decade in a transparent way. The new framework adds several elements to its scope. It includes performance targets per company with a ratcheting mechanism as part of a collective target; it extends to all key sources from both operated and non-operated assets; it expands from upstream to also mid-

and downstream and it increases the quality of methane emission estimates within a set timeline for all assets by incorporating empirical estimation and verification of emissions.

The OGMP 2.0 reporting has been designed to link data to strategic action. To that end, it delivers against four key objectives:

- Provide governments and the public with assurance that member company methane emissions are managed responsibly, both for operated and non-operated assets, thus credibly for informing policy decisions.
- Provide member companies with a credible means to demonstrate that they are contributing to climate mitigation, placing progress against relevant targets in line with the 2025 objectives of the CCAC Mineral Methane Initiative.
- Encourage improved performance in methane emissions reporting and mitigation through defined improvement in measurement methodology, transparency, flexibility, collaboration and best practice sharing.
- Encourage wider participation in OGMP 2.0.

Under OGMP 2.0 member companies commit to reporting Scope 1 methane emissions from all sources at both operated and non-operated ventures across the whole oil and gas sector value chain at an unprecedented level of accuracy and granularity. Companies submit an implementation plan for all assets describing how they will reach the targeted improvement in measuring emissions. This will allow IMEO to track progress towards the stated commitments. Furthermore, member companies announce their own individual reduction targets, expected to be consistent with the overall industry reduction target of 45 per cent by 2025, and periodically report on progress towards these targets.

Five levels form the stepping stones to Gold Standard reporting

OGMP 2.0 establishes five reporting levels that increase in granularity and accuracy. The highest of these levels requires emissions estimates that include the reconciliation of source-level and site-level measurements. To be considered Gold Standard, member companies have three years to reach Level 4/5 reporting for operated assets and five years to reach Level 4/5 for non-operated assets. By incentivizing empirically-based emissions estimates as part of company reporting, an unprecedented amount of global methane emissions will be directly characterized for the first time. The European Union's methane strategy (EC 2020) references the OGMP 2.0 reporting framework as "the best existing vehicle for improving measurement, reporting and verification capability in the energy sector."

OGMP 2.0 will help provide the public with the assurance that methane is being managed responsibly. Companies that conform to this Gold Standard of reporting against targets and continuous improvement in measurement quality will be provided with the means to credibly demonstrate that they are contributing to climate mitigation and delivering against their methane improvement objectives and targets.

OGMP 2.0 Reporting Levels

- **Level 1** – Emissions reported for a venture at asset or country level (*i.e. one methane emissions figure for all operations in an asset or all assets within a region or country*)

- **Level 2** – Emissions reported in consolidated, simplified sources categories (based on IOGP's five emissions categories), using a variety of quantification methodologies, progressively up to the asset level, when available

- **Level 3** – Emissions reported by detailed source type and using generic emission factors (EFs)

- **Level 4** – Emissions reported by detailed source type and using specific EFs and activity factors (AFs)
  - Source-level measurement and sampling may be used as the basis for establishing these specific EFs and AFs, though other source type specific quantification methodologies can be used. This includes simulation tools and detailed engineering calculations (e.g. as referenced in existing OGMP TGDs, and Marcogaz assessment of methane emissions for gas Transmission and Distribution system operators.)

- **Level 5** – Emissions reported similarly to Level 4, but with the addition of site-level measurements (measurements that characterize site-level emissions distribution for statistically representative population)

OGMP 2.0 Gold Standard

"Gold Standard" refers to both the highest reporting levels under OGMP 2.0 and companies' plans to achieve this level. Gold Standard reporting is achieved once companies empirically reconcile measurements at source (Level 4) and site (Level 5) level for a statistically representative portion of their assets. The reconciliation between the two is referred to as Level 4/5. The Gold Standard pathway is awarded to companies that demonstrate a credible and explicit path towards Level 4/5 (i.e. to reconcile their source and site level measurements) reporting within 3 years for operated assets, and 5 years for non-operated assets.

Gold Standard includes the credible path towards the agreed endpoint within the agreed timeline, rather than just the endpoint itself. For this initial reporting round, Gold Standard status is attributed to companies on the basis of the credible and explicit path towards Level 4/5 reporting included in their implementation plan, and of an OGMP 2.0 compliant Level 1 report. The Gold Standard status is captured in each company fact sheet (Annex 1), and is to be interpreted as a Gold Standard pathway, rather than Gold Standard reporting.

Member companies submitted implementation plans to progress to the targeted Level 4/5. It obviously takes time to roll out such extensive changes in measurement and reporting of emissions. As a result, the reported emissions for this year average around Levels 2 and 3, with a clear demostration of commitment by these leading companies to continue the improvement journey in the following years.

Photo credit: shutterstock / tonkid

B. OGMP 2.0 technical standards

The OGMP 2.0 technical level is jointly designed with member companies

The OGMP 2.0 established three task forces to translate the principles in the Framework into practical guidance to help companies meet their reporting requirements:

1. Technical Guidance Documents Task Force
2. Reporting Task Force templates
3. Uncertainty and Reconciliation Task Force

The membership of the technical Task Forces is open to ten OGMP 2.0 members representing their constituency (upstream, mid- and downstream, non-industry), while all companies can contribute to the OGMP 2.0 technical work through the mirror groups.[3]

All three Task Forces work in close collaboration with each other to ensure coordination and consistency throughout different technical deliverables. The co-chairs provide regular updates on progress to the OGMP 2.0 Steering Group, which approves all deliverables. Task Force decisions are reached by consensus. When consensus cannot be reached, the Task Force Co-Chairs present the different points of view to the Steering Group and seek guidance from the Steering Group as appropriate.

The Technical Guidance Documents dynamically document guidance on reporting

The objective of this Task Force is to oversee the development of source-specific Technical Guidance Documents (TGDs) to assist companies in identifying and reporting methane emissions in alignment with the reporting requirements of the OGMP 2.0 Framework (cf. Annex I). The TGDs are living documents and will be updated as practices evolve and new data or technologies become available.

Carbon Limits has been engaged to develop first drafts of the Technical Guidance Documents, which are closely reviewed and adjusted based on the feedback from Task Force members. These works leverage existing international work by other organizations such as the Methane Guiding Principles, Marcogaz, OGCI as well as the TGDs developed under the OGMP 1.0.

3 Participation is limited to 10 people to include three upstream representatives (including a co-chair), five mid- and downstream representatives (including a co-chair) and two non-company members representatives (including a co-chair). The complex nature of the technical topics discussed requires that Task Force members have technical expertise on methane emissions common sources in either the upstream or mid- and downstream segments and have the capacity to dedicate sufficient time to the work of the Task Force.

For the main sources described below, the TGDs outline the quantification methodologies that companies can use to report at Level 3 and Level 4 (source-specific reporting levels). The TGDs are meant to provide guidance, and companies can adopt a different methodology as long as they explain and justify their approach in their annual report.

Three Technical Guidance Documents have been approved by the Steering Group so far. Five others have been drafted and are under discussion in the OGMP 2.0 TGD Task Force.

Table 4. OGMP 2.0 Technical Guidance Documents and Status

Technical Guidance Documents	Status
Glycol dehydrators	Approved
Flare efficiency	Approved
Level 1 and 2 reporting	Approved
Fugitive components and equipment leaks	Drafted and currently under review
Centrifugal compressor shaft seals (wet and dry seals)	Drafted and currently under review
Natural gas-driven pneumatic controllers, pumps and measurement devices	Under development
Reciprocating compressor rod packing	Drafted and currently under review
Purging and venting, starts and stops and other process and maintenance vents	Under development
Incidents, third party damages and emergency stops	Under development
Incomplete combustion	Drafted and currently under review
Un-stabilized liquid storage tanks	Drafted and currently under review
Gas well liquids unloading	Under development
Oil well casinghead venting/flaring	Under development
Gas well hydraulic fracture completion venting/flaring	Under development

Systematically representing uncertainty and being transparent about reconciliation

The objective of this Task Force is to develop guidelines to assist OGMP 2.0 member companies to account for uncertainty and reconciliation when fulfilling the reporting requirements laid out in the Framework.

Several studies demonstrated that the distribution of emissions at both source and site-level is in most cases to be fat tailed (Alvarez *et al.* 2018; Brandt, *Heath and Cooley* 2016). This means that any sampling and statistical treatment will need to include sufficient data to accurately account for the characteristics of the tail of the distribution.

All the questions are addressed in a principles document that is being developed by the Task Force. In addition to introducing main principles, the document will cover topics such as uncertainty of inventory, representative, unbiased sampling strategy, constraints for selection of appropriate measurement techniques and reconciliation. The OGMP 2.0 Reporting Framework does not prescribe a specific set of methodologies for reconciliation, as the high diversity of assets makes an approach based on fixed rules unworkable. The consequence is that the reconciliation process will require both judgment and transparent justification to achieve a tenable result. The guidance is accompanied by practical case studies to illustrate the principles, as well as a glossary clarifying all concepts used.

The Uncertainty and Reconciliation Principles document is currently being finalized by the OGMP 2.0 Uncertainty Task Force in coordination with the TGDs Task Force. It is expected to be shared for mirror groups' comments and the Steering Group's approval in late 2021.

Templates standardize reporting and maximize synergy with other commitments

Members of this Task Force developed reporting templates that were used by member companies to meet their reporting requirements and to provide a list of all operated and non-operated assets. The Task Force also drafted a guidance manual on how to fill out templates for upstream and mid- and downstream companies and developed a process for submission.

While the work of the Reporting Task Force has been completed, OGMP 2.0 partners agreed that the reporting templates will be tested during the first year of reporting, and modifications will be made as partners learn from the reporting process. To facilitate companies' ownership and acceptance of the reporting templates, the Task Force decided to develop two templates, one for upstream based on the OGCI reporting template, and one for mid/downstream based on the Marcogaz reporting template.

The OGMP 2.0 is considering building on the templates to develop an online submission tool to facilitate partners' reporting and data aggregation and analysis.

Photo credit: Saskatchewan Research Council

III. OGMP 2.0 Implementation Plans and Company Reports

A. Implementation plans

Implementation plans as the roadmap to achieving Gold Standard

Companies are required to provide implementation plans that outline a credible and explicit path to reach Gold Standard. The implementation plans consist of the following key elements:

Table 5. Elements of OGMP 2.0 Implementation Plans

Elements of OGMP 2.0 Implementation Plans	
Performance target	Target Defined
	Baseline Year
	Target by 2025
Phasing Plan	Commitment to reach Level 4/5 reporting in 3 years for operated assets
	Credible and explicit path for operated assets ✓ Staged approach ✓ Explanation of staged approach ✓ Indication of possible technologies ✓ Identification of most material sources)
Level 4/5 reconciliation considerations	Indication of possible technologies
Joint Venture dynamics	List of non-operated assets
	Commitment to work with non-operated ventures
	Explicit and credible path for NOJVs

Jonah Energy

Jonah Energy: The smallest OGMP2.0 upstream member leads the way

Jonah Energy turned in the most comprehensive first year submissions, progressing far along the Gold Standard pathway. In addition to a compliant emissions report, Jonah provided a detailed multi-year implementation plan describing existing experience with technologies and a reasonable path forward to achieve the requisite Level 4/5 reporting for operated assets within the three-year time frame. Jonah reported 85 per cent of its emissions from operated assets at Levels 3 and 4. They provided a companion document detailing all emissions sources by category for all levels.

Companies can modify their implementation plans every year if there are significant changes that include for example, acquiring, selling or decommissioning assets, incorporating a new approach or measurement methodology or if they would like to update their goals regarding non-operated assets. The information provided by companies in their implementation plans is not publicly disclosed. The only information accessible to the public is the company's targets.

The Gold Standard for companies that joined prior to the program's launch is attributed based on a pathway defined by a detailed implementation plan and the compliance report for the first reporting year.

Table 6. Overview of Company Implementation Plan Submissions

Segment	Company Partners	Required to Submit Implementation Plan	Required and Submitted	Required and Did Not Submit	Not Required and Submitted	Total Submitted
UPSTREAM	15	14	11	3	1	12
MIDSTREAM	40	33	31	4	2	33
DOWNSTREAM	19	18	17	3	1	18
Total	74	65	59	10	4	63

The text boxes in this section highlight the companies that submitted forward-looking implementation plans outlining deep change of strategies with regards to the deployment of technologies for direct measurements, to ambitious methane reduction targets or to the engagement of non-operated joint ventures on data submission. These plans reflect and detail companies' enhanced commitments to measure, manage and mitigate methane emissions.

Targets

To reach Gold Standard status of reporting under OGMP 2.0, companies need to announce 2025 absolute reduction or near-zero intensity targets. Target setting is a complex exercise requiring a good understanding by companies of their emissions profile. Companies' targets are presented in the company fact sheets annexed to the report.

In the upstream segment, Equinor commits to a low intensity target. Equinor has one of the lowest upstream methane intensities in the industry, underpinned by a clear understanding of detection, quantification and mitigation technologies, across operated assets. Equinor is supporting and undertaking the development and implementation of site-level measurements to verify and validate their reported low emissions, and ensure their methane emissions across all oil and gas activities are kept near zero.

Neptune Energy is an upstream company with an ambitious target to reach a near-zero methane intensity for their production of hydrocarbons based on their exports. They are committed to work with their global assets to have the highest reporting quality and deploy mitigation measures. As their data quality improves, each asset will update their information and identify opportunities for enhancement.

GRTgaz is a midstream company with a clear commitment to reduce emissions in its assets with ambitious targets. Within its implementation plan, GRTgaz shapes a route considering all the technical, operational and economic complexity of the sector. The company targets are based on an analysis of past estimated emissions and growth plans of the company, proposing a logical pathway to mitigate possible emissions on their larger identified sources. The company approach to achieve the reporting in their non-operated joint ventures is robust and clear.

Italgas is a downstream member with ambitious targets and detailed plans for direct measurements. The company presented good implementation plans with credible timelines, targets and technology deployments on an asset-by-asset basis. The company has started an important effort to involve their non-operated joint venture partners. Italgas already plans measurements campaigns next year with its partners and is currently making efforts to convince them to join the OGMP 2.0 Initiative.

Monitoring Technologies

The deployment of monitoring technologies is crucial for OGMP 2.0 companies to perform direct measurements at source and site level and to reach Gold Standard reporting.

In the upstream segment, Shell navigated its complex portfolios and committed to deploy and explore robust technology for measurements and reconciliation. Shell turned in a comprehensive implementation plan, with a special focus on demonstrating an understanding of the nuanced difficulties that could arise regarding the nascent market of methane emission measurement technology and its deployment on a global basis. They conducted a materiality analysis across assets and detailed the dynamics for consideration to support non-operated assets to achieve the Gold Standard within the five-year time frame.

bp selected priority technologies for top-down and bottom-up measurement and made first steps toward the definition of standards for top-down technologies.

bp outlined a detailed plan for deployment of top-down technologies, coupling early deployment of near market-ready technology with further assessment of core measurement parameters. This is the first step towards the definition of bp standards for technology deployment to inform cross-industry standards.

In the midstream segment, Enagás, a company with global operations, submitted one of the most accurate plans to mitigate emissions, including data for non-operated assets and the deployment of technologies for direct measurements in the midstream sector. Enagás developed one of the best implementation plans, with a clear pathway and aggressive targets to reduce emissions in both operated and non-operated assets. The plan includes a complete description of methodologies and technologies planned for use in the coming years to achieve the Level 4/5 reporting level.

Photo credit: bp

Photo credit: Unsplash / JJ Ying

Non-Operated Assets

Under OGMP 2.0 companies commit to report data from their assets in non-operated joint ventures. Counting activities from non-operated joint ventures, OGMP 2.0 includes 30 per cent of global oil and gas production. Yet obtaining non-operated joint venture data can be challenging, and companies are adopting different strategies to achieve this goal.

In the upstream segment, Wintershall Dea provides a clear and granular timeline for operated assets and non-operated joint ventures. The company reports the status for all of their assets as well as a detailed and logical timeline for reaching Level 4/5. The timeline is provided for all assets individually, across a wide array of geographical locations. Notably, Wintershall Dea has a credible timeline for the operators of its non-operated joint ventures submitting data and reaching Gold Standard for each asset.

Snam, Europe's biggest gas pipeline operator, is on the right path to obtain data from non-operated joint ventures. In its implementation plan, Snam outlines current and future steps to engage its affiliates to either join OGMP 2.0 or to provide methane emissions data. Snam went the extra mile on non-operated joint venture data and submitted implementation plans for each of its affiliates, outlining main methane emissions sources along with a stepped approach to reach Gold Standard. Snam is already using measurements to report at Level 4 for many emission sources and is on track to reach the highest reporting level for all the sources across their assets.

B. Company reports

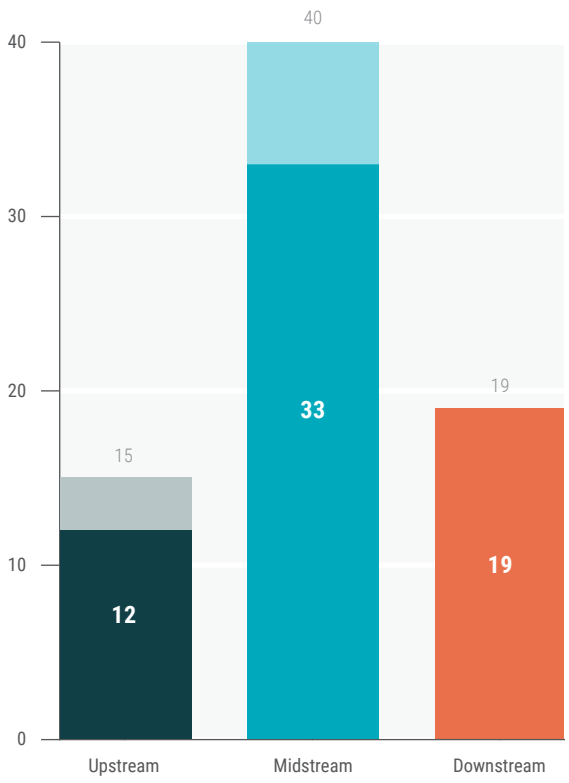
64 leading companies submitted their first OGMP 2.0 report

After joining the OGMP 2.0, companies have until 31 May of the following year to submit their annual report. Only 65 out of 74 member companies were required to submit a report this year, as the newer members joined later and have a commitment for next year. Details on company reports are provided in the table below.

Table 7. Overview of Company Reports

Segment	Company Partners	Required to Report	Required and Reported	Required and Did Not Report	Not Required and Reported	Total Reported
UPSTREAM	15	14	11	3	1	**12**
MIDSTREAM	40	33	31	2	2	**33**
DOWNSTREAM	19	18	18	0	1	**19**
Total	**74**	**65**	**60**	**5**	**4**	**64**

Figure 2: Reports submitted by industry segment



Most companies reported at Level 2 and Level 3 in this first year

OGMP 2.0 companies have three years to achieve Gold Standard reporting for operated assets and five years for non-operated assets. Considering that reporting is still in its first year, and also that the source-specific guidance is still under development, it is not surprising that for this initial reporting round, OGMP 2.0 companies are reporting on average at Level 2 and Level 3. While in most cases the data is incomplete—and because of the lack of emissions data for joint ventures—achieving this level is a commendable early step towards achieving more accuracy and granularity. Companies made significant efforts to increase their reporting quality and most have outlined in their implementation plans detailed steps to reach Gold Standard within the set deadlines.

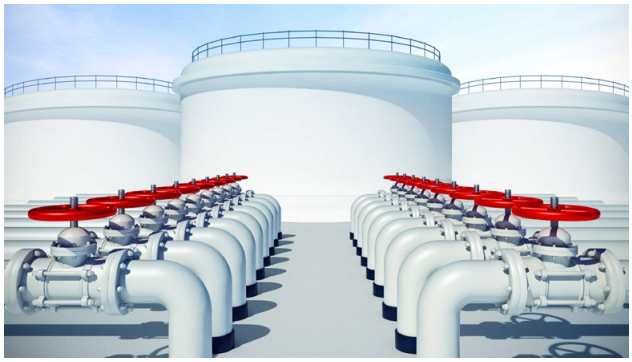
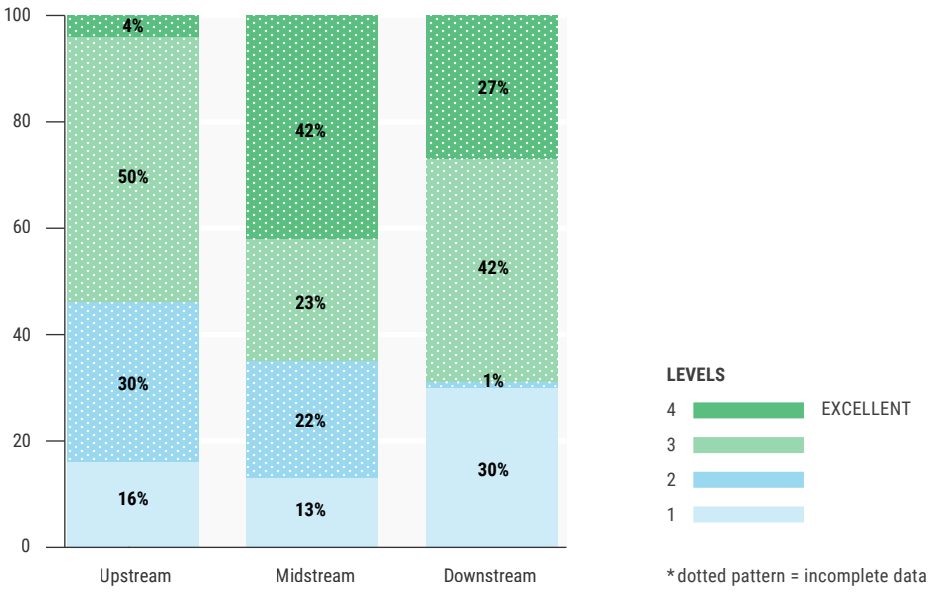


Figure 3: Share of reported emissions at each level out of total emissions reported by industry segment



Including information on non-operated assets

Obtaining data on non-operated assets can be challenging. This is why OGMP 2.0 companies have five years to reach the Gold Standard reporting for non-operated assets. Several companies have provided details in their implementation plans on how they intend to obtain data from their joint ventures by next year through agreements with operators and shareholders. Some started engaging their joint ventures on the development of strategies to measure, reduce and report emissions, while others are trying to persuade their joint ventures to join OGMP 2.0 and report their emissions directly.

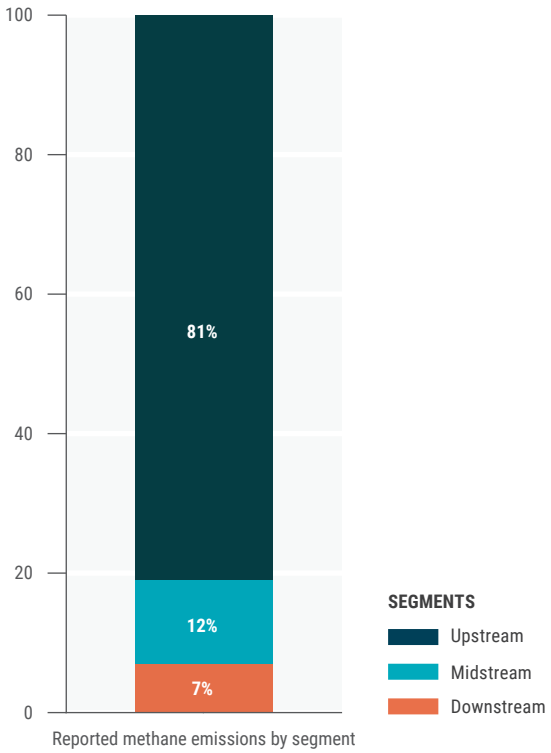
Not all the companies reported data for their non-operated assets completely, while some do not own any of them. In this initial reporting round, some companies reported data for a minor part of their non-operated assets. Shareholder constraints and jurisdictional restrictions can pose additional challenges to gathering information on non-operated assets. There are also logistical and financial barriers to obtaining raw data on assets outside companies' control. The challenges to obtain measurement-based data for non-operated assets may undermine the degree of accuracy of total emissions reported by companies. In some cases, companies did not report their non-operated assets because these are operated – and therefore reported – by OGMP members.

For upstream, 60 per cent of reporting companies disclosed data on their non-operated assets, while 40 per cent did not. However, only 15 per cent of the total submissions from the upstream segment disclosed reported data for all their non-operated assets. For midstream, 40 per cent reported non-operated asset data. 30 per cent did not disclose information, while the remaining 30 per cent do not own any non-operated assets. Only 13 per cent of the total submissions from the midstream segment reported all their non-operated assets. Fifteen per cent of total emissions from all reports submitted across all industry segments resulted from non-operated assets. Breaking down the emissions by segment, 17 per cent of total upstream emissions and 10 per cent of total midstream emissions were reported under non-operated assets. However, given the challenges highlighted above, there is uncertainty surrounding the emission figures and hence percentages until all non-operated assets disclose their data. OGMP 2.0 will continue to provide guidance to improve the confidence of the reports and overcome these challenges through the work of the different Task Forces.

Confidence in emissions data will improve in the coming years

As noted above, OGMP 2.0 companies made good attempts to quantify their emissions; however, only emissions that are reported at Level 4/5 provide a meaningful representation of companies' emissions. The numbers below should therefore be qualified as low confidence numbers. They do, however, give an initial snapshot of OGMP 2.0 companies' emissions and constitute companies' best attempts to quantify their emissions with the guidance currently available. Figure 4 represents the total emissions by segment across all companies that submitted a report, with upstream accounting for 80 per cent of total reported emissions.

Figure 4. Percentage of total reported methane emissions by segment



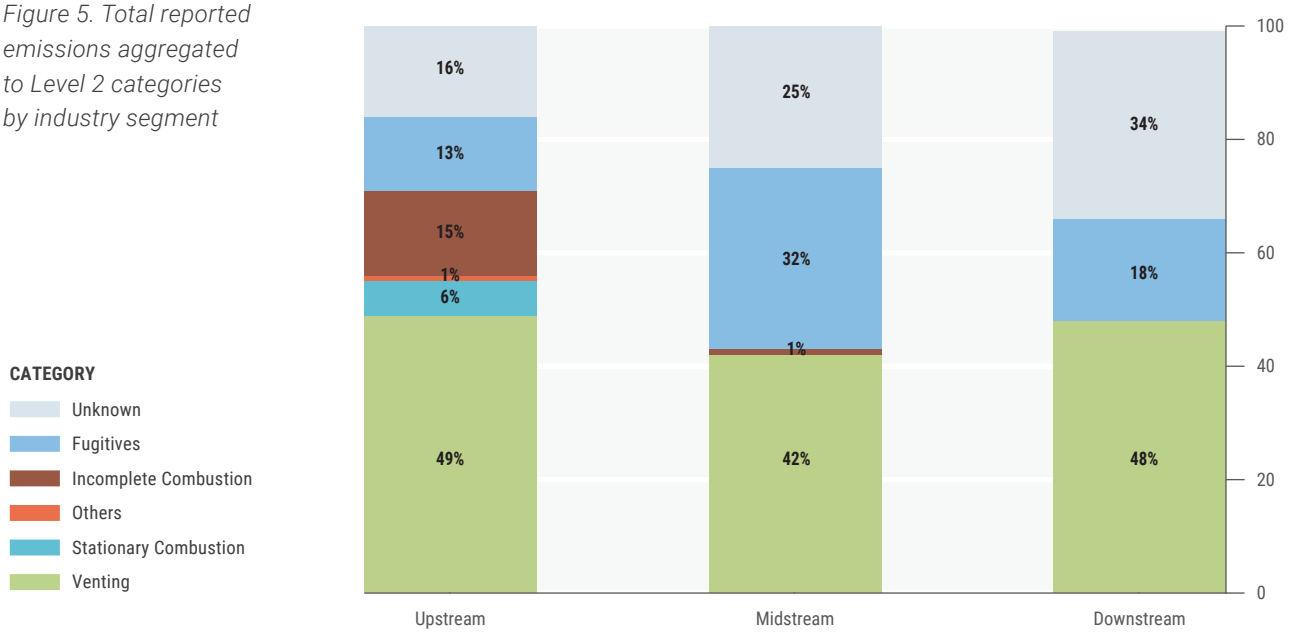
Some early insights into emission sources

Emissions sources can be aggregated by either category or to specific equipment and components of the supply chain. Level 1 does not provide any insight into sources. Level 2 provides information on emissions by category (i.e. fugitives, venting, flaring, combustion). Level 3 refers to source-specific emission estimates, while Levels 4 and 4/5 increase the confidence of the accuracy of the estimates for Level 3 sources by adding measurement of emissions at source and site level. Figure 5 shows the total emissions across all companies by industry segment aggregated by Level 2 categories. Emissions reported at Level 1 are shown under the category "Unkown".

For the three segments, the majority of emissions are reported under the venting category. In part, this is driven by the reports of a few companies with relatively high venting sources. This finding agrees with the literature suggesting the presence of a heavily skewed distribution of emission sources, where a few components or facilities account for a large share of emissions (Brandt, Heath and Cooley, 2016), even though it is based on incomplete data. While venting is also the main contributor of emissions in other emission datasets, such as IEA's Methane Tracker, the proportion is likely to change as operators improve their reporting.

The midstream and downstream segments have a higher fraction of submissions at Level 4 reporting relative to upstream (42 per cent and 27 per cent, respectively versus four per cent out of total reported emissions). However, further technical guidance from OGMP 2.0 is needed to validate measurement methodologies and confirm best practices. It is important to mention that the downstream sector is also likely to have more limited abatement measures relative to other segments, and that emissions are relatively lower also because the industry has historically applied higher management standards being typically located in densely populated areas. As more emissions data is reported at higher levels during the following reporting cycles, a more robust assessment of key sources will be possible.

Figure 5. Total reported emissions aggregated to Level 2 categories by industry segment



C. Company Performance Targets

55 companies out of 65 implementation plans set emission targets

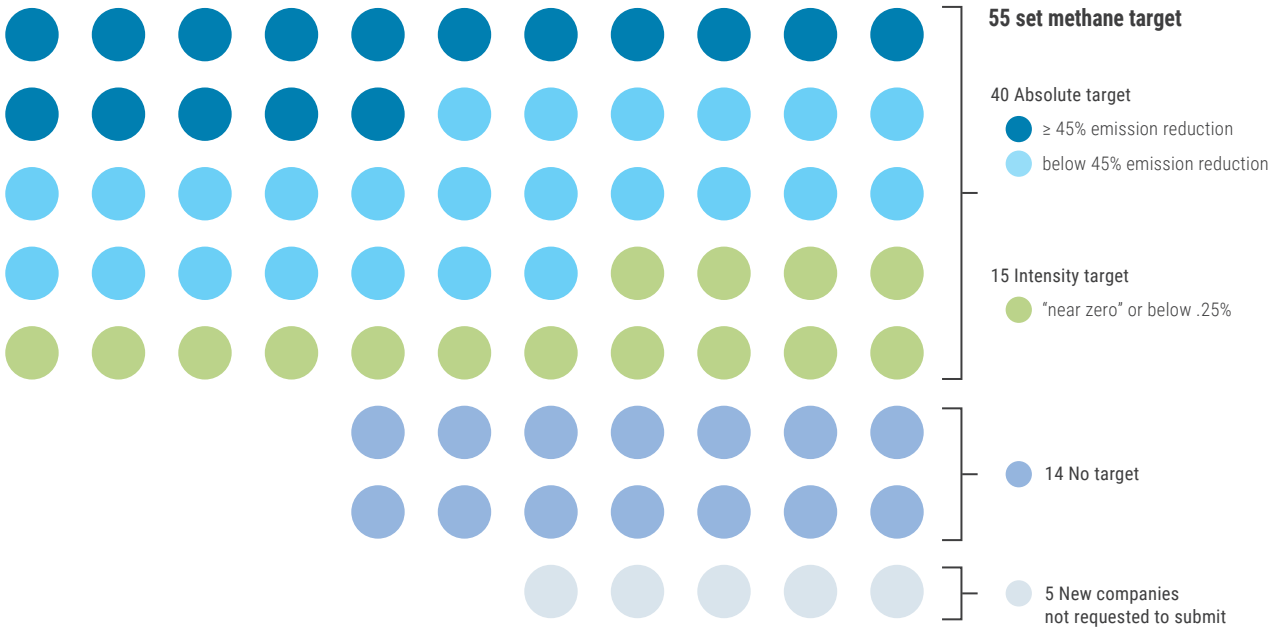
Table 8. Overview of Targets Set by Companies

Segment	Company Partners	Required to Set a Target	Required and Target Set	Required and No Target Set	Not Required and Target Set	Total Targets Set
UPSTREAM	15	14	9	5	1	10
MIDSTREAM	40	33	30	3	2	32
DOWNSTREAM	19	18	12	6	1	13
Total	74	65	51	14	4	55

Fourteen companies that should have set a target did not do so. Nine companies joined very recently and were not required to send their implementation plan and report yet, although four of them did. There is one company in the midstream segment that only reported non-operated assets, although it set a reduction target and is pushing its joint venture partners to achieve it. Most (41) of the 55 reporting companies have absolute targets; the rest (14) have intensity targets.

In the case of the methane intensity targets, all of the companies set targets below or equal to 0.25 per cent. In contrast, only 16 of the 41 (40 per cent) methane targets based on absolute emissions meet or exceed the target of 45 per cent emissions reduction. An overview of the performance targets is presented in the graphic below.

Figure 6. Overview of methane targets



Performance targets will be validated through reconciliation at Level 4/5

Figure 7 and 8 summarise current targets for each company. As reporting is improved over the reporting cycles to come, it will be possible to assess not only whether the extent of emissions reported is accurate but also whether more mitigation is feasible.

Figure 7. Methane intensity targets listed

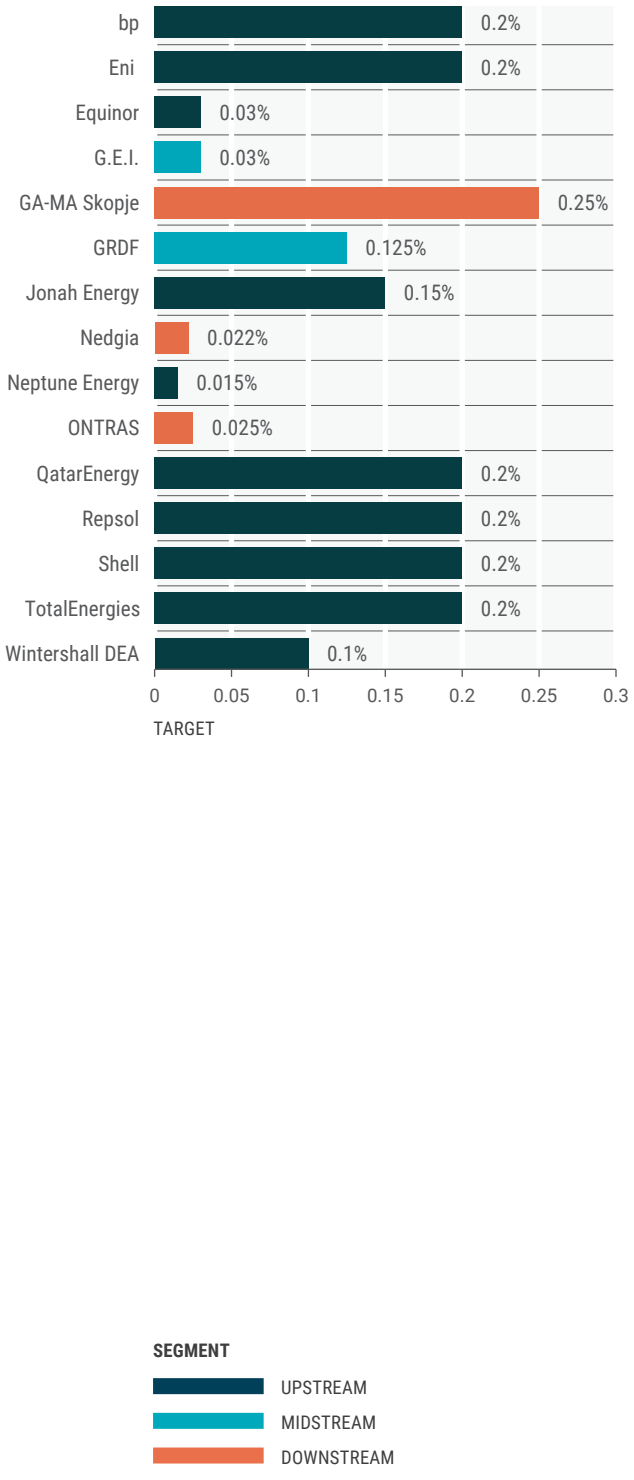


Figure 8. Absolute methane targets listed

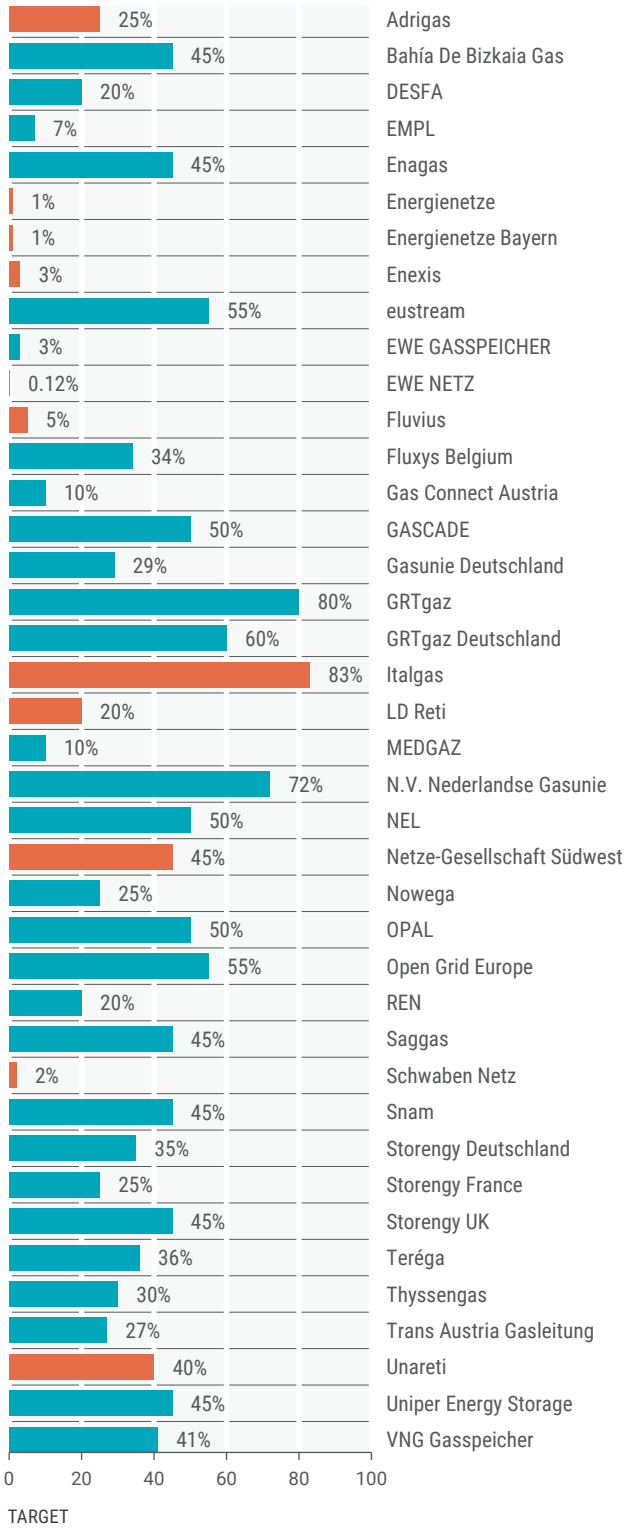


Photo credit: The European Space Agency

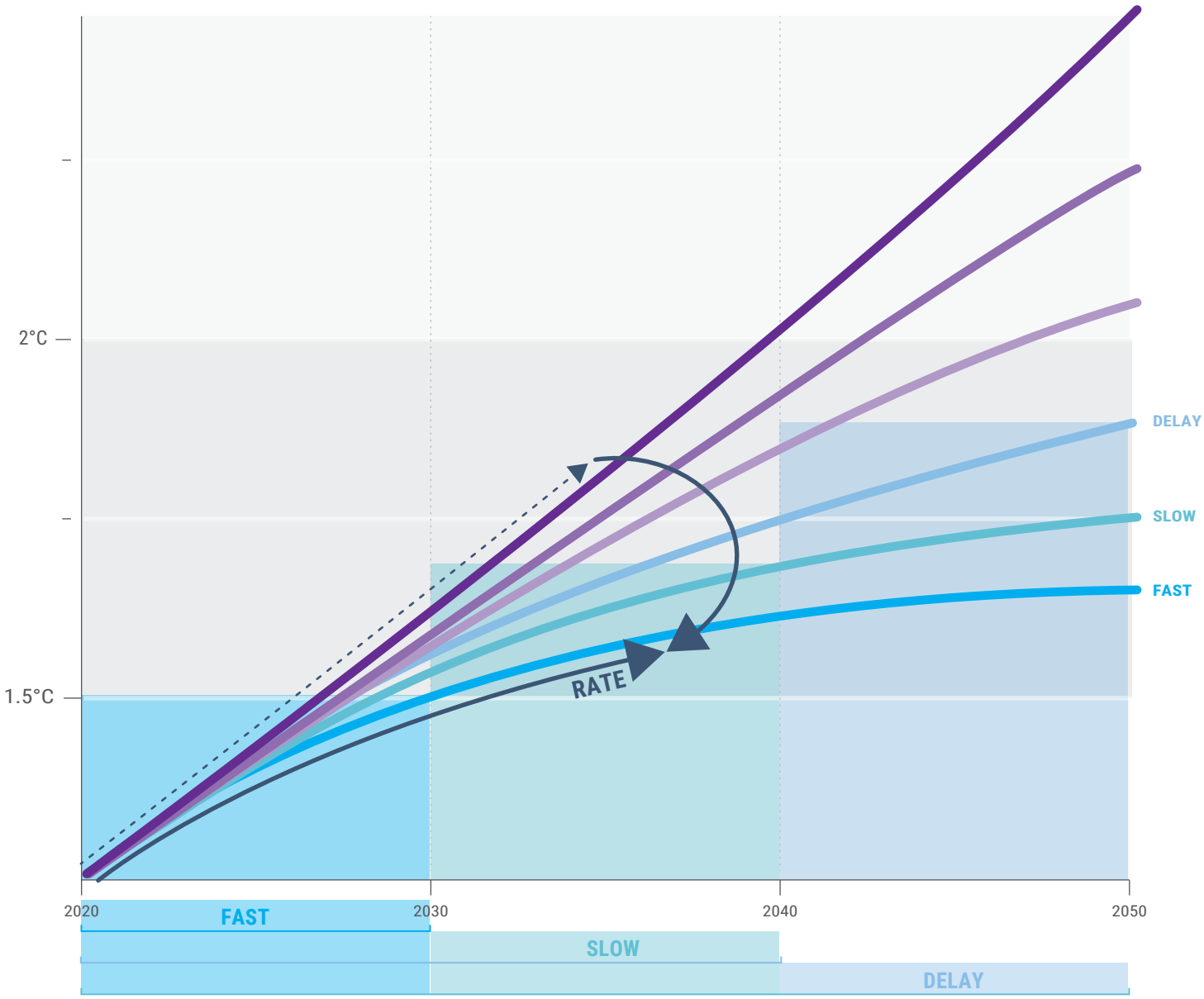
IV. IMEO Science Studies Report

Update on methane emissions science

Methane concentrations continue to rise rising rapidly; fossil sources matter

Methane concentrations in the atmosphere have more than doubled over the past 150 years and continue to rise precipitously (WMO 2019). The timing with which methane emissions are mitigated critically influences the rate of warming of the planet.

Figure 9. Methane Mitigation Timelines



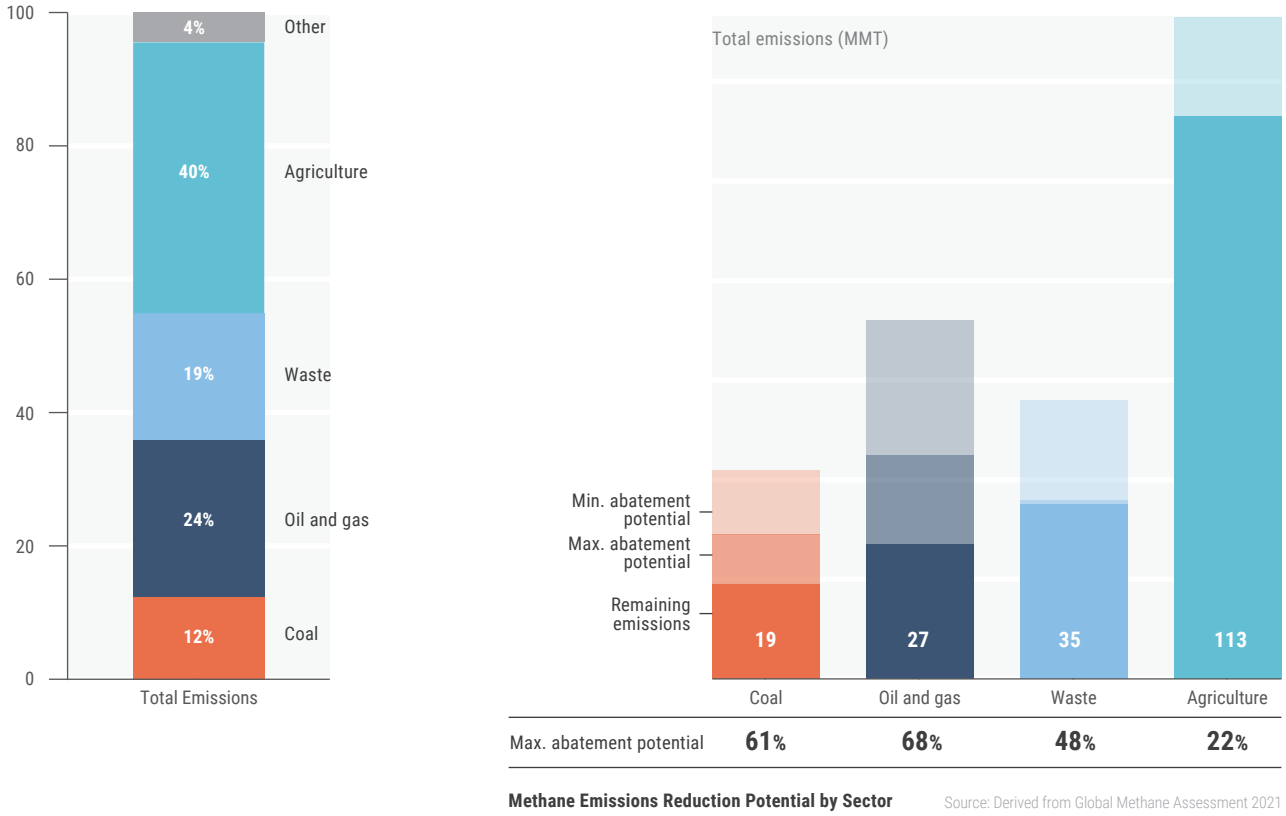
Source: Ocko *et al.* 2021

While both fossil and agricultural sources (Jackson *et al.* 2020) have played some role in this rise in concentrations, the *addressable* reduction is vastly greater in the fossil fuel sector (Ocko *et al.* 2021). This addressability is founded on economic and technical feasibility, as well as IMEO's credible theory of change.

Economic incentives and technical feasibility alone do not necessarily lead to change at scale. Systemic change also requires governance adaptation, social norms evolution and increased interconnection between actors.

This is what IMEO was designed to accomplish.

Figure 10. Anthropogenic methane emissions sources and reduction potential



Methane Emissions Reduction Potential by Sector Source: Derived from Global Methane Assessment 2021

We know enough to act, and better science can help focus and accelerate action

While new scientific studies continue to uncover insights into emissions, it in no way follows that more study is needed before taking action. We know enough to act now.

One of the notable insights from previous studies is that most emissions come from industry standard equipment (Alvarez *et al*. 2018). For example, in American operations, the vast majority of emissions are associated with components such as valves, tanks, incomplete flaring and abnormal process conditions. This is encouraging for mitigation, as it means that emissions come from known sources with known solutions. While the configuration of global oil and gas infrastructure is highly heterogeneous, known solutions apply globally and can be implemented in operations around the world.

For example, an enclosed box illustrates how through accessing knowledge and information that is available inside companies, a reduction of 50 per cent in emissions was achievable in two years in the Netherlands' offshore platforms, even after a decade of sustained reductions of emissions. Existing studies and measurement technologies allow for rapid progress in reducing emissions.

More precise measurements and new methodologies will help accelerate interventions, but the case for acting now is compelling. Over time, and with enough data, it may be possible to develop a root cause analysis that describes the emergence of super-emitters and to assess their likelihood in a given context.

Scientific methane studies need to be based on five core principles that IMEO espouses:

- All research projects are led by academic institutions
- Multiple measurement methodologies are deployed whenever possible
- The full scientific process—from scoping of the study to publication—is reviewed by an independent panel of scientific experts
- All collected data is made publicly available
- Studies are published in peer reviewed journals

This data will allow industry, governments and other stakeholders to prioritise actions to reduce emissions of this impactful climate pollutant. The work to be performed under IMEO will build on this prior work by UNEP in the framework of the CCAC and continue to address gaps in knowledge. There is a need for more direct measurements of oil and gas facilities with publicly disclosed data beyond the initial studies completed so far. Additionally, there is a need for other global studies that focus on specific aspects of the oil or gas supply chain, such as the combustion efficiency of flaring, which is routinely reported with a legacy default factor that likely leads to underreporting of an important source.

Satellites are a game changer, but data challenges remain

There is no doubt that methane measurements from satellites are playing and will continue to play a big role in IMEO's approach. They will allow IMEO to further explore emission patterns from company reported data, as well as to engage with companies that are not OGMP 2.0 members.

Satellites are already showing their potential as a game changer, but the massive amount of data they will be generating needs to be carefully and responsibly understood and combined to reap all its benefits and drive mitigation. The core issues of detection threshold, inversion algorithm to quantify emission rates, transparency and point source versus disperse sources are described in this section with a special focus on satellite data in an enclosed box.

IMEO is already partnering closely with the European Space Agency's TROPOMI instrument and coordinating with the Environmental Defense Fund's upcoming MethaneSat capability, as well as with other satellite operators.

While measured atmospheric methane concentration maps have generated much publicity in identifying hotspots, IMEO is focusing on emissions data that requires extensive computation. It also will focus on assessing emissions over longer periods, as opposed to snapshots of emissions. Over time, and in combination with local in-depth studies, this will deliver the most policy relevant and actionable data.

Reconciling source and site measurement is well understood, as well as technically advanced

Several studies have been conducted using a variety of ground and air-based remote sensing technologies in various regions. For example, studies in the Permian Basin (Zhang *et al.* 2020), in Mexico (Zavala-Araiza *et al.* 2021), and in Australia (Neininger *et al.* 2021) demonstrate how emissions data collected at different spatial scales can be reconciled.

While this process is technically well understood, it requires careful treatment of the various sampling uncertainties—including the fat tail nature of most emissions—to come to a robust conclusion. These studies confirm, however, that integrating empirically based estimates at different scales is truly the gold standard of methane emission assessment.

The OGMP 2.0 Technical Guidance Document (TGD) on Level 4/5 provides guidance on how this is best done. It will be updated with the experience of member companies around the world.

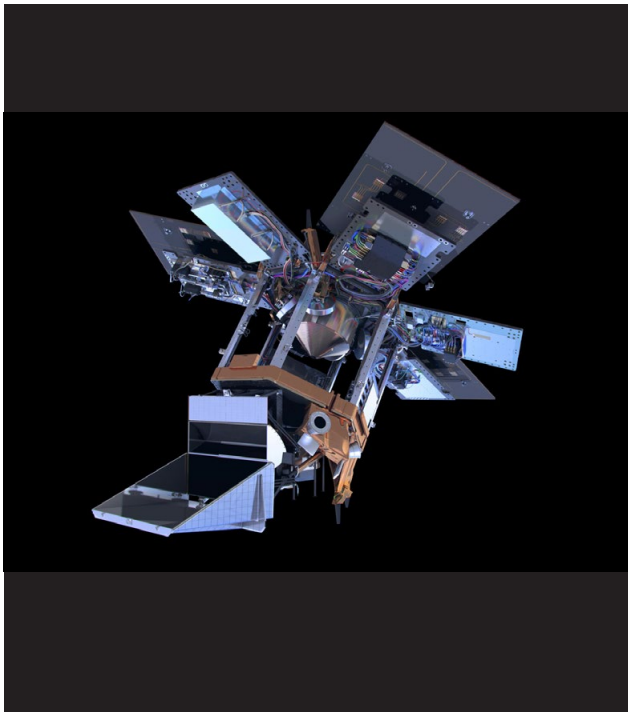


Photo credit: The European Space Agency

Updates from the CCAC international methane studies

There is uncertainty in the scale and location of methane emissions from oil and gas infrastructure within and among regions in the world. An empirically-based characterization of emissions sources is critical to improving emission inventories and implementing effective mitigation strategies.

Ongoing projects that are part of the CCAC Methane Science Studies are targeting oil and gas sectors and production regions with limited empirical data on methane emissions (e.g. offshore production and LNG supply chain). As of September 2021, eight papers have been published on the topic, and at least five more are expected before the end of the year.

Figure 11. Map of CCAC Methane Science Study locations

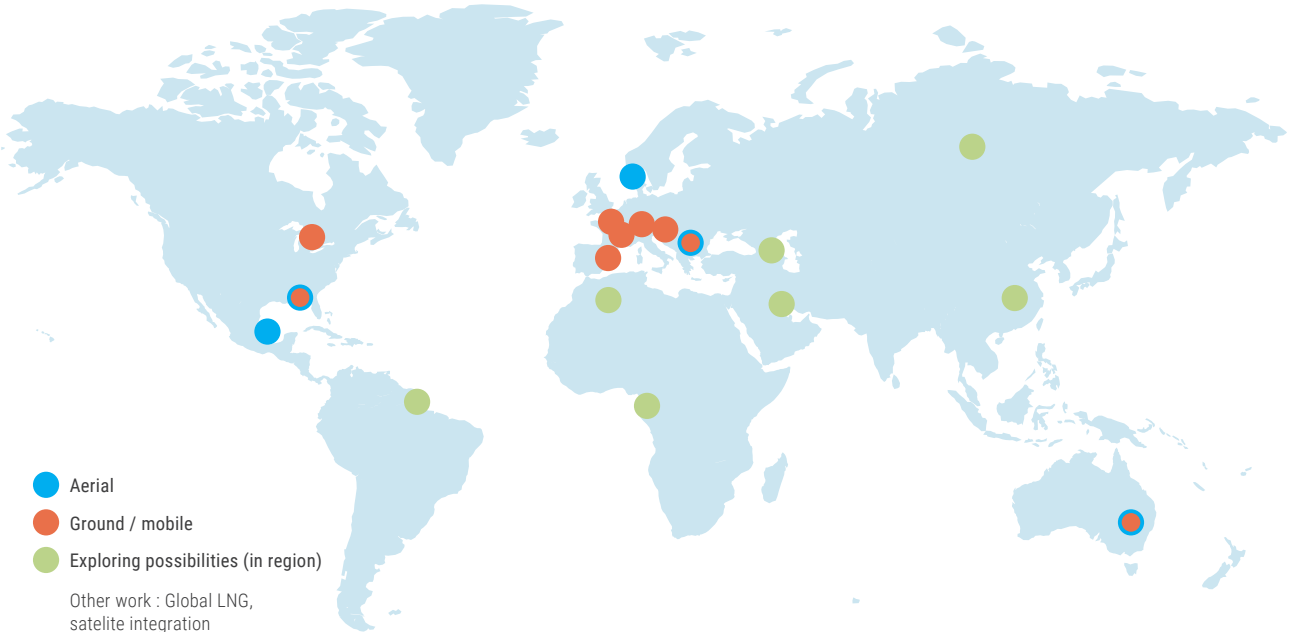


Table 9 – Summary of Ongoing and Published Studies under the CCAC International Methane Studies

Study	Rationale	Status	Key findings
Global LNG study	There is significant uncertainty in terms of methane emissions from LNG facilities (liquefaction, regasification and shipping) with little to no empirical measurements publicly available.	Manuscript in preparation.	Findings to follow publication of manuscript.
Offshore production studies: Gulf of Mexico	There is little to no empirical-based estimates of methane emissions from oil and gas offshore infrastructure. The first offshore study took place in the United States, where it was logistically easier to set up the study.	A methods paper based on ship-based measurements has been published (Yacovitch, Daube and Herndon 2020) A second paper using airborne-based measurements has also been published (Gorchov Negron, Kort, Conley and Smith, 2020)	The published studies highlighted important differences in emissions between shallow and deep-water production infrastructure. The studies highlighted the presence of super-emitters.

Study	Rationale	Status	Key findings
Offshore production studies: North Sea	In addition to the American offshore study, we collected data on British, Dutch and Norwegian oil and gas infrastructure across the North Sea.	A methods paper has been published (France *et al*. 2021) Two additional manuscripts summarising findings for Southern and Norwegian infrastructure, respectively, are under preparation.	Findings to follow publication of manuscripts with results.
European downstream studies	Interest in characterizing emissions from local distribution systems in Europe and comparing them to emissions from US cities (Toronto, was also characterised as a point of comparison between US and European cities). The set of studies also incorporates measurements of midstream facilities near sampling regions.	Three initial papers on Hamburg, Paris and Toronto have been published (Maazallahi *et al*. 2020; Defratyka, Paris, Yver-Kwok, Fernandez, Korben and Bousquet 2021; Ars *et al*. 2020). Additional manuscripts for individual cities and an overall synthesis paper are under preparation.	Initial papers highlight the contribution of a small fraction of high emitting leak indications with a disproportionate contribution to total emissions. The studies also highlight the importance of attribution methods to split thermogenic and biogenic methane emissions in urban environments.
Mexico onshore/ offshore	Interest in characterizing differences between onshore and offshore emission for a major oil and gas production country that relies on simple emission factors for its inventory.	Paper published (Zavala-Araiza *et al*. 2021)	This study integrated airborne-based measurements with remote sensing data (TROPOMI and VIIRS night-time flare data). The study found large discrepancies (more than an order of magnitude) in emission estimates, with offshore production being overestimated and onshore production being underestimated in current inventories.
Australia: Coal Seam Gas (Surat Basin)	This study will help us to get data about emissions from coal-seam gas production, an increasing phenomenon and a critical first step in understanding other places where this production occurs.	2 papers published (Neininger 2021, Harris et at 2021), one in preparation	The Surat Basin is Australia's largest CSG basin accounting for almost 20 per cent of Australian natural gas production. CSG upstream sources emit about 0.4 per cent of produced gas, which is comparable to some onshore dry gas fields (Marcellus Shale in the United States and Groningen field in The Netherlands). However it is substantially smaller than other regions, especially those where oil is co-produced (wet gas).

Study	Rationale	Status	Key findings
Romania onshore coordinated campaign	Opportunity to perform a coordinated campaign that includes the integration of top-down (i.e., airborne-based) and bottom-up (i.e., ground-based mobile measurements) in a country that relies on simple emission factors (IPCC Tier 1). Prior versions of the National GHG Inventory showed Romania as the EU country with highest production-related emissions. A recent update to Romania's inventory has significantly reduced the emissions. This study shows the value of incorporating multiple measurement methods at different scales.	Manuscripts under preparation.	Findings to follow publication of manuscripts.
TROPOMI-based characterisation of regional emissions	Significant uncertainty on methane emissions from several high-producing regions where TROPOMI can be utilized to quantify regional emissions.	Ongoing analysis.	Findings to follow publication of manuscripts.

Early-stage work has started in other regions with limited data and high oil and gas production (e.g. West Africa and the Caspian Sea region) as well as global sources with significant uncertainty, such as abandoned wells. The Observatory will expand this work and will start sponsoring studies over the next six months. IMEO is currently scoping projects in South America, the Middle East, North and West Africa and Southeast Asia. It is also looking at sectors and sources with high uncertainty (e.g. urban methane and flaring).

Demonstrating Top-Down and Bottom-Up Reconciliation

Top-down and bottom-up methods are complementary approaches for quantifying methane emissions from different anthropogenic sources. While both approaches have their unique advantages and limitations (as described below), it is important to understand how these different limitations result in estimation uncertainties versus biases. The two example case studies below (from the UNEP/CCAC Methane Science Studies) illustrate how reconciling top-down and bottom-up methods helps to reduce uncertainties and to reveal biases.

Top-down methods are based directly on empirical, atmospheric data beyond the "fenceline" of emitting units or facilities, which ensures that all emission sources are covered by the measurements. The scale of the measurements significantly reduces (and in some cases eliminates) the need to extrapolate results to the full population. Some top-down methods (e.g. overflights) provide only a snapshot of emissions, but this can be addressed via repeat measurements or longer-term remote sensing monitoring.

Bottom-up methods are often based on a mix of engineering calculations and a limited number of "source-based" direct measurements. This approach allows low-cost emission reporting but assumes complete knowledge of the activity data (e.g., number and type of emission sources) and representativeness of measurements. As illustrated below, the accuracy of a bottom-up emission estimate depends heavily on the completeness and representativeness of the input data.

Example 1: Australia

Coal seam gas (CSG) is a form of unconventional natural gas that is produced in rapidly increasing volumes around the world. Neininger *et al*. (2021) published the first study worldwide using airborne measurement techniques to quantify methane emissions from a producing CSG field: the Surat Basin, Queensland, Australia. Apart from CSG, other major methane sources in the Surat Basin include livestock and coal mining. Neininger *et al*. developed a spatially resolved methane emissions inventory alongside a spatially resolved top-down emission estimate based on airborne measurements. Both the larger regional emission pattern as well as individual "plumes" from the airborne measurements helped to update the emission inventory throughout this study in an iterative manner. Specifically, the aerial surveys highlighted the requirement to add source categories (meat works, kangaroos and CSG-related water storage ponds) and review the feedlot location data.

Example 2: Mexico

Mexico is a major oil and gas producing country. Its emissions inventories have been based in simple emission factors (i.e. IPCC Tier 1) and changes in the estimation methods have resulted in significant changes in emission estimates over the past decade. This makes it impossible to track changes in emissions as well as mitigation progress. Zavala-Araiza *et al*. (2021) quantified methane emissions from Mexico's most important onshore and offshore oil and gas production regions using aircraft-based measurements and satellite data (TROPOMI and VIIRS night-time flare data). This study illustrated how satellite data can be used to independently assess the representativeness of other temporally discrete sampling approaches (i.e. aircraft) with respect to annualized emission rates—thus reconciling these estimates.

A similar reconciliation process was carried out at the facility-level: comparing the airborne-based emission estimate of a high-emitting gas processing complex—where the majority of emissions were related to flaring—to VIIRS night-time flare data. A follow-up study, Shen *et al*., performed a more detailed atmospheric inversion analysis of methane emissions for all oil and gas producing regions in Mexico—finding agreement with the more localized results reported in Zavala-Araiza *et al*.

State of the Art in Satellite Remote Sensing of Methane Emissions

Satellites provide a unique vantage point for mapping any area or location irrespective of where it is situated globally or however difficult to access from the ground. Satellite remote sensing offers a global coverage capacity and can provide regular monitoring at the scale of facilities, regions, countries and continents. There are often areas which are difficult to map due to technical, geographic, political or proprietary reasons, which limits the accessibility and coverage of other modes of measurements, including ground-based and airborne surveys.

For methane remote sensing, the typical scientific quantity retrieved using satellite measurements is the dry air column-averaged methane mixing ratio (e.g. in the units of parts per billion or ppb), denoted as XCH_4. In other words, the satellite measurement retrieves the "raw atmospheric methane concentrations," which are not methane emissions. The emission rates or methane flux can be computed using methane concentrations data but requires analytical and computational techniques, along with other key data such as meteorological datasets.

There are broadly three approaches for characterizing methane from space: i) global mapping, ii) point source mapping and iii) hybrid area/point source mapping. The global mapping approach has been pioneered by several satellite missions in the past, led by governmental space agencies such as starting with SCIAMACHY in the early 2000s, followed by GOSAT in the late 2000s and recently TROPOMI, which launched in 2017. European and Japanese early investments in methane monitoring from space are proving to have been visionary. Global mapping capacity is generally associated with relatively coarse spatial resolution (e.g. TROPOMI's 7 km X 5.5 km), wide swath (2,600 km) and moderately high XCH_4 precision (10-12 ppb). This combination of specifications enables mapping large area sources and gradients in methane concentrations globally at regional-to-country scales (Zhang *et al*. 2020, Shen *et al.* 2021). Since the data are limited to concentrations, scientific and technical teams are engaged in the process of transforming the data from concentrations to emissions using analytical procedures. Scientific studies are demonstrating that global mapping capacity can detect and quantify large area methane emissions and large-emitting point sources. The global coverage on a near-daily basis is one of the main advantages with this approach, whereas the resulting data are significantly limited by cloud cover due to the coarse spatial resolution. Related to this category are the geostationary satellite missions, which will provide high-frequency daytime mapping of XCH_4 at continental scales. For instance GeoCARB will cover major areas of North and South America.

The second category in methane remote sensing is the point source mapping systems that are designed to observe methane plumes from individual emitting facilities (Pandey *et al*. 2019, Varon *et al*. 2019). These systems provide a zoomed-in view of individual plumes at high spatial resolution (e.g. GHGSAT's 30 m X 30 m), enabling the detection and quantification of relatively high-emitting point sources of methane emissions (at 200-500 kg CH_4/hour). Since the focus is on facility-scale mapping, the area coverage is limited with swath widths typically between 10-20 km (i.e. 2 orders of magnitude smaller than global mappers). An increasing number of multiple satellite systems in this category (e.g. GHGSAT satellites, PRISMA, and in the future EnMAP, CarbonMapper) are providing unique opportunities to target specific facilities around the world and monitor emissions from a diverse set of point sources globally. In addition, recent scientific studies show certain multispectral satellite instruments, such as Sentinel-2, can also be used to characterize high-emitting point source emissions.

There is an observational and data gap between global and facility mapping capacities. This third category is centered on the problem of emission quantification from area sources such as oil/gas basins, agricultural fields and so on. Near-future satellite missions in this hybrid category of mapping area/point sources such as MethaneSAT are designed to quantify area-aggregate emissions with high measurement precision (2-4 ppb at 1-2 km footprints), relatively broad swath (200 km) and moderately high spatial resolution (100 m X 400 m). Such a combination of measurement specifications is designed to not only quantify area emissions, for instance from oil/gas basins distributed globally, but also provide data on high-emitting methane point sources. Emissions data from MethaneSAT will be available in the public domain.

While there are inherent differences in the aforementioned capacities for characterizing methane emissions, they operate at different spatial and temporal scales and are thus complementary. For instance, a global mapper can guide area and point source mappers where to target and obtain measurements, whereas the area mapper can tip-and-cue point source mappers to more precisely enable source attribution. In turn, these diverse measurement approaches are helping to build a comprehensive ecosystem of satellites, which is needed to obtain quantitative data on methane emissions from a diverse set of sources, industries and geographies globally and to effectively guide the emissions reductions.

This comprehensive stream of satellite remote sensing data will be a key part of IMEO's data integration platform, which, in conjunction with the company data from OGMP 2.0, emission measurements from science studies and inventory data, will provide a full characterization of methane emissions from global oil and gas infrastructure.

Permanent and High Frequency Methane Monitoring

Typically, leak detection or emission quantification is performed periodically using, for example, an aerial or handheld device. While effective in detecting, periodic emission quantification may not capture the temporal variation in emission rates. Permanent and high frequency monitoring enables i) timely identification of emissions and maintenance or repair and/or ii) continuous quantification of emissions in the oil and gas sector. This group of technologies has been receiving attention from technology providers and researchers and has been tested by some operators. This short section introduces this technology.

How are permanent and high frequency monitoring defined? Permanent monitoring implies a significant increase in frequency of emission monitoring compared to current practices. Depending on the site specifications and the emission history at a particular site, the high monitoring frequency required could be different— ranging from 24/7 monitoring to, for example, once or twice a day.

Spatial scale of monitoring: At the site level, multiple ground-based monitoring devices are placed along the perimeter of a site, typically between 50m and 100m from the site equipment. These devices monitor the concentration of air near the site and send alerts when high concentrations of methane (or other gases monitored, such as VOCs PM 2.5) are detected by the device. Using the communication between the devices, the wind direction and wind speed, the location of the source of emission can be identified. Depending on the definition of "continuous" and the magnitude of emissions, other technical solutions could be considered for site monitoring including high frequency satellite measurements or automatized high frequency aerial measurements. Source level monitoring on the other hand, employs devices installed on pipes or stacks or near an emission source, to monitor emissions from one specific emission source. Since these devices are installed on one piece of equipment, using the flow rate or volume of fluid in the equipment, the emission rate may be quantified directly. Such sensors can be used for example, to monitor high emitting sources identified during site measurement activities.

Knowing the site requirements: This type of monitoring is a direct response to the requirements of the site operator. While permanent (or continuous) monitoring devices help identify emissions, the direct output from these devices is typically the concentration of the plume detected. If the site is using the devices to prevent emissions, monitoring devices fit the bill. However, if continuous quantification is the goal, an additional algorithm is required to convert the concentration (i.e. ppm or ppb per m) to an emission rate (kg per hour). Several groups propose solutions to perform this conversion. According to the operators interviewed, the results are currently quite uncertain and there is no published independent assessment of the reliability of these solutions.

Early results are promising: Some users shared some of their initial lessons learned from early deployment: The installed permanent monitoring devices provide live results to operators via a dashboard—which is useful for efficient response. Operators have highlighted the importance of reliable network coverage and challenges in terms of acting upon methane concentration signals. For example, during low wind speeds, even small plumes have a high concentration, which only highlights the importance of monitoring services that can provide information on actual emission rates. Every interviewed operator underscored the change in attitude towards emissions upon the installation of permanent monitoring devices. Having an alert sent to the operators made emissions 'more visible', increasing the level of awareness and understanding about common emission sources at all levels of the organization. This has translated into more frequent action to reduce emissions.

In the field of methane detection and quantification, progress has been fast over the past few years. New improvements are expected in the field of permanent and high frequency monitoring, particularly due to increasing field experience. When considering continuous monitoring, the operator should first and foremost consider how continuous monitoring will contribute to their overall methane management strategy. Initially, a combination of site level monitoring devices could be installed at a site in order to monitor emissions and understand time variation of emission rate. Source level monitors could be added if high emission high frequency sources are identified. Site level continuous monitoring can be leveraged at OGMP 2.0 Level 5 and used to estimate emissions for a representative group of sites. There are commercially available monitoring devices in the market today that can be integrated into a robust overall methane monitoring approach.

Authors: Malavika Venugopal and Stephanie Saunier, Carbon Limits

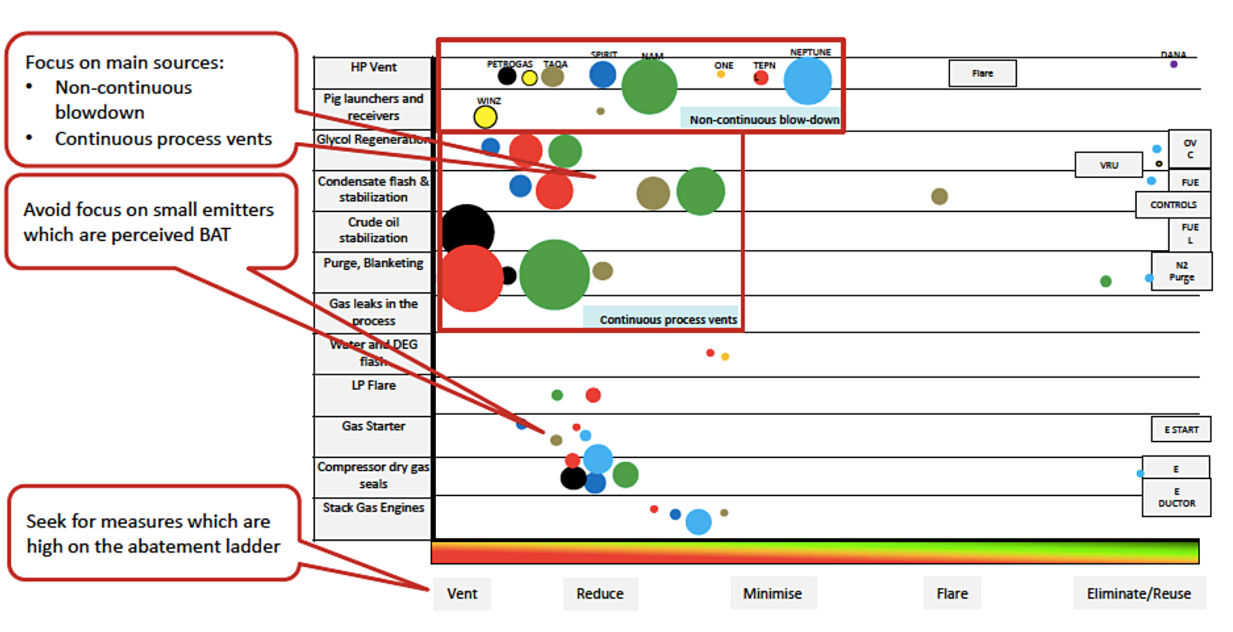
Ask an Engineer – Methane Mitigation from the Bottom-Up

'Reduce methane emissions by half in two years'—that was the lofty promise made by the eight operators of the Dutch offshore to the Government in 2018. The industry reported to the government and independently verified that it beat its promise (TNO 2019). As often, it is the method, not just the result, that offers the most insight.

Dutch North Sea emissions had already been slashed by 80 per cent through various programs, and most of the remaining emissions came from venting (flaring was banned due to a 1980s covenant for bird protection). At the behest of the industry association NOGEPA, MACH10, a consultancy, organized an intense engagement process directly with the Health, Safety, and Environment (HSE) and production support engineers of the various companies. Proposals were collected, compared and ranked openly between the eight operators in detailed standardized charts.

All process and equipment measures under 20 € tCO_2eq (at GWP100) were executed and more expensive options logged for future reference. The measures to reduce methane emissions were focused on avoiding emissions. This reduces the amount of methane emissions substantially, and as such avoids the need to return to a flaring regime as a methane reduction measure, which would again impact birds. A series of web-based videos of a measurement campaign by the Netherlands Organisation for Applied Science (TNO) was commissioned to communicate the data verification process. As of mid-2020, over 4200 tonnes (45 per cent) of future annual methane emissions were avoided.

Engineers from the country operating offices closest to the production sites have a lot of direct knowledge about the design and process flaws that drive emissions, knowledge that often cannot be accessed at company headquarters. Asking and empowering these engineers can be an important complement to action driven from direct measurement of emissions.



Annex 1. Company Fact Sheets

Company factsheets present information from each company's implementation plan and annual report and indicates if a company has reached Gold Standard. The logo of the company is displayed, along with a short company description.

The factsheets are grouped by segment (upstream, midstream and downstream) and presented in alphabetical order.

Target

The factsheets present the target set by each company for 2025. Companies were requested to provide either an absolute target or an intensity target for operated assets. In the case of absolute target, the baseline year chosen by the company is also indicated.

Data Quality

The factsheets contain graphs regarding the quality of data reported by the company. There are five levels of data, with higher levels indicating better data quality.

The graphs show the distribution of reported emissions by level. Emissions by level are normalized with the company's total reported emissions for operated and, where applicable, non-operated assets. The half circle is then subdivided by percent of emissions at each reporting level. Companies that have both operated and non-operated assets have two graphs.

A gray color scale is used when no data was reported. This is sometimes the case for reporting on non-operated assets when companies have not yet secured access to data from their non-operated joint ventures. In some cases, a company's non-operated assets are operated (and therefore reported) by a different OGMP member. In other cases, companies reported data for a fraction of their non-operated assets. As companies gain commitments to collect data from the operators of their non-operated assets, the distribution of emissions for those assets will change. As a result, the factsheets for both operated and non-operated assets will evolve with increased quality of reporting.

The half circles may include shading with a dotted pattern in any reporting level that has incomplete data. Data can be incomplete for two reasons:

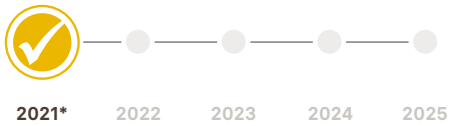
1. Missing source or sub-source data relevant to a given reporting level.
2. Insufficient description of utilized measurement technology, frequency and/or methodology to quantify emissions on an annual basis by source for Level 4.

Data is considered missing if the reported data lacks clarity, is fragmented or is not sufficiently clear. Because of the complexity of the supply chain, some information might be missing for the first year or might need to be consolidated.

Incomplete data due to limited description of measurement methodology is expected this year, as the Technical Guidance Documents outlining recommended quantification methodologies for Level 3 and Level 4 are still under development, and most companies are not yet reporting with higher levels of confidence for measurement quantification.

Gold Standard

The factsheets indicate that a company reached the Gold Standard with a gold mark. For this reporting round, the Gold Standard is granted for the thoroughness of a company's implementation plan. Later it will be granted for reporting at the highest levels (Level 4 and 5).



*implementation plan approved for data quality improvement

BP

bp continues to maintain a high focus on methane building on many years of effort across our operating businesses. To support our new Ambition, our aim 4 is to "**install methane measurement** at all our existing major oil and gas processing sites **by 2023**, publish the data, and then **drive a 50% reduction in methane intensity** of our operations." And we will also work to influence our joint ventures to set their own methane intensity targets of 0.2%.

We are focusing on achieving reductions across our key methane sources, including fugitives, combustion and flaring; and on producing a greater proportion of our gas from lower intensity operations.

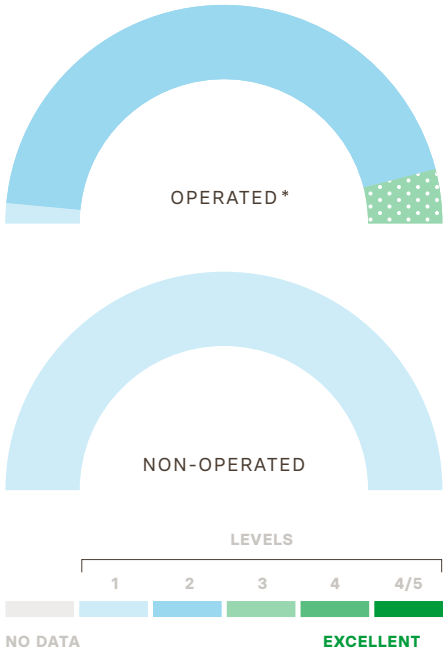
By the end of 2023 we aim to roll out a new measurement approach to relevant sites. This approach, developed in 2020, comprises a prioritized hierarchy of options for making more use of methane measurement. Based on this approach we have set a **2025 target of 0.20%**. Our currently reported methane intensities are based on general industry methodologies and cannot be compared directly to our new target.

Rolling out our new approach will involve continued testing and initial deployment of measurement technologies and equipment. To guide us, we have developed a methane measurement hierarchy. With technology to detect and measure methane evolving fast and different technologies possibly being better suited to different types of assets and geographies, a flexible approach allows us to move towards increased continuous site and source level measurement systems as more advanced technology becomes available.

2025 TARGET (intensity*)

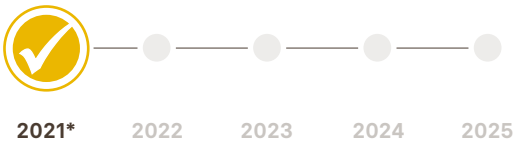
*methane emissions based on measurement in line with the bp methane measurement hierarchy as a percentage of marketed gas

DATA QUALITY



*dotted pattern = incomplete data

GOLD STANDARD



*implementation plan approved for data quality improvement

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GOLD STANDARD = assigned to companies in the first year that have submitted robust implementation plans on how to achieve level 4/5 reporting by 2024 for operated assets and 2026 for non-operated assets

SEGMENT

UPSTREAM

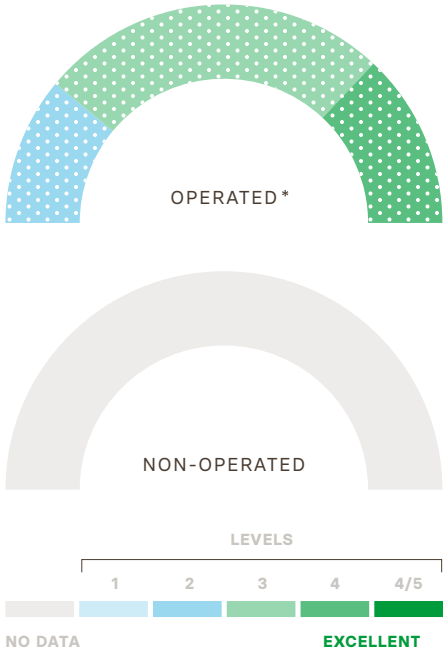
ECOPETROL

Ecopetrol is a National Oil and Gas company, the largest in Colombia and the fourth in Latin America. The Ecopetrol Group integrates the entire value chain in its business (Exploration, Production, Transportation and Refining). In 2021, the Ecopetrol group has established its ambition in the pursuit of net zero emissions to 2050, through partial goals such as: by 2030 the company will reduce by 25% of its CO_2eq. emissions in scopes 1 and 2 compared to what was emitted in 2019; To Reduce its total CO_2eq emissions by 50% to 2050 in its scopes 1, 2 and 3. Through actions such as energy efficiency, renewable energy, hydrogen initiatives, natural solutions and carbon capture and sequestration. An important component of this plan has to do with the reduction of fugitive emissions, vents and burns in flares, which is absolutely aligned with the OGMP2.0 in which Ecopetrol is an active part due to the importance that this support represents in the achievement of Ecopetrol´s objectives regarding decarbonization plan in terms of methane reductions.

With its decarbonization plan the Ecopetrol Group is the first in the Oil and gas sector in Latin America to set this ambition, The Company seeks to contribute to the Sustainable Development objectives and the purpose of limiting global warming as established in the Paris Agreement, also Ecopetrol contributes with Colombia's goal to reduce 51% of greenhouse gas emissions by 2030. o reduce emissions up to 10% of reported quantity by 2025.

NO TARGET

DATA QUALITY



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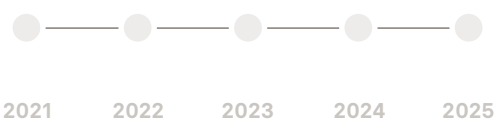

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SEGMENT

UPSTREAM

ENI

Eni is an integrated energy company with more than 30,000 employees in 68 countries around the world. In 2021, the company launched a new strategy that will enable it to provide a variety of fully decarbonized products, combining environmental and financial sustainability. The recent merger of the renewable and retail businesses, the development of bio-refineries and biomethane production, and the sale of low-carbon energy carriers and mobility services at service stations are among the main levers for taking the path towards decarbonization.

Eni aspires to contribute to the achievement of the Sustainable Development Goals of the United Nations 2030 Agenda, supporting a just energy transition that meets the challenge of climate change with concrete and economically sustainable solutions by promoting efficient and sustainable access to energy resources, for all.

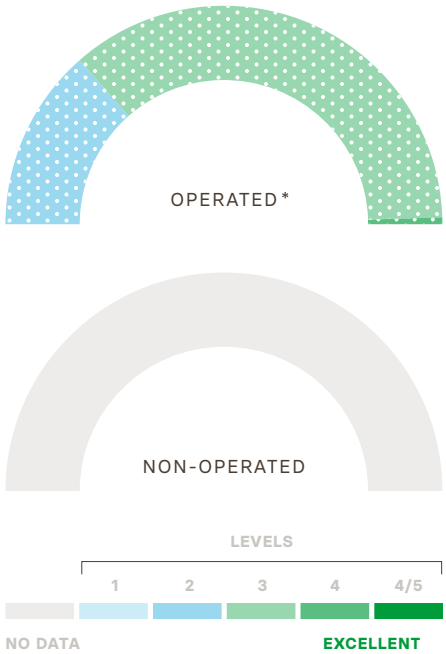
Eni's commitment to the energy transition translates into tangible actions towards total decarbonization of all products and processes. Eni's new strategy aims to achieve by 2050 the net zero target on GHG Scope 1, 2 and 3 emissions, and the associated emission intensity, referred to the entire life cycle of the energy products sold.

Eni has long been committed on methane emissions mitigation, being one of the industry founders of the OGMP and among the first companies to set public targets for reducing methane emissions from operations. Through its participation to OGMP 2.0, Eni continues to enhance methane management practices and improve quality and transparency of methane emissions reporting, while reinforcing its commitment to reduce methane emissions throughout its value chain.

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY



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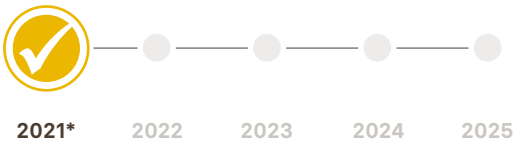

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SEGMENT

UPSTREAM

equinor

EQUINOR

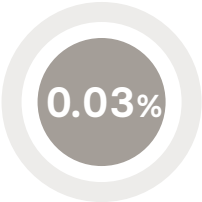
Equinor aims to be a leading company in the energy transition and our ambition is to reach net-zero GHG emissions by 2050. Equinor's corporate methane emissions intensity is one of the lowest in the industry and we are dedicated to improving our performance even further, by continuing
to explore emission reduction opportunities.

In Equinor, we have significantly improved how methane emissions in our own operations are quantified and reported. We will continue to develop and implement technologies and procedures to detect and reduce methane emissions, support industry efforts to reduce methane emissions across the oil and gas value chain, increase the quality and transparency of reported data, and support the development of sound methane policies and regulations. In collaboration with peers, governments, and technology providers, we are working on a wide range of methane measures globally. By working together, we can achieve significant reductions in methane emissions from the oil and gas sector.

The OGMP provides companies a credible and transparent way of improving their methane emissions reporting and performance. In addition to the OGMP, Equinor is also part of the Methane Guiding Principles partnership and engaged in their work to systematically monitor and reduce methane emissions – both for assets we operate and for assets where we are a partner.

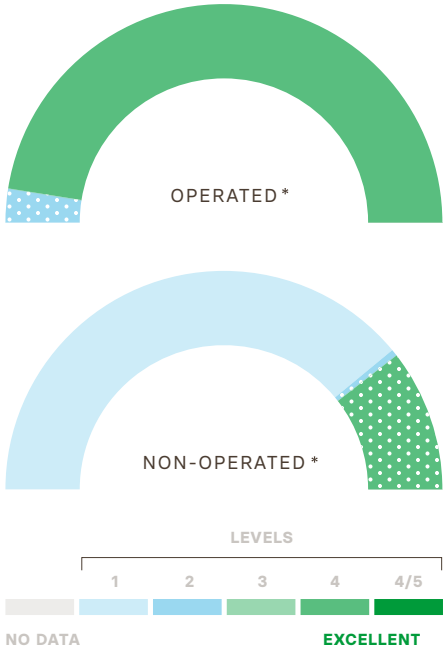
Equinor's 2020 methane intensity for our upstream and midstream business remained low at approximately 0.03%, which is around 1/10 of the industry average.

2025 TARGET (intensity*)



* maximum amount of total annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY



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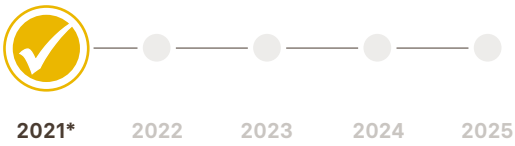

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SEGMENT

UPSTREAM

JONAH

Jonah Energy is an oil and gas exploration and development company headquartered in Denver, Colorado and operating in the Jonah and Pinedale Fields in Sublette County, Wyoming. We are one of the largest privately held natural gas producers in the U.S. and focus on producing natural gas in an environmentally responsible manner.

Our Vision is to be the leading sustainable natural gas producer in the U.S.

We believe that natural gas will play an important role in the reduction of greenhouse gas emissions from the global energy value chain, but the industry must be transparent for natural gas to achieve its full potential. We signed on to OGMP 2.0 because it is the leading example of an independent, verifiable and measured performance standard that will help create that transparency.

As the first U.S. company to sign on to OGMP 2.0, our participation is a major component of our Responsibly Produced Gas initiative, which seeks to make us a leading low emission producer and preferred partner for utilities and their customers concerned about the impacts of climate change.

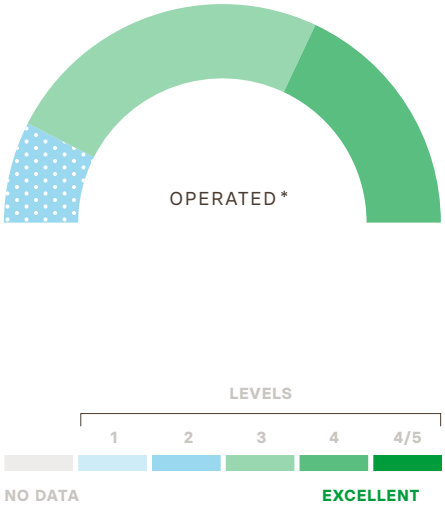
Our multi-year efforts to innovate around emissions monitoring, measurement and reduction have resulted in one of the lowest documented emissions profiles of any producer in the U.S.

Jonah's work, and similar efforts by other producers who take this challenge seriously, will result in a differentiated gas marketplace for consumers concerned about emissions. Furthermore, a market for differentiated, low-emission American natural gas will support global climate goals through global export as liquified natural gas.

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY



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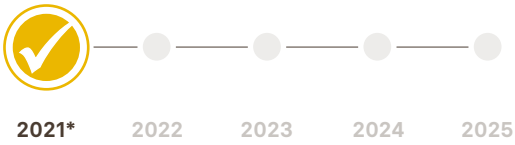
GOLD STANDARD



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SEGMENT

UPSTREAM

NAFTOGAZ GROUP

NAFTOGAZ

Naftogaz of Ukraine is a vertically integrated oil and gas company engaged in full cycle of operations in gas and oil field exploration and development, production and exploratory drilling, gas and oil transport and storage, supply of natural gas and LPG to consumers.

Naftogaz group includes operated assets like Ukrtransgaz (Undergound gas), Kirovogradgaz (Distribution grid) and UkrAvtoGaz (CNG refueling), Ukrgazvydobuvannya, Ukrnafta and Chornomornaftogaz (Upstream). Naftogaz has non-operated assets in Ukrnafta, only of 50%.

In line with Naftogaz group's commitment to reduce methane emissions and improve monitoring and reporting, Naftogaz prepared the report of methane inventories to the Oil and Gas Methane Partnership in line with the OGMP 2.0 reporting framework and sent it on August 11, 2021 by email.

Naftogaz group's efforts to reduce emissions from natural supply gas chains are currently being supported by EBRD. As part of this support, a detailed bottom-up inventory of the company' methane emissions is being developed based on the technical information provided by individual business units, and further steps will be undertaken to establish procedures and methodologies for subsequent periodic reporting.

After the procedures have been established, Naftogaz will undertake subsequent preparation of inventories in line with OGMP timelines.

NO TARGET

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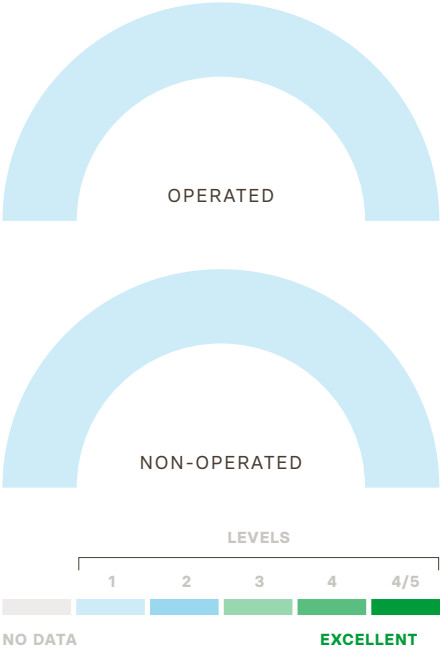

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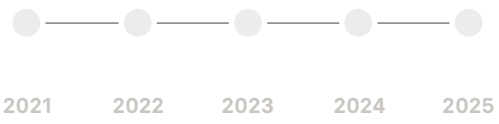

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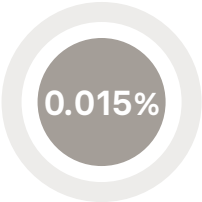
SEGMENT

UPSTREAM

NEPTUNE ENERGY

2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

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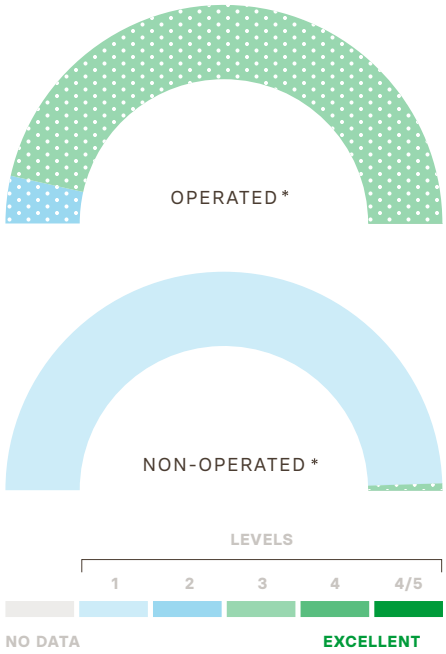

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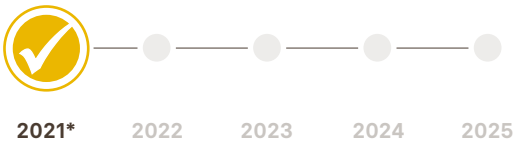

* implementation plan approved for data quality improvement

NEPTUNE ENERGY

Neptune Energy is an upstream company with an ambitious target to reach a near-zero methane intensity for their production of hydrocarbons based on their exports. They are committed to work with their global assets to have the highest reporting quality and deploy mitigation measures. As their data quality improves, each asset will update their information and identify opportunities for enhancement.Neptune Energy is an independent exploration and production (E&P) company with operations across Europe, North Africa and Asia Pacific.

Neptune's vision is to be the leading independent E&P company by meeting society's changing energy needs and creating value for all our stakeholders. Our differentiated portfolio is long life, low cost and lower carbon. We have a gas-weighted production portfolio and are uniquely positioned for the energy transition.

Our values of excellence in health, safety and the environment, accountability, integrity and teamwork are a core component of our business and help guide our actions. Established in 2018, we now employ some 1,400 people in the UK, Norway, Netherlands, Germany, Algeria, Egypt, Indonesia and Australia.

We recognise the role that reducing methane emissions plays in meeting global climate goals, which is why we are taking proactive steps to minimise these emissions. We are targeting net zero methane emissions by 2030 for all operated assets. The company methane intensity based on 2020 data is 0.01%. Methane makes up ca 5% of Neptune's total GHG emissions on a CO_2e basis. Current activities underway to try to improve the accuracy of methane emissions measurements from offshore installations include a joint science project with EDF and the Carlyle Group. This is an evaluation of advanced methods for quantifying facility-level offshore methane emissions, to identify key sources and prioritise mitigation actions. This study will help us to identify areas that require further action, and how we can apply new measurement techniques across our global operated portfolio.

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SEGMENT

UPSTREAM

قطر للطاقة
QatarEnergy

QATARENERGY

QatarEnergy is an integrated corporation responsible for the development of cleaner energy resources as part of the energy transition in the State of Qatar and beyond. It stands at the forefront of efforts for the long-term sustainable development, utilization and monetization of the energy resources in the State of Qatar. The company was established in 1974 as the state-owned petroleum company, responsible for the operation, management and development of all oil and gas activities in Qatar, including exploration, production, processing, and marketing and sales of its products to local and global markets. QatarEnergy supplies major customers around the world with various types of products. As "Your energy transition partner", QatarEnergy is the world leader in the production of Liquefied Natural Gas (LNG), the cleaner, safer, more flexible, and reliable source of energy, and an integral partner in the global energy transition.

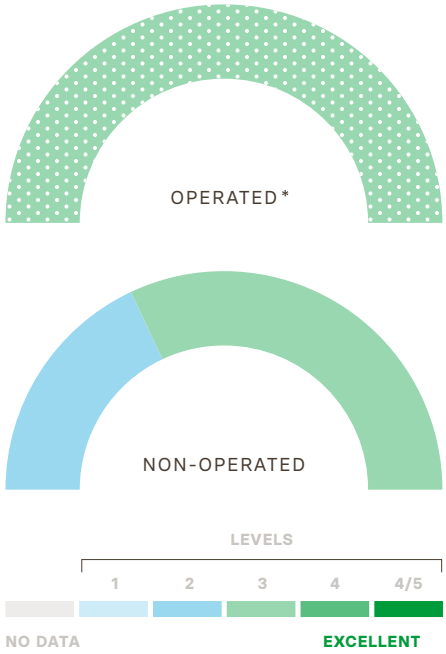
QatarEnergy has an extensive investment portfolio that extends well beyond Qatar, partnering with leading global players. Underwent through a remarkable transformation over the past three years, QatarEnergy commits to achieving low carbon operations, contributing to the faster transition towards a low carbon economy.

We at QatarEnergy make considerable progress towards our ambition to provide affordable and cleaner energy for people and our planet responsibly, for a better and prosperous future. A key part of our climate focus going forward is to track and reduce methane emissions throughout all stages of the natural gas value chain. QatarEnergy is committed to increase the measurement efforts and data sharing of methane emissions and supports ambitious actions to curb them.

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of total monetizable products

DATA QUALITY



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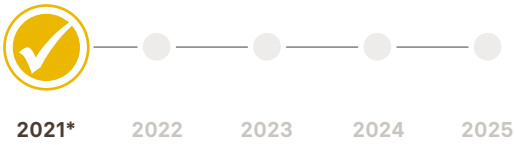

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SEGMENT

UPSTREAM

REPSOL

Repsol joined the CCAC OGMP in 2016 according to our commitment with the methane emissions reduction in the oil and gas sector. During these years we have been reducing venting, performing fugitive emissions surveys in our operated assets, improving flare management and retrofitting pneumatics devices.

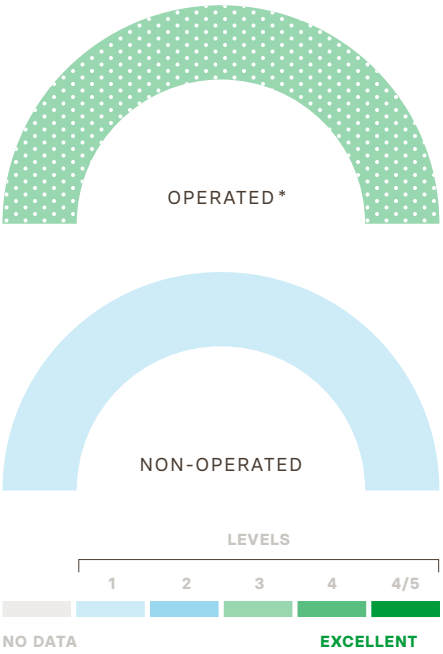
Our company has been reporting CH_4 emissions externally and taking action on mitigation for many years, but in October 2020 Repsol's endorsement to OGMP 2.0 was confirmed, which shows the commitment to improve reporting and methane management in our operated and non operated assets. The endorsement to this partnership give us the opportunity to share knowledge on methodologies and technologies and to improve scientific and technical understanding of CH_4 emissions.

Convinced of the importance of the role of natural gas in the energy transition, Repsol has announced a new target of reaching a methane intensity of 0.20% by 2025 in its operated assets.

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY



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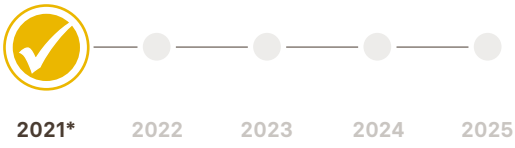

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SEGMENT

UPSTREAM

SHELL

Shell is a global group of energy and petrochemical companies* with expertise in exploration, production, refining/marketing/trading of oil and natural gas, and manufacturing marketing of chemicals. Shell's purpose is to power progress together with more and cleaner energy solutions. Our strategy is to accelerate the transition of our business to net-zero emissions, purposefully and profitably. Safety, environment protection, and social responsibility are fundamental to our approach.

In 2018, Shell announced a methane emissions intensity target of 0.20% by 2025 for its operated oil and gas assets in Upstream and Integrated Gas. In 2020, Shell announced its climate target to become a net-zero emissions energy business by 2050, in step with society's progress in achieving the goals of the Paris Agreement.

We use a range of methods and technologies to limit methane emissions from our operations. Shell also collaborates with industry, international institutions, non-governmental organisations, and academia to reduce methane emissions and improve data quality, through a range of initiatives including: The Climate and Clean Air Coalition Oil & Gas Methane Partnership (OGMP), the Methane Guiding Principles, the Oil and Gas Climate Initiative, and the World Bank's Global Gas Flaring Reduction Partnership. In 2020, Shell signed the OGMP 2.0 Framework which aims to improve the accuracy and transparency of methane emissions reported in the oil and gas sector.

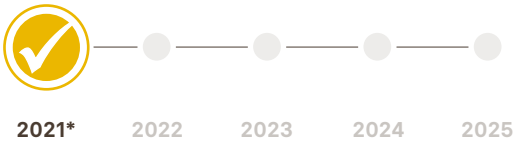
*The companies in which Royal Dutch Shell plc directly or indirectly owns investments are separate legal entities. "Shell", "we", "our" are referring to Royal Dutch Shell plc and its subsidiaries.

2025 TARGET (intensity*)

*maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY

GOLD STANDARD



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SEGMENT

UPSTREAM

TotalEnergies

TOTALENERGIES

For more than three decades, TotalEnergies has been taking steps to disclose and reduce its methane emissions. The Company has reduced by around 50% its operated methane emissions since 2010, and intends to further reduce them by 2025. In 2020, these emissions amounted to 64 kilotonnes, 98% of which came from upstream activities. They represented a methane intensity of 0.15% of the commercial gas produced for oil and gas facilities, and less than 0.1% for gas facilities. TotalEnergies is committed to maintaining these intensities below 0.2% and 0.1% respectively.

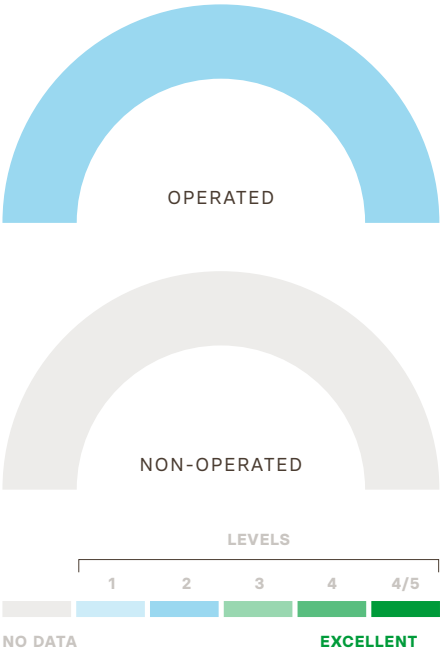
The Company's methane inventory is mainly based on flow metering for fuels gas and flares, as well as generic emissions factors and engineering calculations. This inventory is supplemented with a yearly Leak Detection And Repair (LDAR) campaign on each oil & gas operated assets. TotalEnergies' methane emissions data for 2020 have been disclosed at level 2 for its operated assets. In the 2022 report, 2021 data will be detailed at Level 3 and emissions for its non-operated assets will also be reported. TotalEnergies' objective is to reach the level 4-5 by 2023 for its operated perimeter and by 2025 for its non-operated perimeter.

Rapid reductions in methane emissions are vital to ensure that gas fully plays its role in the energy transition. TotalEnergies has set an ambitious strategy to reduce emissions from flaring, venting and fugitives' sources, associated with a cutting-edge research program to develop and select measurement technologies.

2025 TARGET (intensity*)

Oil & Gas Assets: 0.2% / Gas Assets: 0.1%
*maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY



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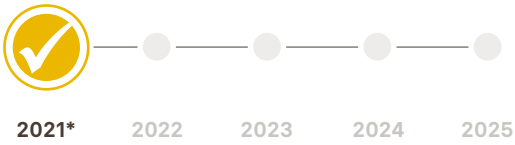

*implementation plan approved for data quality improvement

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SEGMENT

UPSTREAM

wintershall dea

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas on operational base

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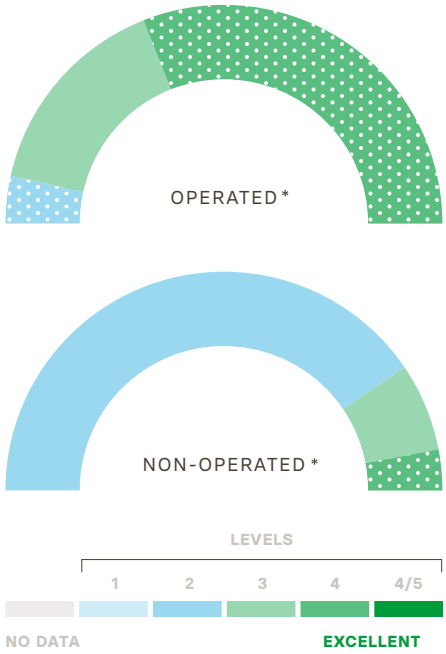

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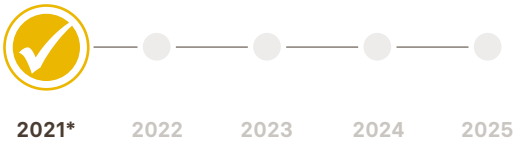

* implementation plan approved for data quality improvement

WINTERSHALL DEA

Wintershall Dea is committed to be a leading company in carbon-efficient gas and oil production. As a European company, we strongly support the EU`s 2050 carbon-neutrality target.

To play our part in this commitment, we have set ourselves ambitious targets.

We want to be net zero across our entire upstream operations – both operated and non-operated — by 2030. This includes Scope 1 (direct) and Scope 2 (indirect) greenhouse gas emissions on an equity share basis.

As a member of the Methane Guiding Principles industry initiative, we are working towards a continual reduction in methane emissions. We have committed to achieve a methane emissions intensity of below 0.1 % by 2025 and beyond.

Our approach to reach these targets is focused on following four pillars:

Portfolio: We steer our already gas dominant portfolio towards lower emissions, by considering GHG emissions as a key metric and by using carbon pricing when making investment decisions.

Management: We are continually working on implementing energy efficiency and emission reduction measures in our activities, e.g. by using renewable energy in our operations.

Offsetting: We intend to invest in nature-based solutions in order to compensate for unavoidable emissions.

Technology: We are investing in projects like carbon capture and storage (CCS) and hydrogen. By accelerating hydrogen and CCS projects, we strive to control and reduce our net carbon intensity from initial production to the final consumption of energy and the reduction of Scope 1, 2 and 3 emissions.

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SEGMENT

UPSTREAM

BAHÍA DE BIZKAIA GAS (BBG)

Bahía de Bizkaia Gas (BBG) is the owner of a Liquefied Natural Gas (LNG) Regasification Plant in the port of Bilbao. We get LNG from tankers from all over the world and transform it into natural gas for domestic, commercial and industrial consumption and for the generation of electric power.

Our reception, storage and regasification operations are key to the supply of energy in the Basque Country and to support the Spanish and European gas systems.

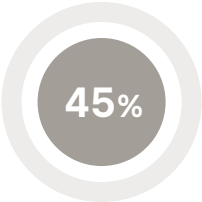
Our storage capacity amounts to 450,000m^3 in three tanks (150,000m^3 each), while our send out rate is 800,000Nm^3/h. Finally, our jetty has a capacity up to vessels of 270,000m^3 storage capacity.

We also have a truck tank loading station to deliver LNG to satellite plants by road and the necessary facilities for LNG carrier load.

Mission and vision:
Our mission is to ensure the supply of natural gas in the Basque Country and the surrounding areas, contribute to the diversification of supply sources in the Spanish gas system and strengthen the position of the Basque Country and Spain as strategic players in the Spanish and European gas systems, respectively.

Our interest in our participation in the O&GMP is to know about the latest technologies to measure the fugitive leaks and being informed about the CH_4 future regulations to allow us to prepare ourselves technically for possible new requirements.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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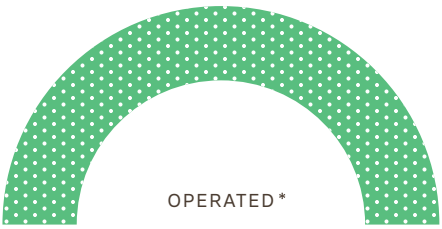

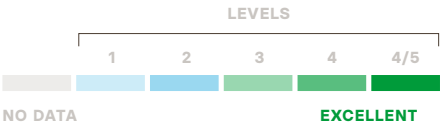

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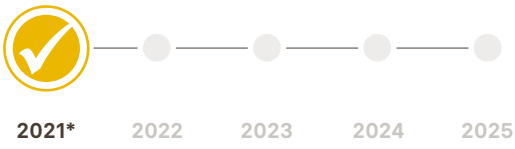

* implementation plan approved for data quality improvement

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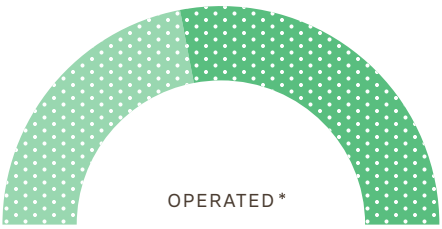
SEGMENT

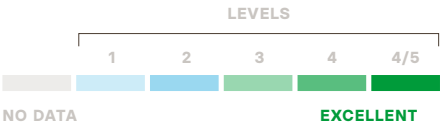
MIDSTREAM

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY





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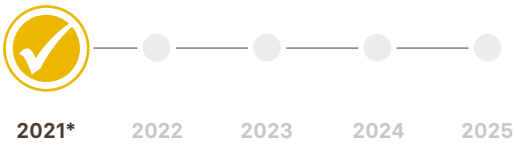

* implementation plan approved for data quality improvement

DESFA

DESFA SA, the leading gas infrastructure company in Greece, is responsible for the operation, management, utilization and development of the national gas grid and its interconnections, in a technically sound and economically efficient way, in order to best serve its users with safety, reliability and adequacy. DESFA **operates** 1466km of Gas network, 49 Metering and/or Regulating Stations, 68 Valve Stations, 56 Scrapper Stations, 4 Entry Point Stations, 1 Compressor Station and 1 LNG terminal of useful storage capacity 225000m^3 LNG. Currently, DESFA has no **non-operated** assets.

DESFA is committed to manage all its activities for ensuring protection of the environment, taking into account the principles of sustainability and maximum preservation of natural wealth. In line with the EU energy and climate goals, DESFA is contributing to net-zero decarbonisation by 2050. The reduction of direct and indirect emissions of greenhouse gases is our distinct and strong commitment.

Focusing on methane emissions, DESFA set an absolute performance **target** of 20 % reduction from the company's activities until 2025, in comparison with 2015, in line with the UN Global Methane Alliance initiative. To achieve this target, DESFA implements several best available techniques (minimize venting by optimizing operations, intense leak detection and repair programs, boil off recovery in LNG terminal etc). Recently, DESFA optimized specific preventive maintenance operations leading to significant methane emissions reduction.

DESFA's new projects are designed predominantly to minimize methane emissions.

Moreover, DESFA participates in associations, workshops and R&D projects to share knowledge and adopt novel techniques on methane emissions reduction.

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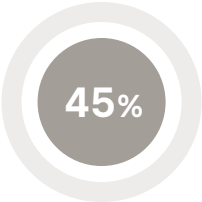
SEGMENT

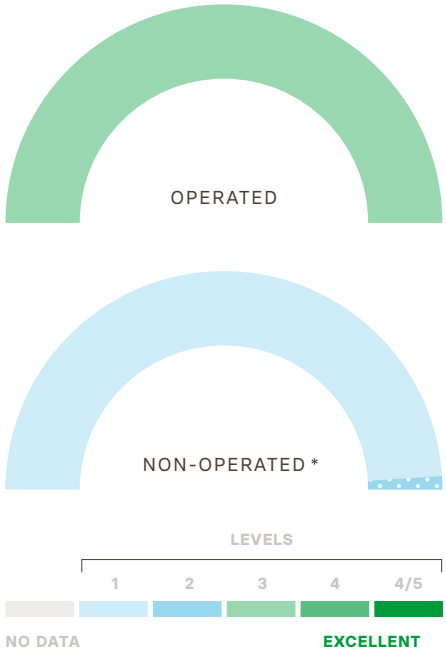
MIDSTREAM

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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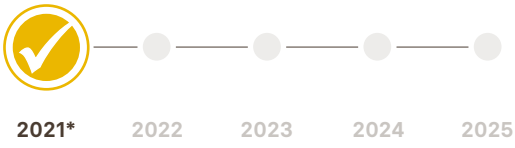

* implementation plan approved for data quality improvement

ENAGÁS

Enagás is the leading gas infrastructure company in Spain. Enagás **operates** 11,000 km of gas pipelines, 19 compressor stations, 493 regulation and metering stations, three underground storages and four LNG terminals. Enagás also has **non-operated** facilities holding stakes in assets in Spain* (two LNG Terminals); México (LNG Terminal, transmission network and one compressor station); Chile (LNG Terminal); Peru (transmission network); Greece* (Greek gas operator) and the US (company that owns, among others, 11,000 km of transmission pipelines). Enagás also holds a stake in the *Trans Adriatic Pipeline* linking Greece, Albania and Italy.

Enagás is committed to reach **carbon neutrality by 2040**. To achieve this, Enagás has set out an ambitious **Decarbonisation Strategy** setting short-medium-long intermediate targets.

The reduction of methane emissions is a cornerstone of our Decarbonisation Strategy. Enagás' efforts to reduce these emissions are based on the following pillars:

- **Mitigation measures**: Implementation of the best available techniques to minimise the emissions.
- **Targets**: in 2019 Enagás committed to reduce its methane emissions by 45% in 2025 and 60% in 2030 vs 2015 figures in line with the *UN Global Methane Alliance* initiative.
- **Science and R&D efforts**: collaboration with academia and leading innovation projects
- **Industry Leadership**: participation in associations, workshops, training sessions, reports and studies to share knowledge and raise awareness (e.g. signatory of the *Methane Guiding Principles; involvement in* MARCOGAZ, GIE, GERG, IGU, GIIGNL, ...).

* Non operated assets in Spain (i.e. Saggas and BBG) and Greece (i.e. Desfa) are operated by OGMP 2.0 members and hence their data is not included in the non-operated graph to minimize reporting burden and the risk of reporting potentially misaligned numbers. There are specific company factsheets for each one.

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SEGMENT

MIDSTREAM

eustream
SLOVAK GAS TSO

EUSTREAM

Eustream is the gas transmission operator in Slovakia. Eustream pursues the objective of ensuring safe, reliable and ecological gas transport to European markets. Eustream's network is an important energy link between the East and the West, forming the robust system connected to the gas systems of Ukraine, Czech Republic, Austria and Hungary.

Eustream is continuously investing in state-of-the-art technologies that improve its operational efficiency and save the environment. Methane emissions were massively addressed in Eustream in previous decade. The methane reductions in Eustream have been very significant and gradual. This was achieved by coordinated actions in three main fields.

Deep modernization: The network of Eustream has undergone significant optimization and modernization, focusing on compressor stations. The result was reduction of compressor units and gradual decommissioning of obsolete, less efficient technology and its replacement by modern, highly efficient technologies.

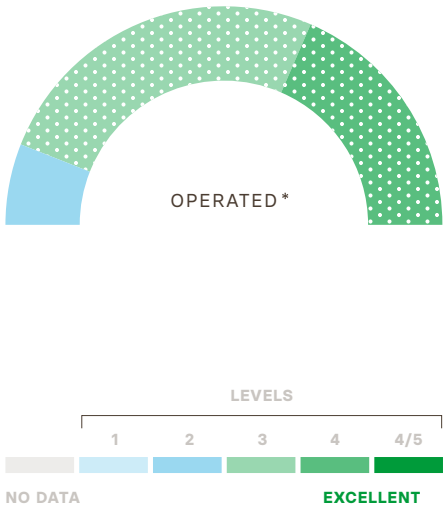
Minimizing venting in operations: The mobile pumping compressors were implemented which allow pumping of gas from a closed pipeline section to another pipeline during maintenance. It significantly reduced venting and the solution is mobile and very flexible.

Implementation of detailed and coordinated LDAR system: In 2010, Eustream introduced the LDAR program. After the 2010-2011 pilot project, the methodology for locating and quantifying gas leaks was fully integrated into the operational safety practices of the company. The company effort on elimination of localized gas leaks resulted in significant decrease in fugitive emissions. The LDAR methodology is continuously improved and updated in line with latest know how.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2014 estimates

DATA QUALITY



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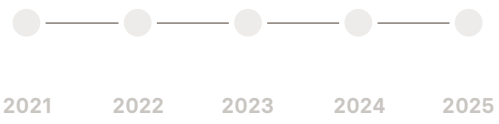
GOLD STANDARD



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SEGMENT

MIDSTREAM

EWE

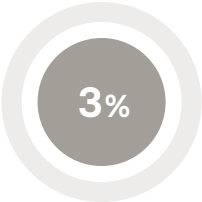
EWE GASSPEICHER

Since the seventies of the past century EWE GASSPEICHER GmbH (EWE) plans, builds and operates cavern storages for natural gas in northern Germany. Until now, EWE owns four locations with a total number of 38 caverns.

Over last 50 years of operation, EWE has continuously improved the operating procedures and has modernized the existing constructions and installations. Beside commercial interests, these measurements served the environmental protection, especially when it comes to the mitigation of methane emissions. Examples of measures introduced include thermal use of vapors in gas drying facilities, reverse compression of seal leakages by reciprocating compressors or flaring of operational gas releases.

Currently, with highly developed mature and complex facilities and by using innovative procedures EWE ensures a state-of-the-art emissions management, which is considered to be above the industry average. In addition to this, EWE strives to make further improvements.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2020 estimates

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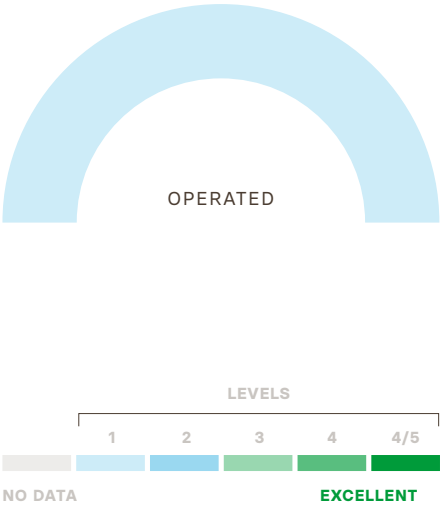

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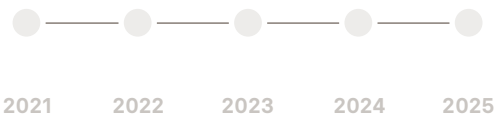

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SEGMENT

MIDSTREAM

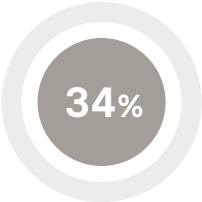
FLUXYS BELGIUM

Fluxys Belgium is an independent gas infrastructure company with no interests in the generation or sale of energy. In this regard, the Belgian federal energy regulator has certified Fluxys Belgium as a transmission system operator operating in accordance with the full ownership unbundling model as per the European third package of legislative measures for the gas market. The company has more than 90 years' experience in the development, financing, construction, operation and maintenance of gas infrastructure.

With 900 employees the company operates 4,000 kilometers of pipeline (4 compressor stations and 192 pressure reduction stations), a liquefied natural gas terminal totalling a yearly regasification capacity of 9 billion cubic meters and an underground storage facility.

As a purpose-led company, Fluxys Belgium together with its stakeholders contributes to a better society by shaping a bright energy future. Building on the unique assets of gas infrastructure and its commercial and technical expertise, Fluxys Belgium is committed to transporting hydrogen, biomethane or any other carbon-neutral energy carrier as well as CO_2, accommodating the capture, usage and storage of the latter.

2023 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2023 based on 2017 estimates

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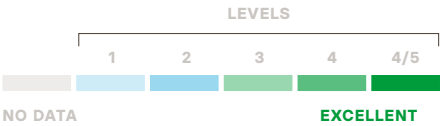

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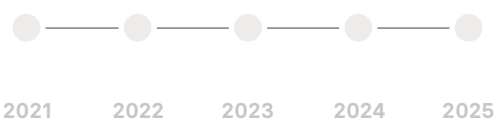

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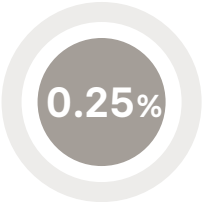
SEGMENT

MIDSTREAM

2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

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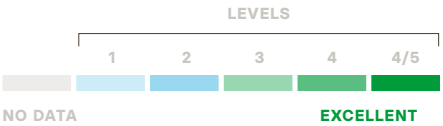

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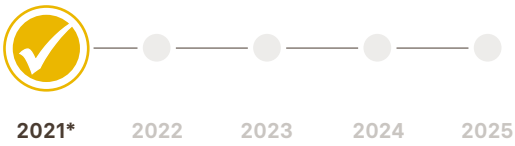

* implementation plan approved for data quality improvement

GA-MA SKOPJE

GA-MA Skopje is the only transmission system operator (TSO) on the territory of the Republic of North Macedonia. GA-MA AD Skopje is a joint stock company with 100 % shares held by the Government of North Macedonia.

- High pressure 54 bar pipeline 130km
- Mid pressure 12 bar pipeline 80km
- Design pressure 54 bar
- Working pressure 40 bar
- DN 500
- No current offtakes
- No underground gas storage
- No compressor
- Current gas consumption 340 million Nm^3/year
- Current supply source is from border with Bulgaria (MK/BG) 40bar DN500.
- Three metering lines (ultrasonic meters), each of 100 000 Nm^3/h. Designed capacity is 800 mil. Nm^3/year with the possibility of increasing to 1200 mil. Nm^3/year

Sum of all facilities and pipeline network is 100% operated by TSO GA-MA

Facilities

- 1 launching station on the high-pressure pipeline Ø 500 mm
- 1 receiving station on the high-pressure pipeline Ø 500 mm
- 16 valve stations on the high pressure (54 bar)
- 40 valve stations on the mid pressure (12 bar)
- 7 high pressure 54bar metering and regulating stations
- 60 mid pressure 12 bar metering and regulating stations of which 50 are in the Skopje region
- 1 main high pressure (max 54 bar) cross-border station MK/BG

Supply options

- Current supply source is from Russian origin on the border with Bulgaria (MK/BG) 40bar DN500.
- Intake point is “Zidilovo” after 4,3km from border between MK/ BG

Current demand

- Current gas consumption is 340 million Nm^3/year
- Main consumers are industry and power generation plant TE-TO Skopje. Main consumers are in the Skopje area.

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SEGMENT

MIDSTREAM

GAS CONNECT AUSTRIA

GAS CONNECT AUSTRIA

Gas Connect Austria is an Austrian gas network operator with a high-pressure natural gas pipeline network of around 900km. It is clear from our mission statement that we take sustainable account of the impact on people and the environment. We therefore focus also on the reduction of me-thane emissions. We use established management systems to reduce and avoid environmental pollution.

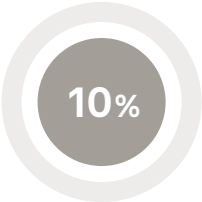
The following management systems are operated and practiced:

- ISO 9001: Quality management system
- ISO 14001: Environment management system
- ISO 50001: Energy management system
- ISO 45001: Occupational health and safety management system
- ISO 27001 Information security management system

These management systems are continuously monitored and audited by external certified inspec-tion bodies.

In the past we did a lot of initiatives to avoid and reduce methane emissions. We are generally sub-ject to a continuous improvement process, which we naturally also apply to our environmental per-formance. This approach is confirmed, for example, by our participation in OGMP 2.0. In the course of this participation, we have refined our reporting system with regard to methane emissions and, among other things, initiated new reduction and avoidance measures. Of course, we are striving to achieve the Gold Standard by implementing the requirements resulting from our participation in OGMP 2.0 to the best of our ability and within the specified timeframe. In general the decarbonisa-tion requirements to net zero is a major challenge for us. To meet this challenge, we have devel-oped reduction targets for CO_2 and CH_4 to be achieved through the implementation of planned reduction measures.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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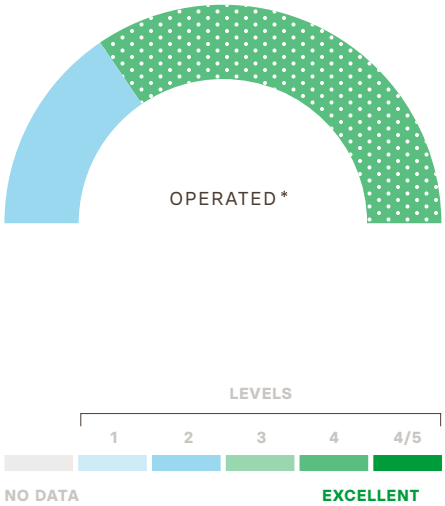

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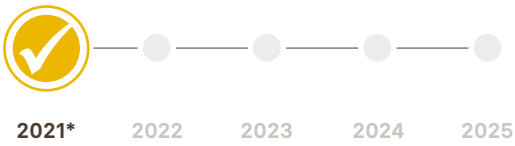

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SEGMENT

MIDSTREAM

GASCADE

GASCADE GASTRANSPORT GmbH

The global climate concerns all of us. The OGMP 2.0 is an excellent initiative to work together on the issue of reducing methane emissions. We at GASCADE are glad to contribute. We are determined to further reduce methane emissions and play our part in achieving the common goals. GASCADE aims to reduce its methane emissions till 2025 by 50% compared to 2015 and we are putting every effort into achieving this objective. We pursue high quality standards and plan maintenance measures with foresight. We regularly check our facilities regarding possible leaks. In addition, we use mobile compressors during the maintenance work to minimize gas losses. Existing operational processes are also being optimized to reduce the methane emissions.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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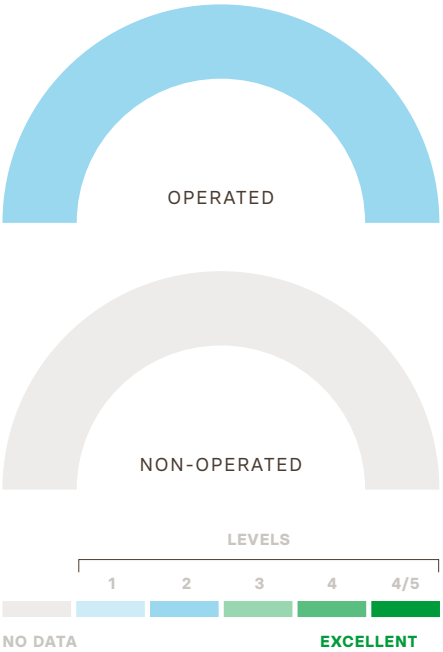

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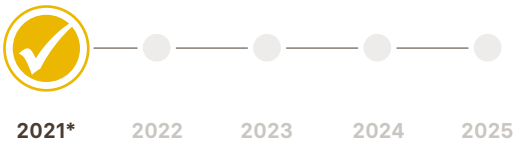

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SEGMENT

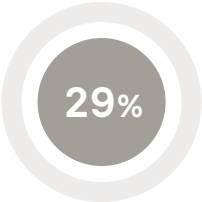
MIDSTREAM

GASUNIE DE

Gasunie is a European energy infrastructure company. Gasunie's network is one of the largest high-pressure pipeline networks in Europe and consists of over 17,000 kilometers of pipelines in the Netherlands and Germany. Gasunie is helping to accelerate the transition to a CO_2-neutral energy supply. The company believes that innovations in the gas sector can make an important contribution to this, for example in the form of renewable gases such as hydrogen and green gas. When it comes to hydrogen, scale and an integrated approach to the entire hydrogen chain are important. Gasunie is therefore investing in innovative partnerships and a hydrogen backbone for transport and storage. Both existing and new gas infrastructure are important in this context.

Gasunie, as a founding member of the European Green Gas Initiative, has set itself the goal of achieving a 100% climate-neutral gas transport infrastructure by 2050. The transport of hydrogen, synthetic methane or biogas are the decisive steps to achieve this goal.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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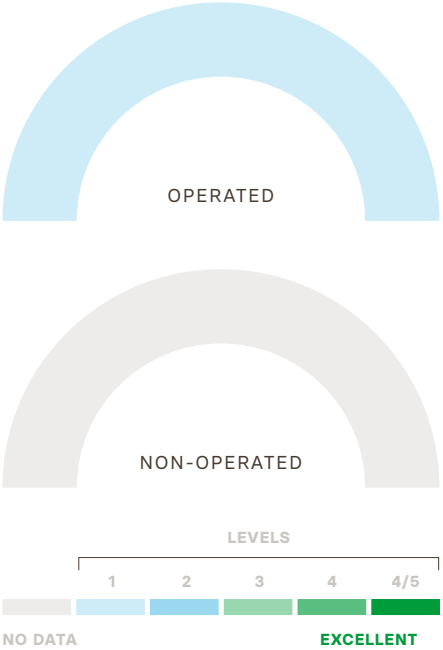

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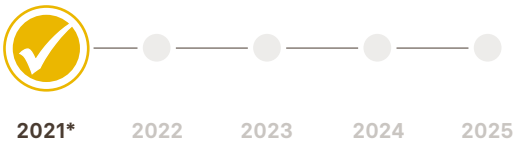

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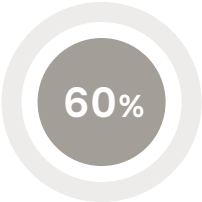
SEGMENT

MIDSTREAM

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2009 estimates

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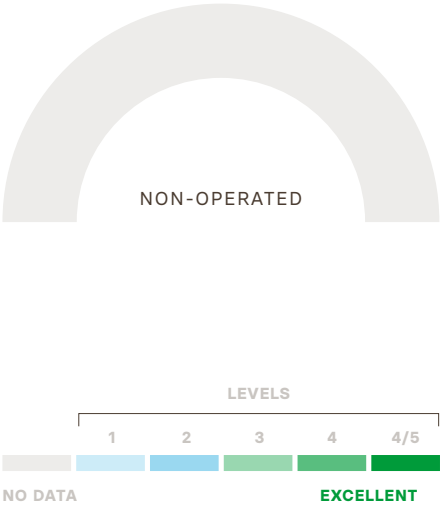


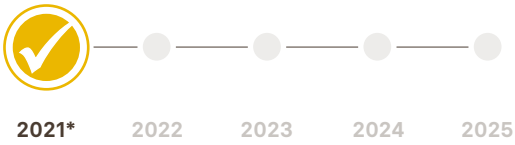
GRTGAZ DEUTSCHLAND

GRTgaz Deutschland is a wholly owned subsidiary of GRTgaz SA. GRTgaz is the most significant transmission system operator (TSO) in France and, like GRTgaz Deutschland, is certified as an Independent Transmission Operator (ITO) under European law.

GRTgaz Deutschland is a shareholder of MEGAL GmbH & Co. KG, the pipeline system of the same name in Germany. The MEGAL pipeline system is a part of the market area THE and offers a bi-directional cross border point at the German-Czech border in Waidhaus, at the German-French border in Medelsheim as well as at the bi-directional cross border point at the German-Austrian border in Oberkappel. The MEGAL pipeline system consists of two pipelines: the MEGAL Nord (North) pipeline and the MEGAL Süd (South) pipeline which are connected via a 40 km-long connection line between Schwandorf and Rothenstadt.

As the main connector of Eastern and Western Europe, GRTgaz Deutschland manages a transport system that moves large amounts of natural gas through Southern Germany. Our network connects the gas infrastruture of Germany with that of our parent company in France as well as the networks of Czechia and Austria. As part of the German and European gas infrastructure, we play a critical role in securing a lasting gas energy supply in Germany and Europe. As a team, we ensure first-class services, a discrimination-free network access, and maintain close contact with our customers.

GOLD STANDARD



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SEGMENT

MIDSTREAM

GRTGAZ FR

GRTgaz is the main gas transmission system operator in France with more than 32,000 km of pipelines to transport gas from suppliers to consumers connected to its network. GRTgaz has 2 subsidiaries: Elengy, a leader in LNG terminal services in Europe, and GRTgaz Deutschland, a German transport network operator.

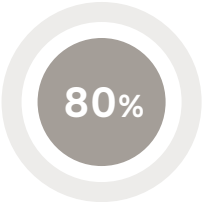
In 2016, GRTgaz set an ambitious strategic objective of dividing its methane emissions by 3 in 2020. GRTgaz successfully achieved this target thanks to Leak Detection and Repairs programs, annual audits carried out by third parties, mobile compression solutions and R&D programs operated by RICE (the GRTgazR&D center).

GRTgaz is now targeting to divide by 5 its methane emissions by 2025, compared to 2016. This represents a decrease of 16.2kt CH_4 between 2016and 2025.

An investment program dedicated to methane emission reduction is already ongoing and will be strengthened.

GRTgaz is an active member of the OGMP 2.0 Task Forces, the Methane Guiding Principles, GIE /Marcogaz working groups, and European GERG R&D projects. Among the R&D projects carried out by RICE, GRTgaz participates in the GERG research project on top-down measurements. Within GIE/Marcogaz methane Working Group, GRTgaz is a main contributor to recommendation documents and advocates for better methane management through several presentations in seminars and webinars. In France, GRTgaz works closely with the other gas infrastructure operators to promote methane reduction actions and will keep on promoting sound and thorough methane reduction practices across the gas supply chain in the upcoming years.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2016 estimates

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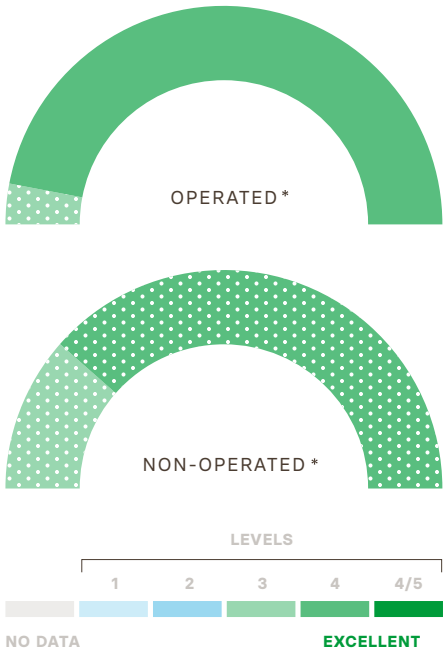

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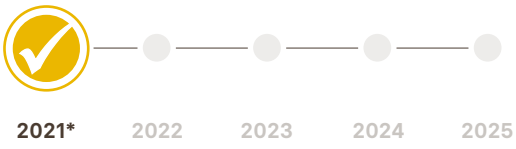

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SEGMENT

MIDSTREAM

MEDGAZ

Medgaz is in charge of operating the last direct gas pipeline Algeria-Europe via Spain, as well as of the design and construction of the expansion project. Medgaz started the activity on April 2011, with a capacity of 8 BCM/year of natural gas and without interruption since then. Expansion project will increase the capacity up to 10 BCM/year.

Medgaz operates the system comprising a compression station in Beni-Saf, Algeria, an offshore pipeline from Almeria to Spain and a reception terminal in Almería.

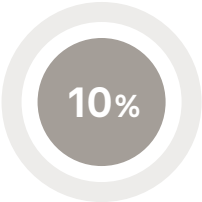
With the Expansion project (ongoing), the yearly estimated emissions will be modified according to production (4 turbo compressors installed instead of 3). The marine pipeline technical data is: 210km, 24 inches and maximum depth of 2.165m.

Medgaz, respectful of the environment, is applying best practices and looking for technical and procedure improvements to help to preserve our surroundings. In that sense, Medgaz HSE department reports methane emissions from main emission sources on a monthly basis, both internally and to our shareholders. The reporting involves main equipment depressurization as well as natural gas self-consumed (burned). Yearly targets established have the aim of reducing the impact of Medgaz activity.

Medgaz has been engaged in methane emissions reduction by joining the OGMP and designing a reduction plan for the upcoming years.

Methane emissions reported cover year 2020 and are associated to level 3 and 4 (asset's data sheet and emission calculation based on volume and working pressure). Performance target is to reduce emissions up to 10% of reported quantity by 2025.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2020 estimates

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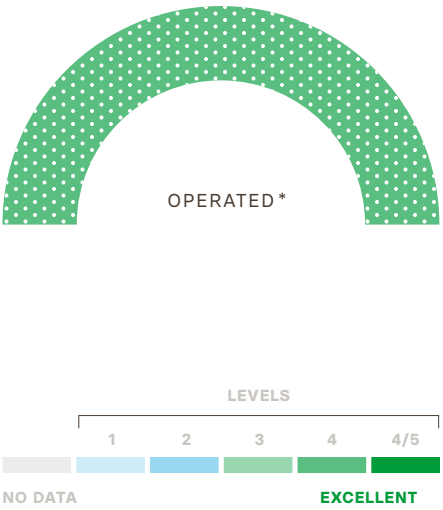

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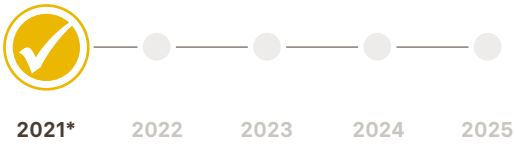

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SEGMENT

MIDSTREAM

empl
europe maghreb pipeline limited

EMPL

The Maghreb-Europe Gas Pipeline is a system of high-pressure pipelines carrying natural gas from the wells in Hassi R`Mel (Algeria) to Spain and Portugal. A pipe measuring 1,400km in length and 48 inches in diameter connects Africa with Europe via an underwater section (Strait of Gibraltar).

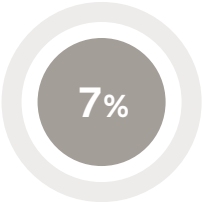
EMPL operates and maintains the Moroccan section of the system, linking the Algerian fields with the Spanish gas pipeline network through 540km on land and 47km underwater (27 beneath Moroccan waters).

On average, 30% of natural gas consumed on the Iberian Peninsula is transported through this section every year. Furthermore, the gas pipeline supplies gas for electricity generation at two combined cycle power plants in Morocco which produce 17% of the Moroccan electricity output.

EMPL has always given a high relevance to the environmental and social aspects of our Business in Morocco and, therefore, be part of the OGMP 2.0 initiative is a great opportunity to move forward on reducing carbon emissions, meeting climate objectives and contributing to the vision of natural gas as an energy transition source.

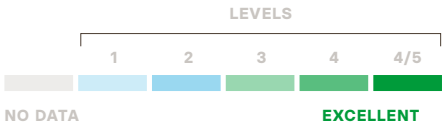
Aligned with our strong commitment to reduce methane emissions and, with the aim of being categorized as a "gold standard" member by the OGMP, EMPL has defined a ambitious implementation plan that, based on LDAR campaigns, operational actions and the use of new technology and methodology, will make possible to enhance our already existing emissions control strategy, the performance of the target reduction and to achieve the top level of reporting in the next three years.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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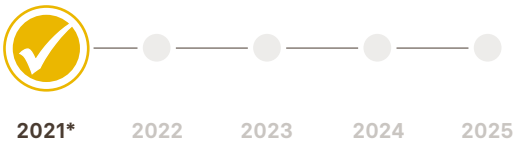

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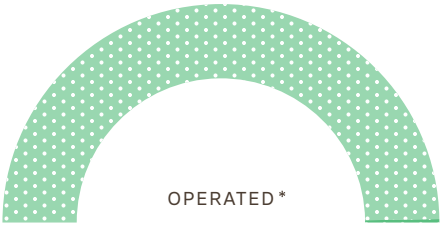
SEGMENT

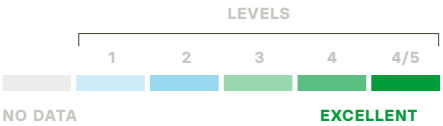
MIDSTREAM

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY





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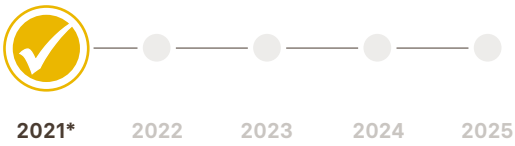

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NEDGIA

Nedgia, part of Naturgy Group, is the leading company in the natural gas distribution activity in Spain, supplying natural gas to 70% of consumers. With a long history of more than 175 years, Nedgia is currently operating in 11 autonomous communities with around 6 million of supply points.

Its main asset is more than 54,000km of infrastructures allowing the energy supply of natural gas to be delivered safely and efficiently today, and also the distribution of renewable natural gas (like biomethane) and hydrogen in the future.

Nedgia has a longstanding commitment on network innovation to enhance operations, improve safety and minimize impact of our activity on the environment. Innovation, safety, proximity and customer service are part of its reason for being and characterize its activity.

The company works to develop innovative and efficient solutions to minimize methane emissions, as part of its Sustainability Plan, and contributing to build a carbon-free energy system to fight climate change. In the last years, we have been working in a proactive way to mitigate our methane emissions through voluntary programs and by driving research initiatives together with some of the main European gas associations and organizations, highlighting the fact that we remain strongly committed to tackle this issue and contribute to achieve the EU's climate neutrality objective.

We also work on a coordinated basis with Naturgy companies around the world in an effort to minimize methane emissions. This is part of our Sustainability Plan to reduce GHG emissions, aligned with the European Green Deal.

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SEGMENT

MIDSTREAM

NEL

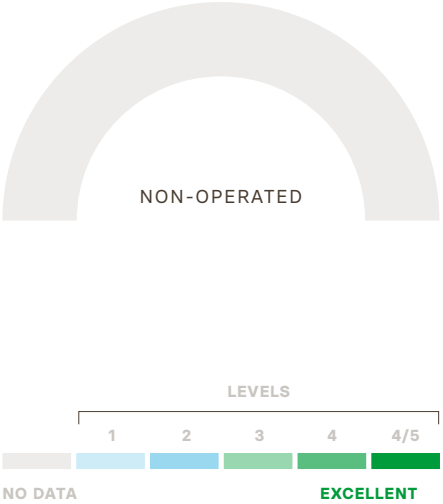
NEL GASTRANSPORT GmbH

The global climate concerns all of us. The OGMP 2.0 is an excellent initiative to work together on the issue of reducing methane emissions. We at NGT are glad to contribute. We are determined to further reduce methane emissions and play our part in achieving the common goals. NGT aims to reduce its methane emissions till 2025 by 50% compared to 2015 and we are putting every effort into achieving this objective. We pursue high quality standards and plan maintenance measures with foresight. We regularly check our facilities regarding possible leaks. In addition, we use mobile compressors during the maintenance work to minimize gas losses. Existing operational processes are also being optimized to reduce the methane emissions.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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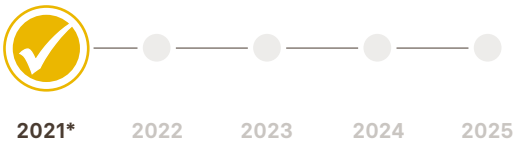

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SEGMENT

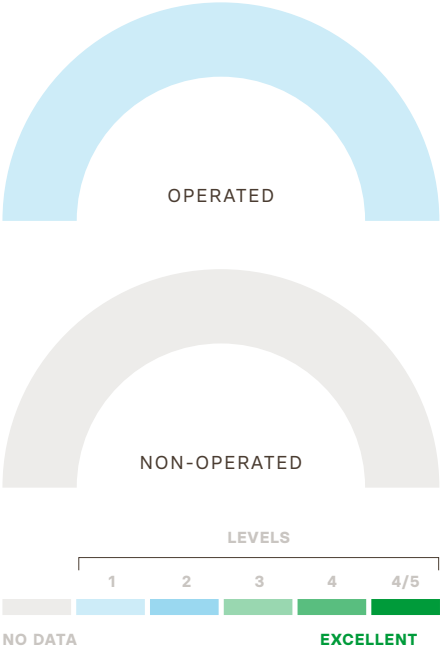
MIDSTREAM

Wir transportieren Gas.
nowega

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



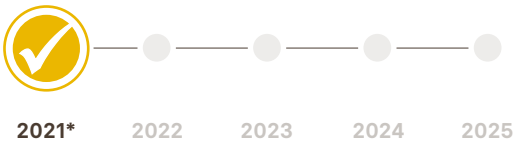
NOWEGA

Nowega is a TSO based in Münster with a workforce of over 100. We currently operate and market around 1500 km of high-pressure gas pipelines - from the Dutch border across Lower Saxony and through parts of North Rhine Westphalia. Our network structure has grown historically together with the production activities in the North German region and is unique among its kind in Germany. In our grid network we operate one compressor station with a capacity of 1 MW.

Nowega is acutely aware of its responsibility not only towards its own employees, but towards the environment, the community, and the customers. With the reliable and economic operation of pipeline networks and plants, we make an important contribution to the security of supply. For decades, we have been carrying out maintenance and servicing measures (e.g., LDAR measures), some of which go above and beyond the requirements of the DVGW regulations, with the aim of reducing the impact on the environment. Reducing emissions while maintaining security of supply is of paramount importance to us, which is why we always follow the best practice approach, looking for new technologies and methods, e.g., for gas leak detection.

Nowega is a founding member of the GET H_2 Initiative, which aims to establish a Germany-wide hydrogen infrastructure - the basis for the gradual transition from a natural gas grid to a hydrogen infrastructure. In our view, an H_2 infrastructure will make a significant contribution to the CO_2-neutral energy supply of the future.

GOLD STANDARD



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SEGMENT

MIDSTREAM

gasunie
crossing borders in energy

N.V. NEDERLANDSE GASUNIE

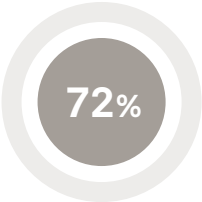
Gasunie is an energy infrastructure company. In the Netherlands and the northern part of Germany, we operate the infrastructure for the large-scale transport, storage and conversion of gas. At the moment, this is mainly natural gas, but the energy transition is increasingly bringing about a shift towards green gas, hydrogen, heat and CO_2 networks.

Our task is to ensure safe, reliable, affordable and sustainable energy infrastructure services, ensuring that everyone has access to energy, always. This is of crucial importance to the economy and society. Our geographical position means that we are at the heart of the north-western European energy market.

Our transport and infrastructure services connect the producers of energy to the (end) users of energy. We give third parties non-discriminatory access to our services. We operate and develop energy infrastructure and energy trading platforms: gas transport networks, international transit pipelines, gas storage, gas conversion, LNG infrastructure and virtual gas trading platforms.

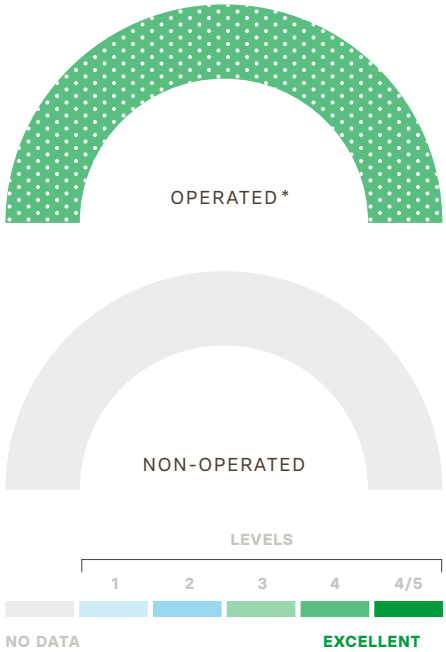
Our infrastructure functions as an international hub for the supply and transit of gas. This enables us to contribute to a liquid, competitive and reliable European energy market. We work to accelerate climate-neutral energy supply by developing transitional energy supply chains and sustainable energy supply chains. We do so by striking up new partnerships and creating new business models. We invest in projects in the areas of green gas, hydrogen, heating, CCUS and LNG. The Dutch state is our sole shareholder. Our headquarters are in Groningen (the Netherlands), and our main German office is located in Hanover.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 1990 estimates

DATA QUALITY



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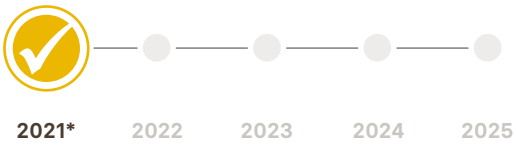

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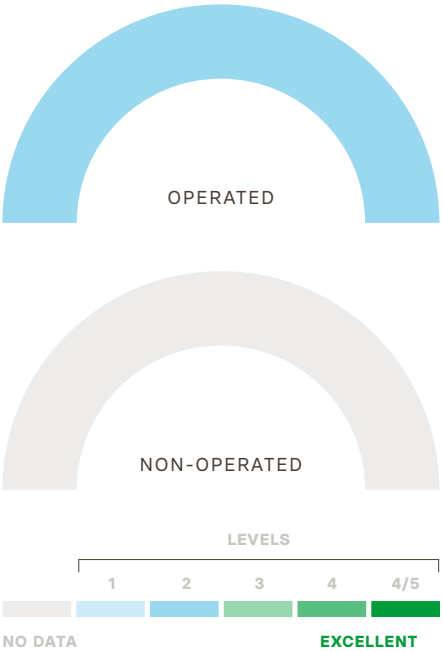
SEGMENT

MIDSTREAM

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2009 estimates

DATA QUALITY



OGE

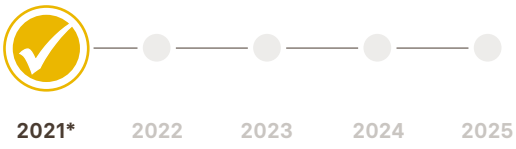
OGE is one of Europe´s leading gas transmission system operators. We operate the longest pipeline network of all German TSOs and play a key role in ensuring safe and reliable transport of gaseous energy carriers throughout Europe. We continue to further develop the infrastructure to move natural gas today and green gases in the future.

We want to make a significant contribution to climate protection in Germany and Europe. Hence, we are actively working on the transformation of natural gas to green gases. Furthermore, we are engaged in efforts to increase the security and quality of our natural gas transmission services. That includes tackling the issue of methane emissions within our pipeline network.

OGE is actively working to reduce methane emissions from the transmission of natural gas. We have long been taking various measures to reduce methane emissions in our part of the value chain and we are striving for more. To further reduce our methane emissions and continue to take the lead on this issue, we have set ourselves the goal of achieving a 55% reduction by 2025 compared to 2009. To this end, we have identified and are applying meaningful new technical measures to curb emissions. These include, for example, the use of mobile compressors, a technology which we will continue to develop and strengthen.

We are a committed member of several initiatives and associations to work alongside our public and private partners to tackle the issue of methane emissions throughout the gas industry.

GOLD STANDARD



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SEGMENT

MIDSTREAM

ontras Gastransport GmbH

ONTRAS GASTRANSPORT

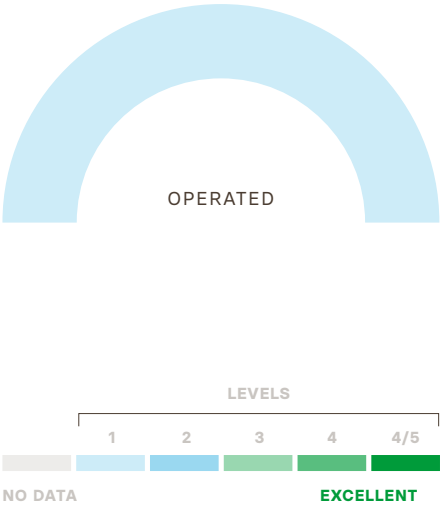
ONTRAS Gastransport GmbH is a national gas transmission system operator in the European gas transport system based in Leipzig. ONTRAS operates Germany's second-largest gas transmission system, with approximately 7,500 km of pipelines and about 450 interconnection points, to ensure the seamless transport of natural gas to our customers. To do so, we link the interests of transport customers, dealers, regional network operators and producers of regenerative gases.

As part of our commitment "ONTRAS going green" we are constantly working on making our infrastructure ready for the integration of renewable gases such as hydrogen and biomethane and strengthening our efforts in reducing the carbon-footprint of our activities. We are therefore delighted to be part of the OGMP 2.0 initiative enabling us to work together with renowned partners from across the entire value chain supporting us to monitor, report and reduce verifiably the methane emissions of our operations and thereby contribute to the decarbonisation of our energy system.

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY



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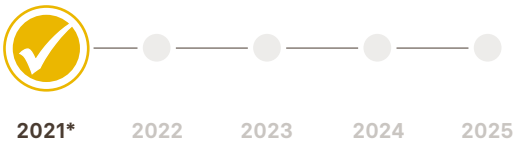

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SEGMENT

MIDSTREAM

OPAL

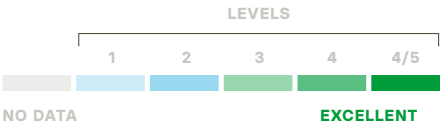
OPAL GASTRANSPORT GmbH & CO. KG

The global climate concerns all of us – and we at OPAL want to make our contribution. The OGMP 2.0 is a great initiative, and we are proud to be part of it. We are committed to lower methane emissions and hence play our part in achieving the common goals. OPAL aims to reduce its methane emissions till 2025 by 50% compared to 2015, and we are putting every effort into achieving this objective. In detail, this means that we are consistently checking all our facilities for methane leaks, using state-of-the-art methods to reduce methane emissions, developing our high-quality operational processes and standards further, and plan our maintenance with foresight.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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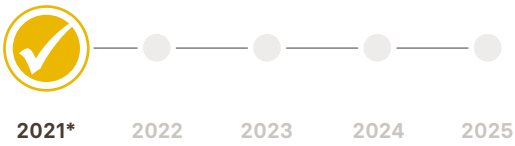

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SEGMENT

MIDSTREAM

REN
Redes Energéticas Nacionais

REN

REN is the Portuguese high pressure natural gas transmission system operator, and very high voltage electricity transmission system operator, and undertakes the global system management of both national electric and natural gas systems under the framework of public service concessions. REN is additionally the concession holder for the Portuguese LNG plant in Sines and the Underground Storage facility in Carrico.

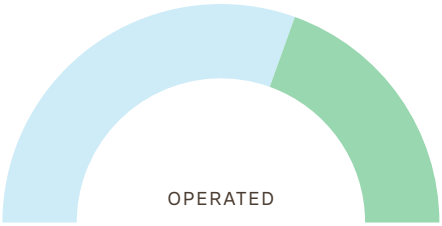
Along with its ambition of maintaining one of Europe's leading position, when it comes to renewable energy sources integration and as a leading player in operational performance, REN is committed to UN's sustainable development goals, engaging in several initiatives in the environmental, social and governance area, such as reforestation, global warming limitation or gender equality.

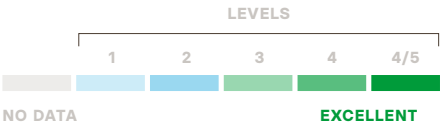
Sustainable development is thus one of REN's core values and present throughout all its activities. Motivated by the overarching goal of becoming carbon neutral by 2040, REN participates in the Oil & Gas Methane Partnership as part of the United Nations Environmental Program, which aims at systematically and responsibly reduce methane emissions. By implementing best practices in the natural gas sector, REN seeks to actively contribute to the improvement of the quality of life of citizens and to fighting climate changes by cutting down noxious gas emissions and setting the stage for a transformational change that will help preserve and restore nature and biodiversity.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2018 estimates

DATA QUALITY





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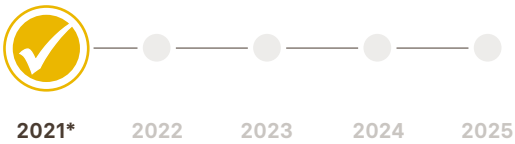

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SEGMENT

MIDSTREAM

RETRAGAS

Retragas srl, a company of A2A S.p.A. Group, is a regional natural gas transport company operating in northern Italy whose network is located downstream of the regional network of the major transport company and is directly interconnected to the latter.

Backed by the Group's distinctive management and technical skills, Retragas efficiently manages the service through its regional transport system, handling more than 350 million cubic meters of natural gas per year. The network is over 400 km long distributed over the territory of Lombardy, Trentino-Alto-Adige and Piedmont and by 9 primary interconnection cabins.

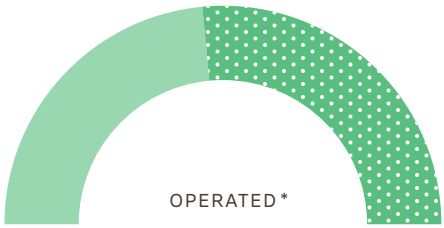
The basic service provided is the continuous and interruptible transport of natural gas on the regional network to accredited sector operators (shippers, traders). Gas is received at the delivery points of a network area and transported to the redelivery points of the same area.

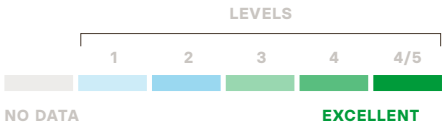
The service is subject to transport rates determined according to the indications of the Regulatory Authority for Energy, Networks and the Environment.

To manage the provision of the basic service in conditions of safety and cost-effectiveness, Retragas makes available accessory services such as, for example, the management of transportation data, the assignment of capacity, sales and transfers of capacity, operational balancing of the transport system, administrative balancing, compliance with the minimum pressure values at the redelivery points and the permitted gas quality intervals, the planning and management of maintenance, billing and management of service emergencies.

NO TARGET

DATA QUALITY





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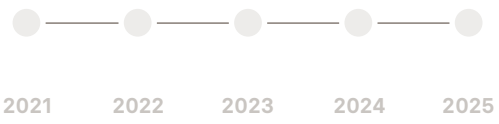

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SEGMENT

MIDSTREAM

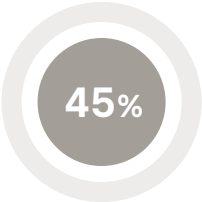
SAGGAS

The Saggas Company owns the regasification plant located in the port of Sagunto, a key infrastructure of the Spanish energy sector. Saggas provides greater security and efficiency to the national gas system by diversifying the natural gas entry points and placing ourselves close to the final consumption points. The proximity to the main producing countries in Africa and the Middle East means that Sagunto plant is strategically located.

Liquefied natural gas (LNG) arrives at Saggas facilities by LNG vessels; it is changed the liquid to a gas and place it into the basic network of gas pipelines. Saggas services includes: vessel unloading, storage of LNG, regasification, loading of road tankers, reloading of methane tankers, loading of LNG to small-scale vessels, and in 2022 LNG bunkering according to the deployment of the European Union alternative fuels infrastructure Directive.
All processes use state-of-the-art technologies and are carried out under the strictest safety and quality controls.

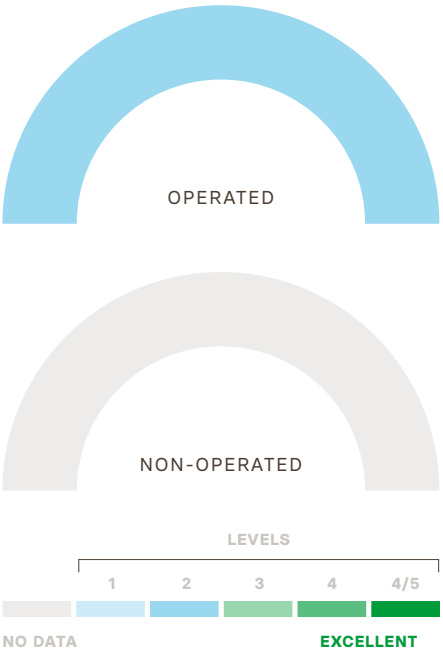
As a member of the energy sector, Saggas aims to improve its global performance and provide a solid base in order to develop initiatives in the areas of Sustainable Development, Energy and Climate Change. Saggas guarantees the development and use of efficient technologies. Saggas Carbon Strategy Plan 2014 – 2020 was our first goal, so that, we are on the verge of being more ambitious in our second Carbon Strategy Plan 2021 - 2026. We move forward together."

2025 TARGET (absolute reduction*)

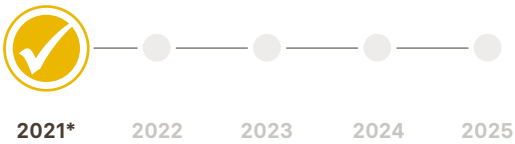


* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



GOLD STANDARD



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SEGMENT

MIDSTREAM

SNAM

Snam is one of the world's leading energy infrastructure operators, focused on transmission, storage and regasification of natural gas in Italy and on new energy transition initiatives (hydrogen, biomethane, sustainable mobility, energy efficiency).

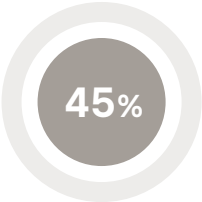
Snam is committed to reduce methane emissions in all its businesses having set an absolute reduction target of 45% by 2025 vs. 2015, in line with the OGMP 2.0 indications. Methane emission reduction is part of an ambitious strategy to achieve carbon neutrality (scope 1 and 2) at 2040, with an intermediate reduction target of 50% by 2030 vs. 2018. In 2020 natural gas emissions decreased by 30% vs. 2015, avoiding approximately 183,000 tons of CO_2eq of atmospheric emissions, implementing best practices that include in-line gas recompression, hot tapping machines, Leak Detection and Repair, etc.

To account methane emissions, Snam developed an international methodology in collaboration with GRI - US EPA for over 20 years, integrated with emission factors based on field measurements carried out by external companies since the 1990s. Over the last years, emission factors for fugitive emissions have been updated, based on measurement campaign in representative facilities, in accordance with EN 15446.

Snam is also actively participating in different Working Groups and Task Forces at EU / international level (IGU, Gas Naturally, Marcogaz, GIE, CEN, GERG, MGP and others), including CDP activities reaching "Climate Change A List".

Snam's targets, results and activities to reduce emissions are disclosed in the Sustainability / Financial disclosure on Climate Change Reports (https://www.snam.it/en/Investor_Relations/Reports/Annual_Reports/index.html)

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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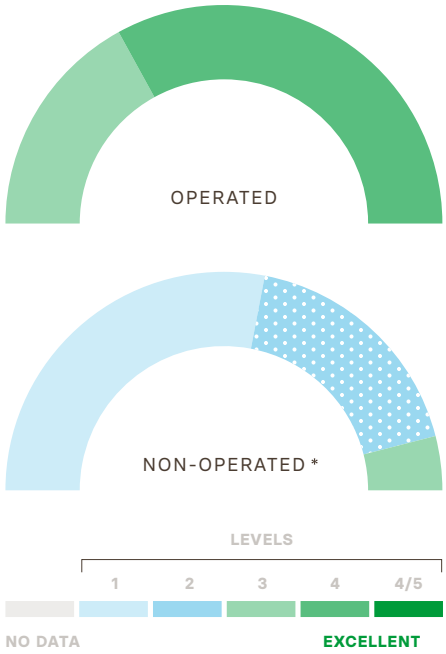

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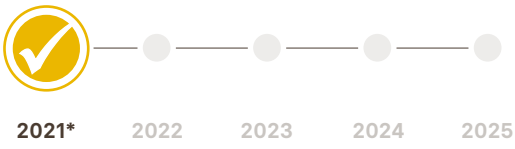

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SEGMENT

MIDSTREAM

storengy

A company of ENGIE

STORENGY DEUTSCHLAND

Storengy Deutschland GmbH bundles the ENGIE group's gas storage activities in Germany. Its core business includes planning, construction and operation of storage facilities and marketing of gas storage capacities. Storengy operates six gas storage facilities across Germany and offers storage services for third parties: technical operations management, technical dispatching, and maintenance.

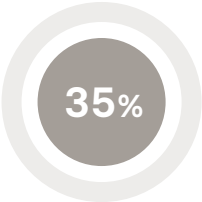
Already below the "near zero" emissions intensity threshold (as defined by the OGCI), Storengy Deutschland GmbH engages itself, through its participation to OGMP 2.0, to continue its efforts to reduce its environmental impact, especially in terms of methane emissions. Storengy Deutschland GmbH wants to act on all the possible sources of methane emissions in its processes.

The first goal is to identify and reduce fugitive emissions of its sites. The use of innovative technologies to point out, measure and remedy those kinds of emissions is one of the priorities for Storengy Deutschland in the years to come.

Another key topic for Storengy Deutschland's methane emissions reduction is activities related to maintenance works and venting operations. In a first step, Storengy Deutschland invested in a mobile hot flare, to avoid venting to the greatest possible extent during main planned maintenance activities. Then the focus will be set on emissions through compressors' seals.

To have a better overview of its emissions, Storengy aims at improving its reporting and measurement capacity and knowledge, by deploying new technologies. As a result, methane emissions of all kinds will be better identified, allowing an improved path to efficiently reduce them.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2016 estimates

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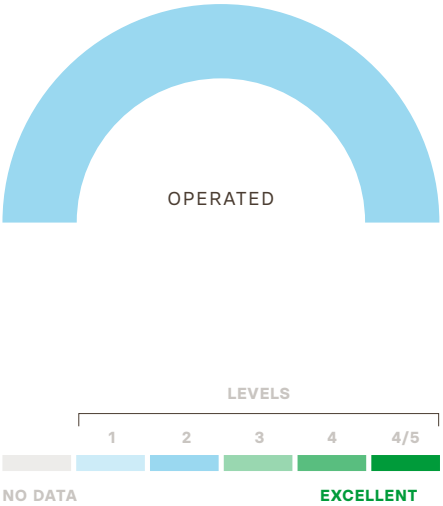

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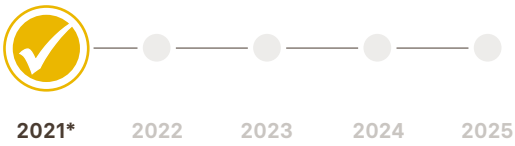

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SEGMENT

MIDSTREAM

storengy

A company of ENGIE

STORENGY FRANCE

Storengy France, an ENGIE subsidiary, is a key player in underground gas storage. Drawing on 60 years of experience, the company develops and operates 14 storage facilities in France and offers its customers innovative products.

Its mission is to provide flexibility to gas markets and to contribute to the security of energy. Storengy France's storage facilities represent 10 billion m^3.

And if today we store natural gas, tomorrow it will be renewable (biomethane, hydrogen, etc.).

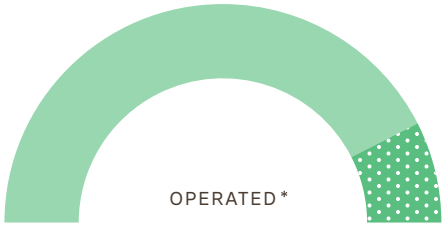
As a committed actor to energy transition, limiting methane emissions of energy-related activities, and more specifically of the underground gas storage activity, has become a major strategic challenge for Storengy France. In that purpose, Storengy France has recently committed on reducing methane emissions by 25% by 2025 (compared to 2016 emissions) on all storage sites in operation. A first objective of this action plan is to monitor the various sources and to quantify methane emissions according to OGMP 2.0 standards. Then, the target is both to avoid and reduce methane emissions due to underground storage facilities activity.

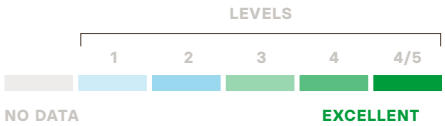
In compliance with ENGIE's strategy and the European Commission challenge to combat global warming and in particular methane emissions, the reduction of our environmental footprint shall continue until we reach carbon neutrality. Methane emissions reduction program will strongly contribute to this ambition and all operational teams are mobilized for this topic.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2016 estimates

DATA QUALITY





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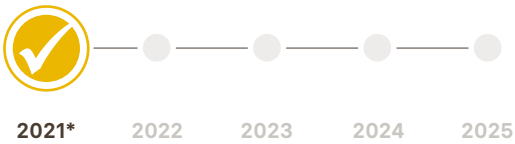

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SEGMENT

MIDSTREAM

storengy

A company of ENGIE

STORENGY UK

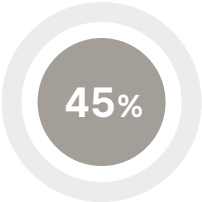
Storengy UK is the UKs largest fast cycle natural gas storage facility. Operating the Stublach Gas Storage Project, a salt cavern storage facility in Cheshire, Northwich since 2007. Enhancing the security of supply to the UK gas market. Stublach comprises 20 underground salt caverns, created between 2009 and 2018. Each of these caverns stores natural gas over 500 metres below the surface.

Storengy UK's 4.4 TWh storage capacity is equivalent to the energy consumption of 0.6% UK (300,000) households.

At Storengy UK we are passionate about actively supporting the transition to Net Zero carbon emissions. We have set ourselves an ambitious target of being net zero by 2045. We intend to deliver net zero through a range of projects including:

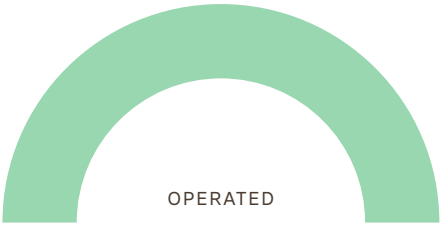
- Providing Hydrogen Refuelling Stations to facilitate the move away from diesel powered vehicles
- Hydrogen storage instead of natural gas
- Investing in the development of biogas plants using farm and food waste to create net zero gas
- Geothermal Energy opportunities

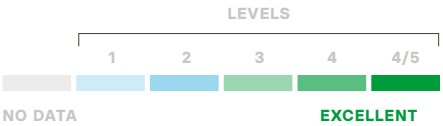
2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2016 estimates

DATA QUALITY





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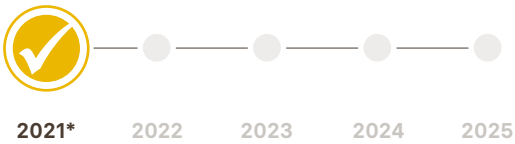

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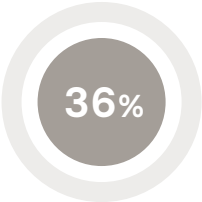
SEGMENT

MIDSTREAM

TEREGA

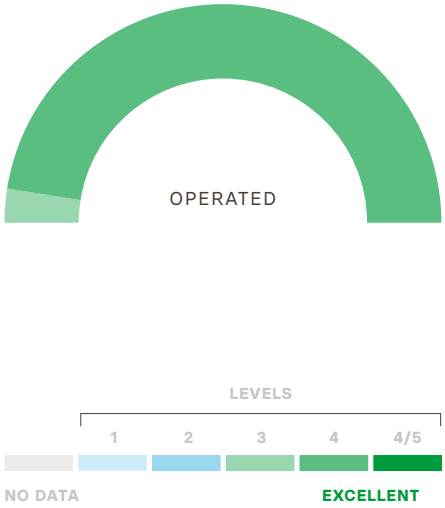
Fully aware of the Energy Transition issues, TEREGA is committed for many years in projects to reduce its carbon footprint. Its internal strategy relies on the "Avoid - Reduce - Offset" approach: the neutral air impact has been reached for TEREGA activities in 2020. The engagement of TEREGA in the OGMP initiative was natural evidence, supporting the fact that the MRV (Measure - Reporting - Verification) process is the first key to a strong reduction path of CH_4 emissions."

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2017 estimates

DATA QUALITY



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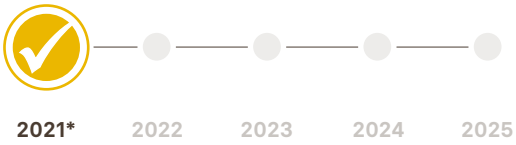

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SEGMENT

MIDSTREAM

THYSSENGAS

Thyssengas GmbH has the clear vision, that the usage of gaseous fuels – especially climate-friendly gases such as biomethane or hydrogen – will deliver an essential contribution to reach climate goals.

We are convinced that an ultramodern gas infrastructure is the only way to achieve the objectives of the decarbonization of the energy industry while keeping the security of supply still on the highest level and to reconcile them with each other.

Thyssengas welcomes the opportunities given by OGMP 2.0 Framework to demonstrate that avoiding methane emissions is a key factor in our asset operation, resulting in an overall awareness of the importance of the matter. Within the company, processes and measures are progressing towards reporting according to OGMP 2.0 Gold Standard.

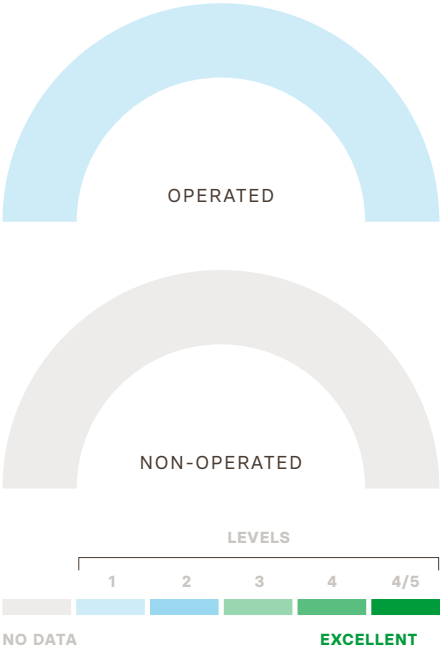
The Thyssengas OMGP 2.0 report (reporting year 2020) relies on asset categories as provided by the German National Inventory Report. The applied methane emission factors express recent knowledge gained by current measurements.

In general, by participating in the OGMP framework Thyssengas has committed itself over the coming years to the constant improvement of methane emissions reporting and to the reduction of these emissions.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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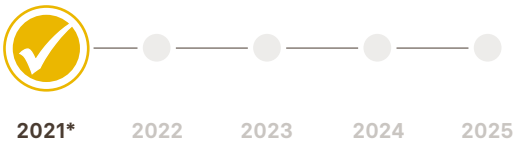

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SEGMENT

MIDSTREAM

TRANS AUSTRIA GASLEITUNG

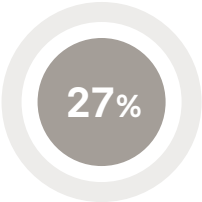
Trans Austria Gasleitung GmbH is a certified Austrian Independent Transmission Operator with main activities in the transport of gas and the operation and maintenance of high-pressure gas pipelines and facilities for the reliable and secure supply of energy to Austria, Slovenia and Italy. More than 30 billion cubic metres of gas are transported annually from the Slovakian/Austrian border to the Austrian/Italian border via the approximately 1,140 km long pipeline system. The shareholders of Trans Austria Gasleitung GmbH are Snam (84.47 %) and Gas Connect Austria GmbH (15.53 %).

Trans Austria Gasleitung is aware of the common challenges to tackle climate change and considerable efforts have been made in the past to continuously reduce methane emissions with a positive impact on environment (reduction of GHG emissions) and safety (continuous monitoring of the network). It is therefore particularly keen to be an active partner in the UNEP's Oil and Gas Methane Partnership.

The TAG Pipeline System is continuously being adapted to the state of the art and operated in compliance with the strict legal requirements. In addition, TAG actively implements measures to achieve a continuous and sustainable reduction of GHG emissions. For example, ten heavy duty gas-operated compressor units were decommissioned and replaced by four electric driven compressors within the last four years.

The harmonized recording and reporting of emissions and the professional exchange within OGMP make it possible to identify further potentials in the prevention of emissions in gas transportation and are actively transforming the company for a future carbon-free society.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015-2020 estimates

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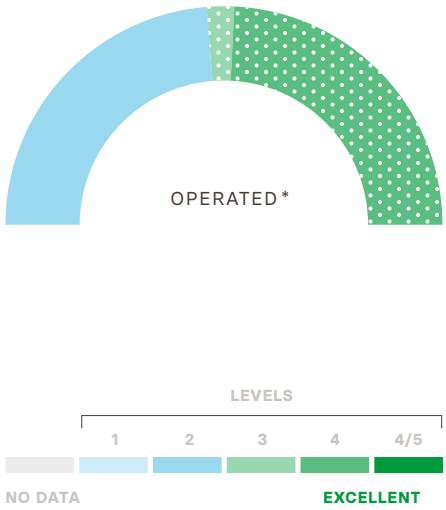

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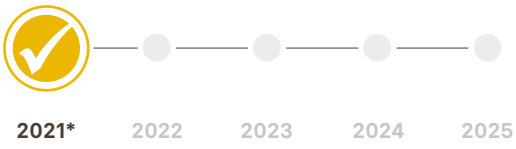

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SEGMENT

MIDSTREAM

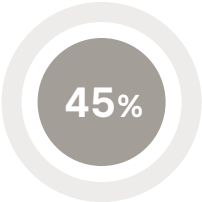
UNIPER ENERGY STORAGE

Uniper Energy Storage operates underground gas storage facilities and holds interests in non-operated facilities in Germany, Austria and the UK. Providing an overall storage capacity of almost 82 TWh – around 7% of all Europe's gas storage capacity - the company is one of the top 5 storage operators in Europe in terms of capacity.

Based on its solid operating experience, acquired over several decades through its predecessor companies, Uniper Energy Storage identified the importance of methane emission reductions early on and became a launching member of the Oil and Gas Methane Partnership (OGMP) 2.0 in 2020. Uniper Energy Storage reported in 2020 the majority of its methane emissions from operated assets on a level 4 reporting standard and has already successfully achieved substantial emission reductions compared to the base year 2015.

Uniper Energy Storage is committed to monitor closely its methane emissions, to record them in accordance with aligned, reliable and comparable methodologies and is actively promoting the OGMP 2.0 reporting framework with its Joint Venture partners for non-operated assets.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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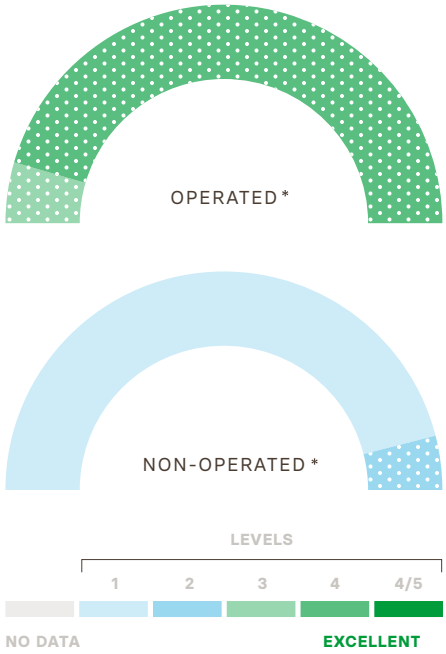

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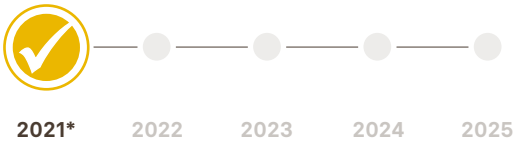

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SEGMENT

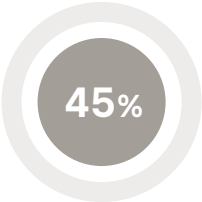
MIDSTREAM

VNG Gasspeicher

VNG GASSPEICHER

With a storage capacity of 2.2 billion m³ (equivalent to 25 THW), VNG Gasspeicher GmbH is the third-largest gas storage operator in Germany. A secure energy supply and effective climate protection are key issues for us. As part of OGMP, we are therefore also committed to reducing methane emissions. By establishing more accurate measurement methods and investing in the optimization of our technical facilities, we aim to significantly reduce unwanted gas escapes from our surface facilities. By 2025, we thus aim to reduce emissions by approximately 45% compared to 2021. We believe this is important and are pleased to be able to play our part in climate protection.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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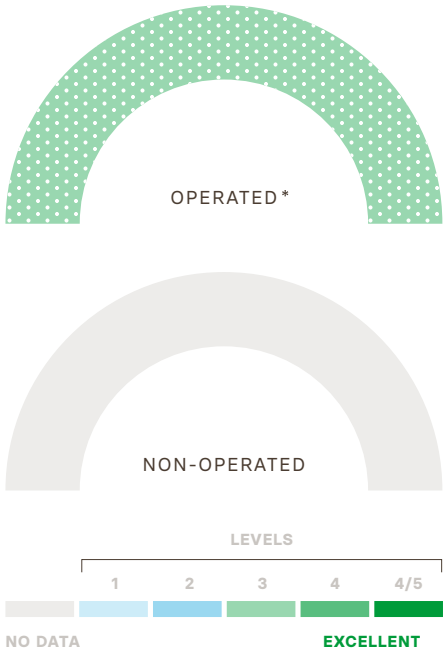

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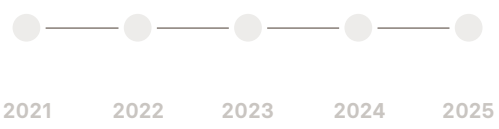

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SEGMENT

MIDSTREAM

ADRIGAS

ADRIGAS

ADRIGAS S.p.A., a company belonging to the SGR Group, is an industrial reality active in the natural gas distribution sector, in which it boasts excellent skills in terms of safety and quality of services. Since 1959 it has been designing, building, and managing a network of gas pipelines mainly located in the Emilia Romagna and Marche regions which today measures over 2,700 kilometers and which has over 800 reduction plants and about 175,000 meters.

The head office is located in Rimini. The activity of ADRIGAS S.p.A. is expressed in a constant commitment to citizens and its 175,000 end customers. Although we are an energy and infrastructure company linked to tradition, we strongly believe in the need to actively operate in the energy transition and our investments are oriented in this direction. In 2020 Adrigas achieved energy efficiency certificates which led to savings of over 30,000 TOE.

Furthermore, the activities of the entire SGR Group have led to savings in CO_2 emissions of over 8,000 tons.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2020 estimates

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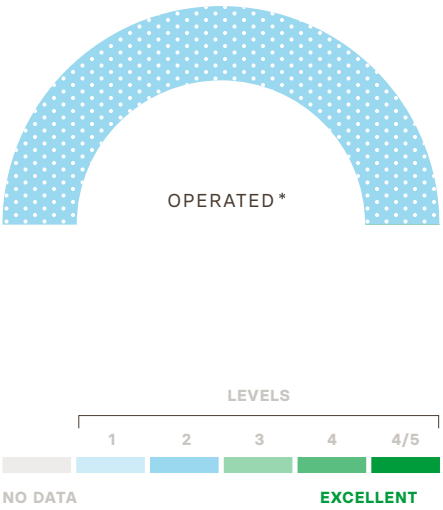
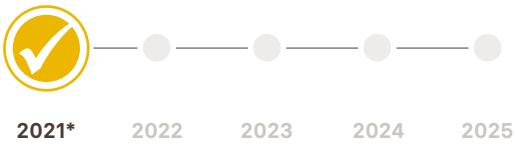


* dotted pattern = incomplete data

GOLD STANDARD



* implementation plan approved for data quality improvement

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SEGMENT

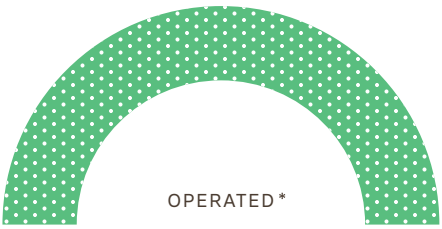
DOWNSTREAM

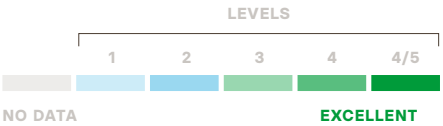
COTEQ NETBEHEER

CoteqNetbeheer is aDSO in the eastern part of the Netherlands.Coteq Netbeheer owns a gas distribution grid with a total length of 4426,7 km.

NO TARGET

DATA QUALITY





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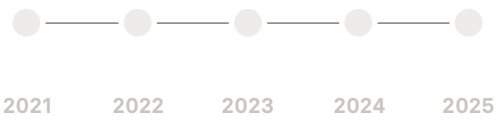

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SEGMENT

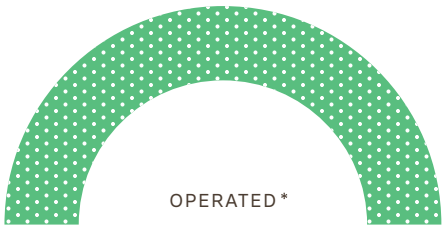
DOWNSTREAM

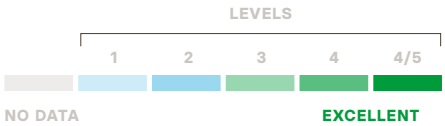
ENDURIS

Enduris is the DSO in the province Sealand. Enduris is part of theStedin Group.On the first of January 2022 Enduris will merge with Stedin, and will become part of the planning and reporting by Stedin. At the moment Enduris owns a gas distribution grid with atotal length of 4819,7km.

NO TARGET

DATA QUALITY





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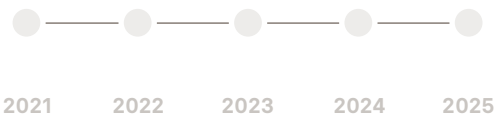

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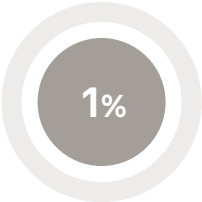
SEGMENT

DOWNSTREAM

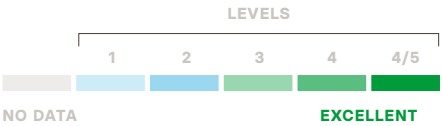
Energienetze Bayern

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY



ENERGIENETZE BAYERN

Energienetze Bayern GmbH &Co.KG (ENB) is a gas distribution company, active in the south of Germany in upper and lower Bavaria. ENB is a 100 % subsidiary of Energie Südbayern GmbH with its seat in Munich. We distribute 21 TWh of natural gas and biomethane to 150.000 residential, commercial and industrial endusers and connected distribution grids.

ENB operates 10.200 km of local and regional gas grids, all assets are operated by ENB. All cast-iron pipes were substituted in the past years.

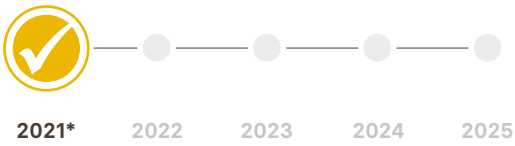
Due to the high investment of 614 Mio. € over the last 20 years, 74 % of the grid is made of polyethylene, all steel pipes are for 100% equipped with cathodic protection and ENB notice a permanent extremely low rate of methane emissions in its pipeline network.

Joining the OGMP 2.0 in October 2020 is a logical next step in our efforts to measure and quantify our already small proportion of emissions in greater detail and find ways to further reduce them. We are committed to follow the path for gold standard.

Due to this excellent technical status, to reduce the methane intensity below 0,1 % means, we're facing a challenging target.

ENB takes an active role in the work of OGMP and helps to distribute through our engagement in the associations the knowledge to other DSO in Germany. All measurements and experiences feed into the large German measurement program – organized by the DVGW - to update and expand the official emissions factors of the German Environment Agency.

GOLD STANDARD



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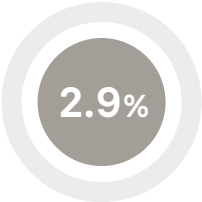
SEGMENT

DOWNSTREAM

ENEXIS

Enexis owns a gas distribution grid with atotal length of 46.321 km, of which 288 km exists of grey cast iron in the low pressure part of the grid.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

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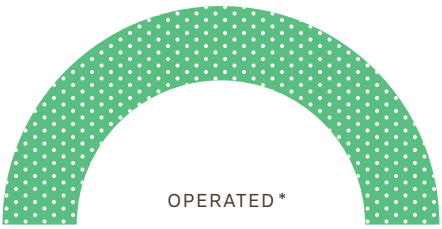

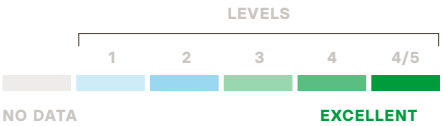

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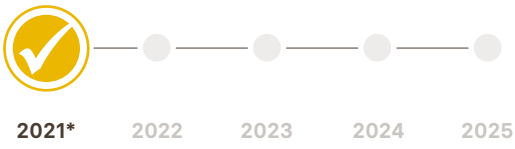

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SEGMENT

DOWNSTREAM

EWE NETZ

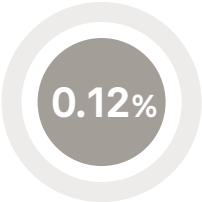
EWE NETZ GmbH operates the largest natural gas distribution grid in Germany with a total length of over 57,000 km in various regions of Germany. The entire supplied area covers more than 2,800 km and more than 786,000 households and companies.

With a significant influence on the sustainable and therefore environmentally friendly energy supply in the home country and beyond, the aim is to maintain the first-class network quality of EWE NETZ and at the same time to use further optimization potentials.

EWE NETZ has set itself the goal of reducing operational and incident methane emissions in the distribution grid. Due to the Set of Rules by the DVGW applicable in Germany, different technical specifications and extensive measures that actively contribute to the reduction in damage and methane emissions are already mandatory for the distribution grid. In the past decades, EWE NETZ has established measures like e.g. substitute grey cast iron with modern material or downsizing shut-off sections. This already leads to a low intensity factor of less than 0.1%. This proven strategy that led to fewer methane emissions will be continued.

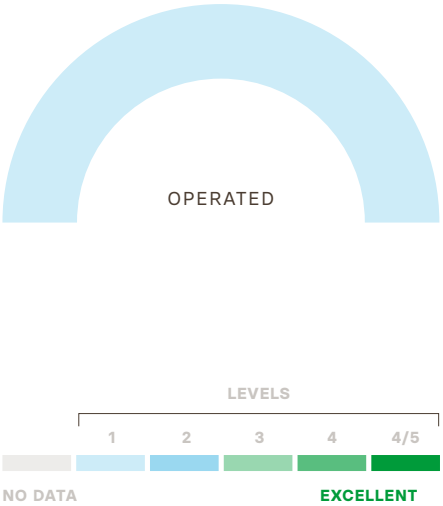
Being member of OGMP strengthens the activities to an extensive management of detailed methane emissions. With this, EWE NETZ has been part of measurement programs to create and verify transparency. The results specifically intend to improve the distribution network database and identify steps for further emission reductions.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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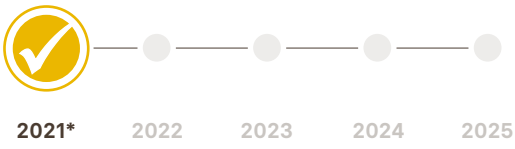

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SEGMENT

DOWNSTREAM

FLUVIUS

Fluvius is the Flemish utility company created on 1 July 2018 by the merger of two former Belgian DSO's. Fluvius is responsible for building, managing and maintaining distribution grids for electricity, gas, sewerage, cable TV and district heating, and public lighting. The company manages over 7 million utility connections.

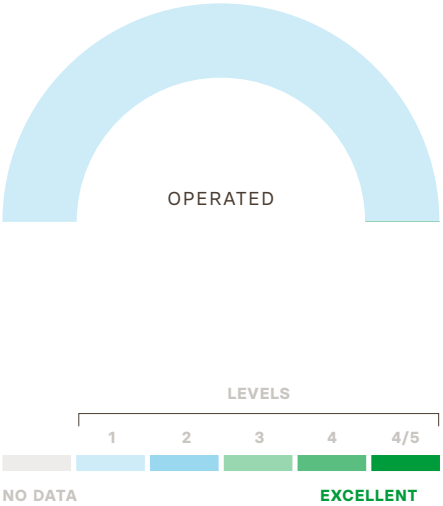
The key mission as a natural gas distribution company is to ensure the delivery of gas to our residential, commercial and industrial customers with high standards of quality, security and affordability, as well as to find and implement innovative solutions.

- The Gas Distribution assets comprise 57.000 kms of gas distribution grid.
- The low pressure grid (up to 100 mbar) is about 47.000km long;
- The medium pressure (up to 15 bar) grid is about 11.000km long.
- The gas from the transport grid is injected into the distribution grid through 100 city gates
- About 13.000 pressure regulating stations are installed to supply the end users either directly or via the low pressure distribution grid.
- The gas distribution grid makes a connection to about 2,3 million customers, of whom a majority are residential end users connected to the low pressure grid.
- The total annual amount of gas distributed through the gas grid is about 68 TWh.

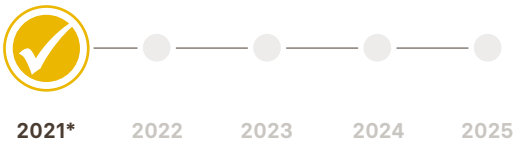
2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



GOLD STANDARD



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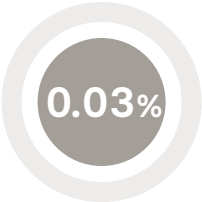
SEGMENT

DOWNSTREAM

GEI

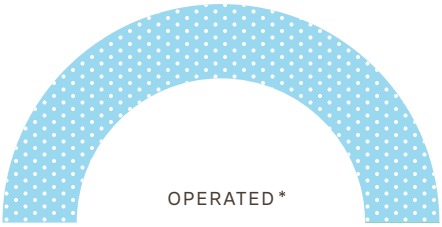
GEI is an Italian gas distribution company operating for 70 years in the north of Italy. We manage 2500 km of network delivering energy from the producer to the final customer with a strong focus on people's safety and environmental sustainability

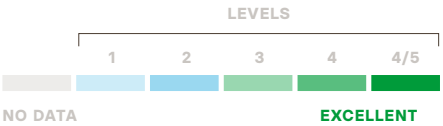
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as a percentage of marketed gas

DATA QUALITY





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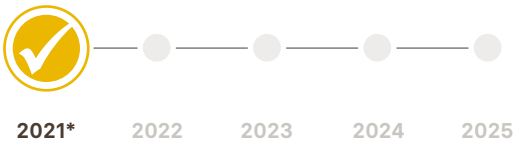

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SEGMENT

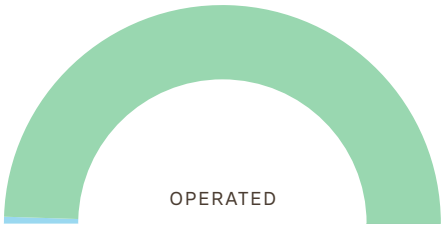
DOWNSTREAM

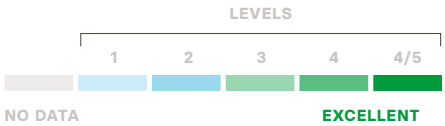
GRDF
GAZ RÉSEAU
DISTRIBUTION FRANCE

2025 TARGET (intensity*)

* maximum amount of annual methane emissions by 2025 as a percentage of delivered gas

DATA QUALITY





GRDF

GRDF is France's main natural gas distribution system operator, distributing natural gas to more than 11 million customers for different uses - heating, cooking, mobility, and industrial processes - regardless of their supplier.

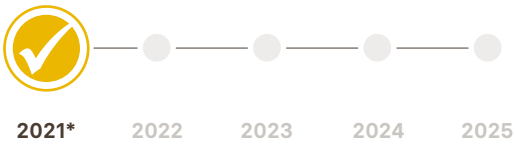
GRDF works in close contact with local and regional authorities, the owners of gas distribution networks. We also interact with other stakeholders in the energy world, from public organizations to economic and social operators.

Performing a public service mission, we build, operate, and maintain the largest gas distribution network in Europe (202,800 km) safely. We guarantee that gas is supplied under the best conditions of quality, safety, performance and cost, and we give all gas suppliers access to the network with complete impartiality. Our role as a distributor is to deliver gas to our customers, maintain and develop the gas distribution network with innovative solutions.

GRDF has strong CSR commitments and is especially involved to reduce the environmental impact of its activities. Concerning methane emissions issues, we have developed a bottom-up methodology to evaluate periodically the methane emissions of gas distribution network. Beyond this quantification, this tool is used to measure the efficiency of the mitigation action plan we carry out to decrease methane emissions of the gas distribution network.

Furthermore, at GRDF we are convinced that the future of energy goes with renewable gas, operating a gas network already well developed and flexible to distribute and store renewable energies. Our goal is to reach 100% of renewable gas in the gas network by 2050.

GOLD STANDARD



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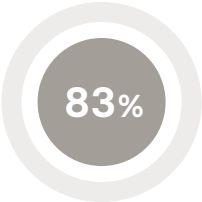
SEGMENT

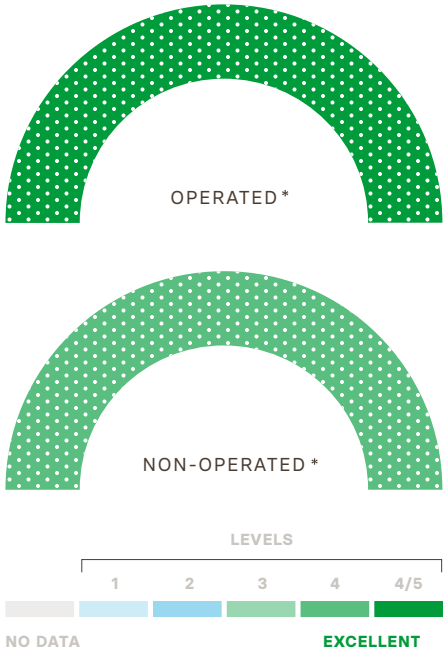
DOWNSTREAM

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



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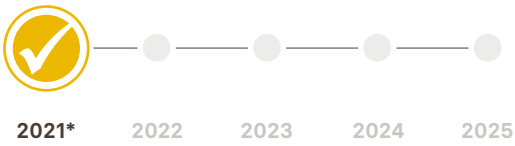
GOLD STANDARD



* implementation plan approved for data quality improvement

ITALGAS

Italgas firmly believes that reducing methane emissions is the main challenge facing gas DSOs, for safety reasons and to contribute to European environmental goals. Italgas' commitment to addressing methane emissions is twofold. First, the company is strongly committed to reducing its direct emissions and those of its subsidiaries. This effort is mainly based on the adoption of Picarro's Cavity Ring-down Spectroscopy, a laser-based leak detection technology that has a methane detection accuracy and speed higher than traditional methodologies (1/billion CH_4 molecules versus 1/million). The result is the annual verification of our entire network and measurement of actual emissions, along with the development of an algorithm capable of calculating annual emissions based on the actual leakage rate of each material or component of our network under "real world" conditions.

In addition, analyzing field data from verification, specific asset replacement and maintenance programs have been implemented to reduce the possibility of future emissions.

Second, Italgas has taken a leadership role in the gas DSO industry joining the OGMP 2.0 initiative from the outset and encouraging proactive methane emission reduction behaviors among its peers. Several actions have been taken, including promoting a common approach to methane emissions abatement among members of GD4S - an association of DSOs currently chaired by Italgas and of which it is a founding member - and among GD4S, CEDEC, Eurogas, and GEODE, three other gas DSO associations. Italgas is also contributing to the effort to define an Italian methane strategy, led by the NGO "Friends of the Earth".

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SEGMENT

DOWNSTREAM

LD RETI

LD Reti is the LGH Group company that carries out the "distribution and measurement of natural gas" activities in 99 municipalities in the North of Italy. The company distributes approximately 599 million cubic meters of natural gas to 265,343 users (delivery points).

The plants managed by LD Reti amount to a total of 3,305 km of network and connections, 71 first stage reduction stations and 1,236 second stage reduction stations. The network with pressures higher than 0.5 bar is mainly built in cathodically protected carbon steel. The network with lower pressures is built in various materials such as spheroidal cast iron, polyethylene, carbon steel. All carbon steel pipes are equipped with cathodic or anodic protection.

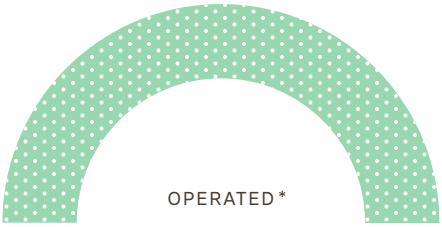
According to the provisions of the Italian regulatory body, LD Reti publishes on the website and with visibility for at least 24 months, the monthly inspection plan of the plants by the month following that of the inspection. (https://www.ldreti.it/impianti/piano-ispezione-mensile-degli-impianti/)

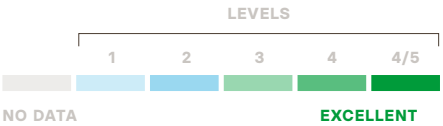
LD Reti's target is to reduce the atmospheric dispersions detected in 2019 by a value equal to 20% by 2025. To obtain the result, we are experimenting methods of inspection of overhead pipes in elevation, we have launched a plan to replace delivery points that do not comply with LD Reti standards. LD Reti also has set up a working group to study new repair and maintenance procedures for pipelines in order to eliminate dispersions into the atmosphere due to venting and purging during maintenance.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2018 estimates

DATA QUALITY





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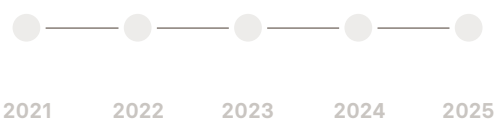

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SEGMENT

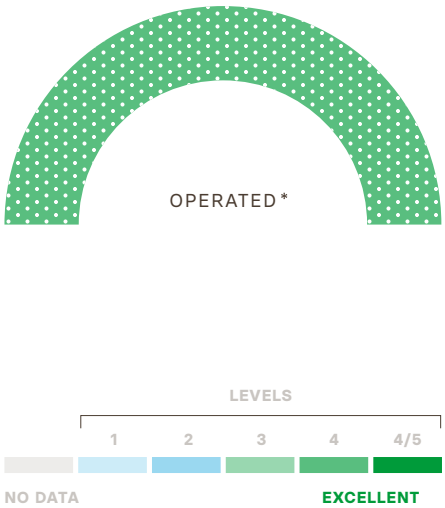
DOWNSTREAM

LIANDER

Liander owns a gas distribution grid with a total length of 41.811,4 km, of which 1150,5 km exists of grey cast iron in the low pressure part of the grid (≤ 1 bar operating pressure) and 18,7 km in the medium pressure (1 - 4 bar operating pressure) gas grid.

NO TARGET

DATA QUALITY



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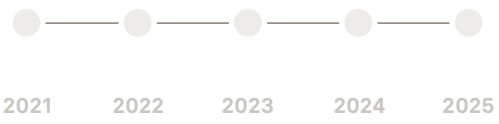
GOLD STANDARD



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SEGMENT

DOWNSTREAM

Netze Südwest

NETZE GESELLSCHAFT SÜDWEST

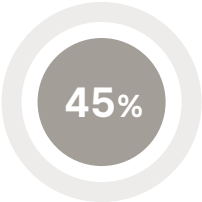
Netze Südwest and its predecessor companies can look back on a history of more than 30 years of gas distribution in Baden-Württemberg.

In our network area, we ensure a secure gas supply and are responsible for the construction, operation and maintenance of the distribution networks, including network connections. We also distribute natural gas and green gases safely to household, industrial and commercial customers. The network area covers approx. 2,953 km² and the length of the pipeline network is currently more than 4,746 km.

The company joined the OGMP in 2021 and was able to determine all methane emission and calculate the emitted quantities. A survey level of 3 was achieved for all emission sources. The emissions correspond only to 0.03% of the gas volumes transported in 2020. During the survey Netze Südwest developed elaborated data and survey standards for future surveys. Therefore, more data will be collected during operation and specific measurements will be carried out at the major emission sources.

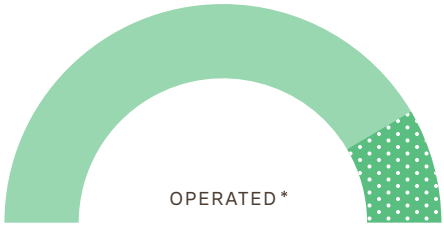
In 2021, methane measurements will already be carried out at the current major emitters, i.e. the gas pressure regulation stations, in order to provide more precise information. With an elaborated action plan, Netze Südwest can raise the methane collection method to level 4 to 5 by 2026. In addition, Netzte Südwest wants to be able to transport 20% hydrogen by 2030 and 100% by 2040. If a sufficient amount of hydrogen is available on the market by this time, Netzte Südwest will have the technology to transport climate-neutral gases.

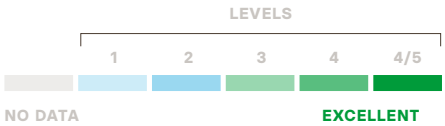
2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2020 estimates

DATA QUALITY





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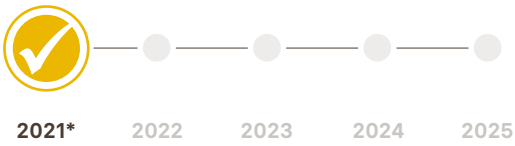

* implementation plan approved for data quality improvement

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SEGMENT

DOWNSTREAM

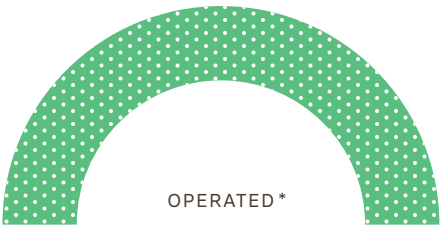
RENDO NETBEHEER

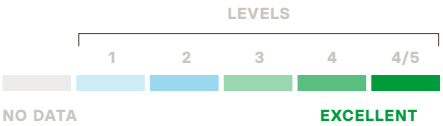
Rendo Netbeheer is a DSO in the eastern part of the Netherlands. Rendo Netbeheerowns a gas distribution grid with atotal length of 3489,8km.

NO TARGET

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY





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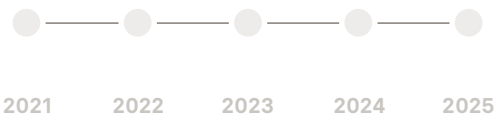

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SEGMENT

DOWNSTREAM

SCHWABEN NETZ

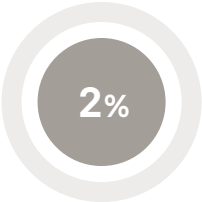
Schwaben netz GmbH is a gas distribution company located in Augsburg, active in the region of Western Bavaria. We are a 100 % subsidiary of erdgas schwaben GmbH. We distribute 13 TWh of natural gas and biomethane through our regional and local gas grid of 7.000 km in 225 communities to 117.000 residential, commercial, industrial end-users and 5 independent DSO. All assets are operated.

In the past 30 years all cast-and ductile-iron pipes were substituted, and the grid has seen major upgrading which led to a constant decrease of the emissions. 57 % of the grid is made of polyethylene and all steel pipes are 100% equipped with cathodic protection. In 2016 ISO 14001 management system was implemented and audited every 3 years.

Joining the OGMP 2.0 in October 2020 is a logical next step in our efforts to measure and quantify our already small proportion of emissions in greater detail and find ways to further reduce them. We are committed to follow the path for gold standard. As we have already reached a very low methane intensity of < 0,1 % we consider our target for 2025 as a challenging endeavour.

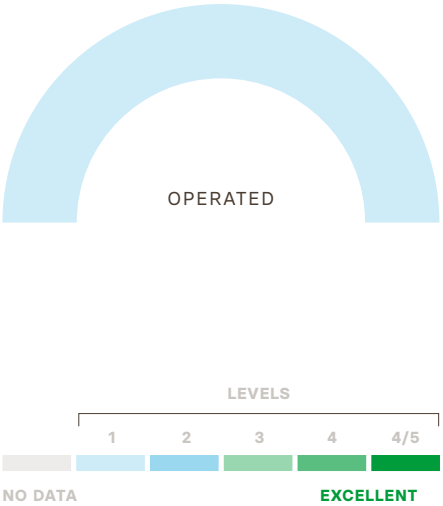
Schwaben netz takes an active role in the work of OGMP and helps to distribute through our engagement in the associations and the Thügagroup the knowledge to other DSO. All measurements and experiences feed into the large German measurement program – organized by the DVGW - to update and expand the official emissions factors of the German Environmental Agency.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY



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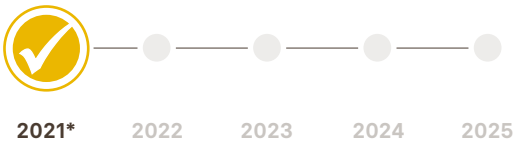

* implementation plan approved for data quality improvement

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SEGMENT

DOWNSTREAM

STEDIN.NET

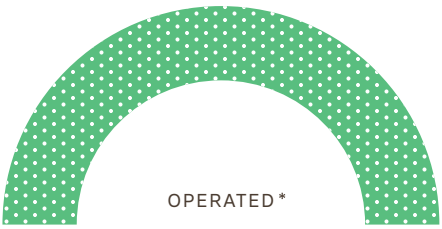
STEDIN

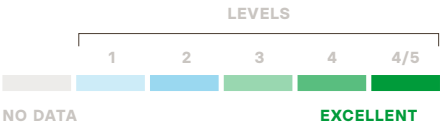
Stedin is the DSO in the largest part of the agglomeration of cities in Netherlands of which The Hague, Utrecht and Rotterdam including the Rijnmond harbour area. Busy, urban area's with a complex infrastructure, where the dependence of energy is large and energy has to be available 24/7. The total length of the distibution grid of Stedin is 23.777 km.

NO TARGET

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY





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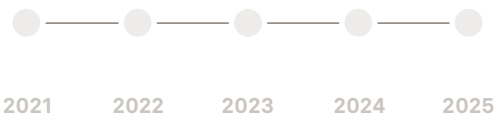

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SEGMENT

DOWNSTREAM

THÜGA ENERGIENETZE

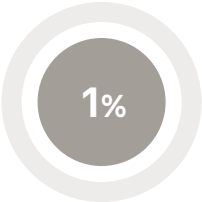
Thüga Energienetze GmbH (THEN) in Schifferstadt is a distribution company operating gas and electricity grids in the south and southwest of Germany. We are a 100 % subsidiary of Thüga AG in Munich. We distribute 6 TWh of natural gas and biomethane through our regional and local gas grid of 4.700 km in in a multitude of communities to 99.000 residential, commercial, industrial endusers and 4 independent DSO. All assets are operated.

For 30 years major reconstruction works were carried out in the grid which led to a constant decrease of the emissions. 71 % of the grid is made of polyethylene, 70 % of steel pipes are equipped with cathodic protection. All cast- and ductile-iron pipes were substituted, now older steel pipes are under renovation.

Joining the OGMP 2.0 in October 2020 is a logical next step in our efforts to measure and quantify our already small proportion of emissions in greater detail and find ways to further reduce them. We are committed to follow the path for gold standard. As we have already reached a very low methane intensity of < 0,11 % we consider our target for 2025 as a challenging endeavour.

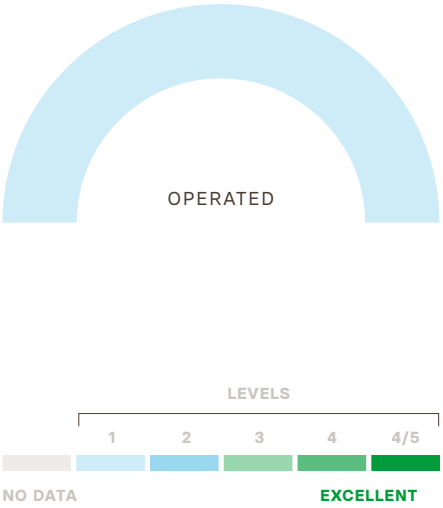
THEN is actively involved in the work of OGMP. We share the experiences within the Thügagroup and the associations to transfer the knowledge to other DSO. All measurements and experiences feed into the large German measurement program - organized by the DVGW - to update and expand the official emissions factors of the German Environmental Agency.

2025 TARGET (absolute reduction*)



* percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY



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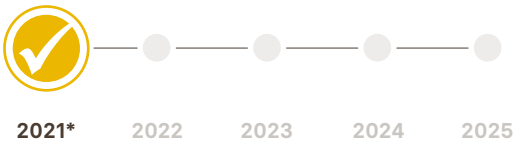

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SEGMENT

DOWNSTREAM

unareti

UNARETI

Unareti is involved in gas distribution in different regions of Italy. Conditions of networks are very different plant to plant.

About the volume of gas dispersed in atmosphere, generally speaking main way to reduce leakages is supersedes pipes, especially those which have bigger number of leaks, but this is often difficult to do in a short time i.e. in historical center of towns, where pipe conditions are usually worse. While replacement is in progress, we are intensifying and improving survey of network and of other parts of distribution plants, like branches (underground and air branches) and meters, using instruments capable of detecting very little volumes of gas leakages. In this way, we are able to detect any kind of leakages as soon as possible, reducing the volume of dispersed gas.

Moreover, usual working methods avoid purging or venting releasing gas in atmosphere, but gas is burned by torch.

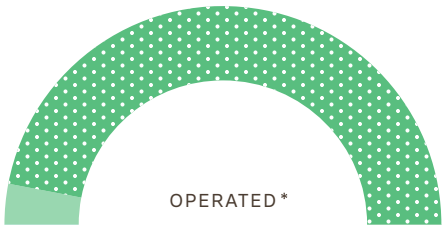
For dispersed gas in 2020, i.e., the volume is significantly less than the volume calculated using average emission factor found in literature, like Marcogaz publications.

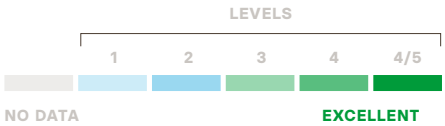
About the level of information, for several years Unareti has been publishing its sustainability report, where you can find the reduction of dispersed gas. To do this, we use the identical way to calculate the volume of dispersed gas planned by OGMP for Level 4. Only for limited parts of the plants, leakages are calculated as at Level 3, and this will be improved to Level 4 in the next years.

2025 TARGET (absolute reduction*)

* percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY





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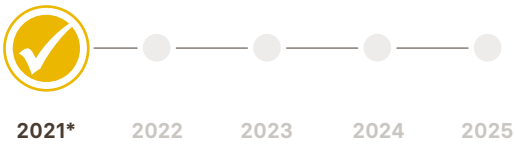

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SEGMENT

DOWNSTREAM

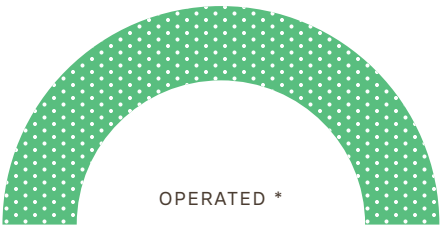
WESTLAND INFRA NETBEHEER

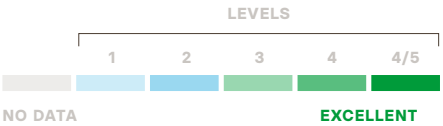
Westland Infra Netbeheer owns a gas distribution grid in the western part of the Netherlands with atotal length of 1034,7 km, of which 5,4km still exists of grey cast iron in the low pressure part of the grid.

NO TARGET

* percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY





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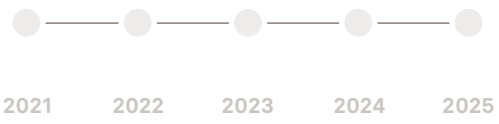

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SEGMENT

DOWNSTREAM

Annex 2. Glossary

- **Emission factors**
  An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

- **Fat Tail**
  A probability distribution that exhibits a large skewness. In the context of methane, this refers to a few emissions sources representing a disproportionate amount of emissions.
  • See box in Chapter 0 Section C.

- **Fossil methane**
  Fossil methane is methane originated from anthropogenic fossil fuel activities, as opposed to biogenic methane, which is produced from plants or animals.

- **Global Methane Initiative**
  The Global Methane Initiative (GMI) is an international public-private partnership focused on reducing barriers to the recovery and use of methane as a clean energy source.
  • https://www.globalmethane.org/

- **Gold Standard**
  "Gold Standard" refers to both the highest reporting levels under OGMP 2.0 and companies' plans to achieve this level.
  • See Chapter II Section A.

- **OGMP 2.0 Implementation Plan**
  Document submitted by OGMP 2.0 companies that outlines a credible and explicit path to reach Gold Standard reporting.

- **Methane Intensity**
  Methane emissions per unit of production.

- **Liquified Natural Gas (LNG):**
  Liquified Natural Gas (LNG) is natural gas that has been cooled to a liquid state, at -162ºC (-260ºF), for shipping and storage.

- **Marcogaz**
  Marcogaz is a non-profit international association founded in 1968 and represents the European gas industry on all technical aspects of the gas system's full value chain.
  • https://www.marcogaz.org

- **Nationally Determined Contributed (NDC):**
  Nationally determined contributions (NDCs), at the heart of the Paris Agreement and the achievement of these long-term goals, embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.
  • https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs

- **Non-operated asset**
  A non-operated asset (NOA) is an asset at which another oil and gas company than the OGMP2.0 member who is reporting its emissions, has the role of asset operator.

- **Non-operated joint venture**
  A non-operated joint venture (NOJV) is a company with multiple shareholders, where the OGMP2.0 member who is reporting its emissions is not the operator of the underlying assets.

- **OGMP 2.0**
  A multi-stakeholder initiative helping the industry to better understand and manage methane emissions through a comprehensive measurement-based methane reporting framework that standardizes rigorous and transparent emissions accounting practices.
  • See chapter II.

- **Point Source**
  A single identifiable localized source of methane emissions.

- **Remote Sensing**
  The process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance (typically from satellite or aircraft).

- **Root cause analysis**
  A method of problem solving that is used for identifying the root causes of faults or problems.

- **Scope 1 methane emissions**
  Direct methane emissions which occur from sources that are controlled or owned by an organization. Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling.

- **Short-lived climate pollutants (SLCP)**
  Powerful climate forcers which remain in the atmosphere for a much shorter period than carbon dioxide (CO_2), yet their potential to warm the atmosphere can be many times greater. Certain short-lived climate pollutants are also dangerous air pollutants that have harmful effects for people, ecosystems and agricultural productivity.

- **Site-level**
  Emissions attributed to an entire site or facility, rather than specific pieces of equipment.

- **Source-level**
  Emissions that are attributed to individual pieces of equipment.

- **Global Methane Alliance**
  Launched by the United Nations Environmental Programme (UNEP) and the Climate and Clean Air Coalition (CCAC) in September 2019, the Global Methane Alliance (GMA) gathers international organizations, non-governmental organizations, financing institutions, and the oil and gas industry to support countries in setting ambitious methane reduction targets for the oil and gas industry.
  • https://www.ccacoalition.org/en/activity/global-methane-alliance

- **United Nations Framework Convention on Climate Change (UNFCCC)**
  Responsible for supporting the global response to climate change. The Convention has near universal membership (197 Parties) and is the parent treaty of the 2015 Paris Agreement.
  • https://unfccc.int

- **Upstream, Midstream, and Downstream Sources**
  • "Upstream" refers the industry segment that explores and produces oil and fossil gas.

  • "Midstream" refers to the industry segment that transports and stores crude oil and fossil gas before they are refined and processed.

  • "Downstream" refers to the industry segment that transforms crude oil and fossil gas into finished products.

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