

An eye on methane

The road to radical transparency



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Abbreviations

CCAC	Climate and Clean Air Coalition
COP	Conference of the Parties
GMP	Global Methane Pledge
IEA	International Energy Agency
IMEO	International Methane Emissions Observatory
IPCC	Intergovernmental Panel on Climate Change
LNG	Liquefied natural gas
MARS	Methane Alert and Response System
MRV	Measurement, reporting and verification
NOC Libya	National Oil Company of Libya
OGMP	Oil and Gas Methane Partnership
ROMEIO	Romanian Methane Emissions from Oil & Gas
TGD	Technical Guidance Document
UNEP	United Nations Environment Programme

Foreword



Methane emissions stemming from human activities contribute a third of the global warming being experienced today. No matter the world's chosen decarbonization path, curbing methane alongside carbon dioxide is crucial for reaching climate stability. Public health, economic livelihoods, and global energy security all stand to benefit from fast methane action across sectors – from energy as we phase out fossil fuels and from others like waste and agriculture. Reducing methane emissions represents one of the most immediate and cost-effective levers we can pull to ensure climate progress.

But delivering methane action at the speed and scale required demands empirical data on where and how emissions occur, and how they change over time. This is why the International Methane Emissions Observatory (IMEO), a flagship project of the United Nations Environment Programme (UNEP), spearheads data-driven efforts in methane reduction alongside diverse partners from across the economy. IMEO's core mission is to provide open, reliable and actionable data to the individuals who can act to reduce methane emissions and it exists at the core of the methane data ecosystem to boost accountability and action.

In close collaboration with scientific partners worldwide and in partnership with governments and industry, UNEP, through OGMP 2.0, is actively defining the global standard for methane transparency in the oil and gas industry. This is a dynamic process, as standards and practices will continue to evolve as new measurement and mitigation methods emerge. UNEP reaffirms its unwavering commitment to expediting the reduction of methane emissions as the world accelerates the transition away from fossil fuels.

Sheila Aggarwal-Khan

*Director, Industry and Economy Division
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A handwritten signature in black ink, appearing to read 'S. Aggarwal-Khan'.



Reducing methane pollution is the fastest way to slow the rate of global warming. Significant cuts in carbon dioxide are imperative for long term climate health, but slashing methane pollution will make temperatures lower than we'd otherwise experience in the next decade.

As the effects of climate change bear down on us, we need to speed deployment of every tool that can lower the intensity of impacts on people and the planet, and oil and gas methane is critical.

Governments and industry are now making significant new commitments to reduce methane pollution, which will lead to greater climate safety and healthier communities. To maintain this momentum, we need reliable data to give countries and companies the incentive and the means to find and fix emissions faster. The information will also let us know if these pledges are being fulfilled.

Environmental Defense Fund has long advocated for a science-based focus on methane. For over a decade, we have sponsored global campaigns to measure methane across the oil and gas industry and worked closely with public, private, and civil society stakeholders to tackle this issue. In 2024, our subsidiary will launch MethaneSAT, a highly advanced methane-tracking satellite that can measure emissions virtually anywhere on Earth.

Any collective challenge requires a trusted source of data, one that stakeholders can use to direct their actions. This is where UNEP's IMEO comes in. To guide action on methane, the data must be based on empirical measurements, not merely estimated. EDF is a close partner of UNEP, helping its scientific efforts and supporting recruitment of companies into its partnerships. IMEO stands as an essential catalyst enabling those best positioned to act to reduce methane emissions.

Fred Krupp

President, Environmental Defense Fund

A handwritten signature in black ink, appearing to read 'Fred Krupp'.

IMEO at a glance



127

MARS notifications
127 methane plumes



37%

OGMP 2.0 coverage
37% of global oil and gas production



20

Methane science
20 scientific papers published



Photo credit: Envato



Global anthropogenic methane emissions are responsible for about 30 per cent of the Earth's warming being experienced today.



Reducing these emissions is one of the fastest, most cost-effective ways to slow the current rate of warming.



Rapid growth in methane emissions monitoring and heightened global attention set the stage for an unprecedented level of information on how much methane is being emitted and where from.



UNEP's International Methane Emissions Observatory is catalysing a methane data revolution and building the infrastructure to ensure that data accelerates methane action.

Executive Summary

A methane data revolution is just around the corner, making it possible to move beyond generic emission factors that attempt to estimate the release of methane pollution, and to replace them with more accurate empirical measurements of what is actually happening on the ground. This is crucial for effective mitigation measures. The International Methane Emissions Observatory (IMEO) of the United Nations Environment Programme (UNEP) is poised to catalyse rapid climate action informed through these new data, with a programme of science studies, industry partnerships, the design of a robust measurement, reporting and verification (MRV) framework, a satellite alert and response system, and a team of several dozen methane experts.

IMEO Grows Its Impact

The mission of UNEP's International Methane Emissions Observatory is to provide open, reliable and actionable data to the individuals who can act to reduce methane emissions. Since its launch at the Group of Twenty (G20) meeting in 2021, IMEO has grown its effectiveness and impact (Box 1).

The year 2022 saw widespread recognition of the importance of curbing methane emissions, with increased attention in the media, extensive coverage at the United Nations Climate Conference in Sharm El-Sheikh, Egypt (COP27) and the growth of the Global Methane Pledge (GMP). At COP28 in Dubai, United Arab Emirates, IMEO launched the new Methane Alert and Response System (MARS). This system collects data from multiple satellites and issues alerts to countries and companies when emissions are detected.

Under the GMP, more than 150 countries have committed to collectively reducing their methane emissions by 30 per cent across all sectors by 2030. UNEP, through IMEO and the Climate and Clean Air Coalition (CCAC), is the designated implementation partner for the GMP. IMEO collaborates with governments, scientists, satellite operators and companies to integrate and improve the quality of methane emissions data, with a specific focus on identifying mitigation opportunities.

Box 1. IMEO highlights as of 2023

- 20 IMEO-funded and coordinated peer-reviewed studies have been published and 7 studies submitted or under review.
- 114 oil and gas companies – covering 37% of production – joined UNEP's measurement, reporting and verification programme OGMP 2.0 September 2023 cut-off.
- Methane Alert and Response System (MARS), launched at COP27, has issued alerts on 127 plumes to the responsible authorities.
- Methane data platform is under design.
- Funding is secured for baseline studies that will provide an empirical and actionable assessment of emissions across methane-emitting sectors for selected countries.



Photo credit: QatarEnergy

Unlocking the Methane Data Revolution

Global anthropogenic methane emissions are responsible for about 30 per cent of the Earth's warming being experienced today (UNEP, CCAC and International Energy Agency [IEA] 2023). In many cases, emission reductions can be achieved in a cost-effective manner using existing technologies. Given the short-term warming impact of methane emissions, rapid reduction of these emissions is essential to meet agreed climate targets under any scenario for global decarbonization. Methane is primarily emitted in the energy, agriculture, and waste sectors, with the energy sector offering the greatest potential for rapid cost-effective mitigation. This is why UNEP's IMEO has chosen this sector for its initial focus.

Scientific studies based on global atmospheric observations estimate that total anthropogenic methane emissions from the oil and gas sector are in the range of 80-140 million tonnes per year. However, significant uncertainty surrounds the magnitude and location of emissions. Current emission reports rely mainly on legacy emission factors – estimated average values of the methane pollution released from various sources per unit of activity – instead of on empirical, measurement-based characterization of actual emissions across the oil and gas supply chain. This has made it challenging to track changes in emissions over time.

Over the past decade, the methane science community has developed and demonstrated the robustness of measurement-based approaches, with the Oil and Gas Methane Partnership 2.0 (OGMP 2.0) spearheading a substantial shift in the practice of measurement-based reporting for the oil and gas industry. A new generation of satellites is in the process of revolutionizing the quantification of emission data with unprecedented accuracy and precision. Leveraging the capabilities and partnerships established since 2021, IMEO is poised to catalyse this data revolution, delivering transparent, reliable and actionable emission data to regulators, investors and companies.

Better Data, Ongoing Action

In 2023, a total of 92 oil and gas companies reported their 2022 methane emission data to UNEP's transparency initiative, OGMP 2.0. In this early stage, the main benefit lies in the transition from generic estimation methods to empirical measurements. This allows companies to more strategically focus their mitigation efforts. While the aggregate dataset is not yet comprehensive enough to provide regional insights, it provides crucial information to those with the agency to execute actual emission mitigation actions. This report highlights stories of the practical progress in implementation and mindshare increase for methane mitigation among OGMP 2.0 member companies.

In the oil and gas production segment, where the vast majority of methane emissions are released, the operated assets of OGMP 2.0 members (property, plants, equipment, etc.) contributed one-sixth of global oil and gas production, with another one-fifth of the assets being non-operated. In 2022, the cumulative methane emissions reported by OGMP 2.0 member companies totalled 1.6 million tonnes. For all emissions in OGMP 2.0 scope in 2022, stemming from one-third of global production, the reported volume is equivalent to around 2 per cent of total oil and gas emissions. The significant difference likely has several contributing factors, which require attention and are explored in this report.

84

companies met the Gold Standard pathway criteria

In total, 84 companies met the Gold Standard pathway criteria, meaning that they are on a credible pathway to achieve Gold Standard reporting of methane emissions for a vast majority of their operated assets by the third year and of their non-operated assets by the fifth year. Individual company fact sheets are annexed to this report. Notably, the quality of measurement of methane emissions is still growing, and companies need to continue to expand coverage to more of their assets.

In the coming year (Box 2), IMEO anticipates a continued enhancement in both the quantity and quality of reported data as more assets are reported at increasing levels. The greater availability of robust scientific data will enable a more precise understanding of any disparity between emission reported by companies and actual quantities measured in the atmosphere. By 2025, thanks to the methane data revolution, a more comprehensive assessment will be possible, providing a more thorough account of methane emissions in the sector.

Box 2. IMEO look ahead for 2024

- Continuous improvement of OGMP 2.0 reporting level
- Roll-out of Methane Supply Index version 0
- Full operationalization of MARS
- Kick-off of country baseline studies
- Further diversification of IMEO funding

01

A Climate Data Revolution



Photo credit: Neptune Energy

1.1 The Threshold of a New Era

Radical transparency in methane emissions is just around the corner.

Over the past decade, a concerted large-scale scientific effort has been undertaken to measure methane emissions, primarily from the oil and gas industry. Many of the initial studies were done in North America, slowly expanding to other parts of the world. Findings from this growing body of work have indicated 1) large discrepancies between the magnitude of reported and measured methane emissions (in some cases significant underestimation of emissions), and 2) improved understanding of unknown and/or unexpected sources of emissions. For the first time, an understanding is emerging of what emissions were produced, where, and from which sources.

This change is about to bear fruit.

The characterization of methane emissions is about to shift from using average factors to using empirically derived data that capture the spatial and temporal heterogeneity that characterizes methane emissions. This shift allows for, for the first time, the accurate tracking of changes in emissions. A new generation of satellites, including GOSAT-GW, Sentinel-5, Carbon Mapper, and MethaneSAT, will revolutionize the production of near real-time quantitative emission data, enabling determination of total emissions for key regions and sub-regions with greatly increased accuracy.

The collection and use of independent, measurement-based data will be key to assessing the accuracy

and completeness of reporting and to identify major discrepancies among datasets. Over the next couple of years, IMEO will be assembling a first-of-its-kind comprehensive open, reliable, integrated emissions dataset, which can be used to accelerate mitigation efforts. These data will be readily accessible by industry, investors, policymakers and the general public alike. When combined with a push for industry to enhance its monitoring and the transparency of the resulting data, the ability to find and eliminate methane emissions is enhanced even more.

This improved understanding of emissions based on empirical data will dramatically improve the accountability of industry as well as the ability of policymakers to target regulations effectively. It will also support companies' strategic investment decisions.

Yet having granular data is not enough. Reducing emissions necessitates bridging the gap between data and action. This requires a set of institutional arrangements that brings together the parties, enables learning, and provides accountability and transparency – at a global scale and with relevant speed. With foresight, the institutions to deliver the upcoming data revolution have already been created. This is mainly the Global Methane Pledge and its data arm, UNEP's International Methane Emissions Observatory. With these key components in place, alongside initiatives such as the Global Methane Hub, the UNEP-convened CCAC, the International Energy Agency, and satellite operators, the world is poised to harness the transformative power of enhanced data availability on methane emissions and to translate it into concrete mitigation measures.

1.2 Accountability and Agency

Progress requires action and accountability from those with the agency to reduce emissions.

Data need to be measurement-based, accurate and publicly available to ensure accountability. They also need to be relevant to the individuals who have the agency to fix emissions, rather than being merely allocated or reliant on emission factors. The imminent methane data revolution will fulfil these needs. However, making these new data relevant to the actors who need to make investments, change operational practices, or evolve a company culture requires an additional step. The availability of transparent emissions data is therefore necessary, but insufficient.

UNEP's International Methane Emissions Observatory is designed to enable a diversity of stakeholders to move from empirical measurements to action. It achieves this by integrating independent data from a diversity of sources and making these data accessible and intelligible for policymakers, companies and the public. As data sources multiply, integrating and reconciling them into a coherent set is an essential step to avoid a cacophony of seemingly contradictory observed emissions.

IMEO recently played this role when it consolidated multiple measurements of the massive 2022 Nord Stream twin pipeline leak into a single unified perspective. Previously publicized measurements had exhibited substantial discrepancies, sometimes differing by an order of magnitude. Yet, by integrating those data in a transparent manner, it was possible to show how they were in fact providing a consistent picture of overall methane emissions from the leak and how they varied over time.

Oil and gas methane emissions generally exhibit high spatial and temporal variability, so multiple measurements may seem disparate yet may also be simultaneously true, because they measure emissions at different moments and from different sources. From these disparate pieces, a coherent whole can usually be constructed by deploying transparent integration techniques. In a sense, each observer of the Nord Stream leak was measuring a piece of the proverbial "elephant," but it took a sustained data integration effort to assemble all the pieces into a coherent picture of the entire animal and how the different parts relate to each other. Given the rapid proliferation of measurement tools and scales, as well as substantial variability of methane emissions among sources, a successful mitigation effort requires a neutral institution to perform data integration.

IMEO will provide a methodology and the empirical data to underpin a Methane Supply Index, which will enable recognized authorities to accurately characterize the methane footprint of various global supply chains (Box 3).

More accurate data will allow policymakers to set specific targets for reductions by sector and regions and to determine if emission reductions are taking place. Companies and their asset managers will be able to better identify where to focus their mitigation efforts.

To bridge the gap between data and action, a structural connection with those who have the agency to reduce emissions is necessary, particularly with asset managers. Initiatives such as UNEP's Oil and Gas Methane Partnership 2.0 (OGMP 2.0) play a vital role in this regard. OGMP 2.0 collaborates with companies to enhance the quality and quantity of empirical measurements and to report the resulting data. Importantly, the highest level of reporting (the so-called Gold Standard) requires a reconciliation of source- and site-level measurements. The individual and collective progress of OGMP 2.0 member companies on this journey is documented in section 3 of this report.

Box 3. The Methane Supply Index

Accurately quantifying methane emissions from an oil and gas industry supply chain into a particular market provides a basis for buyers to discriminate purchasing or for regulators to levy fees. For example, the European Union Methane Strategy describes such a requirement.

To ensure credibility and effectiveness, the index must be published by a neutral entity. IMEO will maintain a **Methane Supply Index** methodology and publish the index data.



Photo credit: Envato

1.3 Mind the Gap

There is a large difference between global measurement-based assessments and industry-reported emissions.

While the full data revolution is still ahead, enough preliminary and partial measurements are now available to hint at the extent of the knowledge gap that needs to be collectively bridged to effectively mitigate methane emissions.

An increasing body of scientific studies has estimated that the total global methane emissions from the oil and gas industry are in the range of 80-140 million tonnes per year, representing 20-40 per cent of global anthropogenic methane emissions. These estimates are based on a combination of atmospheric inverse modelling and isotope source apportionment (Schwietzke *et al.* 2016; Hmiel *et al.* 2020; Saunio *et al.* 2020). The International Energy Agency's (IEA) methane tracker estimates emissions at the lower end of this range (IEA 2022). Oil and gas production assets generally contribute the most significantly, releasing an estimated 75 per cent of the total oil and gas emissions (IEA 2022).

In 2021, the then-72 member companies of the OGMP 2.0, representing just under one-third of global oil and gas production, reported 1.3 million tonnes of methane emissions from both operated and non-operated assets. These company-reported emissions are more than an order of magnitude lower than what would be expected based on the atmospheric measurements.

In the reporting for 2022, total emissions from the now 92 member companies of the OGMP 2.0 – representing 34 per cent of global oil and gas production – amounted to 1.6 million tonnes. However, this was still a mere 2 per cent of the total methane emissions from the oil and gas industry. For 2023, IMEO expects at least another 3 per cent of production to be added to the reporting, for a total of 37 per cent industry coverage. Clearly there continues to be a large difference that needs to be understood.

While the quality of reported data on methane emissions has improved, the majority of assets are still not reporting measurement-based estimates (so-called Level 4 and Level 5 reporting under the OGMP 2.0), and many non-operated assets of OGMP 2.0 member companies were not reported. There is also the possibility that the emissions of non-OGMP 2.0-members could be on average much higher than those of current members, although the difference would have to be huge to account for the discrepancy.

The difference between methane observations and OGMP 2.0 reported emissions is consistently large across all regions. Comparing the country totals with IEA data (IEA 2022) or the early satellite assessments of country emissions (e.g. Shen *et al.* 2023) does not yet provide conclusive evidence of gap differences between countries or regions. Not only does the quality of the bottom-up data from the companies needs to progress further towards OGMP 2.0 Level 5, but the uncertainties in the satellite measurements are still too great to provide concrete guidance.



Photo credit: Fluxys Belgium - David Samyn

1.4 Expanding to All Five Sectors

IMEO's country baselining studies will push empirical measurements into all five sectors.

In its 2022 Annual Report, IMEO introduced the framing of “one gas, five sectors,” emphasizing that each of the five main methane-emitting sectors – oil and gas, coal, waste, rice and livestock – requires a distinct theory of change and thus specific mitigation strategies.

This departure from the traditional focus on the pollutant itself shifts the attention towards the polluters and agents who can undertake mitigation activities. A methane molecule has the same climate impact whether it is emitted by a cow or by a leaky valve in an oilfield. However, it is important to recognize the significant differences among the sectors responsible for methane emissions, including variations in the polluters' agency, access to capital and knowledge, as well as available technical and regulatory solutions.

To enhance understanding and empirical quantification of methane emissions, in 2023 IMEO is launching a new series of country baselining studies across multiple sectors. These studies couple multi-scale, top-down approaches (e.g. a combination of regional-level measurements with more detailed site-level measurements) with more granular analysis of bottom-up data led by local sectoral experts.

This integrated approach aims to improve the understanding of key methane emission sources specific to selected countries.

Initially, the focus will be on countries that have existing methane measurement capacity and reduced logistical constraints, in order to test the applicability of existing approaches across all sectors and to refine methodologies so that they are applicable to countries that have less existing capacity to undertake the required measurements. This effort will be closely followed by a focus on countries where limited empirical emission data are currently available. IMEO will select the countries for this effort in consultation with a range of stakeholders, including the countries themselves.

IMEO's baselining studies are designed to be useful to governments, civil society, industry and other stakeholders in prioritizing actions to reduce methane emissions. Concurrently, IMEO is working with partners, including within the processes of the Intergovernmental Panel on Climate Change (IPCC), to develop engagement plans with countries focused on translating the study findings into policies, strategies and opportunities for improving updated Nationally Determined Contributions towards reducing greenhouse gas emissions under the Paris Agreement; incorporating direct measurement data into national inventories; and other opportunities.



Photo credit: Fluxys Belgium - David Samyn

1.5 Reducing the Climate Footprint of Steel

Methane emissions represent on average one-third of the climate footprint of steel.

Several options exist to abate methane emissions from the steel supply chain. High levels of decarbonization can be realized in the medium to long term with several technology options under consideration, such as hydrogen, and possibly through closed-loop carbon cycling or direct reduction. Selecting the most appropriate method, scaling and cost reduction are all priority areas. Mitigating methane emissions, which on average account for one-third of the climate footprint of the steel supply chain, is a cost-effective and no regret option under any decarbonization scenario for the sector. To achieve this, it is crucial to differentiate between metallurgical coal and thermal coal.

Methane emissions from metallurgical coal have a material impact on climate change, exceeding the impacts of carbon dioxide emissions from the commercial aviation sector in the first 20 years after they are emitted. As the world races towards minimizing the carbon footprints of industries, UNEP's IMEO is focusing on the short-term opportunity represented by methane mitigation in the steel value chain.

The initiative seeks to define the Gold Standard for measurement, reporting and verification (MRV) of methane emissions, combined with ambitious mitigation targets consistent with the Global Methane Pledge and the IEA's scenario for net zero greenhouse gas emissions by 2050. It also aims to meet the urgent need in the steel industry to reduce coal mine methane to a much smaller share of steel's overall climate footprint related to the use of conventional blast furnace technology.

This builds on UNEP's success with the Oil and Gas Methane Partnership 2.0 (OGMP 2.0). The cost of mitigating the vast majority of abatable emissions from metallurgical coal is estimated to be less than 1 per cent of the price of steel. This makes it a viable solution in the short to medium term, while full decarbonization is accelerated and the cost further reduced.



Photo credit: Image-Source/ Envato

1.6 The IMEO Data Timeline

Integration of multiple methane data sources is at the heart of IMEO – a five-year plan.

In light of the improvements in the acquisition and transparency of methane data, and the experience of the past two years of data collection and analysis, IMEO is providing an outlook of the type and granularity of information that it can expect to provide over the next five years. Notably, this schedule is IMEO's current expectation and will be revised as the work continues and analyses are improved.

IMEO's core mission revolves around integrating and correlating data from multiple sources, including

independent satellite measurements, various methane science studies and data sources, OGMP 2.0 company reports and national inventories. Each of these sources operates on different time and spatial scales, and has varying levels of uncertainty. The challenges posed by data integration include obtaining access to all available data as well as determining emissions at varying spatial scales (e.g. regional, country). An important use of the data is as input for a Methane Supply Index, which policymakers have requested as a way to increase transparency regarding international trade routes.

Table 1 provides a summary of the main IMEO data expected over the next five years (2023-2027).

Table 1: IMEO data integration five-year plan, 2023-2027

	PLAN ITEM	FURTHER INFORMATION
2023	MARS version 0 pilot phase Collection of multiple data streams Development and implementation of OGMP 2.0 reporting platform	Public data on plumes, alerts and responses OGMP 2.0 / Science / Inventories / Satellite For companies to input their reported data
2024	Oil and Gas Methane Supply Index version 0 MARS version 1 User Interface design for IMEO public data platform First wave of reconciled (Level 5) OGMP 2.0 estimates Expand to other sectors Analysis of emission patterns, assessment of gaps, key discrepancies	Methodology and cases Definition and user category testing from early OGMP 2.0 members IMEO baseline studies
2025	IMEO public data platform deployment (version 0) Oil & Gas Methane Supply Index version 1 Deepened analysis of emission patterns, assessment of gaps, key discrepancies	Country-level data for GMP baseline and compliance Artificial Intelligence and Machine Learning analysis
2026	Oil & Gas Methane Supply Index version 2	Inclusion of OGMP 2.0 Level 5 data
2027	Root-cause analysis	Establish root cause of heavy-tailed nature of emission distributions



02

MARS: New Global System to Identify Methane Emissions

The innovative MARS approach connects satellite data with those who can act on emissions.



Photo credit: The European Space Agency

At the 2022 UN Climate Change Conference in Sharm El-Sheikh, Egypt (COP27), UNEP's IMEO launched the Methane Alert and Response System (MARS). MARS is the first global system that connects satellite-detected methane emissions with a transparent notification process that promotes on-the-ground emission mitigation efforts.

Since January 2023, IMEO has detected nearly 1,500 methane plumes across the globe from the energy sector (Table 2). Of these plumes, nearly 600 could be attributed to facilities using higher-resolution satellites. This allowed UNEP's MARS initiative to notify government focal points and relevant OGMP 2.0 member companies with actionable information on 127 of these plumes in the oil and gas sector.

IMEO is working with the IEA and the CCAC, with support from co-conveners and champions of the Global Methane Pledge, to engage more countries and to scale up action.

MARS provides actionable and transparent data on methane emissions from satellites, and thereby incentivizes corporations and governments to credibly reduce their methane emissions. MARS harnesses available state-of-the-art satellite data to 1) identify major emission hot spots and events (plumes), 2) activate a network of partners to determine and notify relevant stakeholders, and 3) support and track progress towards mitigation. Through MARS, UNEP's IMEO is building the infrastructure and practice to take full advantage of the upcoming data revolution, to deliver unprecedented transparency on methane emissions.

2.1 MARS – Strengthening Collaboration

Four cross-cutting components for emission reductions.

A key feature in the design of MARS is ensuring that the data on methane emission events reach the individuals who have the agency to act. Simultaneously, the OGMP 2.0 team has been engaging company members on MARS.

MARS consists of four major components to connect data to action (Figure 1).

Figure 1: Four main components of MARS



In **Component 1**, UNEP’s IMEO collaborates with Kayrros SAS and the Netherlands Institute for Space Research (SRON) to use the existing suite of public Earth observation satellites to detect, localize and characterize large emission sources across the globe. Global mapping satellites – such as the European Space Agency’s TROPOMI instrument – are used to identify “hot spot” regions (where one or more sources consistently contribute to greatly elevated methane concentrations) or very large, discrete methane plumes. These data are used to define “regions of Interest” that are further explored using higher-resolution satellites that enable hot spot and emission events to be attributed to specific facilities. Archived data can also be used to determine if emissions from a given facility have occurred in the past. MARS then uses other non-satellite datasets and information from governments and operators to characterize the types of emitting facilities and to determine ownership.

In **Component 2**, relevant government and company stakeholders are informed of events happening in or near their jurisdictions or operations. In all cases, notifications are provided to government-appointed focal points, who are requested to acknowledge receipt of the notification within two days. IMEO also requests the government to assist in notifying – and, in some cases, helping to identify – the facility operator. If the operator is a member of OGMP 2.0, IMEO simultaneously sends the notification to the operator and the government.

In **Component 3**, the notified stakeholders determine how best to respond to the MARS notification, potentially with support from partners the IEA and the CCAC. Once the operators have determined the root causes of the emissions and have developed or implemented mitigation plans, they are asked to communicate this information to IMEO.

Component 4 of MARS includes event-tracking, data documentation and collaborative learning to improve the system. Following the trial phase, within 45 to 75 days post-detection, IMEO will publicly disclose all satellited-detected emission events. The goal is to foster collaboration across the MARS ecosystem to draw lessons from notified events that can be applied to improve MARS and methane action in general.

IMEO is working with a variety of partners on the design and implementation of MARS. The system was designed in collaboration with stakeholders in the European Commission, the United States of America, the IEA and the CCAC. Moving forward, IMEO will continue to work with other partners, such as the World Bank, to implement and improve MARS processes as well as support countries to be able to use these data to mitigate the observed emissions.



Image credit: Kayrros SAS

2.2 Correlating Multiple Satellites

The MARS pilot phase enabled successful notification of 127 emission events.

UNEP's IMEO began the pilot phase of MARS in January 2023 to test the technical aspects of the system. IMEO also worked with partners to improve processes prior to MARS becoming fully operational in late 2023, with full disclosure of all past and ongoing alerts.

Table 2 lists the number of plumes detected through 15 November 2023 by IMEO, as well as the number of plumes notified, by region, as part of MARS.

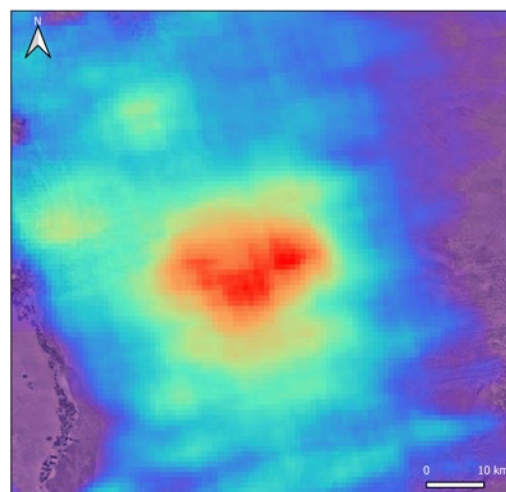


Image credit: TROPOMI hot spot – IMEO

Table 2: Summary of energy sector (coal, oil, and gas) methane emissions detected by IMEO, by region, for 2023 through 15 November.

Region	TROPOMI Hot-Spots		TROPOMI Plumes		Higher-Resolution Plumes		Government Notified Plumes
	Coal	Oil & Gas	Coal	Oil & Gas	Coal	Oil & Gas	Oil & Gas
Central & South America	0	1	0	3	0	11	11
Europe	5	1	11	6	7	0	0
Middle East	0	14	1	59	0	124	46
North Africa	0	5	0	25	0	148	9
North America	7	13	25	137	5	34	32
Southeast Asia & Oceania	4	0	14	0	0	10	10
Russia & Central Asia	16	37	78	373	0	76	18
South & East Asia	21	6	109	10	180	14	0
Southern Africa	3	1	17	0	0	3	1
Total	56	78	255	613	192	420	127

Note: TROPOMI hot spots are determined by averaging observations of enhanced methane concentration and are indicative of regions with one or more persistently emitting sources (Source: SRON). TROPOMI plumes are very large emission events (>10,000 kilograms of methane). Higher-resolution plumes result from analysis of data from Sentinel-2, Landsat 8 or 9, EnMAP and PRISMA. These plumes are around 1,000 kilograms of methane per hour. Note that only higher-resolution plumes can be used for a notification because these data allow for attribution at the facility scale.

Currently events are only notified for Oil & Gas once IMEO has been able to commence government engagement.

2.3 MARS Case Study: Successful Mitigation

A large emission source was collaboratively eliminated in Argentina.

IMEO began engaging the government of Argentina on methane action with a training in 2021. Argentina agreed to be a MARS pilot country, identified a focal point for notification and agreed on a process for responding to a MARS notification.

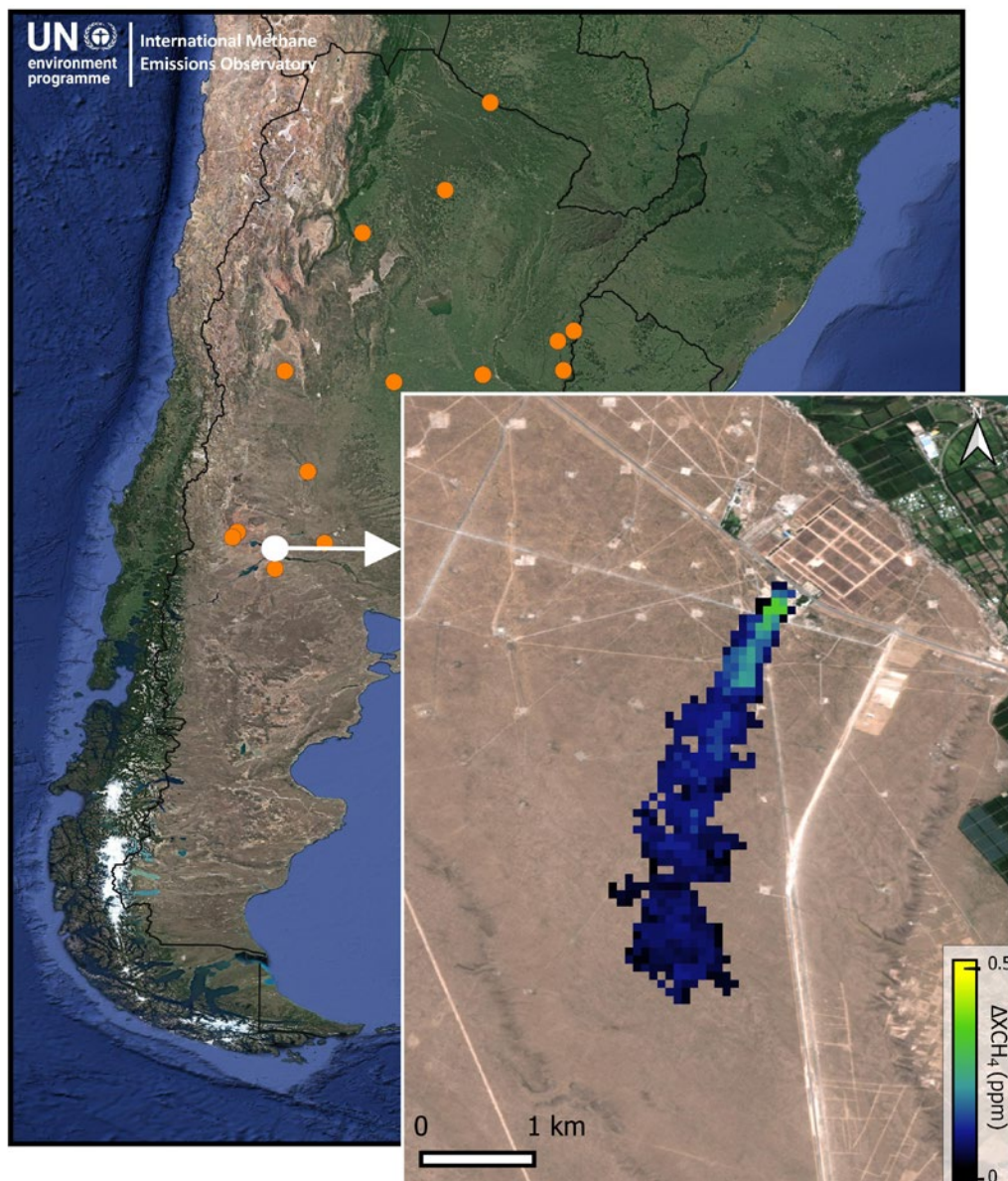
Between January and March 2023, MARS detected 10 methane plumes in Argentina associated with 3 oil and gas facilities. These events were combined into a single notification and provided to the government-nominated focal point. In turn, the government shared the report with

the relevant operators. Operators promptly responded to the notification and shared the requested information on the source, cause and mitigation actions taken.

For one of the detected events, the operator noted that the event was due to an equipment failure, specifically the rupture of tubes in the heat exchanger. Once the leak was identified, the compressor was taken out of service, the tubes were sealed, and a leak verification plan with an infrared camera was implemented. Subsequently, no further emissions have been detected in this location.

IMEO is continuing to engage with the government and with members of industry in Argentina to raise awareness about MARS, build capacity among stakeholders on methane emissions, and address any other emission events when they are detected (Figure 2).

Figure 2: MARS methane event detections in Argentina, 2021-2023



The image (below/on the right) shows a methane plume detected by EMIT on January 29, 2023

Note: Orange dots indicate the estimated location of methane emissions detected by the lower-resolution global mapping TROPOMI sensor onboard the European Space Agency's Sentinel-5P satellite between January 2021 and August 2023.

OGMP 2.0: Radical Transparency in the Oil and Gas Sector

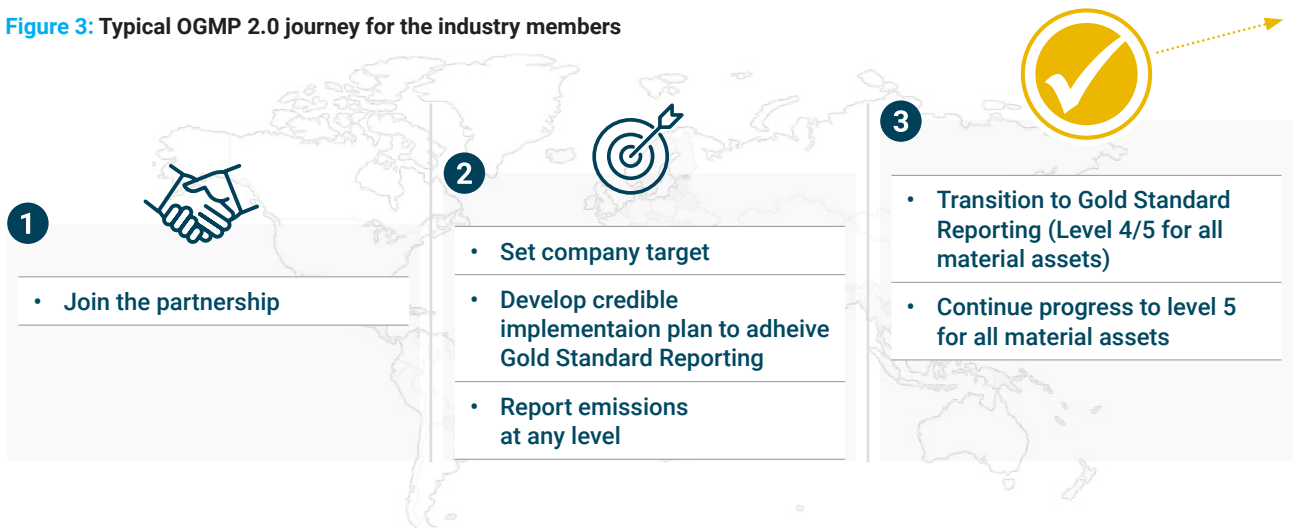
3.1 Robust Growth for OGMP 2.0

OGMP 2.0 is on the brink of transitioning from the Gold Standard pathway to Gold Standard reporting.

OGMP 2.0 was engineered to evolve (Figure 3), ensuring that the programme could move from aspiration to practice, while remaining steadfast in its theory of change

and embracing the differing starting points of individual members' journeys to reduce methane emissions. This transformation embraces the process, resulting in credible and steady progress while adhering to the OGMP 2.0 timeline for incremental progress, rather than the endpoint alone. OGMP 2.0 has a principle-based, rather than a rule-based approach, to accommodate the operational diversity of its members and to allow innovation in measurement and mitigation approaches.

Figure 3: Typical OGMP 2.0 journey for the industry members



While members join in various stages of their emission discovery and the required mitigation, Gold Standard reporting sets out rigorous deadlines against which a member must transition its emissions understanding to greater granularity and higher quality (Box 4 and Figure 4). Members commit to improve the quality of their methane emission data to Levels 4 and 5 by the third year of reporting for all material operated assets and by year five for all material non-operated assets. They document this with a comprehensive implementation plan.

Through the rapid transition to higher-quality and more complete understanding of emissions, on an asset-by-asset basis at the source level, operators develop the critical data necessary to implement meaningful mitigation and for asset managers to prioritize capital towards the largest and most cost-effective reduction opportunities.

More than half of the current OGMP 2.0 members submitted their second annual report in May 2023. This means that they will transition to Gold Standard reporting in 2024, with implementation of their Level 4 methods and Level 5 reconciliation well under way.



Photo credit: Saskatchewan Research Council

Box 4. The five OGMP 2.0 reporting levels

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

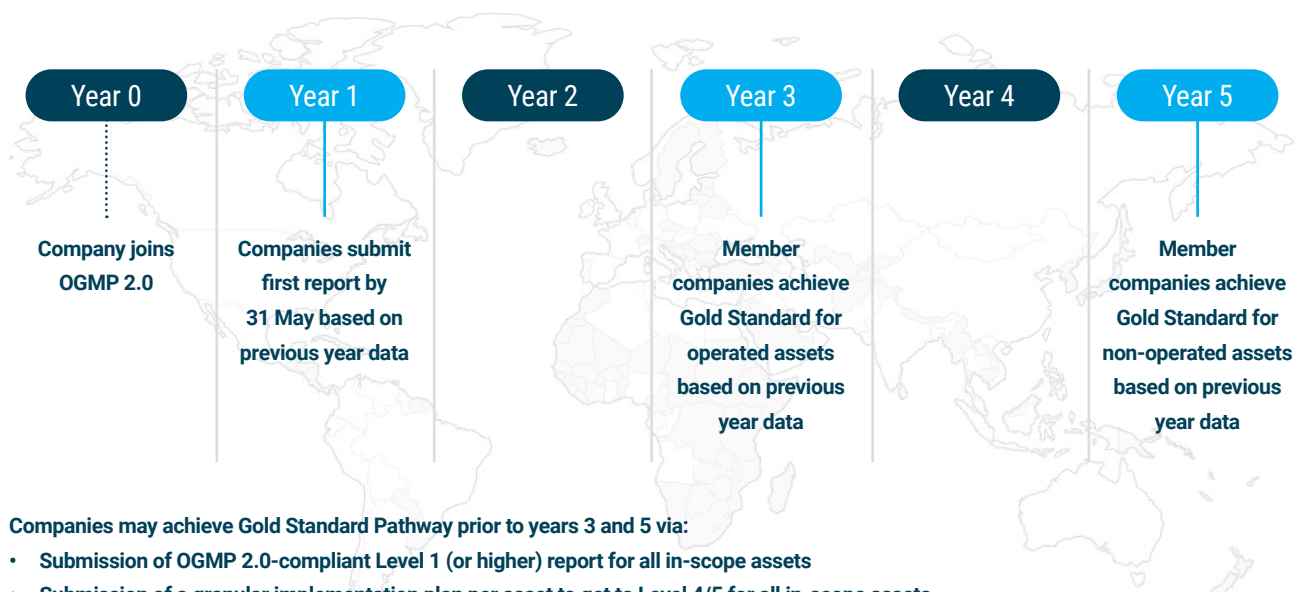
Level 2 - Emissions reported in consolidated, simplified source categories (based on the International Association of Oil & Gas Producers five categories for upstream emissions and on MARCOGAZ' three categories for midstream and downstream emissions), using a variety of quantification methodologies, progressively up to the asset level, when available.

Level 3 – Emissions reported by detailed source type and using generic emission factors.

Level 4 – Emissions reported by detailed source type and using specific emission factors and activity factors. Source-level measurement and sampling may be used as the basis for establishing these specific emission factors and activity factors, although other source-specific quantification methodologies such as simulation tools and detailed engineering calculations (e.g., as referenced in existing OGMP Technical Guidance Documents) may be used where appropriate.

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

Figure 4: OGMP 2.0 timeline for Gold Standard reporting of methane emissions



Companies may achieve Gold Standard Pathway prior to years 3 and 5 via:

- Submission of OGMP 2.0-compliant Level 1 (or higher) report for all in-scope assets
- Submission of a granular implementation plan per asset to get to Level 4/5 for all in-scope assets
- Establishing a methane reduction target



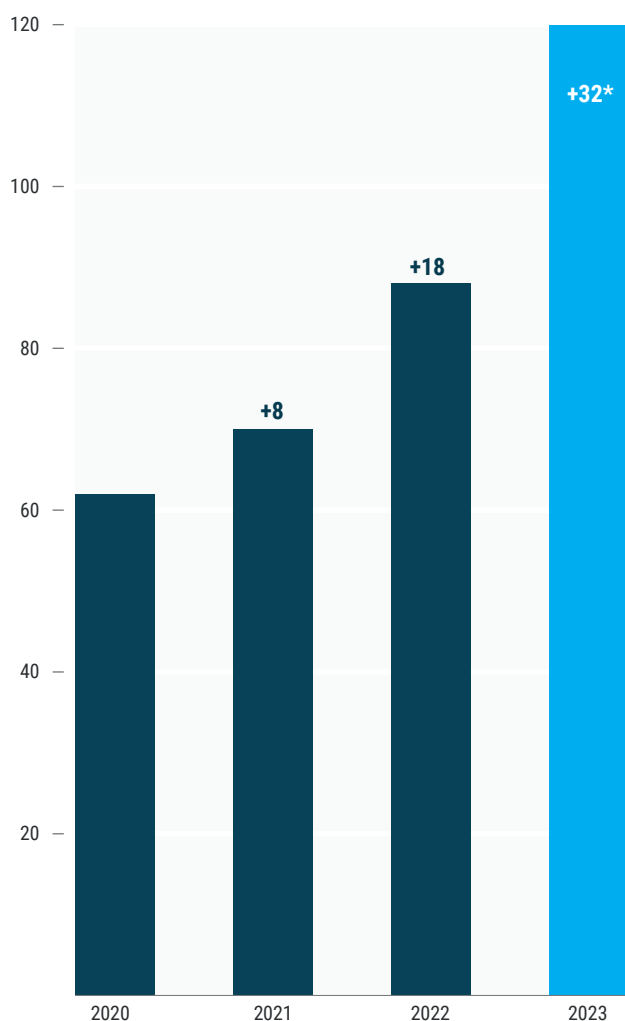
Photo credit: SNAM

Robust growth was achieved for the third year in a row.

OGMP 2.0 is on a trajectory of rapid growth, with the partnership poised to nearly double its membership by the close of 2023 compared to the initial 62 members who joined in 2020 (Figure 5). The projected expansion to 120 companies in 2023 reflects significant progress. Notably, the partnership is experiencing substantial growth in membership from key fossil fuel-producing regions throughout the Americas and from major national oil companies globally.

The growing global preference for OGMP 2.0 as the pre-eminent measurement, reporting and verification (MRV) framework can be attributed to three distinctive and compelling characteristics that set it apart.

Figure 5: Growth in OGMP 2.0 membership, from its inception in 2020 through 2023



* projected number of new companies joining OGMP 2.0 until the end of 2023.



Photo credit: Envato

1. OGMP 2.0 wholeheartedly embraces its identity as a partnership and a dynamic community of practice.

This means that it not only provides a set of guidelines and standards, but also fosters collaboration and knowledge-sharing among operators and stakeholders. It thrives on collective expertise and on the synergy generated by the diverse voices within its community.

2. OGMP 2.0 stands out by meeting operators where they are in their individual methane emission reduction journey.

It offers a pragmatic and robust pathway tailored to the specific needs and circumstances of each participant. This adaptability ensures that companies can effectively progress towards credible methane emissions reduction regardless of their starting point.

3. OGMP 2.0 delivers a consistent and globally recognized foundation for achieving high-quality data, which drives credible emission reductions.

The true value lies not only in the end results but also in the process. OGMP 2.0 provides a protocol to help companies systematically manage their methane emissions, and offers a credible platform for member companies to demonstrate actual reductions to industry stakeholders. By applying the framework comprehensively, from the foundational materiality analysis to the progression to Levels 4 and 5, asset managers have complete ownership and buy-in to their own understanding of emissions. This detailed information, collected with the involvement of the asset managers themselves, gives them the agency to take decisive, effective and credible action to drive down global methane emissions.

OGMP 2.0 is a trusted partner across diverse stakeholders.

For institutional investors, the OGMP 2.0 Gold Standard has emerged as a trusted and comprehensive indicator of responsible methane emissions management within its member companies. Investors have increasingly turned to this framework to gauge the commitment of these organizations to methane emission stewardship.

Investors traditionally relied on standardized disclosures and the sustainability reports of individual companies to gain insights into the methane emissions management of companies in their investment portfolio. However, the absence of consistent and universally accepted information did not allow for a clear comparison of relative performance in methane emission mitigation. In response to this challenge, investors sought a more robust solution, and they found it in OGMP 2.0 (Box 5).

Box 5. OGMP 2.0 as an indicator of performance

OGMP 2.0 provides investors with a binary indicator to assess companies' methane performance. Companies that achieve OGMP 2.0 Gold Standard reporting can be trusted by investors as responsible players when it comes to methane emissions management.

In close collaboration with its partner Environmental Defense Fund (EDF), and in partnership with the UNEP Finance Initiative, OGMP 2.0 is engaging with investors to encourage companies to join the partnership. In 2023, OGMP 2.0 joined forces with EDF, Nordea Asset Management (the largest asset owner in Northern Europe), Amundi (the largest asset owner in Europe) and the California State Teachers Retirement System (the second largest pension fund in the United States of America) to organize meetings with target companies in selected regions to encourage them to join OGMP 2.0.

"CalSTRS sees OGMP 2.0 as a symbol of collective action by the industry to address methane, and encourages all upstream, midstream and gas distribution companies in its portfolio to adopt the framework. It's good for the climate and good for business."

—Aeisha Mastagni, Portfolio Manager, California State Teachers Retirement System

"Curbing methane by companies really just amounts to prudent risk management for the investors involved. OGMP 2.0 is a way for us to lock in real wins in terms of investment value as well as slowing global warming. Regulation is being considered in some jurisdictions, aligned with the Paris Agreement, but companies everywhere should act now in curbing their methane emissions."

—Eric Christian Pedersen, Head of Responsible Investments, Nordea Asset Management

Additionally, the partnership has extended its reach by welcoming the Clean Air Task Force, a U.S.-based non-governmental organization, as a non-company member. OGMP 2.0 is now a frequently referenced standard in voluntary and regulatory frameworks alike. For example, the certification body Equitable Origin requires membership in OGMP 2.0 and Gold Standard reporting as progressive performance targets within its Greenhouse Gas Emissions Objective, embedded within the EO100™ Standard for Responsible Energy Development (Equitable Origin 2022). The measurement-based approach of OGMP 2.0 also guides the proposed European Methane Regulation for the energy sector (European Commission 2021) and the draft Methane Intensity Verification rule for the U.S. state of Colorado (Colorado Department of Public Health and Environment 2023).

IMEO is actively engaged in a collaboration with the COP28 Presidency to broaden its involvement with both national and international oil companies while simultaneously embracing ambitious methane reduction targets and mitigation strategies.



Photo credit: Envato

OGMP 2.0 global coverage has expanded across all segments, but remains relatively low in many regions.

OGMP 2.0 members from 68 countries now jointly represent 37 per cent of global oil and gas production, more than 80 per cent of liquefied natural gas (LNG) liquefaction capacity, around 25 per cent of global natural gas transmission and distribution pipelines by length, and more than 20 per cent of global underground storage capacity (Table 3).

Table 3: Coverage of OGMP 2.0 member assets

Industry segment	Operated assets	Operated and non-operated assets
Production (source: Rystad Energy 2022)	19% of upstream production	37% of upstream production
LNG (source: International Group of Liquefied Natural Gas Importers 2022)	26% of nominal liquefaction capacity	81% of nominal liquefaction capacity
Transmission and distribution pipelines (source: Pakistan Credit Rating Agency 2021)	not available	25% of global pipeline length
Underground storage (source: International Gas Union 2021)	20% of underground storage capacity	20% of underground storage capacity

In 2022, the partnership welcomed its first **South-East Asian** member company, Petronas of Malaysia. OGMP 2.0 has also expanded to previously underrepresented regions and countries. The greatest relative expansion has been in **North America**, with the U.S. membership nearly doubling to 20 (Table 4). **European** participation continued to see steady growth, adding 14 new members in late 2022 and the first half of 2023 across all segments, including Romgaz and ONE-Dyas.

Table 4: U.S. company membership of OGMP 2.0

US membership	
Upstream	APA Corporation, Diamondback Energy, EOG Resources, Presidio Petroleum, Civitas Resources, ConocoPhillips, Crescent Energy, Devon Energy, Diamondback Energy, Diversified Energy Company, Oxy, PDC Energy, Pioneer Natural Resources, Pure West Energy, TRP Energy, Wapiti Energy, EQT Corporation, Jonah Energy
Midstream	Cheniere, Williams

Another area of strong growth has been in membership from **national oil companies**, with the addition of Petronas, Petrobras and PetroEcuador. National oil companies have a critical role to play in achieving methane emission reductions, since they are the largest producers of oil and gas globally, accounting for more than half of oil and gas production and nearly two-thirds of oil and gas reserves. Their unique relationship with national governments offers them an opportunity to influence oil and gas investments and operations in their home countries. In some cases, the national oil company functions as the national regulator, defining local environmental practices.

The production segment significantly expanded membership in the **Latin America and Caribbean** region, which brings coverage to 52 per cent of oil and gas production, where 37 per cent of production is operated by OGMP 2.0 members.

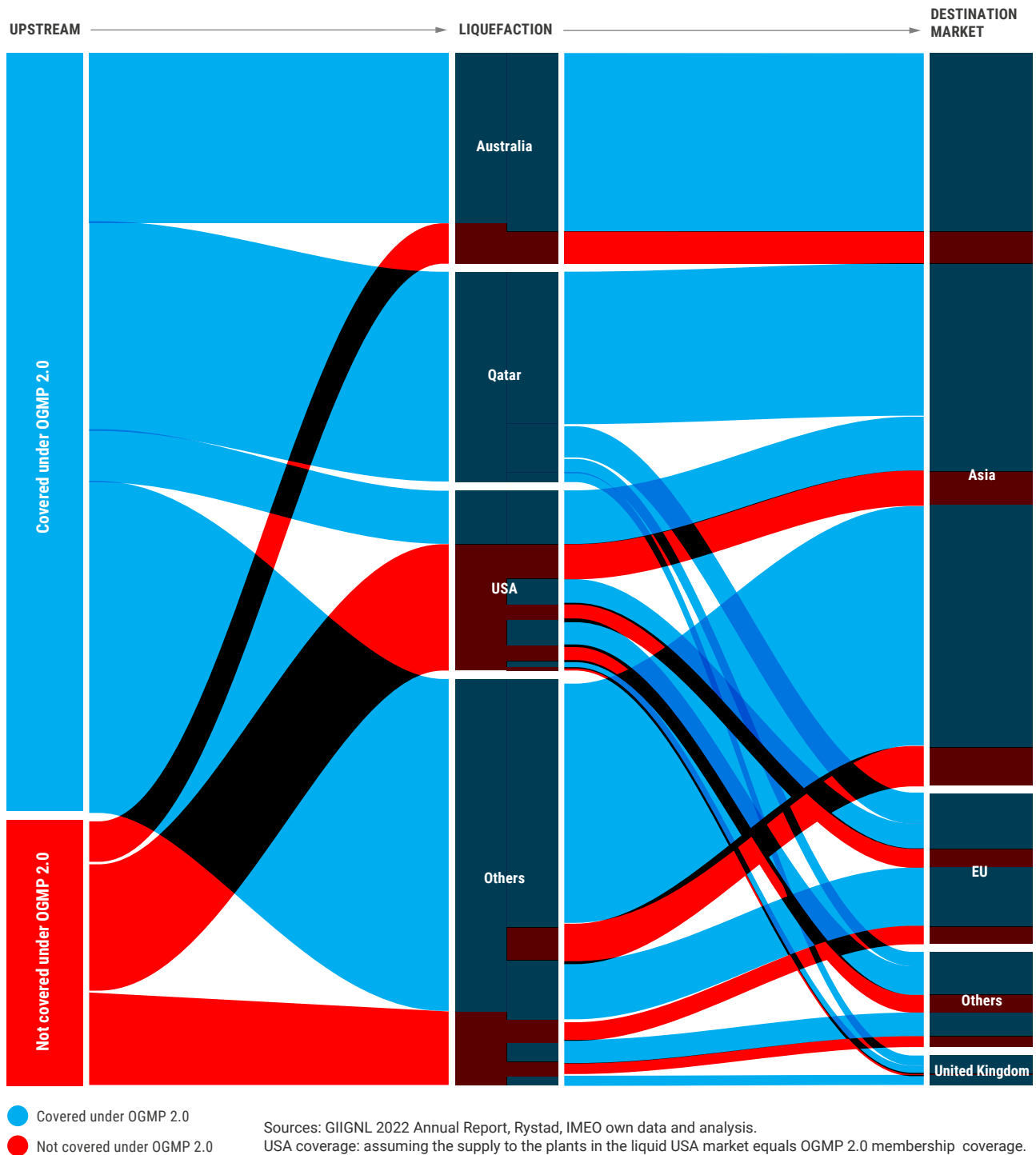


Photo credit: Envato

OGMP 2.0 saw notable growth in coverage of **global LNG**, with the addition of Nigeria LNG and Cheniere. Although upstream production accounts for the majority of emissions, customer leverage in LNG destination markets has the potential to strongly influence emission performance. However, to enable buyer leverage in destination markets,

comprehensive data on the relative emissions intensity of producing regions are essential. Figure 6 depicts the OGMP 2.0 coverage of the LNG value chain. Except for the United States of America, due to its deep liquid gas markets, the upstream production is mostly dedicated to each liquefaction plant.

Figure 6: LNG supply chain share covered by OGMP 2.0 Source: IMEO analysis



3.2 A Community of Practice

Learning together to improve mitigation efficacy.

OGMP 2.0 has evolved into a vibrant community of practice, benefiting both new and existing members. Within this thriving ecosystem, knowledge-sharing among members has become instrumental in advancing methane management practices. This collective learning serves to accelerate progress across the industry.

The intrinsic value of the community was palpable at the inaugural in-person OGMP 2.0 Implementation Conference held in March 2023. This event saw participation from more than 120 representatives, comprising both companies and non-company members. They engaged in joint problem-solving, sharing valuable insights and best practices in plenary sessions and specialized technical break-out groups. These sessions were strategically focused on topics that were jointly identified as high priorities for the partnership. This included critical subjects such as the implementation of OGMP 2.0 reporting requirements, companies' real-world experiences with site-level measurements and reconciliation, and the engagement of joint venture partners.

As a testament to continued collaboration, three new Technical Guidance Documents (TGDs) were approved. These TGDs specifically address the detailed elements of the LNG value chain, encompassing shipping, liquefaction and regasification. This expansion of resources brings the total number of TGDs within OGMP 2.0 to 19, enhancing the depth and breadth of guidance available to members and stakeholders. Additional TGDs are under development, and TGDs developed early in the partnership are under evaluation for updating based on learnings over the last several years.



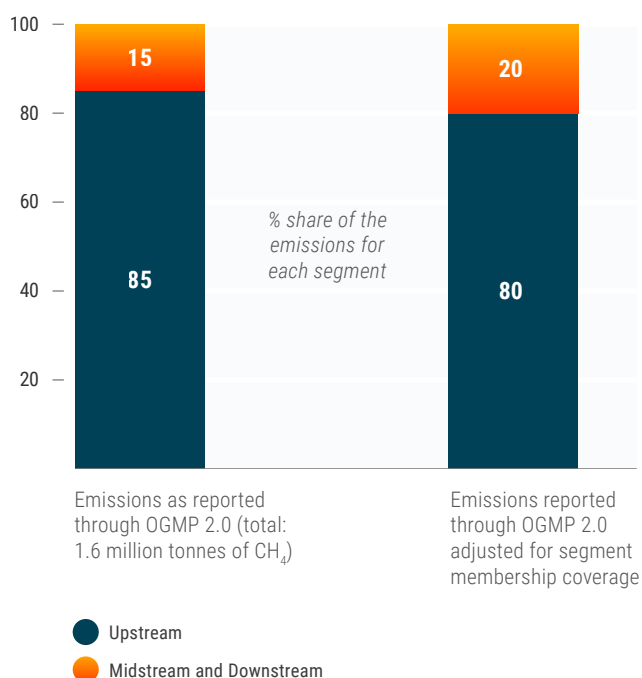
OGMP 2.0 Implementation Conference 2023.
Photo: Ricardo Fernandez/ IMEO 2023

3.3 Data Quality and Uncertainty

Consistent emission trends, mostly upstream, with strongly lagging data for non-operated assets.

For 2022, reported methane emissions across the partnership totalled 1.6 million tonnes. The upstream segment was responsible for 85 per cent of the emissions, or more than five times the emissions of the mid and downstream segments from all assets reported under OGMP 2.0 (Figure 7). This distribution persists when emissions are adjusted for members' asset type.

Figure 7: Share of oil and gas methane emissions by segment type as reported through OGMP 2.0 and adjusted for segment membership coverage



Both operated and non-operated emissions are included in this breakdown. Coverage adjusted emissions were calculated by dividing total emissions of each segment type by global segment coverage. Asset types that were considered are upstream production, LNG liquefaction, LNG regasification, underground storage, shipping, transmission and distribution.

For each asset within the scope, companies are required to specify the quantification methodologies used for estimating emissions. OGMP 2.0 recognizes the inherent diversity in methane management practice and offers a structured approach for companies to classify their asset-level reporting into five distinct reporting levels (Box 4). In line with the principles underpinning the reporting framework, companies seek to progress all assets that have material methane emissions to the highest reporting levels. Notably, companies may have assets spanning multiple reporting levels, especially in the initial stages.

These reporting levels reflect a combination of two types of improvements:

1. Reporting granularity, ranging from asset-level single values to granular, source-level reporting that has been quality assured through asset-level reconciliation with independent site-level measurement.
2. Quantification methodologies employed, ranging from generic or source-specific emission factors, to engineering calculations, to simulations, to direct measurements.

Collectively, these reporting levels provide a primary indicator of increasing data quality and reduced uncertainty.

As expected, the average reporting level, which for now is the only quantifiable indicator of the quality of the OGMP 2.0 data, has decreased in aggregate due to the overall growth in membership, where new member companies generally report at lower levels. However, upon more detailed inspection, the year-on-year reporting for companies progressing within the partnership shows an increase in the average reporting level.

The upstream sector saw a robust increase in the total emissions reported, with 12 new companies reporting their year 1 emissions and 3 additional companies voluntarily reporting ahead of their deadline to submit a first annual report. However, emission reporting levels in aggregate continue to be moderate (lacking significant measurement-based emission data) for operated assets and low for non-operated assets.

Table 5 shows the evolution of the average reporting levels achieved in 2023 by OGMP 2.0 companies' assets, by segment type and operatorship.

Table 5: Emission-weighted average reporting levels by segment type and operatorship of assets (includes all companies from 2023)

Segment	Operated	Non-operated
Upstream	3.0	2.5
Midstream	3.2	2.4
Downstream	3.6	3.3
Average	3.1	2.5

The year-on-year reporting level for a comparable group of companies continues to grow consistently with the implementation plans provided by the companies. This is evidenced by comparing average reporting levels for companies that reported in both 2023 and 2022; for these companies, the average reporting level has increased, as shown in Table 6.

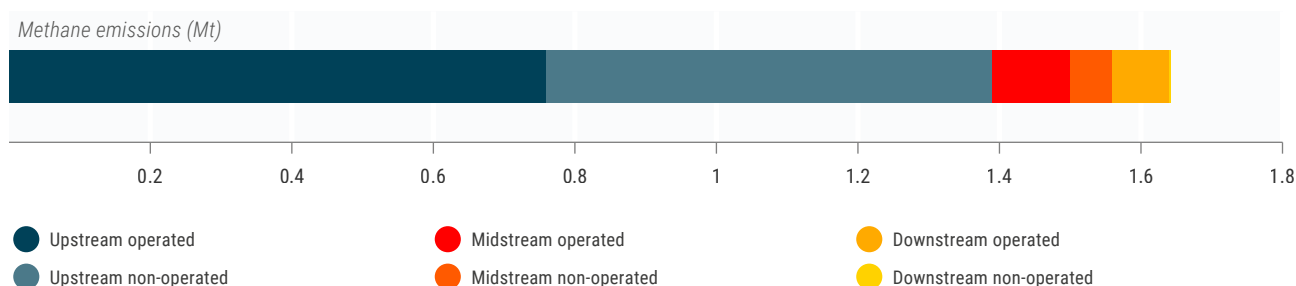
Table 6: Average reporting levels for companies that reported in both 2022 and 2023 (operated assets only)

Segment	Average reporting level	
	2022	2023
Upstream	3.2	3.4
Midstream	3.3	3.7
Downstream	3.0	3.6

For example, the share of upstream emissions from operated assets reported at Level 4 increases from 3 per cent for companies in their first year to 45 per cent for companies in their second year. This is in line with the OGMP 2.0 timelines to reach Gold Standard reporting within three years for operated assets and five years for non-operated assets.

In 2022, 45 per cent of reported upstream emissions were from non-operated assets (Figure 8). But many other non-operated upstream assets did not provide data yet. As a result, the share of emissions from non-operated assets will likely rise in the future as more assets report measured emissions.

Figure 8: Emissions reported through OGMP 2.0 by segment type and operatorship of assets, 2022.



3.4 Findings: Emissions by Region

OGMP 2.0 covers a diverse portfolio of assets in each region.

The rapid growth in OGMP 2.0 membership over the past three years predictably has led to a diverse mix of oil and gas assets being covered across world regions. Major assets from every region are included. For example, Europe is the only region for OGMP 2.0 data where the membership includes a majority of midstream assets and a minority of upstream assets (Figure 9). Conversely, OGMP 2.0 coverage for the United States of America is dominated by production-related (upstream) emissions, limited midstream assets and no downstream assets. Recruitment efforts for new companies are focusing on expanding coverage and leveraging the interconnected structure of the industry through joint ventures.

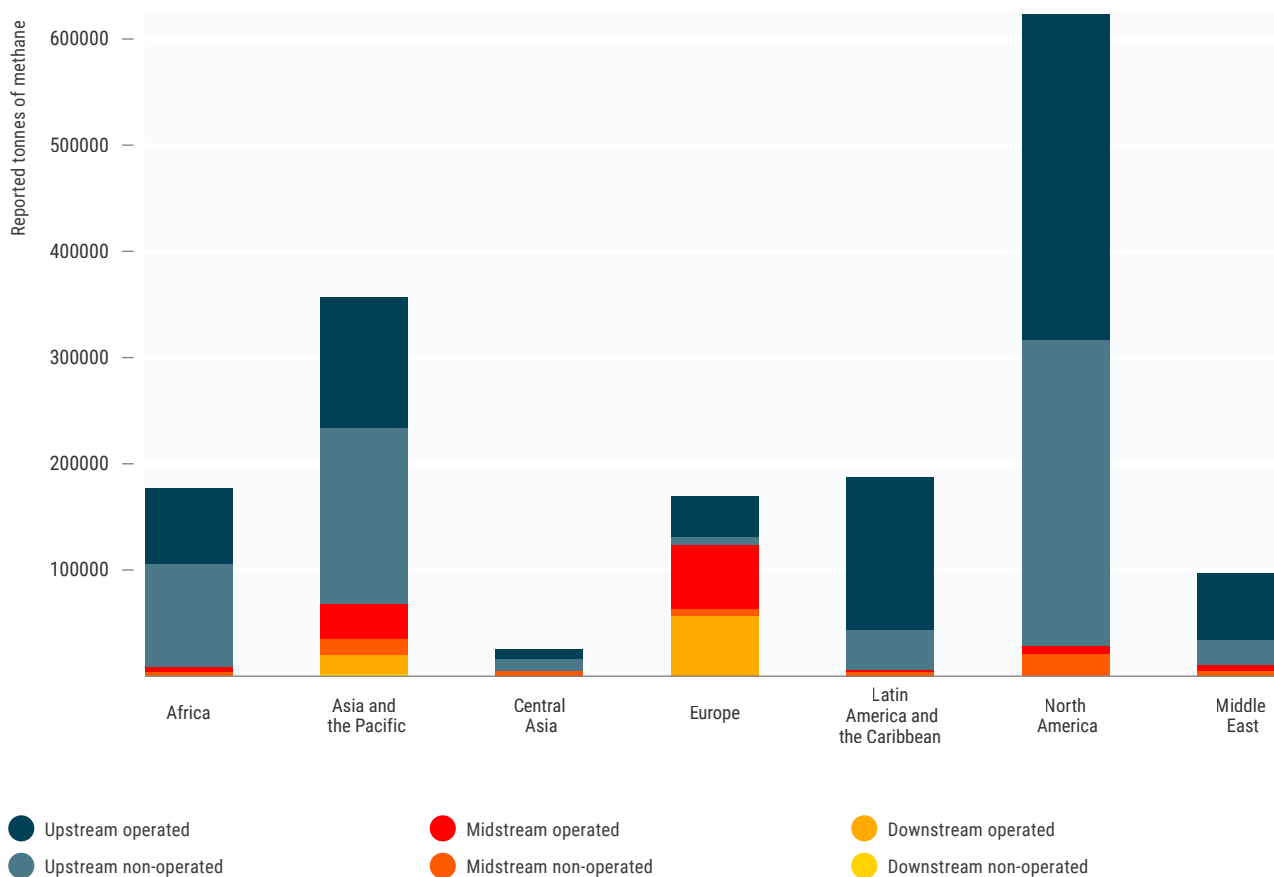
3.5 Findings: Quantification Methodologies

Asset-specific methods for quantifying methane emissions, especially paired with site-level measurements and reconciliation, are critical to achieving emission reductions.

OGMP 2.0 has evolved into a vibrant community of practice, benefiting both new and existing members. Within this thriving ecosystem, knowledge-sharing among members has become instrumental in advancing methane management practices. This collective learning serves to accelerate progress across the industry.

As companies improve their Level 4 reporting of methane emissions, quantification methods at the source level continue to evolve (Box 6). Detailed engineering calculations appear to be preferred, at least for the first sources to transition to Level 4 reporting. This may be because it is simpler to use Level 4 methods that are engineering-based. Whether this is an indication of a more systematic preference, or simply a transition effect, is not known at this time.

Figure 9: Total reported methane emissions (tonnes) by segment, region and operatorship of assets, 2022.



Across all asset segments, engineering calculations remain the dominant Level 4 method for quantifying vented emissions, although measurements using gas flow metering are becoming more prevalent for some types of vented emissions in the upstream sector.

For stationary combustion, companies are developing asset/equipment-specific emission factors, which are applied in combination with flow meter measurements and gas composition analysis.

Fugitive emissions are observed during leak detection inspections (“leak detection and repair” or LDAR campaigns) using technologies such as Flame Ionisation Detector (FID) and optical gas imaging, which frequently quantify emissions for all or a subset of leaks with a special type of OGI camera that provides quantification estimates (qOGI). It is also possible to combine detection with measurement using a Hi-Flow Sampler or with correlation factors included in recognized international standards. If not all leaks are quantified directly, companies conduct measurements on a representative sample of the components to obtain measurement-based emission factors.

In distribution grids, due to the complexity of underground leaks in urban environments and restrictions associated with local jurisdictions, operators often use mathematical formulas derived from theoretical fluid dynamics to estimate emissions. Nevertheless, several companies are trialling new approaches for direct quantification, particularly through the use of sensors mounted on vehicles that can travel through urban and rural areas.

Figure 10: Shares of reported Level 3 and Level 4 emissions, by source, 2022.

	Level 3 %	Level 4 %
Fugitive Component and Equipment Leaks	53 %	16 %
Venting - Natural gas driven pneumatic equipment	16 %	11 %
Stationary Combustion	16 %	29 %
Venting - Well liquids unloading	8 %	3 %
Venting - Tanks	5 %	2 %
Flaring - Incomplete combustion	2 %	35 %
Venting - Other	0 %	4 %

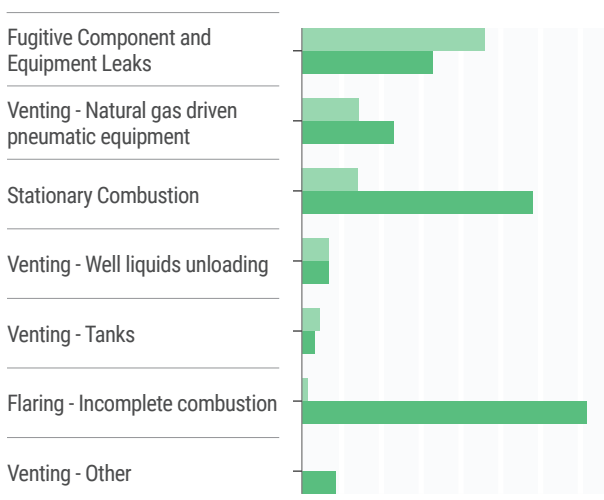
Box 6. Case study: Increasing the data quality for a more effective mitigation strategy

One of OGMP 2.0’s U.S. member companies compared Level 3 and Level 4 reporting for its 2022 methane emissions. Level 3 emissions were estimated based on generic emission factors (U.S. Environmental Protection Agency Subpart W), and Level 4 emissions were quantified according to asset-specific methods (measurements, simulation tools and detailed engineering calculations).

The operator found that Level 4 reported emissions were 2.3 times higher than Level 3 estimates (Figure 10) and yielded substantially different source attributions for the emissions (Figure 11). This confirms that empirical measurements lead to a materially improved assessment of emissions, with further improvements expected at Level 5. Research from Stanford University confirms that for U.S. assets, nearly a factor two increase in the emission inventory can be expected in this process (Rutherford et al. 2021).

This improved emission transparency is allowing the company to design the most cost-effective methane reduction strategy by targeting capital to reduce the largest actual emission sources.

Figure 11: Comparison of reported Level 3 and Level 4 emissions source, in absolute terms*, 2022



*In absolute terms the Level 4 emissions were reported to be 2.3x of that of the Level 3.

● Level 3 ● Level 4

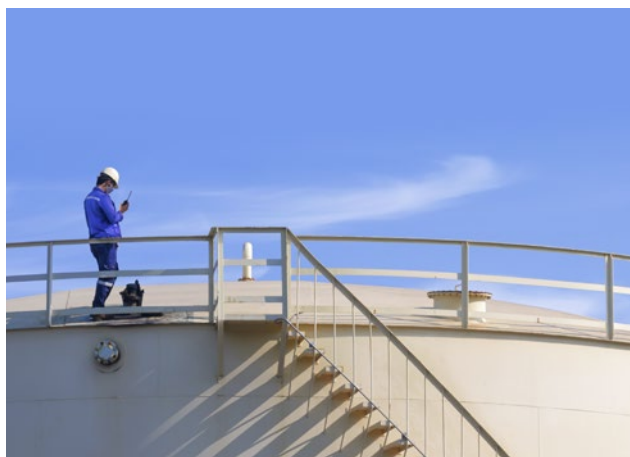
3.6 Company Highlights

Stories of progress by OGMP 2.0 member companies.

Measurement champions

- **ConocoPhillips** provided a detailed and transparent implementation plan and reporting. The company's robust implementation plan includes specialized efforts for each region that consider technologies best suited for each major emission source per region, including detailed plans for site selection to be used in measurement campaigns. ConocoPhillips also provided an excellent description of its approach to data reconciliation. It supplied a detailed assessment of current reporting levels of non-operated joint venture companies, and of potential collaboration and engagement with non-operated joint venture operators and shareholders.
- **Energinet's** reporting sets a high level of transparency. Each of the company's assets was reported separately and described in detail. This confirms that some OGMP 2.0 emission sources are not present, and provides an order-of-magnitude check of the emission profile. Energinet submitted a robust and credible implementation plan to achieve Gold Standard reporting in year 3.
- **Equinor** put in place an ambitious plan to ensure robust technology testing and early piloting, as well as an impressive effort to develop Level 4 methods and tools for all assets that will expedite and facilitate data reconciliation.
- **Italgas** submitted one of the most ambitious implementation plans for its downstream assets. The company performed site-level measurements in its complete network and is already working on data reconciliation. In addition, Italgas is testing several site-level technologies, designing proof-of-concept and setting up a new test field for controlled gas releases in distribution installations.
- **Jonah** showed a continued commitment to follow its implementation plan, including impressive steps in site-level measurements and attempting data reconciliation, acquiring measurement technologies, and conducting expansive measurement campaigns on a significant portion of emission sources. Jonah's approach to attain Gold Standard reporting by the third year is commendable and confirms that Level 5 is well within reach for smaller operators. The company's approach includes thoughtful consideration of sample size, measurement campaign design, and measurement uncertainties and their respective detection thresholds.

- **Storengy France** submitted a robust and credible implementation plan. The company performed site-level measurements for one of its assets, including ongoing reconciliation of source-level quantification and site-level measurements, as well as an assessment of the associated uncertainty. Storengy France was particularly transparent in its reporting, including detailed descriptions and graphics of assets.



Group efforts and member collaborations to accelerate learnings

- **Cheniere, EQT and Williams** are sponsoring the Energy and Emissions Modeling Data Lab, a multidisciplinary research and education initiative to provide reliable, science-based, transparent, measurement-informed methane assessments by developing publicly available models and datasets.
- A group of European midstream operators launched a new phase of the European Gas Research Group (GERG) project to improve knowledge on how to reconcile estimations of source- and site-level methane emissions at midstream sites. Tests included 11 different cutting-edge technologies and took place at a transmission compressor station operated by **Fluxys**. The project is coordinated by **Enagás** and supported by **Gasunie, GRTgaz, Medgaz, Open Grid Europe, Snam, Storengy, and Uniper**, among others.
- The **German transmission system operators** are collaborating to improve their understanding of site-level technologies and data reconciliation. They will be testing a set of technologies at different types of transmission installations.
- Two groups of **distribution system operators** established collaboration in their respective countries, and together they are achieving more than each could individually. This reveals that good governance and the ability to work together can fast-track improvements in quantification methods and overall reporting quality.

- In Germany, the **Thüga Group (Energienetze Bayern, Schwaben Netz, Thüga Energienetze)**, **EWE NETZ** and **Netze-Gesellschaft Südwest** partnered and established a research project at the national level to develop measurement-based emission factors for both below-ground pipelines and above-ground facilities. Companies are also collaborating to test site-level measurements and work on data reconciliation.
- In the Netherlands, **Coteq, Enexis, Liander, NV RENDO, Stedin** and **Westland** worked together to effectively co-create implementation plans. They were also able to carry out and share results to set measurement-based emission factors for the different sources of methane emissions at the national level.

All-stars of non-operated joint venture engagement

- **TotalEnergies** has submitted one of the most comprehensive strategies for engaging its non-operated joint ventures. The company has provided detailed information on how it is supporting, progressing and collaborating with each non-operated joint venture. It has also provided detailed observations on its reconciliation attempts and a gap analysis process. In addition, TotalEnergies is providing technology access and support to its non-operated joint venture operators.

Recognized endeavours

- As part of its Quantification, Monitoring, Reporting and Verification (QMRV) project, **Cheniere** is taking impressive steps to test multiple emission measurement methods, models and technologies in an effort to provide more accurate, timely and measurement-informed emission inventories not only on its installations, but also along its complete value chain in collaboration with

other operators. Cheniere opted not to set a performance target for its initial implementation plan and 2022 annual report before completing its QMRV studies.

- **Naftogaz** has greatly improved its reporting, especially with increased granularity of data. However, due to the difficult circumstances related to the Russian Federation's war in Ukraine, it was not possible for the company to set a reduction target.

Significant progress

- **China Gas** has seen major improvements in its reporting since 2021 in terms of data quality and overall engagement. The company employs a variety of quantification methods and also set an emission target for non-operated joint ventures (a step that is encouraged by the framework for all members).
- **Ecopetrol** is one of the companies reporting at the highest level of asset granularity. It is also undertaking site-level measurements with different technologies.
- **ENI** greatly improved its implementation plan, especially with respect to materiality analysis and detailed planning for the source-level quantification.
- **Ewe Gasspeicher** showed noteworthy year-on-year improvement in its reporting. Not only did the company move all of its assets from Level 3 to Level 4, but it also updated its target to be more ambitious and prepared a sound implementation plan.
- **Repsol** greatly improved the quality of its implementation plan and the transparency of its reporting, in particular with the information provided on divestments and on non-operated joint venture engagement and collaboration.



Photo credit: Envato

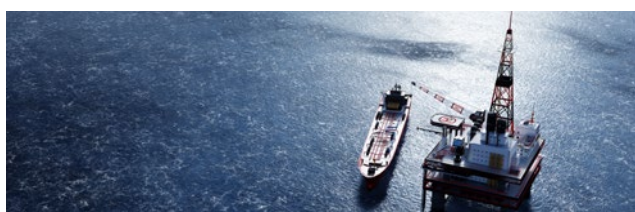
3.7 Company Performance Targets

The majority of companies set intensity performance targets for their upstream assets.

Upstream companies prefer intensity targets. This generally reflects the nature of the upstream business where company production portfolio is quite dynamic year over year and the business expectation tends to be growth oriented. Accordingly, many operators prefer intensity-based targets to leave room for production growth overtime with an emphasis on producing future barrels with greater emissions efficiency than historical performance. While this is understandable from a business perspective, it is at odds with the decarbonization efforts needed to keep the average temperature increase to 1.5 degrees Celsius. Further, generally accepted industry convention, such as the methane intensity targets of OGCI, NGSi and others have, proposed intensity-based targets for several years for upstream. Conversely, there is a preference for absolute reduction targets for the mid and downstream, which tend to have more stable asset portfolios year over year (Figure 12).

Half of the OGMP 2.0 member companies report emissions for 2022 that are already below their 2025 target. However, this may reflect the fact that actual emissions may be higher than historically reported values based on generic methods for estimating emissions. It is expected that companies will review and potentially ratchet up their targets in the next few years once they have achieved OGMP 2.0 Gold Standard reporting.

Photo credit: Envato



3.8 Divestment

In 2022, 49 OGMP 2.0 assets reported by members were divested overwhelmingly outside the partnership.

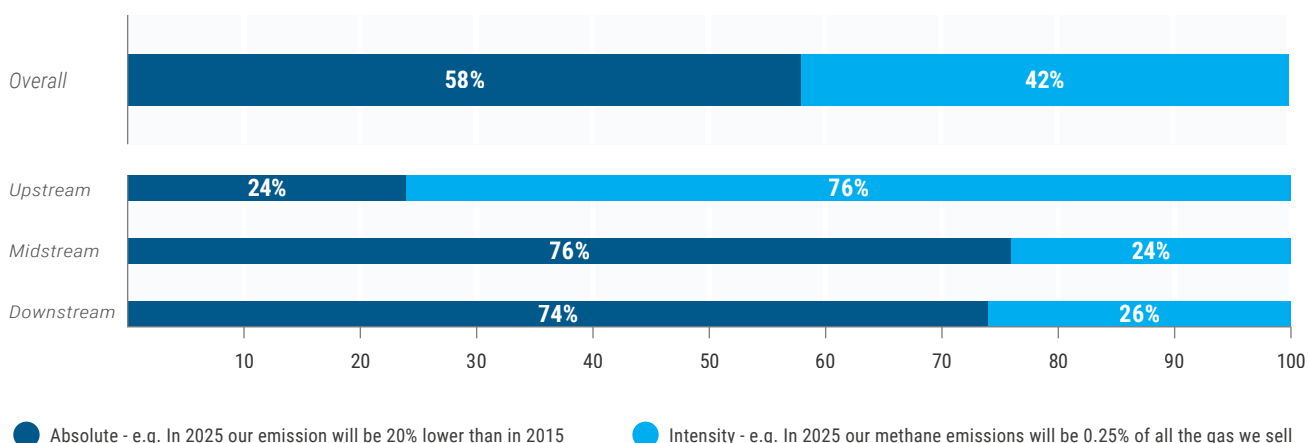
At times, OGMP 2.0 member companies divest assets that are within the scope of OGMP 2.0 to non-OGMP 2.0 member companies. This means that these assets are subtracted from the company's assets for which the measurement of methane emissions is on a continuous path of improvement, and that are subject to the performance target of the company. The visibility and accountability of those assets is lost. It is thus important to track the number of assets divested outside the scope of OGMP 2.0.

In 2022, 49 assets were reported as divested by nine OGMP 2.0 company members, with 96 per cent of them upstream and the majority divested outside the partnership, as evidenced by public data. Table 7 summarizes the regional and operational distribution of those assets.

Table 7: Assets divested by OGMP 2.0 members in 2022

	Total	Operated	Non-Operated
Africa	12	3	9
Asia and Pacific	11	3	8
Russia	11	0	11
Europe	4	1	3
Latin America and the Caribbean	3	1	2
Middle East	1	0	1
North America	7	3	4
Global	49	11	38

Figure 12: Choice of company targets among OGMP 2.0 members, by segment, by company (not adjusted to emissions volumes).



Methane Science Update

4.1 IMEO's Science Approach

Reducing uncertainty in magnitude and location of methane emissions based on multi-scale measurements.

The goal of IMEO's science studies is to reduce the uncertainty in the location and magnitude of methane emissions through measurement studies published in the peer-reviewed literature and the reconciliation of measurement-based emission data. The studies focus mainly on geographical regions and/or sources for which there is limited or no publicly available empirically based emission data (Figure 13). Their objective is to improve the understanding of emission patterns and/or to guide mitigation action. The studies allow for methodology

development and expanding capacity in research institutions, to provide the companies that need to actually mitigate the emissions with more guidance and stronger local partners.

There are five core guiding principles of the studies, which are the basis for the integrity of IMEO's science work:

1. Studies are led by academic/research scientists.
2. Studies employ multiple measurement and emission quantification methodologies whenever possible.
3. The full scientific process – from scoping of the study to publication – is reviewed by an independent panel of scientific experts in IMEO's Scientific Oversight Committee (SOC).
4. All emission measurement data are made publicly available.
5. Results are published in peer-reviewed journals.

Figure 13: Ongoing and published IMEO studies.



To date, UNEP has launched 34 studies in collaboration with 31 academic and research institutions across 19 countries, leading to the publication of 20 peer-reviewed papers, while 23 studies are ongoing. In 2023, IMEO's Scientific Oversight Committee approved eight new

science studies (including one proposal adding a solid waste component to the existing Oman study), and a total of eight papers have been published since the publication of the last IMEO annual report – with an additional two papers expected by the end of 2023.

4.2 Oil and Gas Methane Science Studies

Reducing the uncertainty in oil and gas emissions across key regions.

The oil and gas science studies continue to collect policy-relevant data to improve the understanding of key emitting regions and segments of the oil and gas supply chain. As an example of this, Innocenti *et al.* (2023) collected empirical data on LNG liquefaction and regasification facilities across different world regions. Although more data are needed to fully characterize emissions from the LNG segment, this study underscores the importance of empirical data; prior to the study, most emissions estimates for LNG sites were based on emission factors and engineering calculations. The study also highlights the presence of high emissions related to equipment leaks and large non-continuous sources that demonstrate the continuing need for full-site surveying for leak detection, maintenance and repair processes to minimize emissions.

Similarly, significant progress has been made in integrating multi-scale measurement-based emissions estimates, such as described in the Nord Stream example in Box 7. In Romania, the ROMEQ project (Romanian Methane Emissions from Oil & Gas) – which included researchers from ten European Union institutions – deployed several measurement-based approaches (i.e., to characterize emissions at a component, facility and basin scale) during a field campaign that took place in the autumn of 2019. Three papers (Delre *et al.* 2022; Korbeń *et al.* 2022; Menoud *et al.* 2022) were published in 2022 using data collected during the field campaign, and an additional paper (Stavropoulou *et al.* 2023) was published in 2023 that integrated site-level and source-level data. In that paper, researchers found that oil production sites in Southern Romania emit at least 2.5 times more methane than previously reported. Importantly, the synthesis of collected data identified venting and equipment leaks as key mitigation opportunities for the Romanian oil production sector; similar sources and abatement options can be expected for other oil production regions. Additional ongoing work will integrate airborne-based measurements.



Photo credit: SNAAM

Box 7. Nord Stream: Making sense of diverse methane measurements

On September 26, 2022, explosions of the underwater Nord Stream twin pipeline systems resulted in the leakage of fossil gas to the atmosphere. The incident prompted several scientific research groups to estimate the methane emissions from this event, leading to numerous emission estimates published in news outlets and scientific journals. Understandably, these estimates were published rapidly and showed considerable divergence due to the diversity of assumptions used to calculate emissions. Based on these initial estimates, IMEO published a draft working paper that integrated the existing estimates to generate a plausible wide range of total emissions of 75-230 kilotonnes of methane (UNEP 2023). This finding indicated that the event could potentially be the largest observed release of methane into the atmosphere from a single event.

Following up on this initial effort, IMEO collaborated with more than 20 international research groups that have estimated methane emissions from the Nord Stream explosion to produce a more refined emissions estimate. These research groups applied diverse estimation methodologies including physical volumetric calculations (bottom-up estimates) and sea-based, tower, aerial and satellite measurements (top-down estimates). The wide range of results reflected variations in assumptions and the types of observations made, necessitating harmonization into a more fully integrated assessment. To facilitate this process, IMEO has coordinated data-sharing among research organizations. The resulting project will be submitted for publication in a peer-reviewed scientific journal.

4.3 Coal Methane Science Studies

Establishing an approach for comparing top-down and bottom-up coal mine methane emission estimates.

Methane emissions from coal mining account for around 15 per cent of total global anthropogenic methane emissions, releasing around 43 million tonnes of methane into the atmosphere annually (Saunois *et al.* 2020). Improving the characterization of sources of coal mine methane emissions is necessary to help prioritize the mitigation efforts of companies and governments. Emission sources

(e.g. surface mines, ventilation shafts and draining stations) have vastly different spatial-temporal behaviours that require different management approaches.

IMEO has initiated a Coal Mine Methane Science Studies Program to improve understanding of methane emissions from the coal sector. The primary, although not exclusive, focus is on metallurgical coal mines, which are part of the steel industry supply chain and contribute on average one-third of the climate footprint of steel (see section 1.5).

The goals of the coal science studies include: 1) establish an approach for comparing top-down and bottom-up coal mine methane emission quantification and reporting via collaboration of experts in bottom-up and top-down methods as well as mine operators; 2) apply the approach in different countries using local and satellite studies, reconcile top-down and bottom-up results, and characterize uncertainties; and 3) subject to data availability at required scale and detection limit, quantify coal mine methane emissions using satellite studies in additional countries as a means towards deriving an empirically based global estimate of coal mine methane emissions.

The science studies began with a literature review that identified current gaps in understanding of global coal mine methane emissions. The review highlighted the dynamic nature of coal mine methane emission sources, which can show significant divergence among different mines. It further noted the highly variable nature of the emissions at a given mine over time, given that coal mining is a dynamic process. The literature review also evidenced a lack of bottom-up to top-down comparative analysis or reconciliation.

To address these points, two field studies were launched in Poland and Australia in 2022, both with different multi-scale measurement approaches, including satellite and aerial components. The techniques from these studies will provide a fuller picture of emissions from coal mines.

One of the expected factors requiring careful examination relates to temporal variability of emissions and the reporting methods applied across countries. Establishing a protocol for comparing coal mine methane emission estimates based on top-down and bottom-up approaches and reported values is a path towards enabling 1) verification of currently reported global coal mine methane emissions, 2) verification of reporting of future mitigation activities, 3) characterization of uncertainties related to bottom-up and top-down approaches, and 4) potential re-assessment of the magnitude of mitigation across world regions.

4.4 Looking Forward

Filling key emissions data gaps.

The focus of IMEO's science studies has been the oil, gas and coal sectors (see Table 8 and Table 9), with initial scoping of studies that include other sectors, such as IMEO's baselining studies and initial work with top-down quantification of emissions from Canadian landfills. Future IMEO scientific work will also focus on improving the characterization of key emission sources and advancing and homogenizing robust testing and validation of methane monitoring technologies. There will be a particular focus on flaring efficiency, as the evidence suggests that this source is significantly under-reported (Plant *et al.* 2022).

Initial scoping of IMEO baselining studies

Over the past decade, several methane measurement-based approaches at the site/facility, regional, and country scales have provided robust emission estimates to quantify current emissions, track changes over time and identify key sources of emissions. The site/facility and regional-scale approaches have been largely applied to characterize methane emissions associated with the oil and gas value chain. These top-down approaches have relied on ground-based mobile measurements, airborne-based measurements, tower networks and satellite remote sensing. Existing methodologies are now mature enough to be rapidly deployed and will provide accurate estimates of emissions if applied consistently with the assumed conditions (e.g. the sampling frequency captures potential variability in emissions and the method employs representative/unbiased/stratified sampling).

IMEO is in the initial scoping phase of a set of country baselining studies that will couple multi-scale, regional-level, top-down measurements with more detailed site-level measurements that include more granular analysis of bottom-up data. The work will be led by local sectoral experts with a focus on improving the understanding of key methane emission sources relevant in each country.

Initially, a country with a robust methane measurement capacity and minimal logistical constraints will be selected to test the applicability of existing approaches across all sectors and improve methodologies where needed; this in turn can inform how to effectively collect high-quality data in other countries. For example, these studies require a straightforward process to obtain measurement/flight permits and the availability of scientific instruments. However, the focus of the baselining studies will mostly be countries where data quality on methane emissions is relatively low and where limited empirically based emission data are available. IMEO will select the countries in consultation with stakeholders.

Specifically, robust top-down measurement-based approaches for measuring some non-fossil sources still need to be developed, such as for rice fields. IMEO's baselining studies will allocate resources to facilitate and advance this work.

Towards a robust validation of methane monitoring technologies

It has been encouraging to see that a growing number of methane monitoring service providers offer technologies capable of detection and quantification of methane emissions. These service providers often claim that their technologies are ready and fit for purpose to deliver measurement-based estimates of methane emissions at a variety of site typologies. Many of these service providers have conducted some form of "controlled release" testing; however, there is a lack of transparency and consistency across testing methods to assess the robustness of technologies with integrity.

As countries and industries adopt measurement-based estimation approaches (e.g. OGMP 2.0, the methane fee under the US Inflation Reduction Act, and draft methane regulations in the European Union), it will be necessary to ensure that the methods that are used to detect and quantify the emissions are robustly traceable and comparable to each other.

A robust testing protocol that defines how testing is conducted and how results are disclosed is critical for reported data to have credibility. It is applicable to methane monitoring service providers, regulators, and the scientific community and is best led by the global metrology community. IMEO is expanding current single-blind validation efforts geographically (Box 8) and will be convening the metrology community to lead and coordinate the development of a set of recommendations of best practices for controlled release testing for methane emission detection and quantification. These recommendations can then serve as the basis of regulatory requirements and industry best practices.

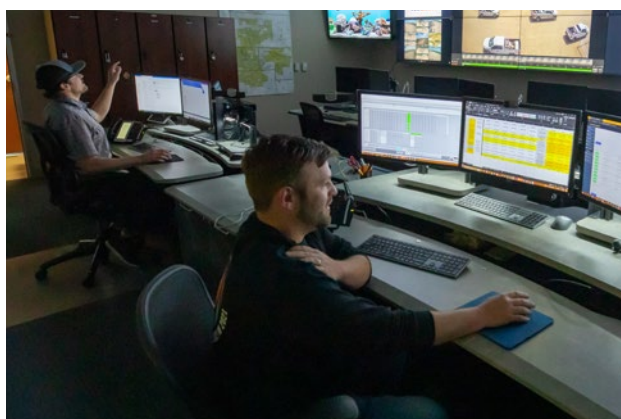


Photo credit: PDC Energy

Box 8. Single-blind validation of methane-sensing technologies

Accurate quantification of methane emissions is crucial for both tracking mitigation and to inform regulatory decision-making. Therefore, methodologies claiming to quantify methane emissions require independent and rigorous validation to give confidence and reassurance that accurate reporting of emissions through measurement is viable.

In mid-2024, a controlled release programme will be conducted at the TotalEnergies TADI facility in Lacq, France and run by the highly experienced Stanford research team (e.g. Sherwin *et al.* 2021). The campaign is planned to last four weeks, with participants expected to join for a week to test their methane quantification capability against a range of controlled methane release rates and in varying meteorological conditions. The programme will be a single-blind validation of methane sensing and quantification technologies with testing of aircraft, drone and ground-based sensors.

During the programme, the participants will not be provided any information on the rates of methane released. Study participants then report detection and quantification results blinded to any ground-truth information on the rates of methane release. Measurements will be undertaken with three goals for each participating group: 1) determining the false positive rate, 2) estimating the minimum detection threshold and 3) estimating the quantification accuracy.

Bringing this type of operation to Europe to allow teams involved in methane emission quantification to test and validate their methodologies is key in starting to ensure that all operators (both academic and commercial) have equity in opportunity to take part in these intercomparison experiments and to benchmark their performance. Results will be published in a similar manner to U.S.-based Stanford experiments in open-access peer-reviewed journals to allow full disclosure on performance.

Improving the characterization of methane emissions from inefficient flaring

Additional scientific work is needed to assess flaring efficiency and the prevalence of unlit flares in regions outside the United States of America. A recent study (Plant *et al.* 2022) based on direct measurements of flares in U.S. onshore production regions found that both unlit flares and inefficient combustion contribute comparably to ineffective methane removal – with flares effectively destroying on average only 91 per cent of methane. This means that nearly five times more methane is released to the atmosphere from flares than is presently assumed (i.e., based on current assumptions from the oil and gas industry that the flare is always lit and that the destruction efficiency is above 98 per cent).

IMEO is partnering with the World Bank’s Global Gas Flaring Reduction Partnership to improve the characterization of methane emissions from flaring across production regions. The work will focus on reducing the uncertainty in destruction removal efficiency estimates based on direct measurements, identifying the root causes of inefficient combustion and unlit flare occurrence, and improving measurement-based approaches to detect and quantify emissions from flaring (e.g. satellite-based data products).






► Organizations that are interested in collaborating with IMEO on methane research may apply for support, including access to data, scientific review and funding. Applications are available at:

<http://www.unep.org/explore-topics/energy/what-we-do/methane/imeo-methane-science-studies>

Table 8: Summary of IMEO’s published and completed science studies

Note: The lead institution for each project is shown under the title of the project.

Study	Rationale/Aim	Status	Key findings
① Synthesis of methane emission estimates from the Nord Stream gas leaks (IMEO)	To synthesize and reconcile reported emission estimates from the Nord Stream gas leaks to derive a plausible range of emission estimates from the incident.	A working paper has been written, and a peer-reviewed paper will be submitted for publication by the end of 2023.	The work highlights that previous emission estimates considerably underestimate the amount of methane released from the event, and that diverse measurement approaches were required to quantify emissions.
② TROPOMI-based characterization of regional emissions (Institute for Space Research, Netherlands)	To address significant uncertainty on methane emissions from several high-producing regions where TROPOMI can be used to quantify regional emissions.	Manuscripts for Algeria and Venezuela have been completed and submitted to journals.	The Algeria study looks at the importance of point sources in relation to total emissions. The Venezuela study found a small, non-significant, trend in emissions between 2018 and 2020 around Lake Maracaibo, implying that the area’s leakage rate expressed against oil and gas production doubled over the time period to around 20%.
③ Global LNG liquefaction and regasification plant measurements (National Physical Laboratory, United Kingdom)	To address significant uncertainty in methane emissions from LNG facilities (liquefaction, regasification, and shipping), with no empirical measurements publicly available.	One paper has been published (Innocenti <i>et al.</i> 2023). Another is evaluating emission estimates.	Large leaks and large non-continuous sources measured demonstrate the continuing need for full-site surveying for leak detection, maintenance and repair processes to minimize emissions.
③ Romania onshore coordinated campaign (Utrecht University, Netherlands)	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 the 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.	Three papers summarizing ground-based data collection were published (Delre <i>et al.</i> 2022; Korbeň <i>et al.</i> 2022; Menoud <i>et al.</i> 2022). An additional paper synthesising results for oil production sites was recently published (Stavropoulou <i>et al.</i> 2023). Two further papers synthesizing airborne-based data will be submitted by the end of 2023.	Measured emissions were characterized by heavily skewed distributions. Based on the source-level characterization, up to three-quarters of the detected emissions from oil production sites are related to operational venting.

Study	Rationale/Aim	Status	Key findings
 Coal Phase 1: Coal Mine Methane Emissions – Sources, Mitigation Potential, Monitoring and Emissions Quantification. (Environmental Defense Fund, United States of America)	An initial desktop study intended to provide the foundation or rationale for further measurement-based science studies (Coal Phase 2).	The final report was submitted to IMEO in August 2022.	China leads the world in estimated coal mine methane emissions. Underground coal mines account for more than 90% of global coal mine methane emissions. Mitigation potential is through drainage and ventilation air. The main variables that affect gas emission rates in coal mining are in-situ gas content of coal seams, strength and reservoir properties of the strata surrounding longwall districts, working depth, panel dimensions, face advance rate and district age. Accounting for coal mine methane emissions is complicated and conducted in variable ways around the world.
 Offshore production studies: Norway (Royal Holloway and Bedford New College, United Kingdom; University of Manchester, United Kingdom)	To characterize methane emissions from oil and gas offshore infrastructure in different offshore production regions, as little to no empirical-based estimates currently exist. Norway is a major European oil and gas producer, accounting for around 45% of European (EU, United Kingdom and Norway) oil and natural gas production over the past decade.	One paper has been published (Foulds <i>et al.</i> 2022).	<p>Offshore facility-level emissions can vary substantially over time, and sufficiently large and representative sampling is needed for meaningful comparisons with reported emissions, which is relevant for OGMP 2.0.</p> <p>The measurements are in good agreement with oil and gas operator reports, but are more than 40% larger than a widely cited globally gridded fossil fuel methane emission inventory based on country-level reports from the UN Framework Convention on Climate Change.</p>
 European downstream studies (Technical University of Munich, Germany; Autonomous University of Barcelona, Spain; University of Toronto, Canada; University of Groningen, Netherlands; Université de Versailles Saint-Quentin-en-Yvelines, France)	To characterize methane emissions from local distribution systems in Europe and compare them to emissions from U.S. cities as well as Toronto, Canada.	Five initial papers on Hamburg, Paris, Toronto and Bucharest have been published (Ars <i>et al.</i> 2020; Maazallahi <i>et al.</i> 2020; Defratyka <i>et al.</i> 2021; Fernandez <i>et al.</i> 2022; Forstmeier <i>et al.</i> 2023). An additional manuscript for London has been submitted for publication, and the overall synthesis paper is in journal peer review.	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 mobile measurements of local distribution emissions to prioritize emission reduction strategies and to fully characterize emissions from these sources. Studies also discuss the importance of attribution methods to split thermogenic and biogenic methane emissions in urban environments.
 Australia Coal Seam Gas (Surat Basin) (Airborne Research Australia; University of New South Wales, Australia)	To obtain data on emissions from coal-seam gas production, an increasing phenomenon and a critical first step in understanding other places where this production occurs.	Three papers have been published (Lu <i>et al.</i> 2021; Neiningner <i>et al.</i> 2021; Kelly <i>et al.</i> 2022).	Coal seam gas upstream sources emit around 0.4% of produced gas, which is comparable to some onshore dry gas fields (Marcellus Shale in the United States of America and Groningen field in The Netherlands). However it is substantially smaller than other regions, especially those where oil is co-produced (wet gas).
 Offshore production studies in the United Kingdom and Dutch North Sea (German Aerospace Centre, DLR, Germany; University of York, United Kingdom; British Antarctic Survey, United Kingdom; University of Cambridge, United Kingdom)	To characterize methane emissions from oil and gas offshore infrastructure, as little to no empirical-based estimates exist. In addition to the Gulf of Mexico offshore study, data were collected on British, Dutch and Norwegian oil and gas infrastructure across the North Sea.	A methods paper (France <i>et al.</i> 2021) and another paper reporting measured emission rates for British and Dutch infrastructure (Pühl <i>et al.</i> 2023) have been published.	Inventories, except for operator-based facility-level reporting, tend to underestimate measured emissions, especially the globally gridded inventory. The study suggests that using facility-level reporting, as recommended in the OGMP 2.0 framework, leads to the highest accuracy when compared to actual measurements. If national inventories adopt this facility-level estimation approach, it could improve the accuracy of methane emission accounting in the offshore oil and gas sector. Interestingly, despite variations in production rates, when compared regionally to airborne studies in the Norwegian Sea and the Northern Gulf of Mexico, the facility-level emission rates align with the overall patterns observed in other offshore areas.

Study	Rationale/Aim	Status	Key findings
8 Mexico onshore/offshore (Environmental Defense Fund, United States of America)	To characterize differences between onshore and offshore emissions for a major oil and gas production country that relies on simple emission factors for its inventory.	One paper has been published (Zavala-Araiza <i>et al.</i> 2021).	The study integrated airborne-based measurements with remote sensing data (TROPOMI and VIIRS night-time flare data). It 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.
9 Offshore production studies in the Gulf of Mexico (University of Michigan, United States of America)	To characterize methane emissions from oil and gas offshore infrastructure, as little to no empirical-based estimates exist. The first offshore study took place in the United States of America, where it was logistically easier to set up the study.	A methods paper using ship-based measurements was published (Yacovitch, Daube and Herndon 2020), and a second paper using airborne-based measurements was published (Gorchov-Negron <i>et al.</i> 2020).	The published studies highlight important differences in emissions between shallow and deep-water production infrastructure. The studies highlight the presence of super-emitters in offshore infrastructure.

Table 9: IMEO initiated and ongoing studies

Note: The lead institution for each project is shown under the title of the project.

Study	Rationale/Aim	Status
Oil and gas studies		
10 Aerial measurements and flux estimates in Azerbaijan (German Aerospace Centre, DLR, Germany; Environmental Defense Fund, United States of America)	No independent empirical data are currently available to derive representative emission estimates of oil and gas sources from former Soviet Union states apart from a limited number of point sources. A local study in Azerbaijan would be the first to derive such estimates.	Project scoping phase.
11 Australia representative LNG liquefaction facility aerial measurements (Airborne Research Australia)	Facility-level measurements of almost all LNG liquefaction facilities in Australia. Multiple measurements are performed at each facility to derive emission estimates under a range of operating conditions.	Project is ongoing. Western Australia flights started in April 2023, with Northern and Eastern Australia targeted for 2024.
12 Feasibility analysis for an IMEO-dedicated helicopter-towed sensor platform (Technical University of Braunschweig, Germany)	The project will determine the technical, logistical and financial feasibility of constructing and operating an aerial methane monitoring platform dedicated for IMEO measurement campaigns. The platform will be designed to address the existing challenges of long lead times for scientifically instrumented aircraft as well as securing permits for operating such aircraft in international air spaces.	Project initiation is ongoing.
13 Global analysis of methane emissions from abandoned oil and gas wells (McGill University, Canada)	Globally, there are millions of abandoned oil and gas wells, but the number of abandoned wells at the global scale has not been estimated.	Field measurement campaigns are planned and some are already ongoing for several EU locations, with additional measurements expected in South America.
14 LNG facility versus sub-facility reconciliation in Australia (National Physical Laboratory, United Kingdom)	Reconciliation analysis of existing measurement data at the facility-level and the sub-facility-level at the same LNG liquefaction plant.	Data from aerial surveys are being reconciled with on-site activity data and bespoke emission factors derived from previous measurements.
15 Multi-scale measurement study of oil and gas emissions in Colombia (Carleton University, Canada)	Combining measurements at the regional, site and source levels, to characterize emissions from oil and gas production in Colombia. There are few, if any, empirically based estimates of methane emissions from South American oil and gas producing countries.	Project is in the scoping phase.
16 Offshore measurement study in Angola and Gabon (German Aerospace Centre, DLR, Germany)	Offshore oil and gas methane study focusing on Angola with potential additional measurements in Congo and/or Gabon. The region is home to substantial oil and gas production by both national and international oil companies, and has been identified as a flaring hotspot.	Field measurement campaign was completed in 2022.
17 Offshore top-down and bottom-up emission quantification at a Floating Production Storage Offloading site in the North Sea (University of York, United Kingdom)	Comparing the methane emission quantifications of a Floating Production Storage and Offloading (FPSO) site at Glen Lyon, Shetland using aerial, drone and bottom-up quantification methods.	Project initiation is ongoing.

Study	Rationale/Aim	Status	
Oil and gas studies			
15	OGMP 2.0 Feasibility Case Study (Queen Mary University of London, United Kingdom)	Desktop study to develop strategies to help companies implement OGMP 2.0 Level 5.	Project initiation is ongoing.
16	Reconciling methane emission inventories with site-level measurements globally (University of Texas at Austin, United States of America)	Supporting further development and implementation of OGMP 2.0 by performing reconciliation of source- and site-level data.	Analysis of data from field measurement campaigns has started.
16	Root-cause analysis of oil and gas emission sources in British Columbia (Carleton University, Canada)	Establishing robust procedures for producing quantitative, measurement-based methane inventories backed by robust uncertainty analysis and performing root-cause analysis to improve mitigation strategies.	Multi-year measurement campaigns.
17	Satellite-based detection of methane plumes from offshore platform (MARS study) (Universitat Politècnica de València, Spain)	Facilitating the implementation of offshore plume detection methods for operational exploitation in IMEO's Methane Alert and Response System (MARS). Component 1 of MARS currently only considers land surfaces. However, data processing remains highly manual, and there are knowledge gaps regarding the potential and limitation of satellite observations for offshore methane mapping.	Project initiation is ongoing.
17	Synthesis study in Permian Basin (Environmental Defense Fund, United States of America)	More data are available characterizing emissions from the U.S. Permian Basin than for any other oil and gas producing basin in the world. The project goal is to catalyse a synthesis of as much of the data collected to date as is possible, allowing multi-scale data to be compared and contrasted.	Data analysis is ongoing.
18	Validation of satellite and mobile measurement approaches through a controlled release in Europe (Stanford University, United States of America)	This campaign will follow existing protocols with several planned improvements in metering accuracy, wind speed measurement, and gas composition analysis, to allow for even more thorough characterization and to minimize uncertainties in ground-release volumes.	Testing will take place at Total's TADI facility in Lacq, France, with multiple European-based operators participating. The field campaign is expected to last for four weeks in June 2024, with a one-week on-site trial potentially taking place in late 2023 or early 2024.
19	Validation of satellite and mobile measurement approaches through a controlled release in the United States of America (Stanford University, United States of America)	Accurate quantification of methane emissions is crucial for both tracking mitigation and to inform regulatory decision-making. Therefore, methodologies claiming to quantify methane emissions require independent and rigorous validation to give confidence and reassurance that accurate reporting of emissions through measurement is viable.	Project initiation is ongoing.
Coal studies			
20	Aerial and ground-based measurements of coal methane emissions in Poland (AGH University of Science and Technology, Poland; German Aerospace Centre, DLR, Germany; Technical University of Munich, Germany; Swiss Federal Laboratories for Materials Science and Technology, Switzerland)	This is the first IMEO study to design, measure and reconcile top-down and bottom-up estimates specifically for the needs in the coal sector.	Campaigns started in June 2022 and should be completed in October 2023. Measurement platforms include mobile aircraft, helicopters, vehicles and a variety of static ground-based systems. The latter include measurements that range from within, at the top of, and far from the ventilation air methane shaft.
21	Australia Bowen Basin pilot Campaign (Airborne Research Australia)	In this pilot project over the course of a week, several flights indicated significant emissions from surface mining. Due to the limited measurements, the outcomes from the pilot project will be incorporated into a full Bowen Basin project.	Initial pilot measurement campaign took place in 2022, and a second phase of measurements took place in September 2023.
22	India abandoned coal mine study (Indian Institute of Technology Bombay)	This project aims to refine the greenhouse gas emission inventory of the Indian coal mining sector by incorporating empirical data on emissions from abandoned coal mines.	Project initiation is ongoing.
23	Study to test greenhouse gas verification procedures using airborne remote sensing and airborne in-situ data to determine methane emissions from coal mines in Australia Bowen Basin Campaign 2023 (University of Bremen, Germany)	The pilot project in Australia demonstrated the capability to collect airborne data at the mine level and finer resolution. For this extended approach, two aircraft will be used, one with in situ and one with remote sensing. This will be one of the first times that simultaneous measurements by both methods will be collected. Both underground and surface mines will be measured, and IMEO hopes to access activity data from participating mines in the coming months.	Project initiation is ongoing.

Waste studies

<p>24 Landfill emissions characterization in Canada (St. Francis University, United States of America)</p>	<p>This project will quantify emissions at dozens of individual landfills across Canada. For a subset of these landfills, a method intercomparison using ground-based mobile measurements, drones, and aircraft surveys will evaluate potential benefits and limitations of each method.</p>	<p>The project is nearly finished, with measurements now completed, and data analysis being finalized. A paper is expected to be published in early 2024.</p>
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Multi-sector studies

<p>24 Global Methane Budget (Stanford University, United States of America)</p>	<p>This project aims at supporting the Global Carbon Project (GCP) to better understand global methane emissions at large, by funding two additional elements to GCP's biennial overview reports: 1) addition of supplementary measurements to aid in distinguishing fossil fuels from other sources, and 2) field campaign in Azerbaijan to measure some of the largest natural geological methane seeps.</p>	<p>A data analysis is under way, which will integrate global measurement data of supplementary tracers (ethane and isotopes). This will be fed into a global model to better attribute fossil methane emissions from other source sectors. Also, a dataset of large geological methane seeps has been developed to aid in the planning of the measurements in Azerbaijan.</p>
<p>25 Aerial methane survey in Oman (German Aerospace Centre, DLR; AGH University of Science and Technology, Poland)</p>	<p>Aerial methane survey characterizing oil and gas site-level emission distribution and potentially also regional-level fluxes. This will be the first in-depth, independent, study of oil and gas methane emissions on the Arabian Peninsula. A waste component has been added to the oil and gas campaign.</p>	<p>Field measurement campaign is planned for late 2023.</p>
<p>Continuous monitoring of methane emissions with TROPOMI satellite observations in support of the IMEO (Harvard University, United States of America)</p>	<p>The Integrated Methane Inversion (IMI) is an open-access, user-friendly cloud-computing facility that allows researchers and stakeholders to perform regional inversions of TROPOMI satellite observations.</p> <p>Research will focus on incorporating automatic construction of inversion ensembles with varying inversion parameters and quantify the sensitivity of results to prior/observational errors, prior emission estimates, satellite retrieval products, and other factors. The study will explore the incorporation of point-source information into the tool, using IMEO's MARS point-source data from independent instruments such as Sentinel-2 to help define prior errors and the emission state vector for the inversion.</p>	<p>Project initiation is ongoing.</p>



Photo credit: QatarEnergy

Building Capacity in Governments to Address Methane Emissions

5.1 Importance of Engaging Government Stakeholders

Growing relationships with government stakeholders drive progress across IMEO's workstreams.

With more than 150 signatories of the Global Methane Pledge (GMP), the importance of engaging governments on methane emissions has never been clearer. While the stage has been set, it is now time for governments to back this commitment with targeted policy action and increased ambition, in the hope of achieving a 30 per cent reduction in methane emissions by 2030. To that end, UNEP's IMEO has been expanding and deepening its engagement with governments around the world.

Governments are a key stakeholder for IMEO. Strong relationships with government officials are necessary to successfully implement IMEO's projects, which often require permits, flight access to facilities for measurements, as well as political support of IMEO's objectives to prioritize action. Importantly, government stakeholders must also have the knowledge and capacity necessary to access and interpret IMEO data to take meaningful mitigation action.

IMEO continues to work with governments around the world, both directly and through partners. IMEO's goals when engaging governments include:

- Raise awareness on methane emissions to catalyse increased ambition on methane mitigation activities.
- Develop and maintain both high-level and technical connections in the government to facilitate IMEO's vision and projects.
- Build capacity in governments to access and utilize IMEO data.
- Assist governments in responding effectively to MARS notifications and work with partners to act towards mitigating identified events.
- Support the implementation of the Global Methane Pledge.

Recognizing the vast array of barriers and opportunities around the world, achieving these goals will look different in every country. As a result, IMEO is developing and implementing tailored approaches that consider local context, existing partnerships and projects, as well as the availability of existing data and satellite capabilities.

5.2 Overview of Training Programme Offer and Delivery

IMEO's Methane Mitigation Training Series lays the groundwork for methane action.

The virtual Methane Mitigation Training Series remains IMEO's flagship capacity-building tool for governments and continues to be an important mechanism through which IMEO begins working with government stakeholders. Since the last IMEO annual report, IMEO has delivered 11 more trainings (39 total) to 270 new participants (650 total), across a broad range of countries.

IMEO's methane mitigation training by the numbers



39 trainings

in **25** countries 



650 trained personnel

Table 10: Overview of modules for IMEO's Methane Mitigation Training Series

	Module	Description
Core modules	Module 1: Methane emissions in the oil and gas sector	Defines terminology related to methane and identifies major emission sources from the oil and gas sector. Explores how countries and companies can reduce emissions in pursuit of ambitious Nationally Determined Contributions.
	Module 2: Methane detection, measurement and quantification	Outlines currently available technologies to detect and measure emissions and best methodologies for quantification of total emissions.
	Module 3: Methane mitigation	Details major sources of methane emissions, cost-effective abatement, potential mitigation activities through the efforts of governments, regulators and operating companies.
	Module 4: Advanced upstream methane emissions	Technical information on existing best practices and technologies for detection, measurement, quantification and mitigation of upstream methane emissions.
Optional modules	Overview Module	High-level summary of the contents of Modules 1-3 for senior-level officials to cover the most important information without going to the technical level. It can be tailored to both a supply- and demand-oriented perspective.
	Module 5: Regulatory approaches to methane emissions (designed and delivered by the IEA)	Covers key considerations and best practices when developing and implementing methane policies and regulations for the oil and gas sector.
	Module 6: Satellites	Reviews the main characteristics, limitations and potential of satellites for methane detection, measurement, and quantification and applicability to government and company practices.
	Module 7: Flaring	Explains major characteristics and challenges that flaring activities pose and offers different tools available for measurement, quantification and mitigation of flaring emissions.
	Module 8: LNG	Overview of methane emission sources from LNG and mitigation options, in addition to elements of policy and expected market developments specific to LNG.

From there, IMEO has been working with a variety of partners to design and implement specific approaches and projects that support countries to take ambitious action on methane emissions. IMEO partners closely with organizations such as the International Energy Agency, the Climate and Clean Air Coalition, the World Bank, the Clean Air Task Force, and Carbon Limits, a consultancy, on these engagements.

As the focus on methane emissions grows internationally, initial engagements are growing into full-scale projects. For example, IMEO is part of a consortium of partners, alongside the Clean Air Task Force and the International Energy Agency, that has responded to a call for proposals from the Climate and Clean Air Coalition to deliver a national methane emissions inventory and mitigation assessment for the oil and gas sector in Iraq. IMEO has committed to provide training during an in-person workshop with representatives from the government. In addition, IMEO will conduct a satellite analysis of oil and gas infrastructure in Iraq. The data from this analysis will be used as an input to the methane emissions inventory and will provide key findings to support the mitigation assessment.

Furthermore, IMEO is working with the European Commission Delegation in Nigeria to conduct a baseline measurement study in Nigeria, with a particular emphasis on building capacity in the government to utilize findings from this study and to conduct similar studies in the future. In the initial phase, IMEO will organize a tailored and in-person

delivery of the training series to stakeholders in the Nigerian government and oil and gas industry. Additionally, members of the scientific community will be supported to conduct a “study tour” of ongoing IMEO Methane Science Studies and will have the opportunity to work with the scientists leading the work. In the second phase, these individuals will undergo further training to enable their participation in measurement campaigns in Nigeria. Finally, IMEO will develop recommendations for measurement, monitoring, reporting and verification (MMRV) based on the findings from the measurement study.

As a final example, IMEO has been working alongside the UN Resident Coordinator’s Office and the U.S. Agency for International Development in Turkmenistan to support targeted action on methane mitigation. Following a delivery of the Methane Mitigation Training Series in early 2023, IMEO has been working with government counterparts to identify a selection of assets for which measurements may be piloted. Technical service partners are also being engaged to support mitigation of methane emission sources found during these pilot measurements.

IMEO’s targeted country engagement will continue to grow with the addition of Regional Case Managers. This will increase IMEO’s ability to respond to requests for support from countries seeking to reduce methane emissions and reach the Global Methane Pledge target.

5.3 Engaging the Inventory Community

IMEO is driving the important dialogue between the scientific and national inventory communities.

The 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories recognized the important role of satellite- and other observational data in reducing uncertainty and verifying the country-level emissions reported to the UN Framework Convention on Climate Change. IMEO, as a provider of both satellite- and other measurement-based data on methane emissions, aims to facilitate the incorporation of these data into country inventories to improve the accuracy of reported emissions. To do so, IMEO recognizes the need to engage the national inventory community to understand challenges and barriers faced by inventory compilers, and to design best practices to overcome them.

In September 2022, the Task Force on National Greenhouse Gas Inventories of the IPCC held an “Expert Meeting on Use of Atmospheric Observation Data in Emission Inventories” in Geneva, Switzerland. IMEO was invited to participate in the fugitive methane emissions Break-out Group. Based on discussions during this meeting, which included both academic experts and national inventory compilers, IMEO is developing a white paper to address in more detail the applications, best practices and tools that will enable national inventory compilers to use IMEO and other observational methane data in the context of their reported emissions. In turn, this white paper – which will be published in the scientific literature – will serve as a roadmap for future engagement by IMEO with the national inventory community, helping IMEO to develop outreach and training material and tools for inventory compilers on the use of these data.

5.4 Implementation Case Study: Successful Mitigation

Satellite data provided by IMEO drive a successful mitigation case in Libya.

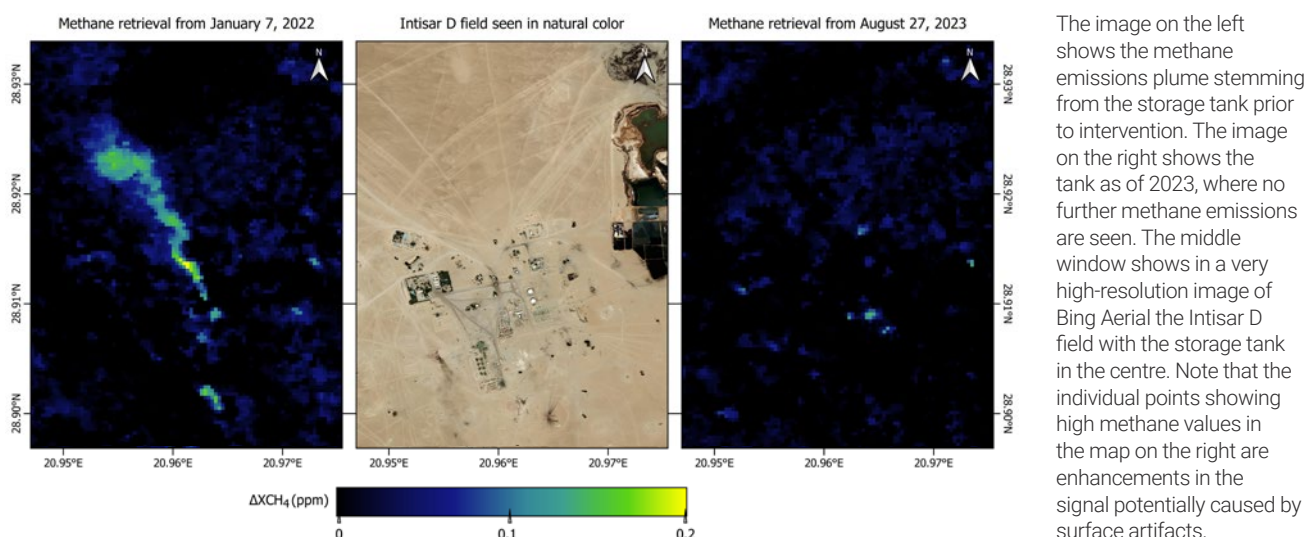
IMEO has been engaging with the National Oil Company of Libya (NOC Libya) on reducing methane emissions from its operations since 2022. Alongside partners at the United Nations Development Programme, IMEO organized a workshop for officials from NOC Libya to provide targeted training on methane emissions from the oil and gas sector, with a focus on the context in Libya.

At this event, UNEP presented a preliminary analysis of available satellite data on emissions from Libya’s oil and gas sector. One asset – the Intisar D oil field – was identified as a major methane emissions hotspot. One of the major sources at this asset was a storage tank that recorded continuous and significant emissions, ranging from 1,000 kg/h to approximately 2,500 kg/h.

With this information, NOC Libya acted to take the storage tank out of service, eliminating this major methane emission source (Figure 14). With further satellite information from UNEP, NOC Libya also acted to eliminate flaring in another field and to recover the flared gas. The produced gas combustion avoided by this action is an estimated 25 million cubic feet per day (20 tonnes per hour), according to NOC Libya. The repurposing of these flared volumes eliminated a large volume of methane emissions.

IMEO intends to carry forward this productive collaboration with NOC Libya through future trainings – notably further work on flaring emissions – and to continue to monitor the area for emissions.

Figure 14: Side-by-side comparison of the Intisar D asset pre- and post-action by NOC Libya.



The image on the left shows the methane emissions plume stemming from the storage tank prior to intervention. The image on the right shows the tank as of 2023, where no further methane emissions are seen. The middle window shows in a very high-resolution image of Bing Aerial the Intisar D field with the storage tank in the centre. Note that the individual points showing high methane values in the map on the right are enhancements in the signal potentially caused by surface artifacts.

06

OGMP 2.0 Company Reports for 2022



Photo credit: Evrivo

OGMP2.0-WIDE FACTSHEET

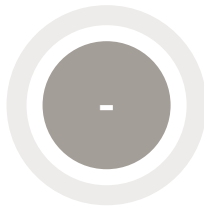
The charts show total methane emissions reported by OGMP2.0 member companies in 2023 across all segments. It depicts aggregate reporting levels, and operatorship.

The dotted pattern indicates that the data reported by companies had missing information (at least one applicable emission source not reported) for those assets. The pattern is applied to the portion attributable to total emissions coming from such assets.

The “No data” category represents assets that are in the OGMP 2.0 scope, but where companies did not report any data. The depicted data was estimated using average regional and segment emission factors from comparable OGMP 2.0 assets. This is akin to an L1 emission factor derived from the OGMP2.0 reported data, hence the dotted light blue legend. No emissions are being added, but it serves to demonstrate the potential missing emissions from assets not being reported.

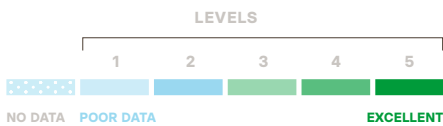
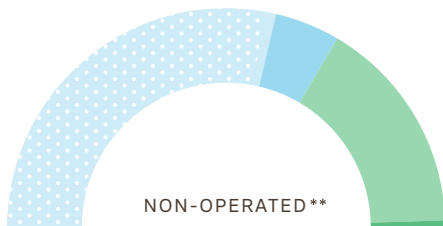
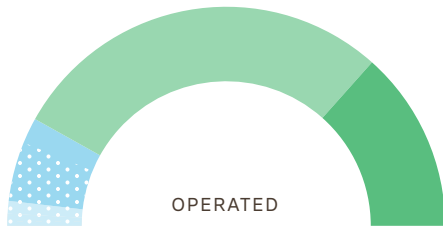
Note that in these initiative-wide graphs, emissions and reporting levels represent the emissions from 100% of all assets in scope (i.e., 34% of global production for 2023). In the individual company factsheets, emissions for non-operated assets are weighed by equity share, and the numeric value of emissions is shown only for operated assets on a 100% basis. When different shareholders reported inconsistent emission levels for a single jointly owned asset, the highest value was chosen.

2025 TARGET



DATA QUALITY

2022 METHANE EMISSIONS ESTIMATES (Mt)



**dotted pattern = incomplete data

INDEX

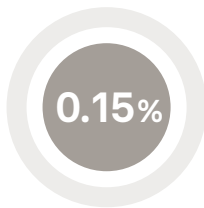
DATA QUALITY = Reporting levels 1 to 5, where increasing level corresponds to increased use of direct measurements

SEGMENT





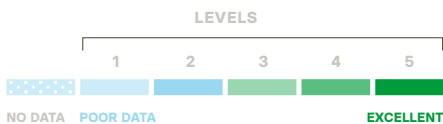
2025 TARGET (intensity*)



* maximum amount of annual methane emissions divided per sales gas

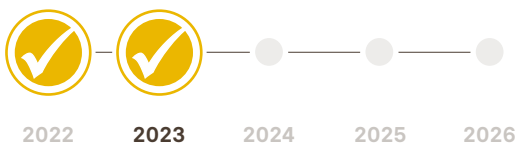
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

ADNOC

Founded in 1971, ADNOC is a leading diversified energy group, wholly owned by the Abu Dhabi Government. Our network of fully-integrated businesses operate across the energy value chain, helping us to responsibly meet the demands of an ever-changing energy market.

As one of the least carbon intensive producers in the world, we are taking significant steps to make today's energy cleaner while simultaneously investing in the clean energies of tomorrow to strengthen our position as a reliable and responsible global energy provider.

We have allocated an initial \$15 billion to advance and accelerate lower-carbon solutions, investing in new energies and decarbonization technologies to reduce our carbon intensity by 25% by 2030 and enable our Near Zero Methane Emissions by 2030 and Net Zero by 2045 ambitions.

INDEX

DATA QUALITY = Reporting levels 1 to 5, where increasing level corresponds to increased use of direct measurements

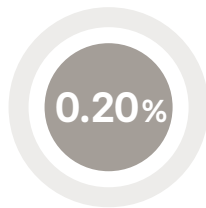
GOLD STANDARD has been awarded to companies who demonstrate an explicit and credible path to report all material assets at levels 4 and 5 within 3 years for operated ventures and within 5 years for non operated ventures. The Gold Standard is maintained by meeting the credible path and continuing to progress reporting to level 5 for the overwhelming majority of material assets.

SEGMENT

UPSTREAM



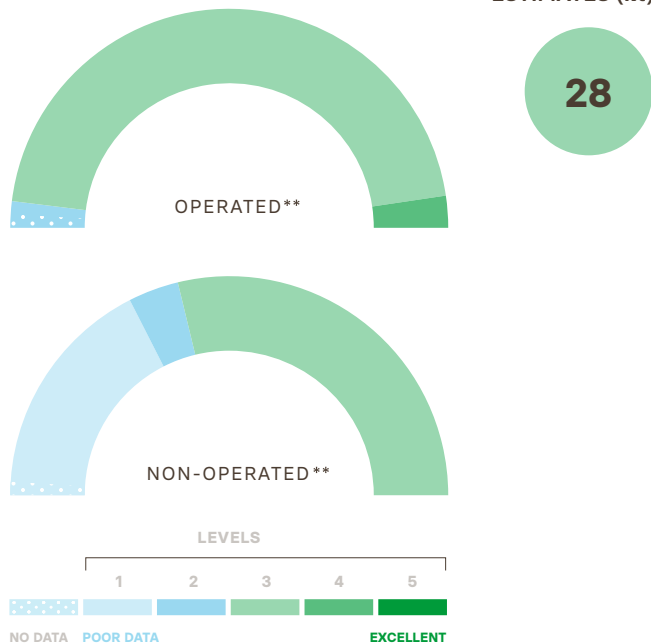
2025 TARGET (intensity*)



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

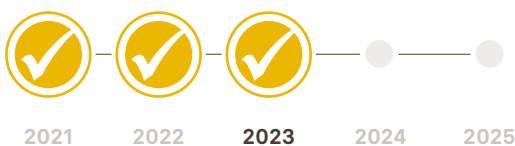
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

BP

bp has an ambition to be a net zero company by 2050 or sooner. One of the Aims in support of this ambition is specific to methane where bp plans to install methane measurement at all its existing major oil and gas processing sites by the end of 2023. This supports delivery of OGMP 2.0 requirements.

In 2021 and 2022, bp's activity included the ongoing installation of enhanced metering as well as software for determining flare efficiency and gas turbine performance. bp also continued to reduce operational methane emissions. This included upgrades and optimisation as well as improved design and use of new technology.

bp's US onshore business, bpx energy, continues to deploy a suite of methane detection and quantification technologies. This layered approach helps further drive reductions in methane. Additionally, bpx energy completed portfolio-wide natural gas certification for 1.1 billion cubic feet per day (bcf/d) against MiQ's Standard.

bp's strategy for site level reconciliation is based upon a learn-by-doing principle, in which field deployments are augmented with further assessment of core measurement parameters. Several pilots were undertaken in 2021 and 2022 in addition to the extensive aircraft campaigns in bpx.

bp looks to drive improvements in methane reporting and performance in its NOJVs through influence and knowledge sharing and, has identified certain NOJVs for priority action. For the prioritized NOJVs, bp is developing influencing plans, including the aspiration for the NOJVs to set their own methane intensity targets (around 0.2%).

INDEX

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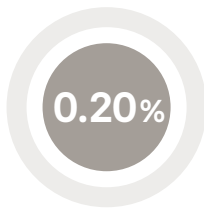
SEGMENT

UPSTREAM

CIVITAS RESOURCES

Operational expertise, unwavering commitment to sustainability, and shared community values reach new levels at Civitas, a company born by bringing together decades of operational experience in the DJ Basin. Civitas is the first carbon-neutral oil and gas producer in Colorado. With a premier management team focused on innovation and our commitment to long-term sustainability, Civitas saw an opportunity to diversify, scale, and extend its business model through acquiring premium positions in the Permian Basin through the acquisition of assets in the Midland and Delaware basins of west Texas and New Mexico in 2023. Civitas is committed to delivering value for our shareholders, local economies, our neighbors, and the energy industry for decades to come.

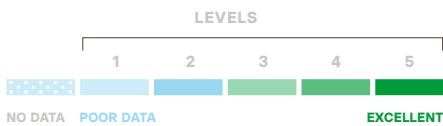
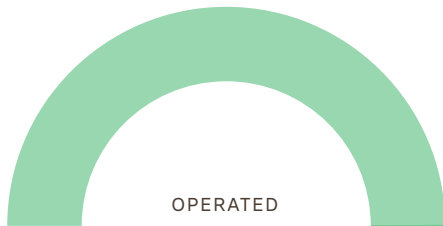
2025 TARGET (intensity*)



* natural gas throughput methane content (0.0192 metric tons / thousand cubic feet)

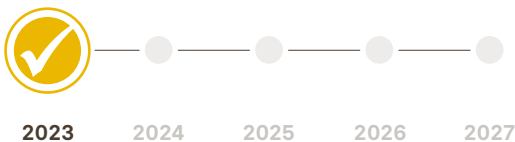
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



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INDEX

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SEGMENT

UPSTREAM



CONOCOPHILLIPS

ConocoPhillips is an independent E&P company headquartered in Houston, Texas with operations and activities in 13 countries. It has a diverse, low cost of supply portfolio including unconventional plays in North America; conventional assets in North America, Europe, and Asia; LNG developments and oil sands assets in Canada. As of June 30, 2023, ConocoPhillips had about 9,700 employees and total assets of about \$90 billion. Total company production for the first six months ending June 30, 2023 was 1,798 MBOED.

In 2020, the company adopted an ambition to reduce its operational greenhouse gas (GHG) emissions to net-zero by 2050. Methane reductions are regarded as a critical near-term action on the company pathway to achieve this ambition. In 2021, ConocoPhillips surpassed its goal of meeting a 10% methane emissions intensity reduction target by 2025 from a 2019 baseline. In response to this achievement, the company set a new medium-term target to achieve a near-zero methane emissions intensity by 2030. This near-zero target is defined as 1.5kg CO₂e/BOE or approximately 0.15% of natural gas produced (methane is converted to CO₂e using the IPCC AR4 global warming potential of 25). The target includes emissions that are related to production and excludes emissions from aviation and polar tanker fleets.

As of year-end 2022, the company achieved an approximate 70% methane emissions intensity reduction from 2015 with an intensity of 2.5 kg CO₂e/BOE.

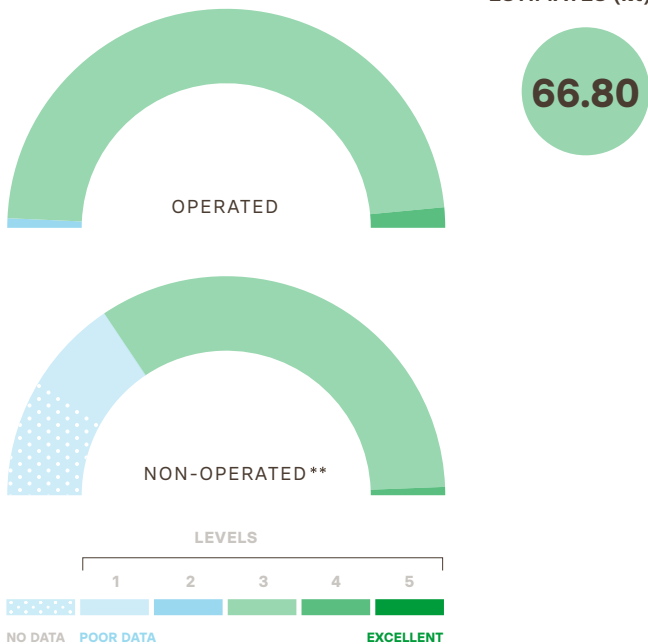
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as kg CO₂e methane/BOE

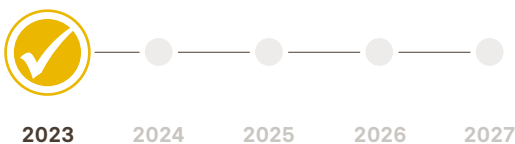
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



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INDEX

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SEGMENT

UPSTREAM



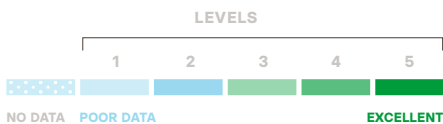
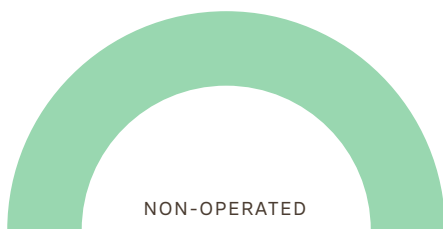
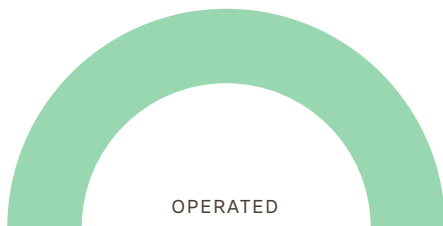
2025 TARGET (intensity*)



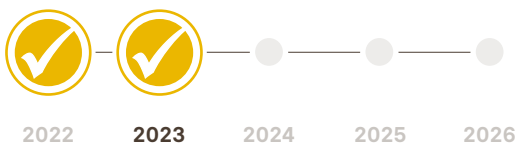
*maximum amount of annual methane emissions by 2025 as a percentage of MBOE production

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

CRESCENT ENERGY

Crescent Energy is a well-capitalized, U.S. independent energy company with a portfolio of assets in key proven basins across the lower 48 states and substantial cash flow supported by a predictable base of production. Crescent's core leadership team is a group of experienced investment, financial and industry professionals who continue to execute on the strategy management has employed since 2011. The Company's mission is to invest in energy assets and deliver better returns, operations and stewardship. For additional information, please visit www.crescentenergyco.com.

Crescent's asset base, which includes oil and natural gas assets in key proven onshore U.S. basins such as the Eagle Ford, Rockies, Barnett, Permian, and Mid-Con, is composed of producing properties with substantial production and hedged cash flow that are complemented by an extensive inventory of reinvestment opportunities across its undeveloped acreage.

Crescent strives to be good stewards of others' assets: our investors' capital, the environment and the communities in which it operates. Crescent believes that this stewardship, and our success, requires an alignment with the interests of our stakeholders including our employees, investors, customers, suppliers and society at large.

INDEX

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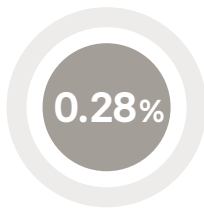
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SEGMENT

UPSTREAM



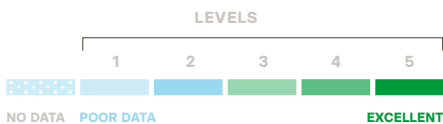
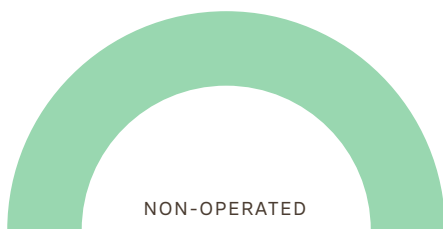
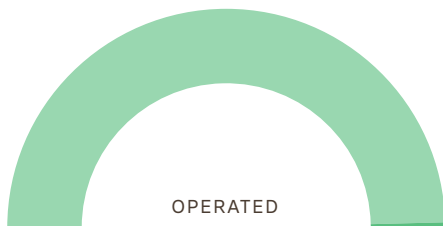
2025 TARGET (intensity*)



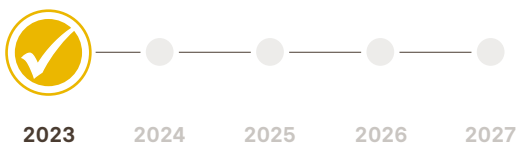
* maximum amount of annual methane emissions by 2025 as a percentage of natural gas produced

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

DEVON ENERGY

Devon Energy (Devon) is an independent energy company engaged in the exploration and production of oil, natural gas, and natural gas liquids. Devon is among the largest U.S.-based independent producers and is included in the S&P 500 index. The company is based in Oklahoma City, Oklahoma. Devon's operations are concentrated in five key areas across the United States, including the Delaware Basin of southeast New Mexico and west Texas, the Eagle Ford Shale in south Texas, the Powder River Basin in Wyoming, the Williston Basin in North Dakota, and the Anadarko Basin in western Oklahoma.

Since its founding in 1971, Devon has pioneered operational practices, proactively applied new technology, and adapted to evolving market conditions, regulatory environments, and increasing stakeholder expectations. This long history will be key to delivering on the company's ambitious emission reduction targets. Devon's emission reduction strategy will involve a range of actions, including expanding and evolving its leak detection and repair (LDAR) program; deploying advanced methane detection technologies in each of its operating areas; reducing the volume of natural gas that is flared; electrifying facilities to reduce the use of natural gas and diesel consumed onsite, including transitioning from gas-driven to air-driven pneumatic controllers or other viable solutions; and voluntarily optimizing facility design to minimize potential leak points and common equipment failures.

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SEGMENT

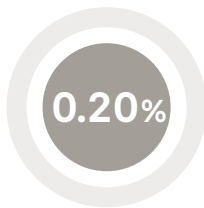
UPSTREAM



DIVERSIFIED ENERGY COMPANY, PLC

Headquartered in Birmingham, Alabama and listed on the London Stock Exchange (LSE ticker: DEC), Diversified is a leading U.S. independent energy company engaged primarily in the production, marketing and transportation of natural gas. As the largest independent conventional producer in the Appalachian Basin and with an expanding asset base in its Central Region, our vertically integrated business also includes a newly acquired and expanded asset retirement company, Next LVL Energy, which now represents a significant portion of the current well retirement capacity in Appalachia.

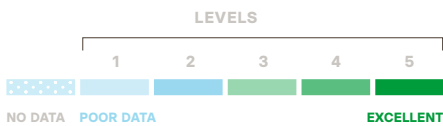
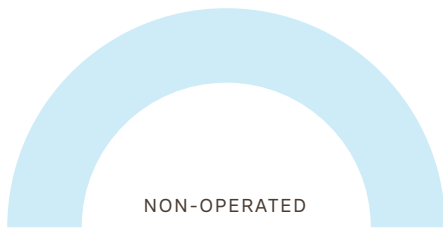
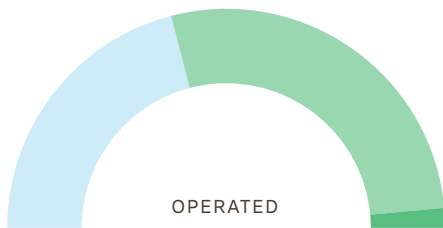
2025 TARGET (intensity*)



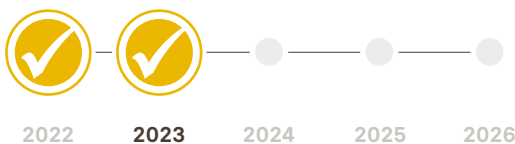
* maximum amount of annual methane emissions by 2025 as a percentage of production

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

INDEX

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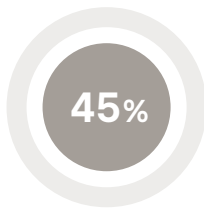
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SEGMENT

UPSTREAM



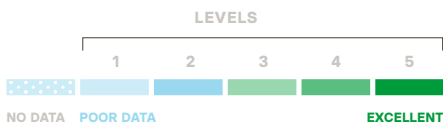
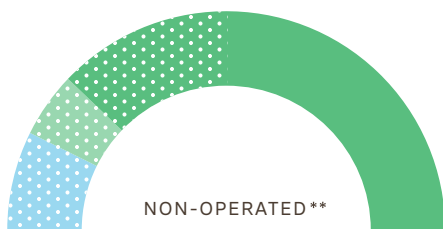
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

ECOPETROL

Ecopetrol S.A. is a public limited company, of the national order, linked to the Ministry of Mines and Energy of Colombia. It is a mixed economy company, of an integrated commercial nature in the oil and gas sector, which participates in all links of the hydrocarbon chain: exploration, production, transportation, refining and commercialization. It has operations located in Colombia, as well as abroad in Brazil, Mexico and the United States (Gulf of Mexico and Permian Texas). Ecopetrol's shares are listed on the Colombian Stock Exchange and on the New York Stock Exchange represented in ADR (American Depositary Receipt). The Republic of Colombia is the majority shareholder with a participation of 88.49%.

The long-term strategy of the Ecopetrol Group (GE for its Spanish acronym), so-called "Energy that Transforms", fully addresses current environmental, social, and governance challenges, maintaining its focus on generating sustainable value for all its stakeholders. This strategy is comprised of four strategic pillars: (i) Grow with the Energy Transition; (ii) Generate Value through TSEG, (iii) Cutting-edge Knowledge, and (iv) Competitive Returns. Consequently, the long-term TSEG targets include: regarding environmental issues, achieve (i) net-zero emissions of CO₂ equivalent by 2050 (scopes 1 and 2), (ii) zero routine gas flaring by 2030, (iii) zero water discharges by 2045, along with a reduction of 58% to 66% in the intake of fresh water for operations.

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SEGMENT

UPSTREAM

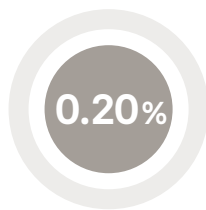


ENI

Eni is an integrated energy company with more than 30,000 employees in 62 countries around the world, whose dedication to the energy transition translates into tangible actions aimed at achieving the total decarbonization of products and processes by 2050.

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 strategy aims to achieve by 2050 the net zero target on GHG Scope 1, 2 and 3 emissions, on entire life cycle of the energy products sold, and net zero target on Scope 1-2 by 2035. 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. In 2023, Eni is confirming its commitment to further reduce methane in line with the Global Methane Pledge and is actively supporting the "Aiming for Zero Methane Emissions Initiative", launched in 2022 by the Oil & Gas Climate Initiative, aiming to eliminate the industry's methane footprint by 2030.

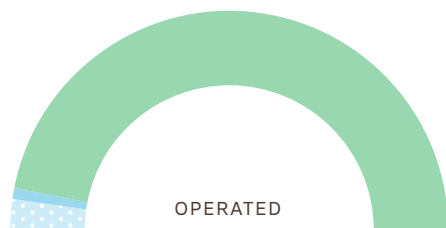
2025 TARGET (intensity*)



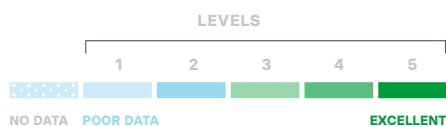
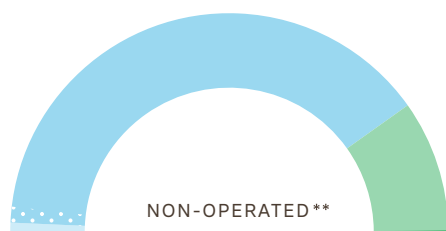
* maximum amount of annual methane emissions by 2025 as a percentage per marketed gas Sm³

DATA QUALITY

2022 METHANE ESTIMATES (kt)



45.12



** dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT

UPSTREAM

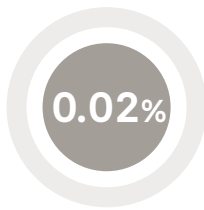


EQT CORPORATION

EQT Corporation (NYSE: EQT) is a leading independent natural gas production company with operations focused in the Marcellus and Utica Shales in the Appalachian Basin. We are dedicated to responsibly developing our world-class asset base and being the operator of choice for our stakeholders. By leveraging a culture that prioritizes operational efficiency, technology, and sustainability, we seek to continuously improve the way we produce environmentally responsible, reliable and low-cost energy. Our values – Trust, Teamwork, Heart, and Evolution – are evident in the way we operate and in how we interact each day.

As the largest producer of natural gas in the United States, EQT is responsible for producing the equivalent of over one minute of every hour of electricity consumed in the United States. We are dedicated to evolving energy and enhancing the critical role that natural gas plays in the future energy mix, both domestically and internationally, while simultaneously addressing energy security and affordability. We are proud to partner with the Oil and Gas Methane Partnership 2.0 to establish and execute on a plan to improve emissions associated with energy production methods. Continuous improvement is at the forefront of our mission. Therefore, we are developing this Implementation Plan to demonstrate our commitment to evaluating our assets and activities and establishing a timely plan with ambitious emission-reduction goals.

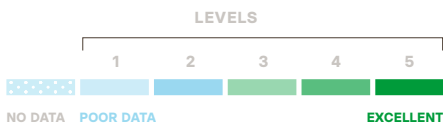
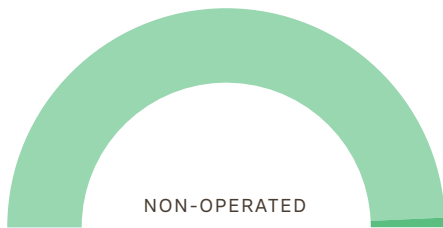
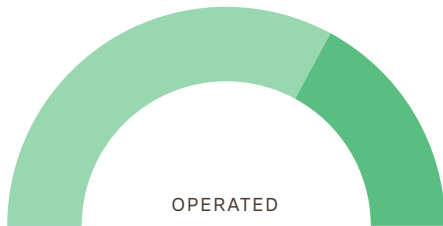
2025 TARGET (intensity*)



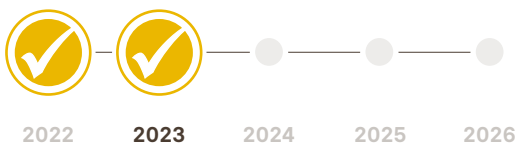
* maximum amount of annual methane emissions by 2025 as a percentage per mass of CH₄ produced

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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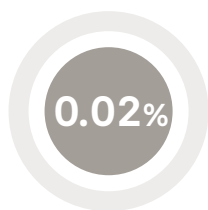
UPSTREAM



EQUINOR

Curbing methane emissions is a key priority for Equinor and we have a target to maintain a near-zero methane emissions intensity towards 2030. Equinor's 2022 methane intensity for our operated upstream and midstream business remained low at approximately 0.02%. It is important to Equinor that our methane emissions numbers and performance are credible, and we continue to refine quantification methodologies for our own operations. An independent study published in 2021 showed that measured methane emissions from Equinor-operated fields on the Norwegian Continental Shelf were at similar or lower levels than those reported by Equinor. A separate 2021 report (on equinor.com) shows that gas produced by Equinor had a lower carbon intensity than the average of gas consumed in Europe. In preparation for broad deployment of site-level measurement, in 2022, Equinor undertook additional testing of methane measurement technologies at the Kollsnes facility, building upon experiences from similar testing in 2021. We are using these tests to inform our approach to site-level measurement, as well as identify opportunities to utilize these technologies to strengthen quantification methodologies for certain material sources. In 2022, Equinor focused on expanding the coverage and the quality of reporting in our partner-operated assets - working with operators and partners to make the case for improved quantification, as well as the inclusion of these asset-specific emissions in our OGMP2.0 reporting. As a member of several collaborative initiatives, we work with peers and partners to systematize methane emission source identification and quantification, and to improve emissions management and reporting.

2025 TARGET (intensity*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)

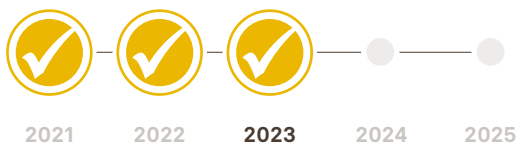


Data not available for 5 out of 26 non-operated assets reported



** dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT

UPSTREAM



XP

XP is a specialized oil and gas operator with a strong track-record in production enhancement and operations decarbonization. We invest in and operate mature onshore oil and gas fields to make the operations safer, greener, more efficient and more productive for a longer time. At the heart of XP's innovative, data-driven, operational model is a digital transformation that enables to uncover new opportunities for production enhancement, reserves growth, operations optimization and environmental footprint reduction. In 2022, XP was providing its services and operating fields for OMV Petrom and Naftogaz in Romania and in Ukraine.

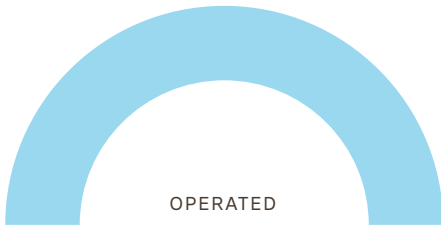
2025 TARGET (intensity*)



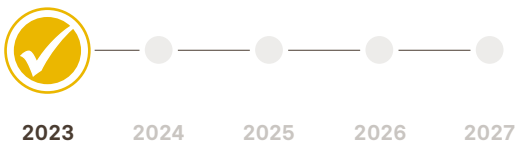
* maximum amount of annual methane emissions by 2025 as a percentage per metric tons hydrocarbon produced

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

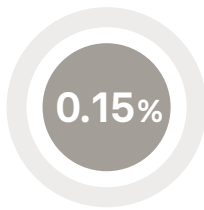
UPSTREAM



JONAH ENERGY LLC

Jonah Energy LLC (Jonah Energy) is a small independent oil and gas exploration and production company headquartered in Denver, Colorado. Our asset base is in the Upper Green River Basin (UGRB) in Southwest Wyoming in the Jonah Field and surrounding area. We strongly believe in the role of natural gas to meet current and future global energy demand and provide reliable domestic energy and further believe this can be accomplished in an environmentally sensitive manner.

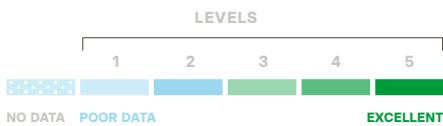
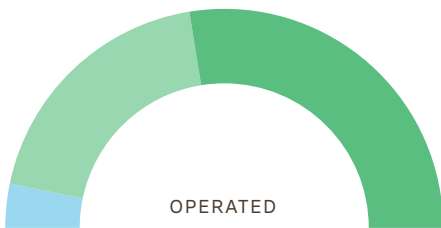
2025 TARGET (intensity*)



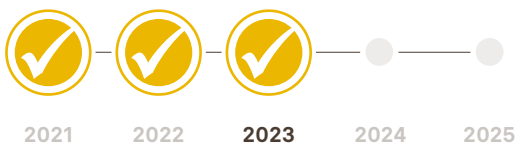
* maximum amount of annual methane emissions by 2025 as a percentage per tonnes natural gas produced

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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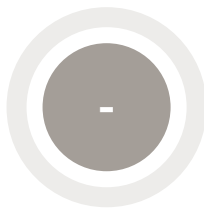
SEGMENT

UPSTREAM

NAFTOGAZ

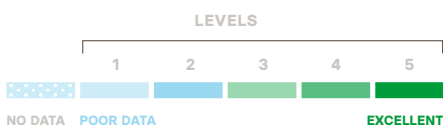
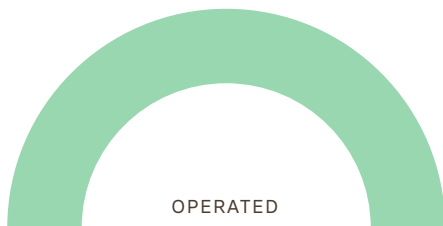
JSC "Naftogaz of Ukraine" engage in a full cycle of field exploration and development, production and exploration drilling, storage of oil and gas, and processing and distribution of oil products, natural gas and liquefied gas to consumers. Naftogaz is committed to future generations, which is why one of our strategic goals is to build up "green" energy assets to enable the energy transformation of Naftogaz and de-carbonisation of the Ukrainian economy.

NO TARGET



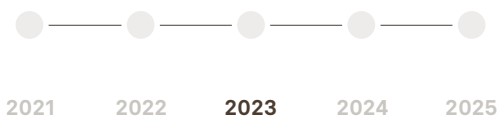
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



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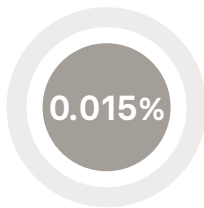
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SEGMENT

UPSTREAM

NEPTUNE ENERGY

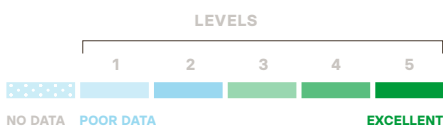
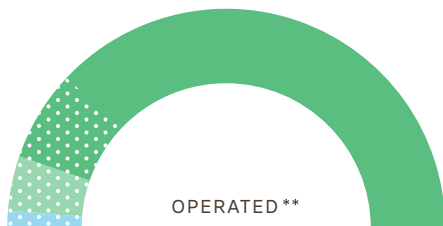
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as a percentage per m³ export gas

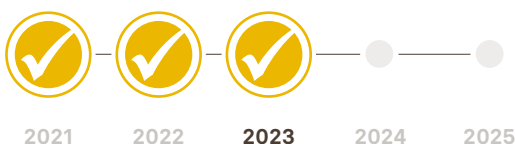
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

NEPTUNE ENERGY

Neptune Energy is an independent exploration and production (E&P) company with operations across Europe, North Africa and Asia Pacific. Our 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 employ some 1,300 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 have set an ambitious target to reach near zero methane emissions by 2030.

Our methane intensity remained stable in 2022 at 0.02%. Methane makes up 5% of our total GHG emissions on a CO₂e basis. We are committed to achieving the highest reporting quality and deploy mitigation measures.

During 2022, scientists working for the Environmental Defence Fund completed evaluation of methane emissions data gathered from our Cygnus platform in the UK in 2021. The evaluation found that while the rotary drone methane measurements and emissions reported at the facility were closely aligned, the fixed wing drone measurements showed greater variance. We are currently planning further studies of our material assets in order to identify an accurate benchmark for measuring total methane emissions and to determine what action we can take to reduce them.

In 2022, we joined the CEO-led Aiming for Zero Methane Emissions Initiative to promote further industry action.

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DATA QUALITY = Reporting levels 1 to 5, where increasing level corresponds to increased use of direct measurements

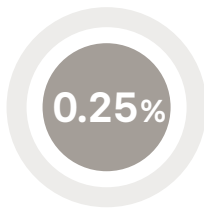
GOLD STANDARD has been awarded to companies who demonstrate an explicit and credible path to report all material assets at levels 4 and 5 within 3 years for operated ventures and within 5 years for non operated ventures. The Gold Standard is maintained by meeting the credible path and continuing to progress reporting to level 5 for the overwhelming majority of material assets.

SEGMENT

UPSTREAM



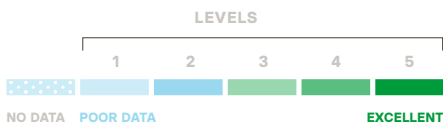
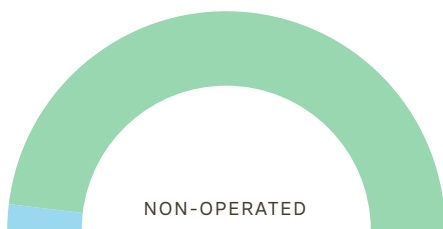
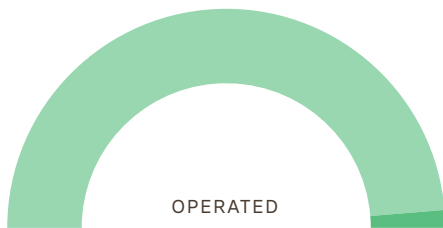
2025 TARGET (intensity*)



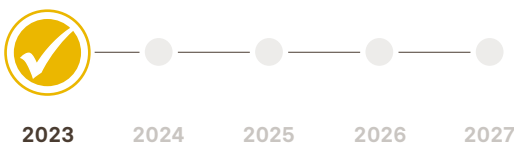
* maximum amount of annual methane emissions by 2025 as a percentage per operated produced Gas Volume

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

OXY

Occidental is bringing together people, resources, innovative technology and our 50+ year legacy of carbon management to accelerate our pathway to net zero, as well as helping others do the same. As the first U.S. oil and natural gas producer to establish net-zero emissions goals for our operations and products (Scopes 1, 2 and 3) aligned with the goals of the Paris Agreement, we've taken a leadership role in developing solutions to accelerate a lower-carbon economy.

Occidental strives to continuously improve operational performance by implementing practices and technologies to reduce methane emissions. Occidental was the first U.S. oil and gas company to endorse the World Bank's initiative for Zero Routine Flaring by 2030, and we achieved that milestone in our U.S. operations in 2022. We continue to expand our deployment of monitoring, automation, facility upgrades and process changes to detect, measure and reduce methane emissions across our global operations, and share learnings and best practices with other leading organizations. In 2022, key projects included expanding ground-based, aerial and satellite methane surveillance, consolidating facilities and retrofitting equipment to remove emission sources, and installing additional gas compression, takeaway capacity and temporary gas storage to reduce flaring and maximize beneficial use of natural gas.

For more information, please read Oxy's 2022 Climate Report and the notes on page 4 regarding forward-looking statements and GHG emissions estimates.

Link: <https://www.oxy.com/siteassets/documents/publications/oxy-climate-report-2022.pdf>

INDEX

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SEGMENT

UPSTREAM

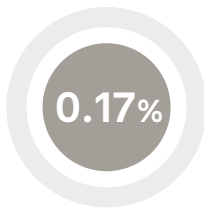


PDC ENERGY

PDC Energy, Inc. is an independent exploration and production company focused on responsible development of natural resources focused in some of the most prolific oil and gas regions in the United States.

Data reflects 2022 reporting year. On August 7, 2023, PDC Energy, Inc. was acquired by Chevron.

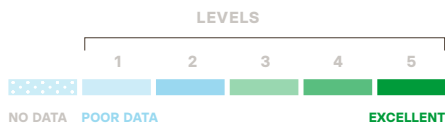
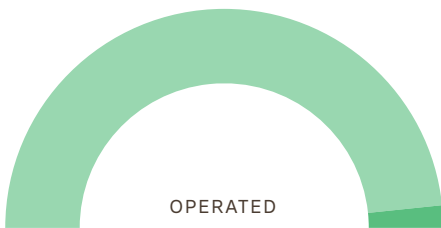
2025 TARGET (intensity*)



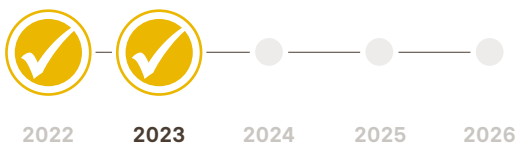
* maximum amount of annual methane emissions by 2025 as a methane content of produced gas throughput

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

INDEX

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SEGMENT





PETROBRAS

Petrobras is a National Oil and Gas company, the largest in Brazil and in Latin America. The company integrates the entire value chain in the oil and gas business, incorporating the segments of Exploration, Production, Gas Processing, Transportation and Refining. Petrobras also operate in the segment of electric energy generation (power plants). Our carbon strategy is based on our understanding that companies will be as competitive to the long-term market as they are able to produce at low cost and with lower greenhouse gas emissions (GHG), with prosperity in scenarios of low price of oil, carbon pricing and possible oil differentiation practices base on their intensity on emissions production. Since 2019, Petrobras has a public methane target related to the upstream segment. This target was reviewed in the 2023-2027 Strategic Plan . The actual goal achieves a 55% reduction, when compared with the base year 2015, with the intensity of methane emissions in the upstream segment by 2025, reaching 0.29 tCH₄/thousand tHC. Petrobras is also signatory of the “Aim for zero methane emissions initiative”. Petrobras has a structured action plan to reduce methane emissions, under the coordination of an internal Carbon Neutral Program. The action plan aggregates solutions like improving methane quantification, reduction and recuperation of gas sent to flaring, reduction of venting and fugitive emissions management through leak detection and repair. The reduction roadmap also includes the incorporation of mitigation technologies on our new projects. Petrobras also collaborates with its peers, international institutions, non-governmental organizations, and academia to reduce methane emissions and improve data quality, through a variety of initiatives including: The Climate and Clean Air Coalition Oil & Gas Methane Partnership (OGMP), International Association of Oil and Gas Producers (IOGP) and the Oil and Gas Climate Initiative (OGCI).

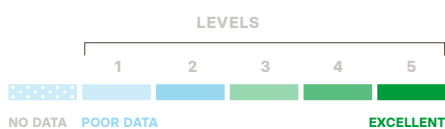
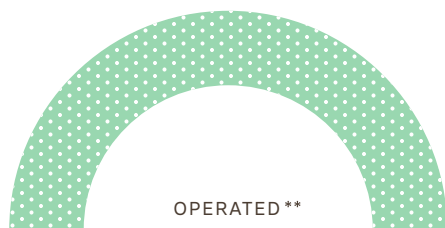
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 per thousand tons of hydrocarbon production

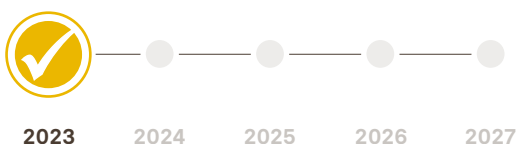
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT

UPSTREAM



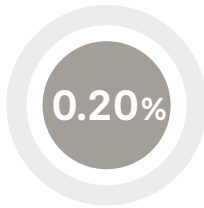
شركة تنمية نفط عُمان Petroleum Development Oman

PETROLEUM DEVELOPMENT OMAN-PDO

Petroleum Development Oman (PDO) is the leading oil and gas exploration and production company in Oman. PDO is determined to join other national efforts and play a leading role towards decarbonization and environmental sustainability. Our energy strategy is set to adopt energy-light recovery mechanisms, enhance energy efficiency, energy conservation, increase the renewable energy resources and constantly aspiring to find creative and efficient means to deal with the growing demand for energy. Ultimately, PDO aspires to cut its emissions by half in 2030 and to achieve net-zero emission by 2050.

In particular, PDO has been actively engaged on methane reduction efforts. This is reflected in PDO's endorsement of methane emission intensity target of 0.20% by 2025 and near zero methane emissions by 2030. PDO's reduction efforts involved joining World Bank's "Zero Routine Flaring by 2030" initiative and implementation of flare reduction projects, facilities maintenance programs, equipment electrification, and extensive flowlines and pipelines monitoring. In addition to a focused and tiered methane management campaign entailed using satellite surveys to identify methane super-emitters (Tier-1), surveying off-plot facilities using drones (Tier-2) and conducting LDAR surveys (Tier-3).

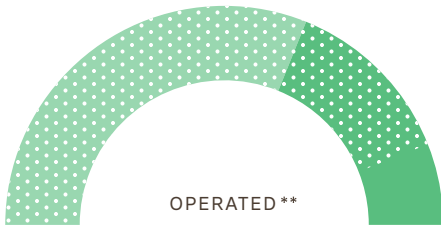
2025 TARGET (intensity*)



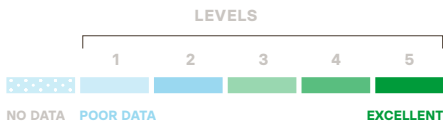
* maximum amount of annual methane emissions by 2025 as a percentage per unit of volume of gas available for sale

DATA QUALITY

2022 METHANE ESTIMATES (kt)

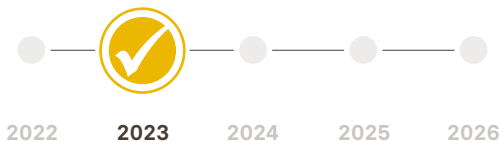


OPERATED **



** dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT

UPSTREAM



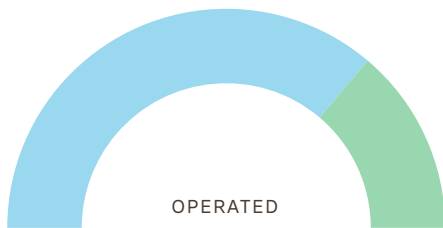
2025 TARGET (absolute reduction*)



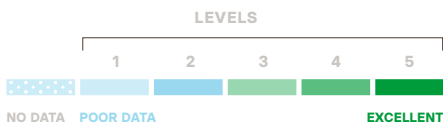
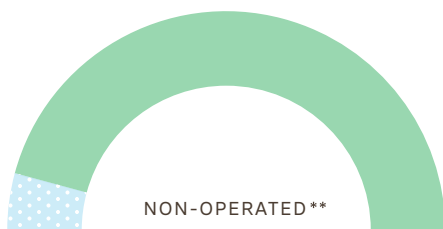
*percentage reduction of annual methane operated emissions by 2025 based on 2019 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)

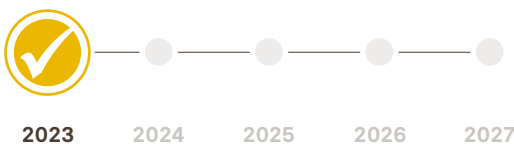


149.01



** dotted pattern = incomplete data

GOLD STANDARD



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PETRONAS

Petroleum Nasional Berhad (PETRONAS) is a dynamic global energy and solutions company with a core intent to power society's progress responsibly and sustainably. As the custodian of Malaysia's national oil and gas resources, PETRONAS explores, produces and delivery energy, both hydrocarbon and renewables, to ensure the security of energy supply for the nation and its customers around the globe. PETRONAS has four core businesses – Upstream, Gas, Downstream, and Project Delivery and Technology. PETRONAS is committed to growing its business responsibly, positively contributing to society and the environment.

PETRONAS announced its Net Zero Carbon Emissions by 2050 (NZCE 2050) pathway in November 2022. Its short-term target for 2024 is to cap greenhouse gas (GHG) emissions at 49.5 million tonnes of carbon dioxide equivalent (MtCO₂e) for Scope 1 and Scope 2 emissions from Malaysia operations. By 2025, the target is to achieve a 50% reduction in methane emissions from PETRONAS groupwide natural gas value chain.

In the medium-term, PETRONAS targets to achieve GHG emissions reductions of 25% by 2030 from 2019 levels for groupwide operations based on an equity share approach, where PETRONAS GHG emissions reflect the economic interest of its operations.

Part of this effort includes methane emissions reduction target of 70% for PETRONAS Groupwide natural gas value chain, as well as a 50% reduction in methane emissions from Malaysia's natural gas value chain in support of the country's Global Methane Pledge.

PETRONAS Operated assets covers 60% of total assets in PETRONAS gas value chain contributing to methane emissions in PETRONAS. Moving forward, PETRONAS aims to complete Level 3 methane quantification for all non-material operated assets, which will be reflected in the upcoming OGMP reporting FY2023.

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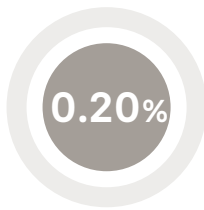
SEGMENT

UPSTREAM

PIONEER

NATURAL RESOURCES

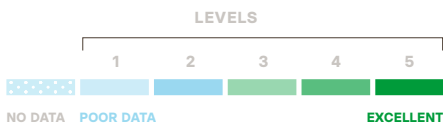
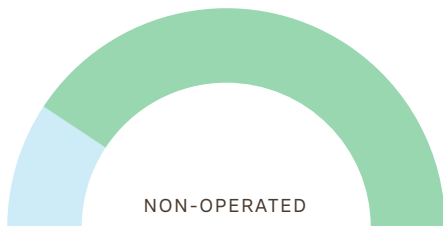
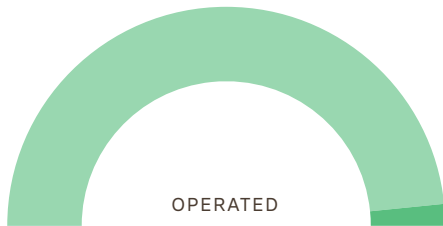
2025 TARGET (intensity*)



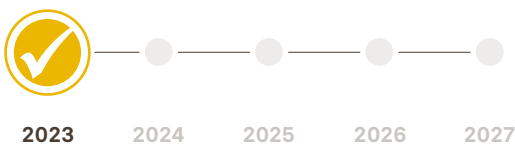
* maximum amount of annual methane emissions by 2025 as a percentage per produced natural gas in mcf

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

PIONEER NATURAL RESOURCES

Pioneer is a large independent U.S. oil and gas exploration and production company headquartered in Dallas, Texas. The company's primary field operations take place on private lands in the heart of the Permian Basin of West Texas. Climate stewardship is important to Pioneer and our stakeholders. We acknowledge the global threats posed by climate change due to increasing GHG emissions and the resulting impact on global temperatures. As such, our strategy is to manage our environmental footprint proactively and limit emissions of methane and other GHGs from our operations. Pioneer set targets to reduce our GHG emissions intensity by 50% and our methane emissions intensity by 75% by 2030 (from our 2019 baseline), the achievement of which would align with Pioneer's ambition to achieve net zero emissions (Scope 1 and Scope 2) by 2050. These targets are based upon strategic plans through 2030, and we will continue to follow best practices in our pursuit of GHG and methane emissions intensity reductions. Accordingly, Pioneer recently joined the Oil and Gas Methane Partnership 2.0 (OGMP), making Pioneer among the first U.S. operators to participate in this voluntary private public coalition with leadership and oversight from the United Nations. As part of this commitment, we have established a short-term measurement-informed methane intensity target of 0.20% of natural gas produced in 2025. This short-term target complements our longer-term methane emissions goals and puts Pioneer on the path to achieving the OGMP "Gold Standard" designation.

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SEGMENT

UPSTREAM



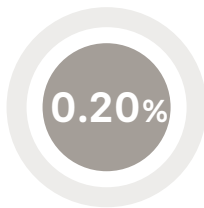
PRESIDIO PETROLEUM LLC

Headquartered in Fort Worth, Texas, Presidio is a leading oil and natural gas efficiency company with assets located in the Anadarko Basin of Texas, Oklahoma and Kansas.

Presidio was established as a differentiated oil and gas operator focused on the optimization of mature, producing oil and natural gas assets in the United States. Without drilling new wells, Presidio has achieved significant scale and consistently executed on its strategy to enhance the operational, financial, and sustainability performance of legacy oil and natural gas assets in pursuit of industry leading returns.

For further information about Presidio, please visit: www.bypresidio.com

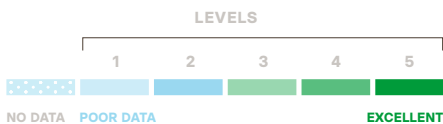
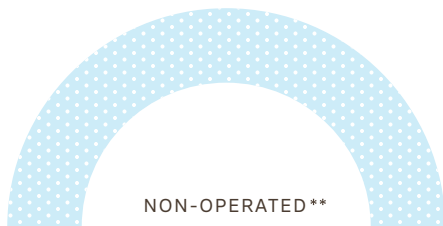
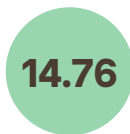
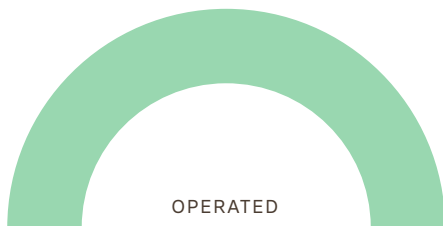
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2028 as a percentage of marketed gas

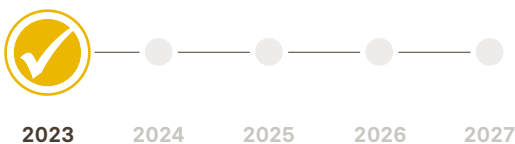
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



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INDEX

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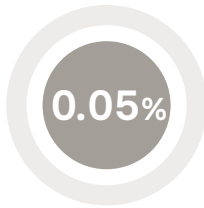
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SEGMENT





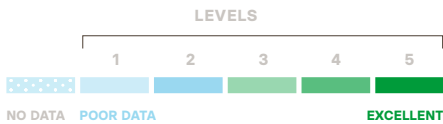
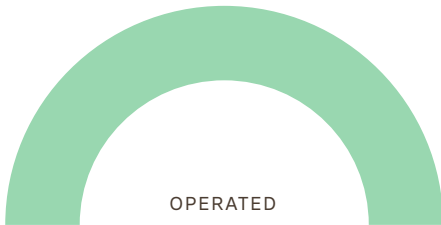
2025 TARGET (intensity*)



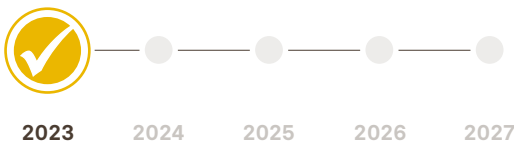
* maximum amount of annual methane emissions by 2025 as a percentage per total produced gas

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

PUREWEST ENERGY

PureWest is the top natural gas producer in Wyoming, where we operate more than 107,000 net acres in and around the prolific Pinedale and Jonah Fields. As of October 1, 2023, our gross operated production was approximately 612 MMcfe/d (net), and PDP reserves are greater than 1.8 Tcfe (net). While we have access to markets across North America, PureWest is uniquely positioned to serve markets in the western U.S.

At PureWest, responsible energy development is more than a regulatory exercise – it reflects our mission and core values and our commitment to excellence in all that we do. We value transparency and accountability and understand our obligation to disclose material information to our stakeholders. This is particularly significant to us as operators on federal lands in the upper Green River Basin, where we are held to a higher standard. This necessary standard is embedded into our business, demonstrated by our judicious operations, our dedicated people, and our commitment to operating responsibly. We recognize that natural gas will be essential to the low-carbon energy transition, and our goal is to be the supplier of choice through this transition.

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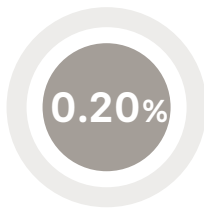
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SEGMENT

UPSTREAM



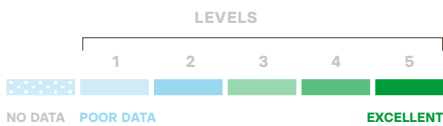
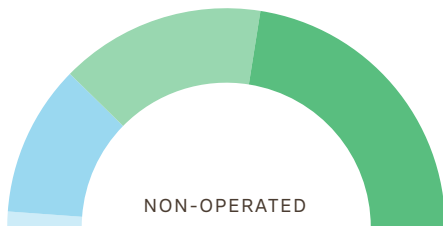
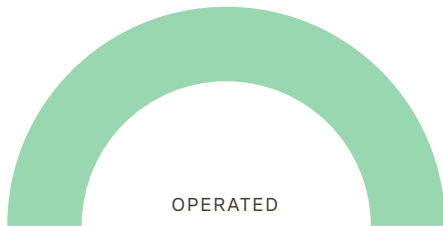
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as a percentage per total monetizable products (tons)

DATA QUALITY

2022 METHANE ESTIMATES (kt)



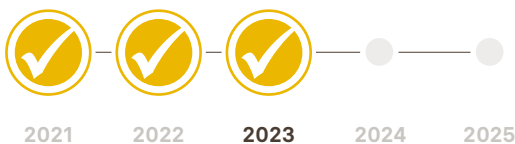
QATARENERGY

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 commits to achieving low carbon operations, contributing to the faster transition towards a low carbon economy. Methane emission reduction is part of our strategy. We have an ambitious plan to curb our emissions which includes increasing our CCS capacity, expanding Solar PV power generation, and investing in nature-based solutions in addition to several flare and methane emissions reduction initiatives and energy efficiency improvements.

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.

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

INDEX

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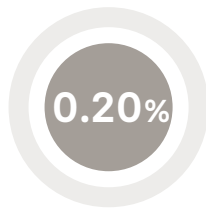
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SEGMENT

UPSTREAM



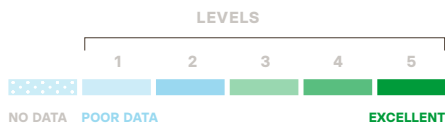
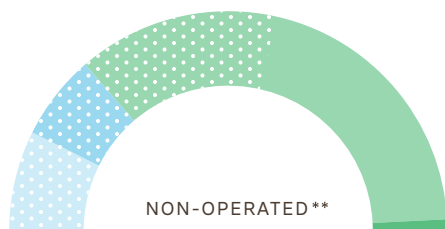
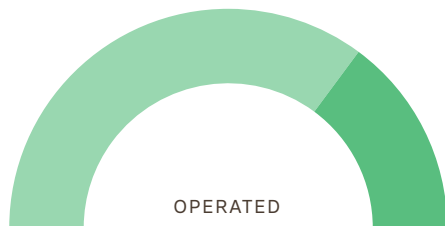
2025 TARGET (intensity*)



* maximum amount of annual methane emissions by 2025 as a percentage per m³ marketed gas

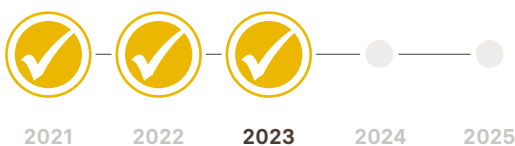
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

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

Our company has been reporting CH₄ 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 CH₄ emissions. The endorsement to OGMP 2.0 has helped Repsol to leverage the conversations with partners in non operated assets and empowered the importance of this topic.

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SEGMENT

UPSTREAM

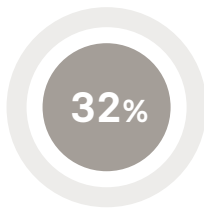


SERICA ENERGY

We are committed to reducing greenhouse gas emissions whilst improving energy efficiency through a plan of actions, projects and investments and are fully aligned to the North Sea Transition Deal and support the World Bank's target of eliminating routine flaring by 2030.

In 2022, we developed our Emissions Reduction Action Plan that sets out how we will achieve our emissions reduction targets on the Bruce facilities through a variety of equipment upgrade and efficiency projects. We are collaborating with industry partners to support low carbon technology projects that will help decarbonise the sector.

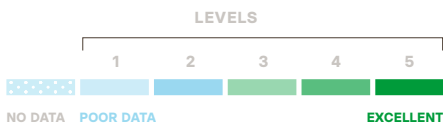
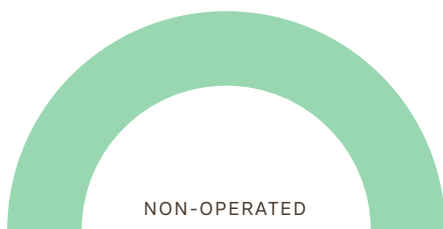
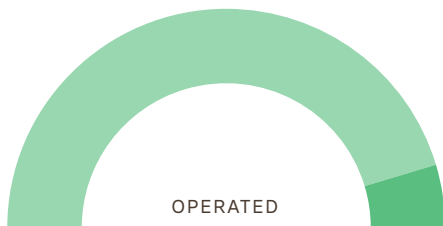
2025 TARGET (absolute reduction*)



*percentage reduction of annual methane operated emissions by 2025 based on 2022 estimates

DATA QUALITY

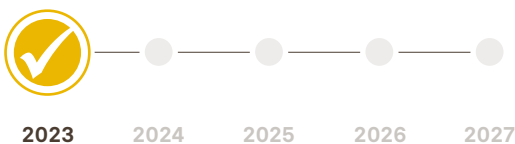
2022 METHANE ESTIMATES (kt)



GOLD STANDARD

INDEX

SEGMENT



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UPSTREAM

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Gold Standard has been achieved on the basis of a credible implementation plan



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, transforming the business and providing more low-carbon energy. Safety, environment protection, and social responsibility are fundamental to our approach.

Shell's climate target is to become a net-zero emissions energy business by 2050. In 2021, we set a target to reduce absolute emissions by 50% by 2030, compared to 2016 levels. This covers all Scope 1 operational emissions, and Scope 2 emissions associated with the energy we buy to run our operations. Shell also has a target to maintain methane emissions intensity below 0.20% by 2025 for its operated oil and gas assets and achieve near-zero methane emissions by 2030.

We continue to collaborate with industry, institutions, non-governmental organisations, and academia to improve data quality and abate methane. Shell signed the OGMP 2.0 Framework in 2020 with activities in 2021 and 2022 including piloting a range of remote-sensing, satellite, and direct measurement technologies and broad scale implementation of methane measurement programs across material assets. Shell continues to expand the variety of technologies and practices to reduce methane emissions from our operations.

* Please read the full Legal Disclaimer at: <https://www.shell.com/investors/disclaimer-and-cautionary-note.html>

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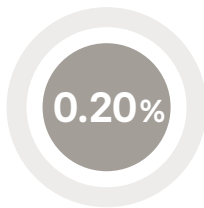
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SEGMENT

UPSTREAM

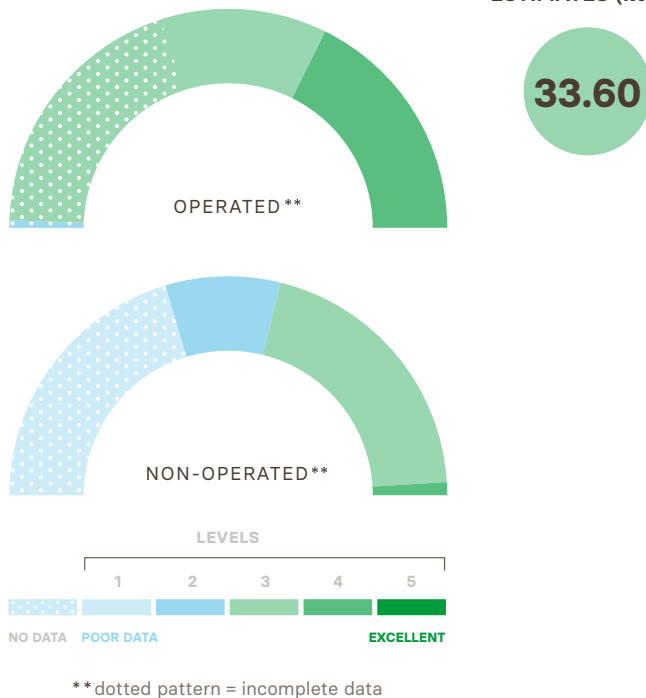
2025 TARGET (intensity*)



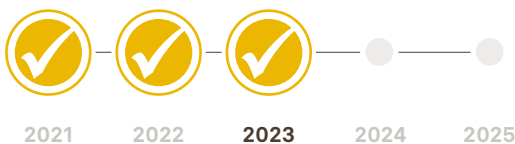
* maintain maximum amount of annual methane emissions by 2025 below 0.20% of total gas marketed for operated oil and gas assets

DATA QUALITY

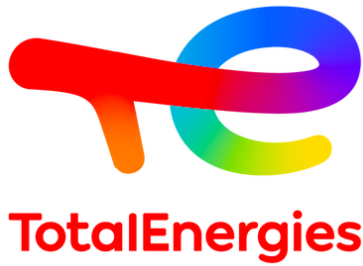
2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan



TOTALENERGIES

Aiming for zero methane emissions is a key element to TotalEnergies' strategy to support natural gas as a transition fuel. This ambition is based on two pillars: measuring methane emissions more accurately and abating those emissions relentlessly, for each source and for each asset.

TotalEnergies has already reduced its operated methane emissions by around 50% between 2010 and 2020. In 2022, the Company further reduced methane emissions by 34% compared to 2020 level, with absolute reduction targets of -50% in 2025 and -80% in 2030 (vs. 2020) on its operated assets. In terms of intensity, TotalEnergies aims at remaining lower than 0.1% of the marketed gas for all its operated gas facilities.

In its Sustainability & Climate 2023 Progress Report, TotalEnergies presented the worldwide drone-based emissions detection and quantification campaign which reached 95% coverage of its upstream Oil & Gas operated sites (in terms of production). This campaign is a key step towards Level 4 and 5 reporting and reconciliation process at site-level. TotalEnergies is also partnering with Colorado State University to develop an international protocol for the qualification of methane emissions measurements.

As a founding member of the OGMP 2.0, meeting the highest standards of reporting for each of our material assets is key for the success of our strategy. TotalEnergies actively supports and promotes the OGMP 2.0 towards partners and the whole oil & gas industry as a key enabler to reach near zero methane emissions.

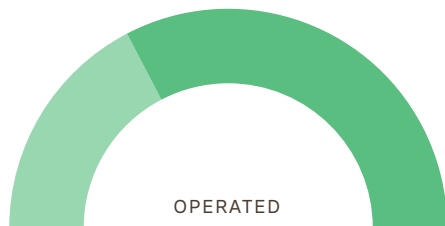
2025 TARGET (absolute reduction*)



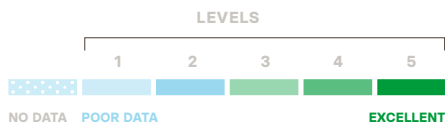
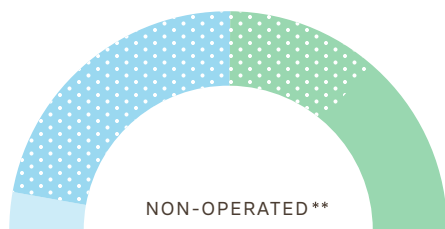
*percentage reduction of annual methane operated emissions by 2025 based on 2020 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)

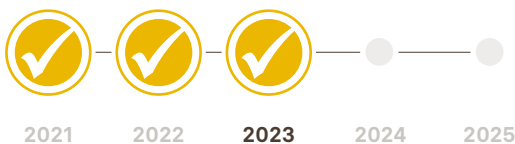


40.96



**dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT

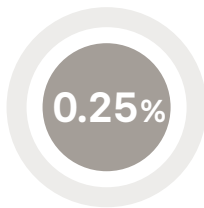
UPSTREAM

TRP ENERGY

As a responsible operator committed to excellence, we are dedicated to advancing environmental initiatives that will lead to a greener oil and gas industry. We work hard to minimize our impact to the environment by adopting best practices that often exceed regulatory requirements.

Our robust environmental, health and safety (EHS) strategy includes mitigating risks, increasing employee knowledge and skills, improving processes, and measuring performance to ensure the protection of our employees, the environment, and the public. We look for opportunities to recycle, minimize energy consumption and reduce our greenhouse gas (GHG) emissions. We also work closely with regulatory agencies to comply with all environmental requirements as well as partner with industry leaders to develop and implement programs that allow us to continue to provide affordable energy that improves the quality of life in both emerging and developed economies.

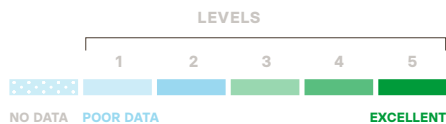
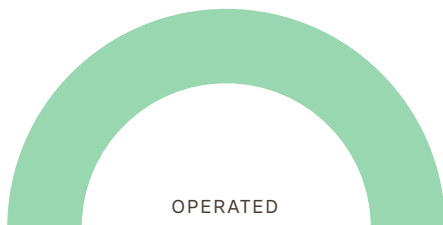
2025 TARGET (intensity*)



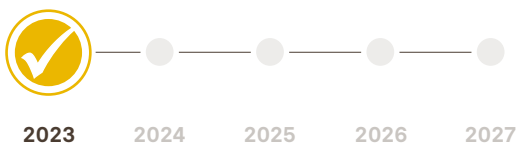
* maximum amount of annual methane emissions by 2025 as a percentage per sales gas (scf)

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

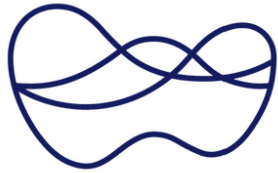
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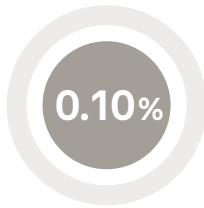
SEGMENT

UPSTREAM



wintershall dea

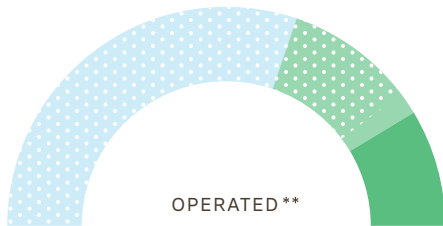
2025 TARGET (intensity*)



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

DATA QUALITY

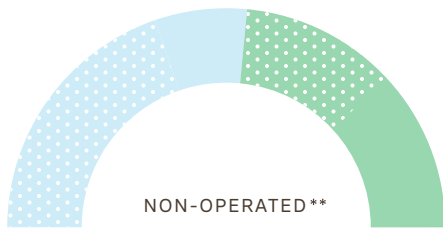
2022 METHANE ESTIMATES (kt)



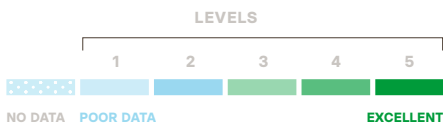
OPERATED **



0.50



NON-OPERATED **



LEVELS

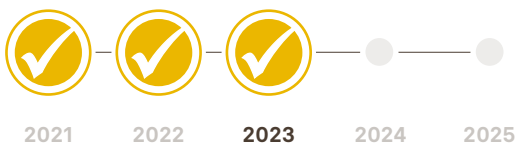
1 2 3 4 5

NO DATA POOR DATA

EXCELLENT

** dotted pattern = incomplete data

GOLD STANDARD



2021

2022

2023

2024

2025

Gold Standard has been achieved on the basis of a credible implementation plan

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 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 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.

In 2022 we kicked off a global measurement campaign to cover all material methane emission sources of our operated assets. Non operated assets to follow during 2023. We strongly engage with our partners to reduce methane emissions through LDAR programmes, reduce flaring and optimize energy efficiency. Offsetting: We intend to invest in nature-based solutions 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 are delivering our goal 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)

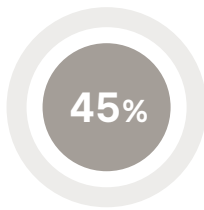
BAHÍA DE BIZKAIA GAS (BBG) Bahía de Bizkaia Gas (BBG) is the owner of a Liquefied Natural Gas (LNG) Regasification Plant in the port of Bilbao. We get LNG from tankers from all over the world and transform it into natural gas for domestic, commercial and industrial consumption and for the generation 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 450,000m³ in three tanks (150,000m³ each), while our send out rate is 800,000Nm³/h. Finally, our jetty has a capacity up to vessels of 270,000m³ 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. Our partners: Enagás Transporte S.A.U owns a 50% share in BBG. The Basque energy (EVE) owns the remaining 50% share in BBG.

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 CH₄ future regulations to allow us to prepare ourselves technically for possible new requirements.

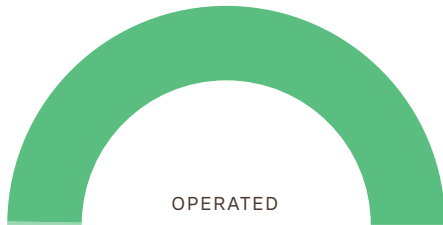
2025 TARGET (absolute reduction*)



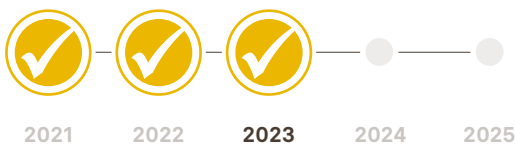
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

MIDSTREAM

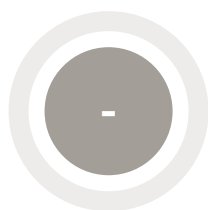


CHENIERE

Cheniere Energy Inc. (Cheniere) is the largest producer of liquefied natural gas (LNG) in the United States and the second largest LNG operator in the world. As the leading U.S. LNG exporter, we connect customers to a secure source of affordable, reliable and cleaner-burning energy, supporting our customers' energy needs and helping power the global transition to a lower-carbon future. Cheniere owns and operates two natural gas liquefaction facilities on the U.S. Gulf Coast and three transmission pipelines across Louisiana, Texas and Oklahoma. Cheniere accounted for 11% of the global LNG market in 2022 and has produced over 3,000 LNG cargoes that have been exported to 39 markets worldwide since 2016.

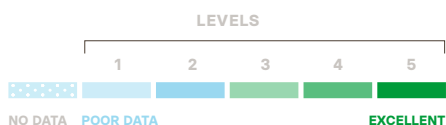
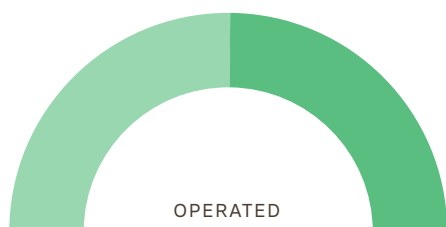
Cheniere's climate strategy focuses on science, transparency and collaboration along our supply chain to measure life cycle greenhouse gas (GHG) emissions to identify strategic and cost-effective opportunities to mitigate emissions. Joining OGMP 2.0 is enhanced by Cheniere's climate strategy initiatives, including our collaborative Quantification, Monitoring, Reporting and Verification (QMRV) programs to better calculate emissions in partnership with natural gas suppliers, midstream companies, shipping companies and academic institutions. In 2022, Cheniere initiated its QMRV program at its liquefaction facilities using multi-scale measurements. We believe an accurate accounting of emissions is essential in setting any emissions target and propose to develop a methane emissions target informed by the QMRV program.

NO TARGET

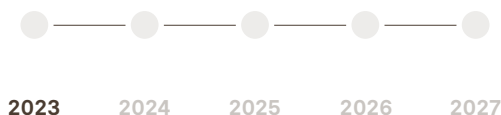


DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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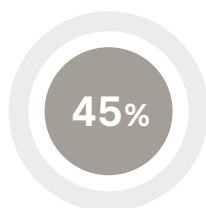
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SEGMENT





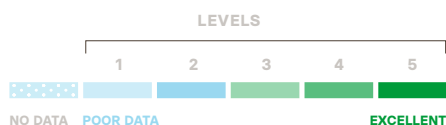
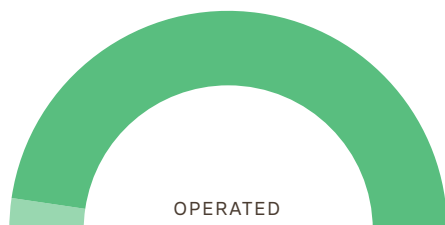
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)

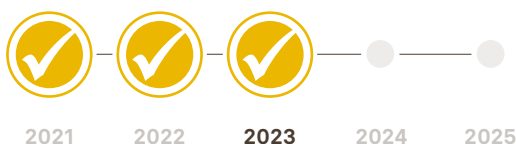


DESFA

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 1466 km of Gas network, 55 Metering and/or Regulating Stations, 4 Entry Point Stations, 1 Compressor Station and 1 LNG terminal of useful storage capacity 225000 m³ 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 the net-zero decarbonisation by 2050. The reduction of the direct and indirect emissions of greenhouse gases is our distinct and strong commitment. Focusing on methane emissions, DESFA set an absolute performance target of 45 % methane emissions reduction from the company's activities until 2025, in comparison with the base year 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.

GOLD STANDARD



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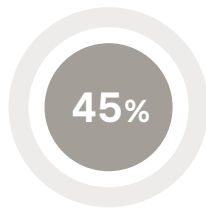
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SEGMENT





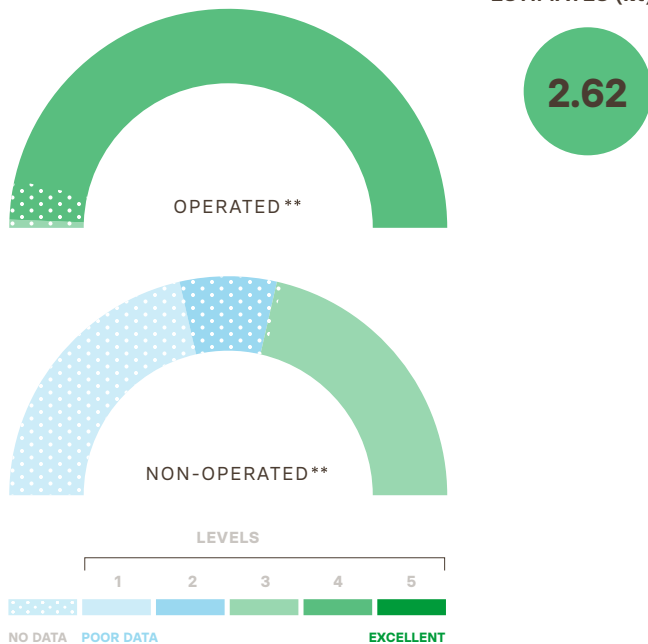
2025 TARGET (absolute reduction*)



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

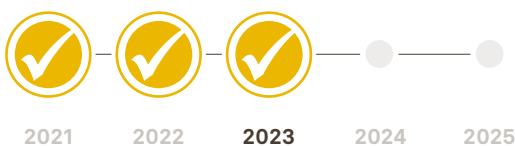
DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

ENAGÁS

Enagás, a midstream company and independent European TSO, is an international reference in the development and maintenance of gas infrastructure and in the operation and management of gas networks. Enagás operates more than 12,000 km of gas pipelines, 19 compressor stations, 493 regulation and metering stations, 3 underground storages and 4 LNG terminals. Enagás also has national and international non-operated facilities holding stakes in assets. Enagás is committed to achieving carbon neutrality by 2040. To this end, it has outlined a decarbonization pathway with emission reduction targets aligned with the 1.5°C temperature increase scenario. The reduction of methane emissions is a cornerstone of our Decarbonisation Strategy. Enagás' efforts to reduce these emissions are based on the following pillars:

The Scope 1&2 emission reduction targets include the Global Methane Alliance methane emissions reduction commitment, which will reduce methane emissions from our business by 45% by 2025 and 60% by 2030 (vs 2015).

Improvement of data accuracy: Quantification according to the most accurate methods.

Mitigation measures: Implementation of the best available techniques to minimize the emissions.

Implementing specific actions that Enagás has identified and planned as part of its Energy Efficiency and Emissions Reduction Plans (To electrify turbo compressors for electric ones by 2040 and proposes the use of renewable gases (biomethane and hydrogen) as operating gas).

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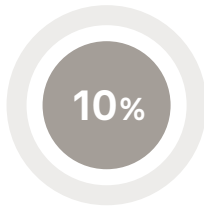
SEGMENT

MIDSTREAM

ENERGINET

Gastransmission

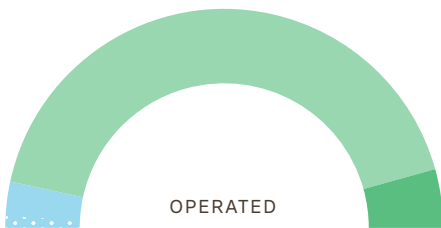
2025 TARGET (absolute reduction*)



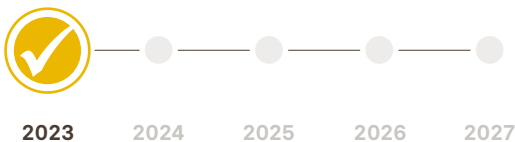
*percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

ENERGINET GASTRANSMISSION

Energinet Gastransmission is the Danish gas transmission operator. Energinet Gastransmission is operating around 1250 kilometres of pipeline with two larger compressor stations, five smaller compressor stations for injection of biomethane, and 44 regulation and metering stations.

Energinet Gastransmission is part of Energinet that is owned by the Danish Government, and the framework for Energinet's portfolio of tasks has been determined by law.

Energinet has overall climate goals to:

- Work towards emissions from natural gas being carbon-neutral by 2050
- Transmission losses and energy consumption for the transmission grid are carbon-neutral by 2030

The Danish Gas Transmission network is expanding rapidly according to its size in the last few years and the years to come. Some of the expansions are due to an increasing biomethane production in Denmark where the production is higher than the consumption of the local grids and therefore needs to be injected into the transmission grid. The grid is also expanded by politically decided gas infrastructure projects, including Baltic Pipe.

Energinet Gastransmission has decided on an absolute reduction target of 10 % by 2025, but due to the large increase in assets the real reduction is 40-50%.

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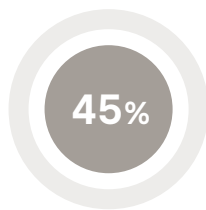
DATA QUALITY = Reporting levels 1 to 5, where increasing level corresponds to increased use of direct measurements

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SEGMENT

MIDSTREAM

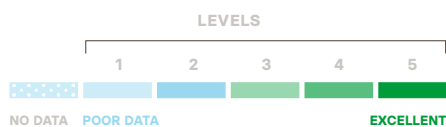
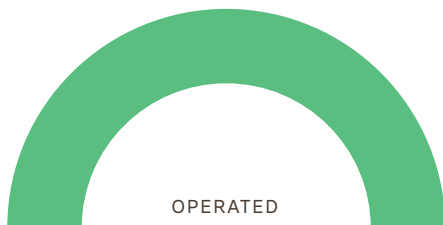
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

EUSTREAM

Eustream is the operator of the major high-pressure gas transmission system in the territory of Slovakia. It is an important energy transmission hub in Central Europe.

Eustream provides:

- Bi-directional west-east transit backbone, supplying gas from the European Union to Ukraine,
- Bi-directional north-south transit corridor, enabling access to LNG terminals in Poland and Croatia

Since 1972, nearly 3,000 billion cubic meters of gas have been transported by eustream. The transmission system consists of four to five parallel pipelines with a diameter of 1200 or 1400 mm. The energy required for the continuous flow of gas is provided by five compressor stations with an installed power of almost 500 MW.

Eustream is actively involved in a number of activities aimed at reducing its carbon footprint, in particular the transport of low-carbon and renewable gases and the reduction of methane emissions. Eustream is developing numerous green hydrogen projects, including outstanding hydrogen backbone projects connecting Ukraine with the EU.

Eustream has excellent results in methane emission reduction, having coordinated effort for more than decade in various fields:

- Significant modernization of the network towards low emission technologies,
- Minimization of venting in operations,
- Implementation of detailed and coordinated LDAR system

These three sets of measures have contributed to a significant and gradual reduction of methane emissions at Eustream. Eustream is a member of OGMP from 2020 and continues to work continuously to reduce methane emissions and improve reporting accuracy.

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SEGMENT

MIDSTREAM



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.

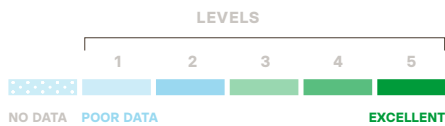
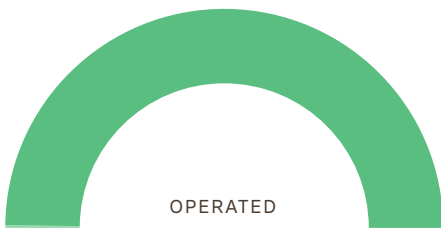
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

MIDSTREAM



FGSZ

FGSZ Ltd is the owner and operator of the Hungarian high-pressure natural gas pipeline system servicing gas distribution companies, power plants and large industrial consumers.

FGSZ is the only transmission system operator (TSO) in Hungary, conducting its activities in a regulated market environment. We operate in accordance with the applicable Hungarian and EU laws at all times, and FGSZ is one of the first European independent TSOs to hold an ITO certificate. In addition to its domestic gas transmission activity, FGSZ transmits gas from Austria to Hungary, and it is also engaged in bi-directional deliveries with Romania, Croatia, Ukraine, Serbia, and Slovakia, while we constantly examine the interconnection possibilities with Slovenia.

Physical properties

- 5.889 km of pipelines, looped system
- 7.229 km telecommunications cable network
- 6 cross-border interconnections
- 10 compressor stations
- 25 physical entry points
- ~400 delivery facilities
- ~700 employees

Partners

- 7 adjacent TSOs
- 1 dominant and several smaller producers
- 2 storage operators
- 6 large DSOs
- 45 shippers
- 80+ wholesale shippers

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SEGMENT

MIDSTREAM

2025 TARGET (absolute reduction*)

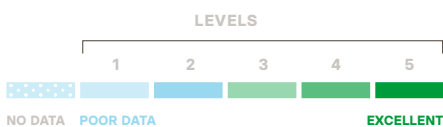
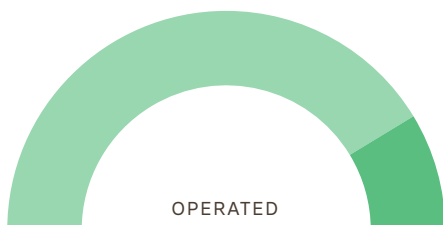


*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

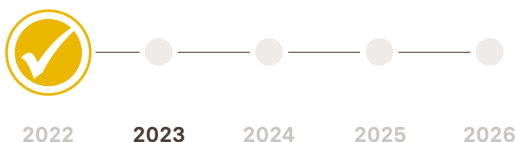
DATA QUALITY

2022 METHANE ESTIMATES (kt)

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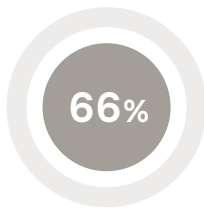
GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan



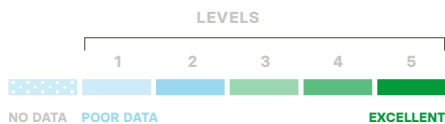
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

FLUXYS BELGIUM

Fluxys Belgium is an independent energy infrastructure company with no interests in the generation or sale of energy. In 2012, CREG, the Belgian federal regulator, certified Fluxys Belgium as a transmission system operator that works entirely separately from natural gas suppliers and producers. The company has more than 90 years of experience in the development, financing, construction, operation and maintenance of gas infrastructures.

With 900 employees, the company operates 4,000 km of high pressure transmission pipelines and associated infrastructure (4 compressor stations and 192 pressure reduction stations), a liquefied natural gas terminal totalling a yearly regasification capacity of 104 TWh and an underground storage facility with a total capacity of 7.6 TWh.

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 CO₂, accommodating the capture, usage and storage of the latter.

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SEGMENT

MIDSTREAM



GASCADE GASTRANSPORT GmbH*

The fully regulated and certified transmission system operator GASCADE Gastransport GmbH independently operates a gas pipeline network throughout Germany. Based in Kassel, the company offers its customers state-of-the-art and competitive transport services for gases in the heart of Europe via the company's own high-pressure pipeline network, which is around 3,250 kilometres long. For the decarbonized energy future, GASCADE is pursuing the goal of converting its transmission network to the transport of hydrogen and is therefore active in several specific onshore and offshore projects for the transportation of hydrogen.

* With the entry in the commercial register on August 31, 2023, the 80 percent fractional ownership of W&G Transport Holding GmbH (WGTH) in the OPAL was transferred to GASCADE Gastransport GmbH (GASCADE) by way of spin-off of the regulated part of the operation. GASCADE's pipeline system is now more than 3,700 kilometers long.

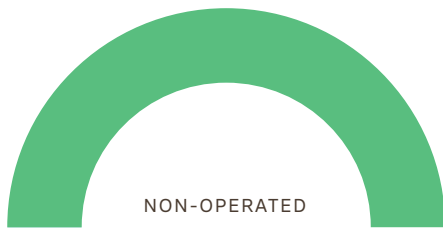
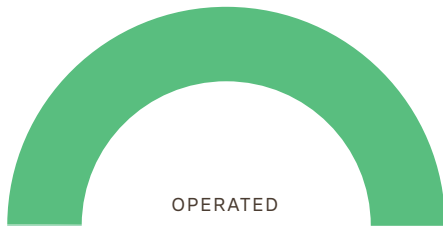
2025 TARGET (absolute reduction*)



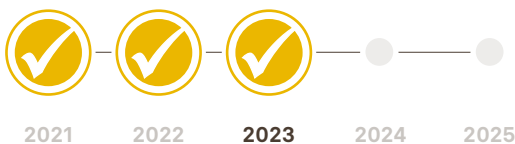
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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MIDSTREAM



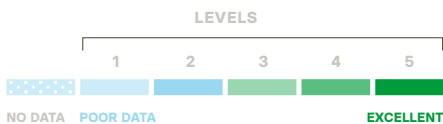
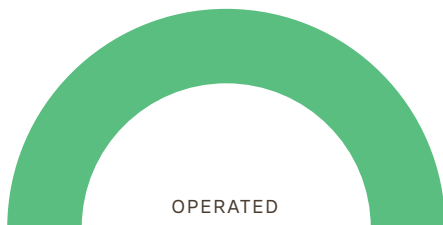
2025 TARGET (absolute reduction*)



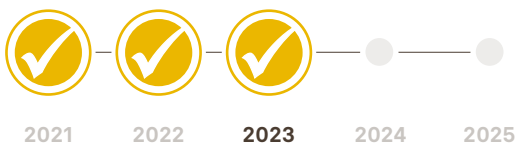
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

GAS CONNECT AUSTRIA

Gas Connect Austria is an Austrian gas network operator with a high-pressure natural gas pipeline network of around 900 km. 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 methane emissions. We use established management systems to reduce and avoid environmental pollution.

The following management systems are operated and practised:

- 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 inspection bodies.

In the past we did a lot of initiatives to avoid and reduce methane emissions. We are generally subject to a continuous improvement process, which we naturally also apply to our environmental performance. 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 decarbonisation requirements to net zero is a major challenge for us. To meet this challenge, we have developed reduction targets for CO₂ and CH₄ to be achieved through the implementation of planned reduction measures.

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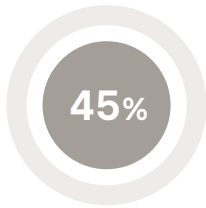


GAS STORAGE DENMARK

Gas Storage Denmark owns and operate 2 storage sites in Denmark. Stenlille is an aquafer storage and LI. Torup is a salt cavern storage.

Gas Storage Denmark want's to contribute to the green transition of the energy systems, by transforming underground storage from methane storage to multi storage of methane, biomethane, hydrogen, CO2 e.g., but also take part of bringing down the emission of methane.

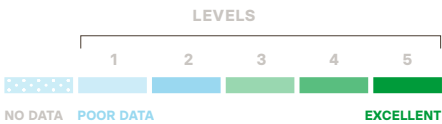
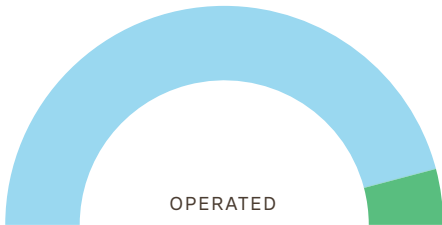
2025 TARGET (absolute reduction*)



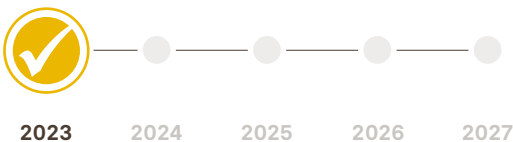
*percentage reduction of annual methane emissions by 2025 based on 2021 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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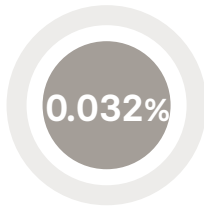
Gold Standard has been achieved on the basis of a credible implementation plan



GAS TRANSMISSION OPERATOR GAZ-SYSTEM

GAZ-SYSTEM plays a strategic role in the Polish economy. The company is responsible for natural gas transmission, operates major gas pipelines in Poland and the Baltic Pipe undersea gas pipeline, and controls the President Lech Kaczyński LNG Terminal in Świnoujście. As part of the 2015-2025 investment programme, GAZ-SYSTEM is developing over 2000 km of new gas pipelines in western, southern and eastern parts of Poland. Interconnections with Lithuania and Slovakia have been completed, as well as the design of onshore gas pipelines that will connect the planned FSRU floating terminal in the Gdansk Bay to the national transmission system. The LNG Terminal in Świnoujście is also being expanded, which will increase its regasification capacity by more than half.

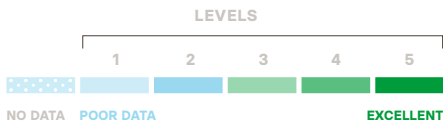
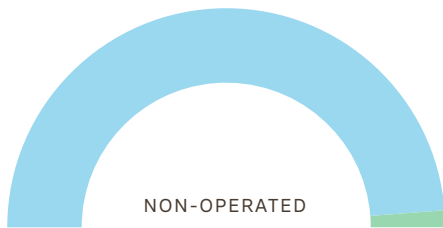
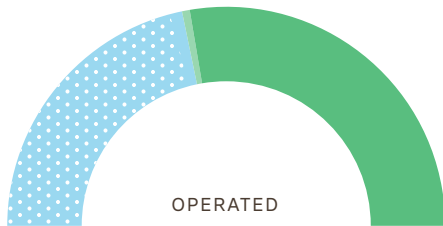
2025 TARGET (intensity*)



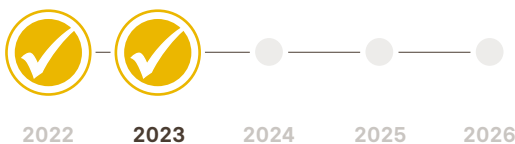
* m³ lost methane/ m³ transmitted natural gas

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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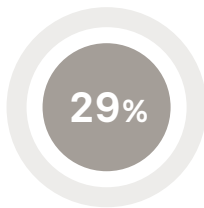
MIDSTREAM



GASUNIE DEUTSCHLAND TRANSPORT SERVICES GmbH

Gasunie Deutschland Transport Services GmbH (GUD) is an independent subsidiary company part of the Dutch energy infrastructure company N. V. Nederlandse Gasunie. Gasunie's whole 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. In Germany GUD operates a high pressure pipeline network of approx. 3,000 km and is JV partner for approx. 1,800 km high pressure pipeline grid. Gasunie is helping to accelerate the transition to a CO₂-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.

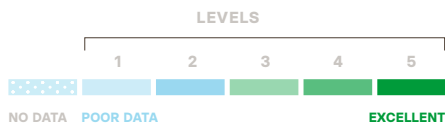
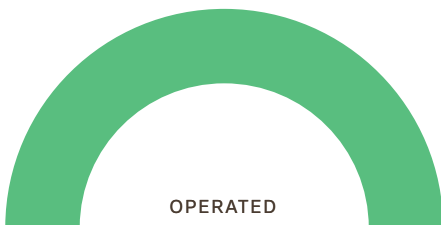
2025 TARGET (absolute reduction*)



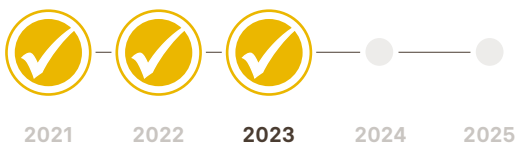
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

MIDSTREAM

N.V. NEDERLANDSE GASUNIE

Gasunie manages and maintains the infrastructure for large-scale transport and storage of gas in the Netherlands and the northern part of Germany. Safety, reliability, sustainability and cost-effectiveness are central in everything we do. Our company was founded in 1963, four years after the discovery of natural gas in the northern Dutch province of Groningen. We are a public limited company under Dutch law and fully owned by the State of the Netherlands. Gasunie has two subsidiaries that manage the gas transport network: Gasunie Deutschland in Germany, and Gasunie Transport Services (GTS) in the Netherlands.

Our mission:

Gasunie is a leading European energy infrastructure company whose core activities are gas transport and gas storage. We serve the public interest and facilitate the energy transition by providing integrated infrastructure services. We focus on value creation for our shareholder(s) and other stakeholders and apply the highest safety and business standards used in the sector.

Our vision:

We believe in a sustainable future with a balanced energy mix and a lasting role for diversified gas. We believe that we serve our customers best with innovative gas and related infrastructure solutions.

Our three pillars

- Ensuring a safe, reliable, affordable and sustainable gas infrastructure in our core area.
- Contributing to an efficient gas infrastructure and services for a properly functioning European natural gas and LNG market.
- Accelerating the transition to a carbon-neutral energy supply.

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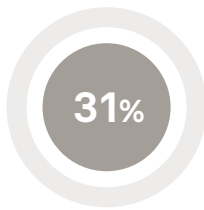
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MIDSTREAM

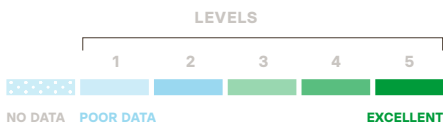
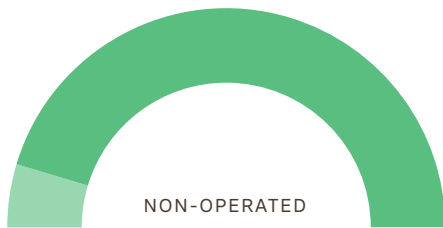
2025 TARGET (absolute reduction*)



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

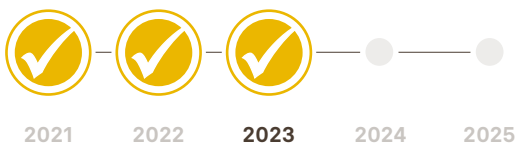
DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan



GRTGAZ

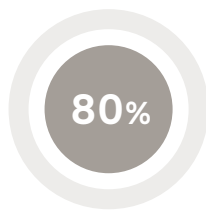
GRTgaz is the main gas transmission system operator in France with more than 32,000 km of pipelines to transport gas from suppliers to consumers connected to its network. GRTgaz has 2 subsidiaries: Elengy, a leader in LNG terminal services in Europe, and GRTgaz Deutschland, a German transport network operator. Due to the legal constraints of the French Energy Code, Elengy has its own methane-reduction trajectory and is therefore reported as non-operated. As an OGMP member, GRTgaz Deutschland is reported separately from GRTgaz.

In 2016, GRTgaz set an ambitious strategic objective of dividing its methane emissions by 3 in 2020. GRTgaz successfully achieved this target and is now pursuing the efforts to continuously reduce its methane emissions.

GRTgaz is now targeting to divide by 5 its methane emissions by 2025, compared to 2016. This represents a decrease of 16.2 kt CH₄ between 2016 and 2025.

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 (the GRTgaz research centre), 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.

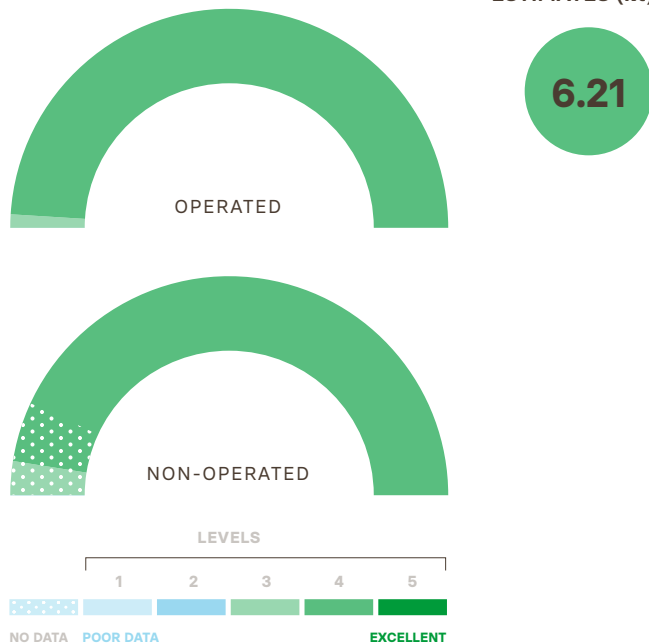
2025 TARGET (absolute reduction*)



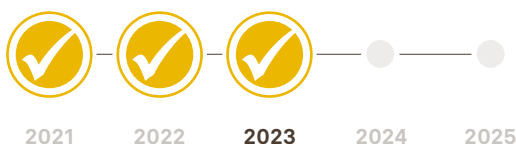
*percentage reduction of annual methane emissions by 2025 based on 2016 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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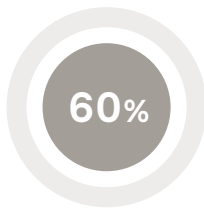
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SEGMENT

MIDSTREAM

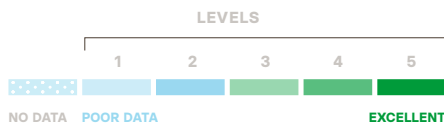
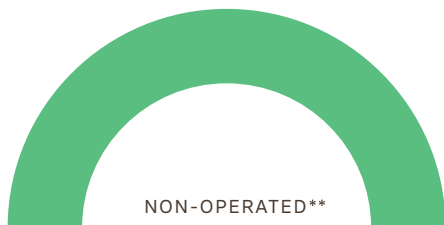


2025 TARGET (absolute reduction*)



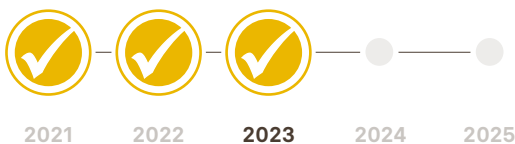
*percentage reduction of annual methane emissions by 2025 based on 2009 estimates

DATA QUALITY



**All non-operated assets reported by OGMP2.0 members

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

GRTGAZ DEUTSCHLAND

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 infrastructure 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 German and Europe. As a team, we ensure first-class services, a discrimination-free network access, and maintain close contact with our customers.

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SEGMENT

MIDSTREAM



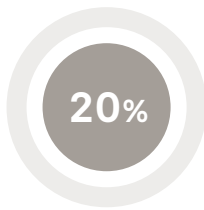
JS AMBER GRID

Operator of the Lithuanian natural gas transmission system, responsible for the transmission of natural gas to consumers and the operation, maintenance, and development of infrastructure.

The goal of Amber Grid is to transform the natural gas system by 2030, adapting it to transport renewable energy resources safely and creating a cleaner future for everyone. We plan to adapt the gas transmission system to new energy so that Lithuania's pipelines carry not only natural gas and biogas but also hydrogen.

We aim to contribute to a climate-friendly economy. By transporting green energy in Lithuania and abroad and changing gas using equipment with clean electric engine compressor, boilers. We reduce the impact on climate change by focusing on energy from renewables.

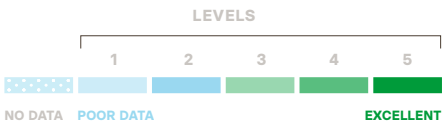
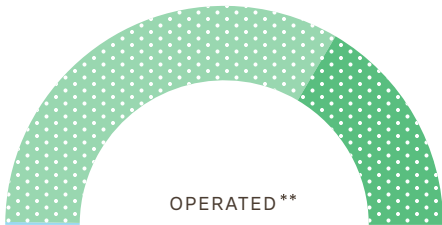
2028 TARGET (absolute reduction*)



*percentage reduction of annual methane emissions by 2028 based on 2022 estimates

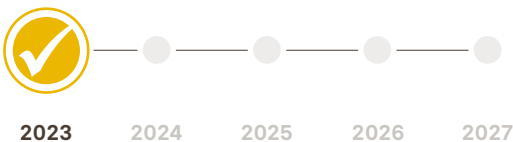
DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT





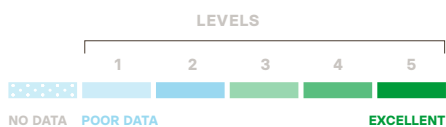
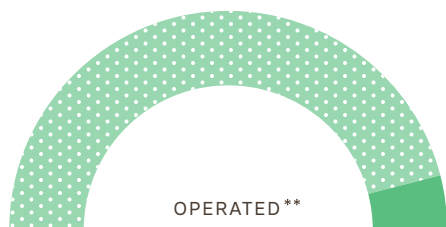
2025 TARGET (absolute reduction*)



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

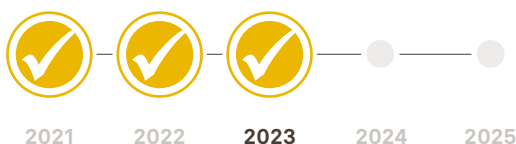
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

MEDGAZ

Medgaz is in charge of operating the direct gas pipeline from Algeria to Spain. Medgaz started the activity on April 2011, with a capacity of 8 BCM/year of natural gas and without interruption since then. After the entry into operation of the fourth turbocompressor on 1st July 2022 (the Expansion project) the capacity of the pipeline has increased up to 10,16 BCM/year.

Medgaz operates the system comprising a compressor station in Beni-Saf, Algeria with 4 turbocompressors, an offshore pipeline from Beni Saf to Almería, Spain with a length of 210 km, 24 inches ND and a maximum depth of 2.165 meters, and a reception terminal in Almería. After the Expansion project performed between 2018 and 2022, the yearly emissions have been modified according to production (4 turbocompressors installed instead of 3). Medgaz, respectful of the environment, is applying best practices and looking for technical and procedure improvements to help preserving 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.

Performance target is to reduce emissions up to 10% of reported quantity by 2025.

In addition, as part of its commitment to position Medgaz as a low carbon energy infrastructure, Medgaz is analyzing initiatives to reduce its carbon footprint (methane, CO₂) and improve its ESG metrics.

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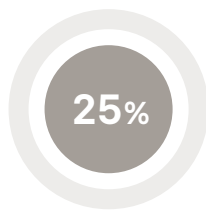
SEGMENT





THE NATIONAL GAS COMPANY OF TRINIDAD AND TOBAGO LIMITED

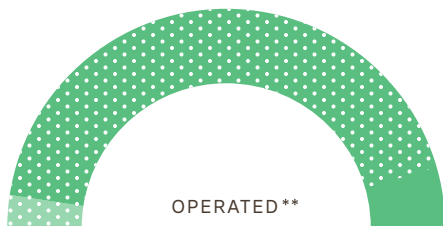
2025 TARGET (absolute reduction*)



*percentage reduction of annual methane emissions by 2025 based on 2021 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



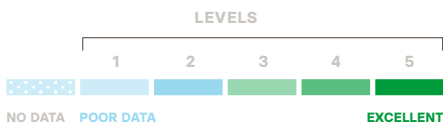
OPERATED **



5.99



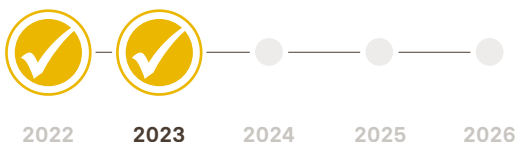
NON-OPERATED ***



** dotted pattern = incomplete data

*** All non-operated assets reported by OGMP2.0 members

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

THE NATIONAL GAS COMPANY OF TRINIDAD AND TOBAGO

The National Gas Company of Trinidad and Tobago Limited (NGC) and its subsidiaries are an integrated group of energy companies operating in Trinidad and Tobago's energy sector, with a growing presence in other jurisdictions. A profitable and high-performing state enterprise, parent company, NGC plays a pivotal role in Trinidad and Tobago's gas-based energy sector and is strategically positioned along the entire natural gas value chain. Through its people, investments, strategic partnerships and pioneering gas pricing model, NGC has secured the profitability of the local gas-based energy sector and catalysed the social and economic development of Trinidad and Tobago for four and a half decades.

NGC's core business is the aggregation, purchase, sale, transportation, and distribution of natural gas in Trinidad and Tobago. Other areas of business include (non-operated) joint venture oil production; marketing and trading of energy commodities; portfolio investments; technical services; engineering; procurement and construction services and activities in the sustainable energy space, including renewable energy and energy efficiency projects and investments. NGC owns, maintains, and operates most of Trinidad and Tobago's gas pipeline network of approximately 1,000 km, both offshore and onshore. The capacity of the network is 4.4 billion standard cubic feet per day (Bcf/d), supplying power generation, world-scale petrochemical plants, and a wide range of non-petrochemical light manufacturing, industrial and commercial enterprises.

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SEGMENT

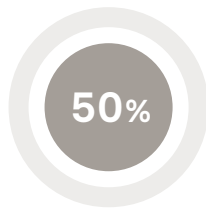
MIDSTREAM



NEL Gastransport GmbH (NGT)

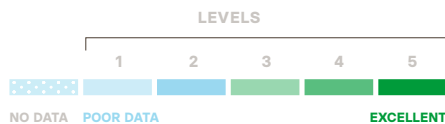
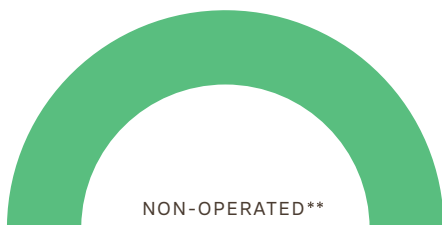
The fully regulated and certified transmission system operator NEL Gastransport GmbH (NGT) independently operates the North European Natural Gas Pipeline (Nordeuropäische Erdgasleitung – NEL) and is responsible for transporting natural gas in a safe and reliable manner.

2025 TARGET (absolute reduction*)



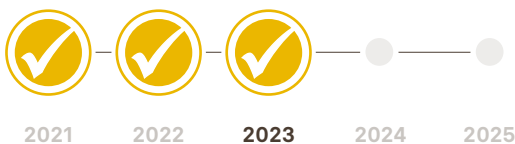
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY



**All non-operated assets reported by OGMP2.0 members

GOLD STANDARD



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SEGMENT

MIDSTREAM



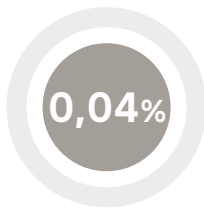
NIGERIA LNG LTD

Nigeria LNG Limited (NLNG) is one of the world's top suppliers of LNG. NLNG was incorporated as a Limited Liability Company on May 17, 1989, to harness Nigeria's vast natural gas resources and produce Liquefied Natural Gas (LNG) and Natural Gas Liquids (NGLs) for export.

NLNG is an Incorporated Joint Venture owned in the following proportions: Nigerian National Petroleum Company Limited (NNPCL) (49%), Shell Gas B.V. (25.6%), TotalEnergies Gaz & Electricité Holdings (15%), and Eni International N.A. N.V. S.à.r.l (10.4%). NLNG has a total production capacity of 22 Million Tons Per Annum (mtpa) of LNG and 5mtpa of Natural Gas Liquids (NGLs) from its six-train plant complex. In 2019, NLNG shareholders took the Final Investment Decision (FID) on its 7th train and awarded the Engineering, Procurement and Construction (EPC) contracts for the plant expansion in 2020.

The long-awaited expansion will increase production capacity by 35 per cent from 22mtpa to 30mtpa and enhance NLNG's competitiveness in the global market. Train 7 is expected to start production in 2026.

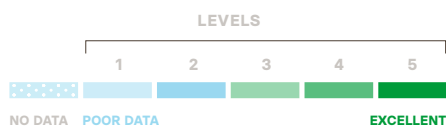
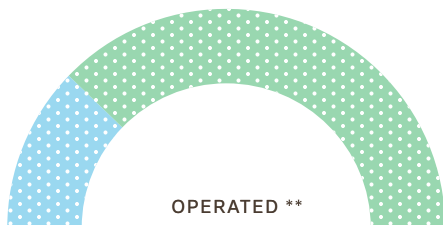
2025 TARGET (intensity*)



* total amount of methane emissions as a percentage of produced LNG

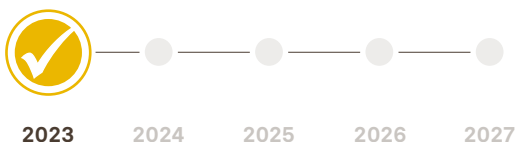
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** dotted pattern = incomplete data

GOLD STANDARD



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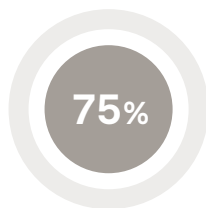
SEGMENT

MIDSTREAM

Wir transportieren Gas.



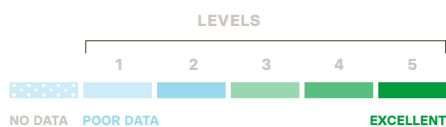
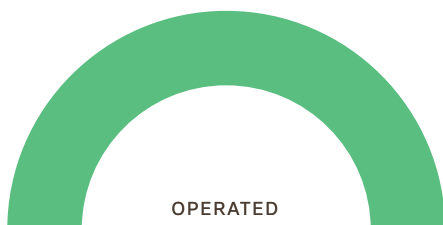
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

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 network we operate one compressor station and three biogas feed-in plants with a total capacity of 2 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 H₂ 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 H₂ infrastructure will make a significant contribution to the CO₂-neutral energy supply of the future.

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SEGMENT

MIDSTREAM

ONTRAS

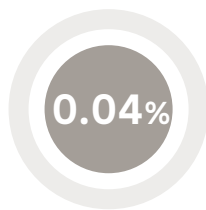
ONTRAS

ONTRAS Gastransport operates the 7,700 kilometre gas transmission system in eastern Germany and is responsible for the reliable and efficient transport of gaseous energy - today and in the future. We are actively shaping the energy market of the future, contributing ideas and developing sustainable solutions for our infrastructure. In doing so, we rely on reliable technology, many years of experience and a dedicated team. Our gas infrastructure is compatible with renewable gases and thus also supports a variety of use cases for hydrogen, such as material applications, mobility and heat.

As part of this effort 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.

With the ONTRAS H2-Startnetz, we want to lay the foundation for the hydrogen infrastructure in eastern Germany. By 2030, a network of more than 900 kilometres of pipelines is to be created.

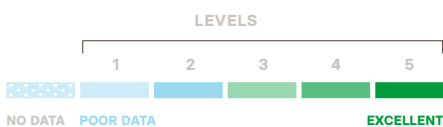
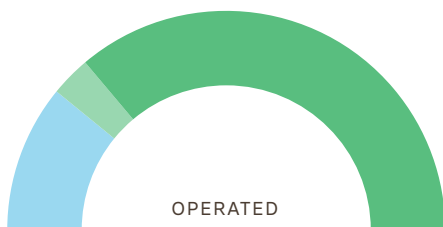
2025 TARGET (intensity*)



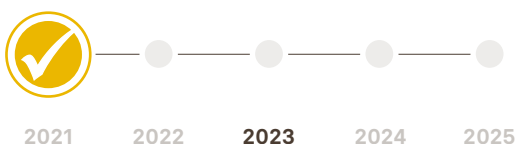
* maximum amount of annual methane emissions by 2025 as a percentage of operated assets over transported gas

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

MIDSTREAM



OPAL Gastransport GmbH & Co. KG (OGT)*

OPAL Gastransport GmbH & Co. KG is the network operator of the Baltic Sea Pipeline Link (OPAL, for short) and responsible for transporting natural gas safely and reliably on OPAL from Lubmin near Greifswald to the end point of the OPAL near Brandov (CZ) on the German-Czech border. Based in Kassel, the company offers its customers state-of-the-art and competitive transport services in the heart of Europe via the company's own high-pressure pipeline, which is around 470 kilometres long.

*With the entry in the commercial register on August 31, 2023, the 80 percent fractional ownership of W&G Transport Holding GmbH (WGTH) in the OPAL was transferred to GASCADE Gastransport GmbH (GASCADE) by way of spin-off of the regulated part of the operation. Since then, OGT was dissolved.

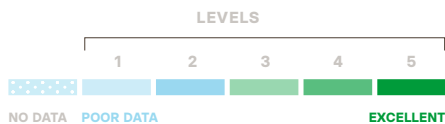
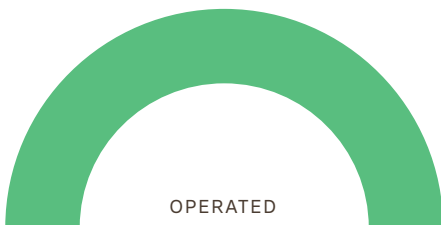
2025 TARGET (absolute reduction*)



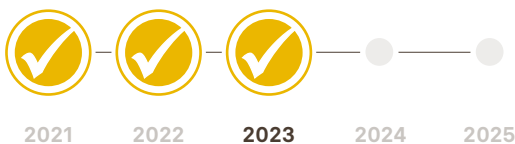
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



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SEGMENT





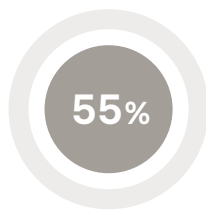
OPEN GRID EUROPE

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.

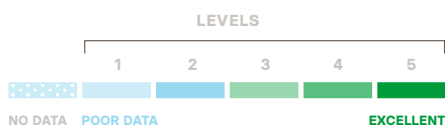
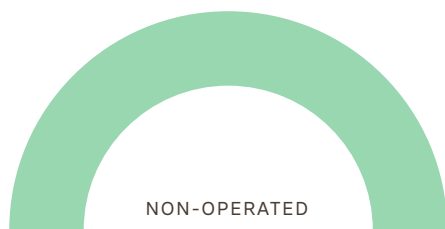
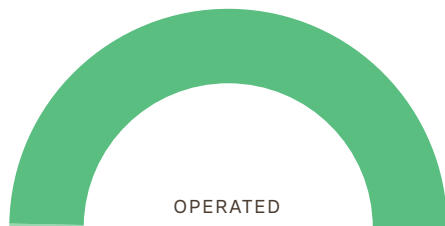
2025 TARGET (absolute reduction*)



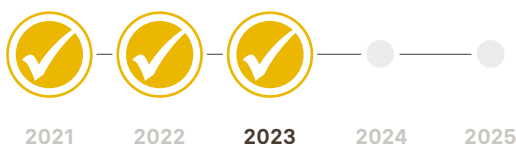
*percentage reduction of annual methane emissions by 2025 based on 2009 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

MIDSTREAM



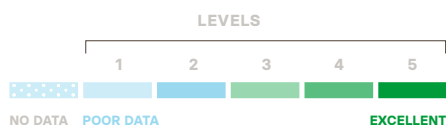
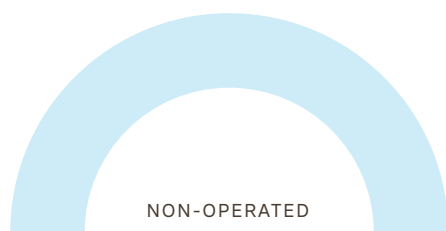
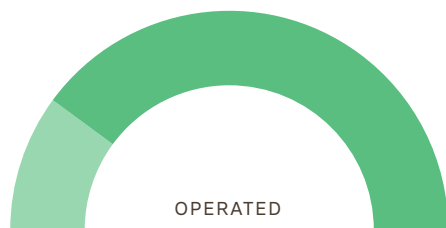
2025 TARGET (absolute reduction*)



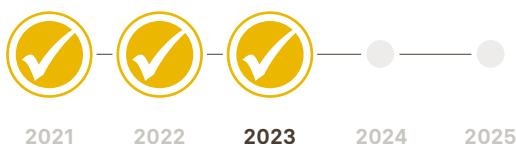
*percentage reduction of annual methane emissions by 2025 based on 2018 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

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 Carriço. REN also holds stakes in Electrogas, a Chilean gas transmission system operator, whose facilities constitute non-operated assets for REN.

Along with its ambition of maintaining one of Europe's leading positions, 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.

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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 largest transport company and is directly interconnected to the latter.

Retragas efficiently manages the service through its regional transport system, handling more than 360 million cubic meters of natural gas last year 2022.

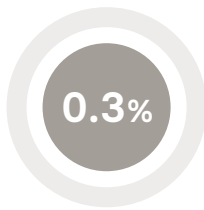
We are present with our networks (over 400 km) and plants (8 primary interconnection cabins) in Lombardy and Trentino-Alto-Adige.

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 scope and transported to the redelivery points of the same scope. Service is subject to transport tariffs determined according to the indications of the Regulatory Authority for Energy, Networks and Environment.

To manage the provision of the basic service in conditions of safety and economy, Retragas makes available ancillary services such as, by way of example, the management of transport data, the transfer of capacity, transfers and transfers of capacity, the operational balancing of the transport system, administrative balancing, compliance with the minimum pressure values at the redelivery points and the permissible gas quality intervals, the planning and management of maintenance, invoicing and management of service emergencies.

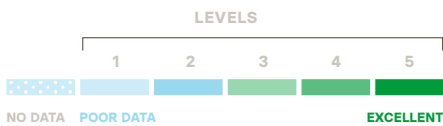
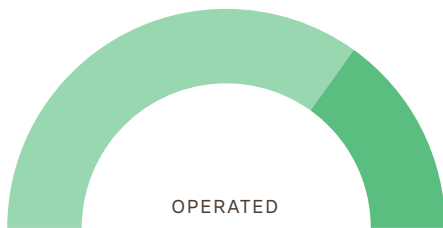
2025 TARGET (intensity*)



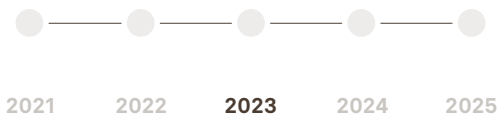
*Emission from pipeline gas not returned to the user

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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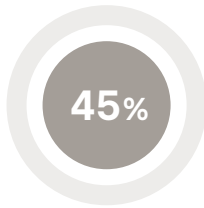
SEGMENT

MIDSTREAM

Gold Standard has been achieved on the basis of a credible implementation plan



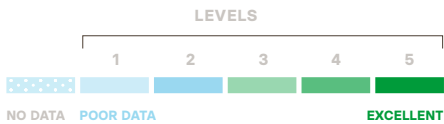
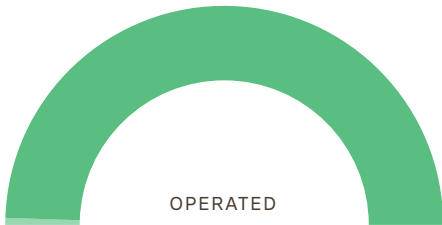
2025 TARGET (absolute reduction*)



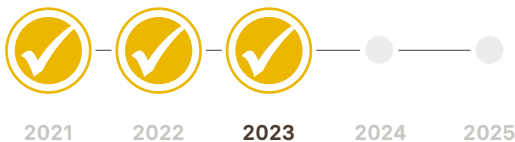
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

SAGGAS

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. 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.

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SEGMENT

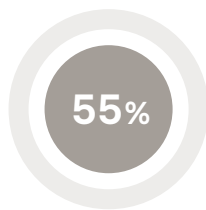
MIDSTREAM



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). It is among the top ten Italian listed companies by market capitalization. Snam is committed to renewing its infrastructure with hydrogen-ready standards and to developing integrated projects along the green gas value chain, with investments in biomethane, hydrogen, sustainable mobility and energy efficiency. It also creates new green areas through a benefit company focused on forestation projects. Snam has secured the acquisition of two floating regasification units (FSRU). The ships have a storage capacity of 170,000 cubic metres each and feed the gas into the existing network after regasifying it from its liquid form (LNG) with an annual regasification capacity of 5 billion cubic metres. The first one will operate starting from 2023, the second by 2024. 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. Since 2021 Snam increased its absolute methane emissions reduction target from -45% to -55% by 2025 vs. 2015 related to the operated business, a more ambitious target than that indicated by the OGMP 2.0 protocol. During 2022 Snam defined a new absolute methane emissions reduction target of -65% by 2030 vs. 2015 related to the operated business, a target aligned to what recommended by the OGMP 2.0. In 2022 Snam methane emissions decreased by 46% vs 2015. Methane emission reduction is part of an ambitious strategy to achieve carbon neutrality (scope 1 and 2) at 2040, with intermediate targets by 2025, 2027 and 2030. Snam is also actively participating in different Working Groups and Task Forces at EU / international level (IGU, 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)

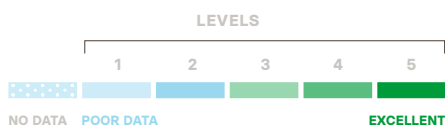
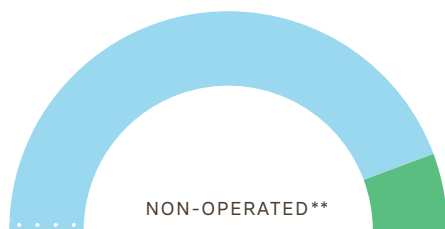
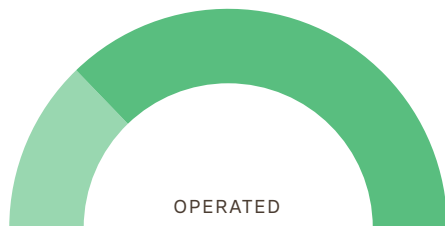
2025 TARGET (absolute reduction*)



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

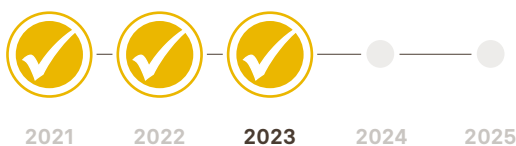
DATA QUALITY

2022 METHANE ESTIMATES (kt)



** All non-operated assets reported by OGMP2.0 members

GOLD STANDARD



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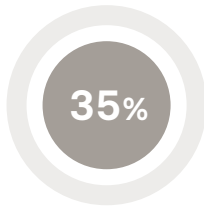
SEGMENT

MIDSTREAM



A company of ENGIE

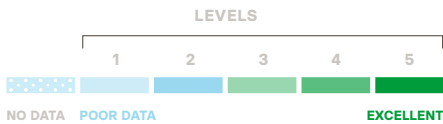
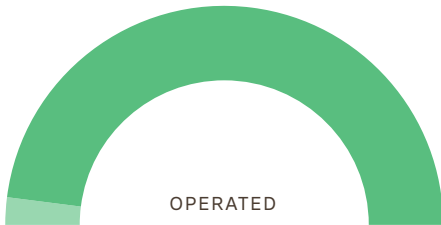
2025 TARGET (absolute reduction*)



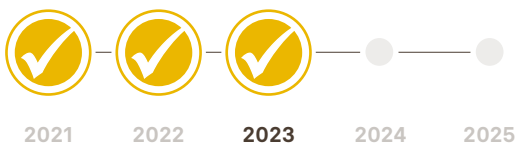
*percentage reduction of annual methane emissions by 2025 based on 2016 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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STORENGY DEUTSCHLAND GmbH

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 term of methane emission. Storengy Deutschland GmbH wants to act on all the possible sources of methane emissions in its processes.

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SEGMENT

MIDSTREAM



A company of ENGIE

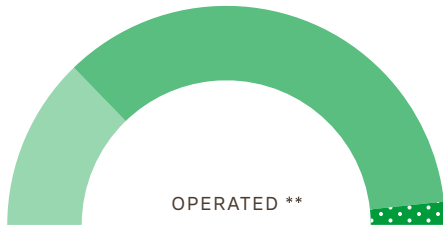
2025 TARGET (absolute reduction*)



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

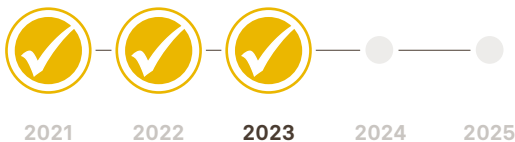
DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

STORENGY FRANCE

Storengy France, an ENGIE subsidiary, is a key player in underground gas storage. Drawing on more than 70 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 m³.

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 committed on reducing methane emissions by 40% 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 NET ZERO. Methane emissions reduction program will strongly contribute to this ambition and all operational teams are mobilized for this topic.

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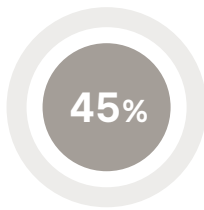
SEGMENT

MIDSTREAM



A company of

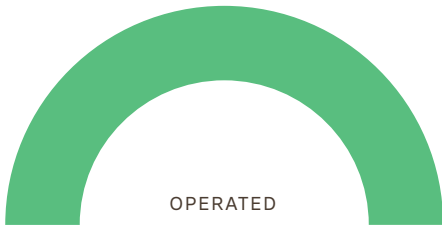
2025 TARGET (absolute reduction*)



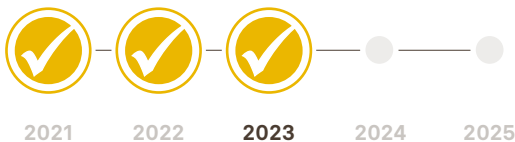
*percentage reduction of annual methane emissions by 2025 based on 2016 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

STORENGY UK

Storengy UK is a subsidiary of ENGIE, we developed and now operate the Stublach Natural Gas Storage site in Cheshire, the largest onshore in the UK. Storengy UK has operated the Stublach Gas Storage Project, a salt cavern storage facility in Cheshire, Northwich since 2007. Stublach comprises 20 underground salt caverns, created between 2009 and 2018. Each of these caverns stores natural gas over 500 metres below the surface. Now fully completed, the scheme is the largest on-site gas storage facility in the country, enhancing the security of supply to the UK gas market. We are actively participating in the energy transition and supporting the UK government strategy to reach net zero by 2050.

Key Stats:

- Commercial Storage capacity 4.5 TWh
The site can hold enough gas to supply the UK for 2 days (or to meet the gas needs of a big city like Greater Manchester - 1.2 million homes - for 120 days)

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 2025. We intend to deliver net zero through a range of projects including:

- Installation of gas recompression station for maintenance blowdowns
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 produce net zero gas
Geothermal Energy opportunities

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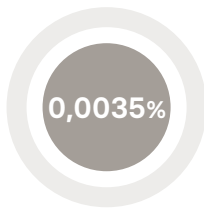
SEGMENT

MIDSTREAM



Trans Adriatic Pipeline

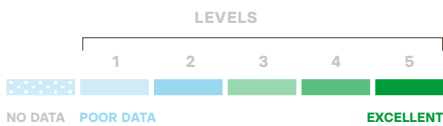
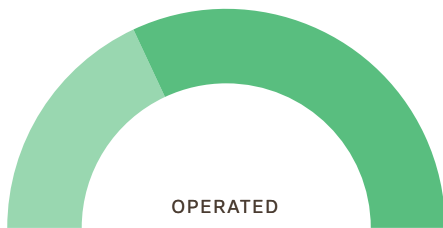
2025 TARGET (intensity*)



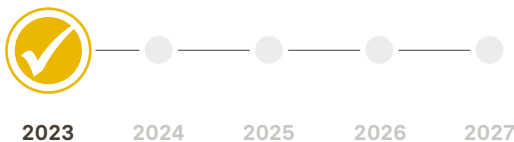
*Nm³ / Nm³ of gas transported

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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TRANS ADRIATIC PIPELINE

TAP transports natural gas from the giant Shah Deniz field in the Azerbaijani sector of the Caspian Sea to Europe. The 877 km long pipeline connects with the Trans Anatolian Pipeline (TANAP) at the Turkish-Greek border, crosses Greece and Albania and the Adriatic Sea, before coming ashore in Southern Italy.

TAP facilitates gas supplies to South Eastern European countries through existing and prospective interconnectors. TAP is connected to Interconnector Greece Bulgaria (IGB) which started its commercial operations in October 2022, providing Caspian gas to Bulgaria, enhancing security of energy supplies in one more European country.

TAP is strategically and economically important to Europe and essential in providing reliable access to a new source of natural gas. TAP plays a significant role in boosting Europe's energy security, supply diversification, as well as its decarbonisation objectives.

As Europe transitions to climate neutrality, we are focused on making sure this happens in a sustainable manner. We placed ourselves on a decarbonisation pathway aiming to ensure that our operations are climate neutral by 2050. Our short-term target is to reduce our carbon footprint by 5, the methane emissions by 8 and the fugitive emissions by 54% between now and 2025. Moreover, in the context of our expansion framework, we are assessing the potential of electrifying our new compressor units and stations, ideally with renewables-generated power.

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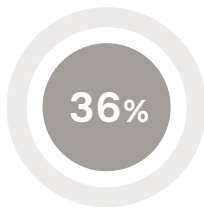
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SEGMENT

MIDSTREAM



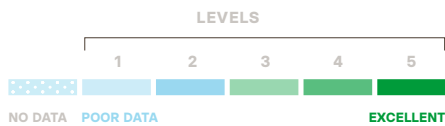
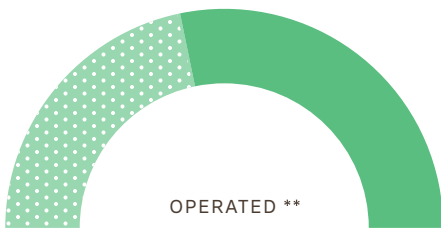
2025 TARGET (absolute reduction*)



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

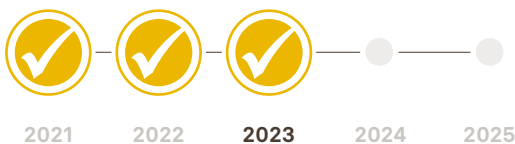
DATA QUALITY

2022 METHANE ESTIMATES (kt)



**dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

TERÉGA

As a major European actor in the energy market, Teréga has been developing and operating gas transport and storage infrastructures for more than 75 years.

Representing about 15% of the french natural gas transport grid and 25% of french storage capacity, Teréga is committed to the safety, maintenance and enhancement of its infrastructures, to provide everyone with an ever safer, more efficient, and more environmentally integrated network.

As a responsible actor in the energy sector and fully aware of the challenges of environmental and energy transition, Teréga has been involved for several years in projects to reduce its carbon footprint, through its internal strategy relying on the "Avoid - Reduce - Offset" approach.

The engagement of Teréga in the OGMP initiative is a natural evidence, supporting the fact that the MRV (Measure - Reporting - Verification) process is the first key to a strong reduction path of CH₄ emissions.

Teréga is committed to -30% Green House Gases emissions by 2030 (versus 2021) and -36% of methane emissions by 2025 (versus 2017). Thus, Teréga tests and implements solutions to reduce direct emissions of methane, including re-compression units for vented gas, replacing venting by flaring in various conditions, collection and reinjection of seal leaks.

Teréga aims at contributing to the energy transition through the development of projects to lower the carbon footprint of the energy supplied to its clients.

Therefore, Terega has launched several studies for the development of hydrogen transmission and storage infrastructures, the development of biomethane infrastructures, and explores solutions for carbon capture & storage.

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SEGMENT

MIDSTREAM



THYSSENGAS GmbH

Founded in 1921, Dortmund (Germany) based TSO Thyssengas GmbH has more than 100 years of experience in the operation, service and maintenance of gas networks. Our infrastructure mainly extends to the territory of North Rhine-Westphalia (North West of Germany) and transmits approx. 6 billion cubic metres of gas through ca. 4400 km of underground transmission network. At more than 1000 exit points the gas is safely being served to downstream networks, industrial customers and power plants. We are part of the well-integrated European gas transmission grid forming the basis for an internal energy market. In addition, we are taking the need for the energy transition seriously and our objective is to take an active part in its implementation. While we are convinced that our gas infrastructure can be the building block for a safe, cost-effective and eco-friendly energy supply in the future, we are fully aware that this will only work if we do our job responsibly. Therefore, we are constantly working on the improvement of our processes using new technology and innovation. The identification and reduction of methane emissions is one of our essential tasks. Furthermore, we strongly believe in the potential of hydrogen as a future energy carrier diminishing greenhouse gas emissions. Accordingly, we are one of the key drivers behind the discussion to establish a hydrogen-based energy system in Germany.

In 2023, the Thyssengas OMGP 2.0 report (reporting year 2022) relies almost completely on specific measurements gained which we have conducted in our network as well as in equivalent networks of other German TSOs (in Germany, 12 TSOs jointly form the German transmission network and provide one single entry-exit-system to the users). More details on the L4 documentation are given in chapter 'Credible and Explicit Path for Operated Assets/Level 4 documentation'. 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.

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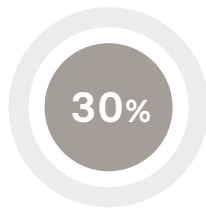
SEGMENT

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MIDSTREAM

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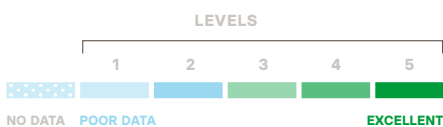
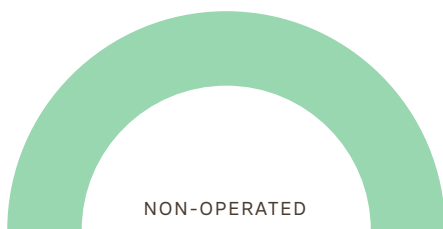
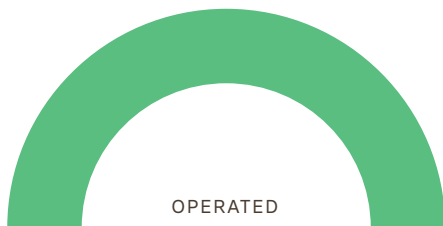
2025 TARGET (absolute reduction*)



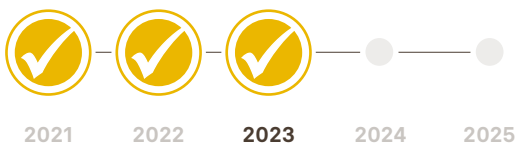
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

TRANS AUSTRIA GASLEITUNG

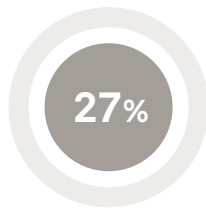
Trans Austria Gasleitung GmbH with its approximately 1,140 km long pipeline system and 5 compressor stations (approx. 420 MW of power installed) is a certified Austrian Independent Transmission Operator with its main activities in the transport of gas and the operation and maintenance of high-pressure gas pipelines and facilities for the reliable and secure supply of energy to Austria and neighboring countries.

We are aware of the common challenges to tackle climate change and considerable efforts have been made in the past to continuously reduce emissions with a positive impact on environment (reduction of GHG emissions). The company aims to reduce its absolute methane emissions by 27% by 2025 and is therefore particularly keen to be an active partner in the 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, we implement 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 five 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 methane emissions in gas transportation. The company is also a member of the European Hydrogen Backbone (EHB), to actively contribute future steps towards a carbon-free society.

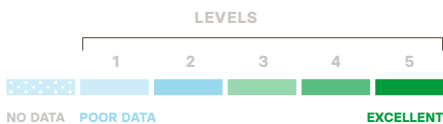
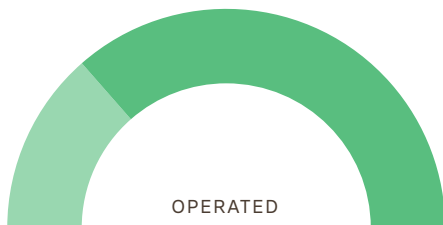
2025 TARGET (absolute reduction*)



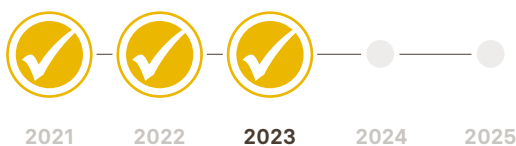
*percentage reduction of annual methane emissions by 2025 based on 2017 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

INDEX

DATA QUALITY = Reporting levels 1 to 5, where increasing level corresponds to increased use of direct measurements

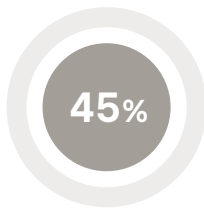
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SEGMENT

MIDSTREAM



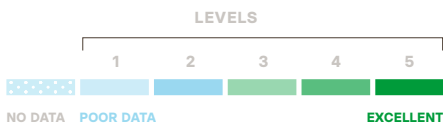
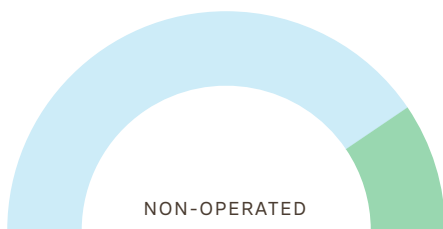
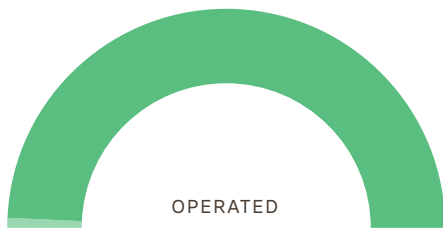
2025 TARGET (absolute reduction*)



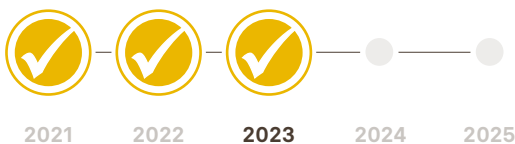
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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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 around 83 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, 2021 and 2022 the majority of its methane emissions from operated assets on a level 4 reporting standard, received Gold Standard in all three years 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. Uniper Energy Storage stays with the already submitted absolute reduction target which is to reduce the methane emissions of active and self-operated assets by 45% compared to 2015 until 2025.

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SEGMENT

MIDSTREAM

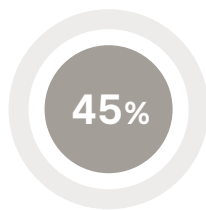
VNG GASSPEICHER

VNG Gasspeicher GmbH has been building and operating underground gas storage facilities for half a century. Accordingly, all of our technical gas storage processes are safe, reliable and efficient. This is backed up by a highly qualified team at all storage sites, state-of-the-art telecontrol technology - and integrated quality and safety management.

At the same time, development never stands still. We are constantly working with market partners and scientists on the storage facilities and technologies of tomorrow. Key issues here are sustainability and environmental protection.

Our society is undergoing a profound transformation to combine a secure energy supply with effective climate protection. To ensure that we, as a gas storage company, can make a contribution to the transformation within our means, we are voluntarily committed, among other things as an OGMP member, to measuring and reducing our methane emissions.

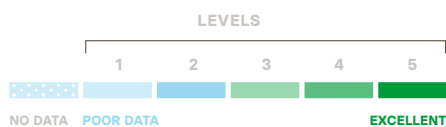
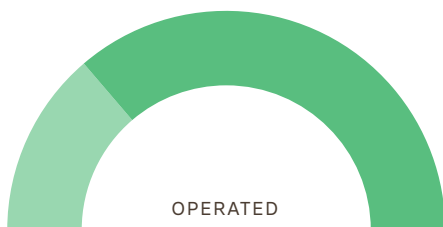
2025 TARGET (absolute reduction*)



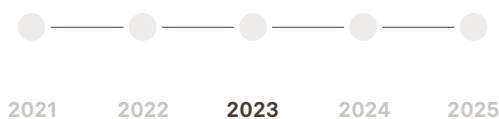
*percentage reduction of annual methane emissions by 2025 based on 2020 estimates

DATA QUALITY

2022 METHANE ESTIMATES (kt)



GOLD STANDARD



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SEGMENT

MIDSTREAM

2I RETE GAS S.P.A.

2i Rete Gas is the second largest gas distributor in Italy. The company is present in 18 regions out of 20 where, at the end of 2022, has come to serve over 4.9 million end customers in more than 2,200 municipalities. In 2022 2i Rete Gas has distributed 5.6 billion cubic meters of natural gas through its 72 thousand km of network.

2i Rete Gas, aiming at minimizing the direct impact of its operations on the environment, is strongly committed to reducing methane fugitive emissions and views the OGMP 2.0 membership as a further stimulus to achieve its targets.

In this regard, over the last three years, the company has intensified its efforts to lower emissions from the network by carrying out advanced leak detection and repair campaigns supported by state-of-the-art technology. The results of this activity not only allowed a more effective identification of dispersions and fast repair of leaks, but also made it possible to acquire a set of information that, in turn, resulted in a more accurate method for quantifying emissions, assessing the actual performance of managed assets and defining data-driven long term CO2e reduction targets.

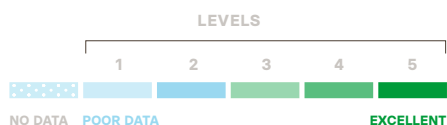
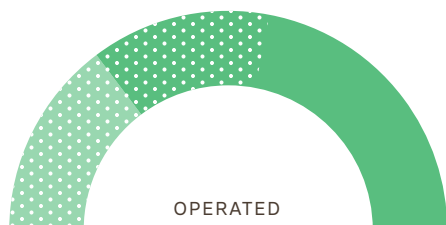
2025 TARGET (absolute reduction*)



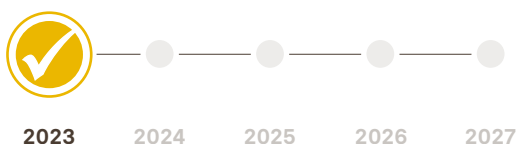
*percentage reduction of annual methane emissions by 2025 based on 2021 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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SEGMENT

DOWNSTREAM

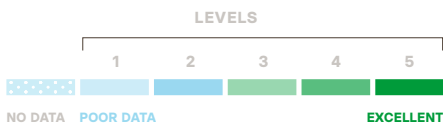
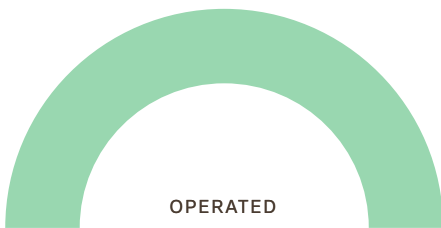
2025 TARGET (intensity*)



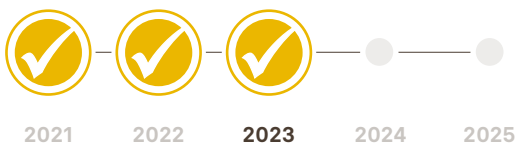
* per meters of pipelines

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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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. Since 2020 Adrigas achieved energy efficiency certificates which led to savings of over 30,000 TOE. Furthermore, the entire SGR group also reported, in 2022, a cumulative value relating to avoided CO2 emissions equal to 33,230 tco2 (starting report in 2015).

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SEGMENT

DOWNSTREAM



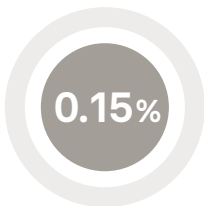
CHINA GAS HOLDINGS LIMITED

China Gas Holdings Limited ("China Gas"), listed on the Main Board of the Hong Kong, is one of the largest multi-regional integrated energy supply and service companies in China. The Company has built a comprehensive business development structure that is led by the pipeline natural gas business, LPG, LNG, propane micro-pipeline network, hydrogen energy development, and utilization, low-carbon comprehensive energy services, energy internet operation, gas equipment and kitchen appliance manufacturing, and grid electricity.

China Gas has always adhered to its mission and responsibility of "Uniting People Together and Benefiting Society", consciously integrates corporate social responsibility into its strategy, corporate culture, and production and operation activities, and strives to build a harmonious enterprise providing clean and convenient energy and services to customers, and seeking happiness for society as a whole.

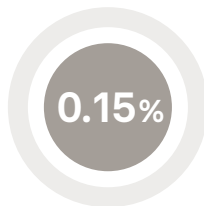
China Gas will adhere to the three major development principles of "maintaining a leading position in the industry, adapting to industry development trends and optimizing business structures, and paying equal attention to accelerating development and strengthening management", and will strive to build a comprehensive energy supply service trend that covers the whole energy, the whole industry, to develop into a world-class comprehensive energy supply service provider and urban and rural green operator with significant social and economic influence.

2025 TARGET (intensity*)



OPERATED

* maximum amount of annual methane emissions by 2025 as all gas marketed over the annual period

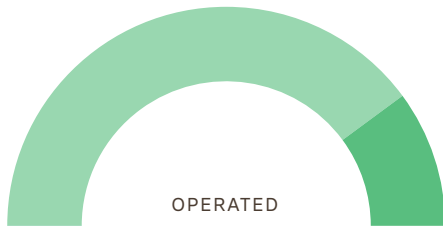


NON-OPERATED

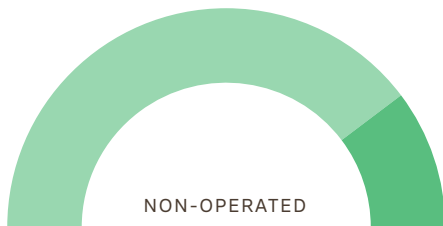
* maximum amount of annual methane emissions by 2025 as all gas marketed over the annual period

DATA QUALITY

2022 METHANE REPORTED (kt)



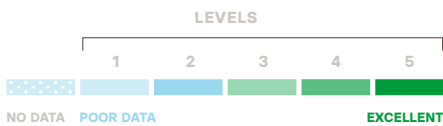
OPERATED



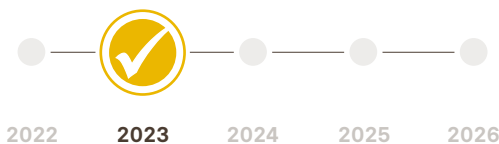
NON-OPERATED



21.61



GOLD STANDARD



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SEGMENT

DOWNSTREAM

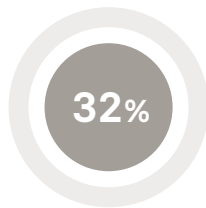


COTEQ NETBEHEER

Since 1966, the Cogas group has provided energy in the form of electricity, heat and gas to the eastern part of the Netherlands and is situated in Almelo. Coteq Netbeheer is a DSO and part of the Cogas group. Coteq owns a gas distribution grid with a total length of 4445 km that provides gas to 142,666 consumers. Coteq strives to be an excellent DSO by providing a safe and reliable energy infrastructure. The company also aims to support the energy transition in the region and to reduce the impact of the business operations on the environment.

In the Netherlands, all grid operators (TSOs and DSOs) are regulated by the government. Coteq Netbeheer is one of the six DSOs in the Netherlands. These DSOs combine their efforts in the sector association Netbeheer Nederland to learn from each other's experiences and to continuously improve the safety and reliability of the combined networks. Coteq Netbeheer has always put much effort into reducing the amount of gas leakage. Coteq has no grey cast-iron in their gas grids anymore, as in the years before 2013 all the grey cast-iron had been replaced by other materials that cause less leakages. Venting is also strictly limited, stations are multiple times a year maintained and the network monitored. There is a thorough LDAR program in which the whole network is reviewed with a sniffing device. This approach has been developed from a safety perspective. Nevertheless, the obtained insights in the environmental impact of methane emissions combined with the climate goals, make the environmental impact the main argument to reduce the emissions even further.

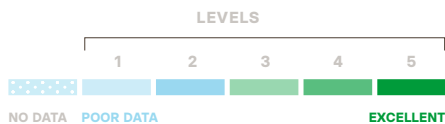
2025 TARGET (absolute reduction*)



*percentage reduction of annual methane emissions by 2025 based on 2022 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



**dotted pattern = incomplete data

GOLD STANDARD



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SEGMENT

DOWNSTREAM

DISTRIGAZ SUD REȚELE

Distrigaz Sud Retele is the biggest gas distributor within the South of Romania (21 counties and the capital city of Romania, Bucharest).

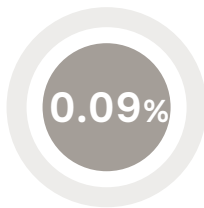
The company has over 2 million customers, 47 years of experience within the gas field and 2,700 specialists working in the company.

Our goal is to provide the gas infrastructure that people need and to maintain and develop the gas distribution network, ensuring that we do this in the most sustainable and responsible way.

Our strategic priorities are industrial safety, environmental protection, assuring the conformity with the legal requirements, economic performance and customer relationships.

By joining the OGMP, Distrigaz Sud Retele aims to reduce methane emissions according to the commitments assumed and improve the process of quantifying methane emissions in order to obtain the gold standard.

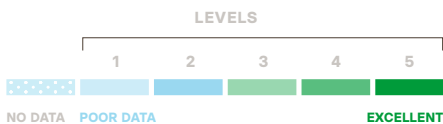
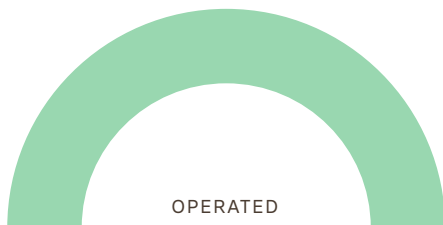
2025 TARGET (intensity*)



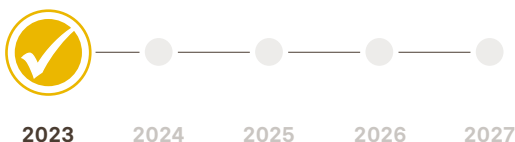
* maximum amount of annual methane emissions by 2028 as a percentage of marketed gas

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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SEGMENT

DOWNSTREAM



Energienetze Bayern

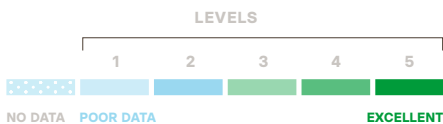
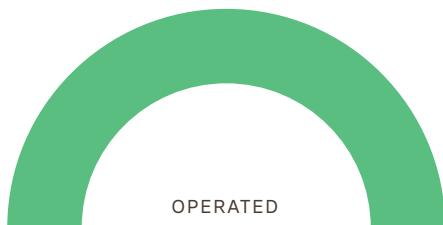
2025 TARGET (absolute reduction*)



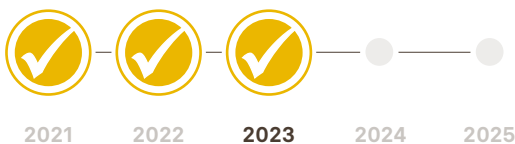
*percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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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 155.000 residential, commercial and industrial endusers and connected distribution grids.

ENB operates 10.500 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 over the last 20 years, 75 % 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, the methane intensity has already been reduced to 0,03 %.

In 2021 and 2022 ENB has increased the measurement efforts especially in the pressure regulations stations and the small local compressors, for which a new German DVGW-lead program has been initiated with several DSO. In addition new measures have been taken to lower operational emissions by venting and flaring during the construction and repair of distribution grids.

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SEGMENT

DOWNSTREAM



ENEXIS

Enexis is a grid operator. We ensure that millions of customers in five provinces in the Netherlands (Groningen, Drenthe, Overijssel, Noord-Brabant and Limburg) have access to electricity and gas every day. 4.984 employees work at Enexis. Beside a safe and reliable energy supply, we are working on increasing the sustainability of the energy system in the Netherlands. On the one hand, by connecting wind farms, solar farms, district heating and charging points for electric mobility and, on the other hand, by working on building the energy system of the future together with our stakeholders. In the future (to be precise no later than in 2050), the Dutch energy system has to be carbon neutral. The government, companies and social organizations have agreed this in the Dutch Climate Agreement. The energy system may then no longer have a negative effect on the climate. This is possible when the switch is being made to renewable energy sources, such as green gas and hydrogen.

Enexis Netbeheer plays a central role in the energy chain. We distribute energy safely to customers. We work every day for the construction, maintenance, development and operation of the electricity and gas grids. We work together with many parties on innovations to make the energy supply more efficient and sustainable. Besides technological innovations, such as energy storage or congestion management, data also plays an important role. We facilitate an open electricity market by making energy data available to suppliers and market parties in a safe manner. As a result, administrative processes, such as switching energy supplier, can take place seamlessly for customers. Our ambition is clear: we realize the energy transition in our service area. We do this in close cooperation with our stakeholders. In order to succeed in this task, we need to focus on our core activities.

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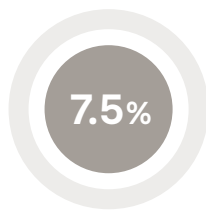
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SEGMENT

DOWNSTREAM

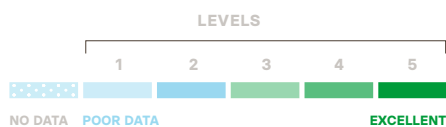
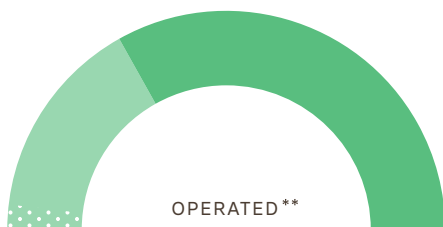
2025 TARGET (absolute reduction*)



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

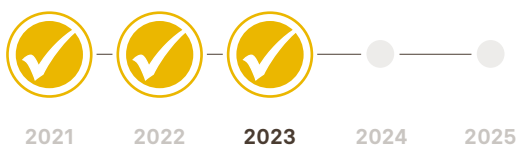
DATA QUALITY

2022 METHANE REPORTED (kt)



**dotted pattern = incomplete data

GOLD STANDARD

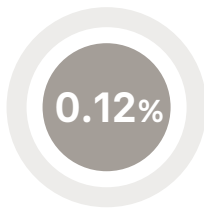


Gold Standard has been achieved on the basis of a credible implementation plan

EWE NETZ

EWE NETZ GmbH is an OGMP member with different assets in the downstream sector. EWE NETZ operates the largest natural gas distribution grid in Germany with a total length of over 57,000 km in the regions of Lower Saxony, Brandenburg and Rügen. The entire supplied area covers more than 2,800 km² and more than 799,000 households and companies. The distribution grid including main and service gas lines are operated in the pressure level of low pressure, medium pressure and high pressure. The high-pressure distribution grid covers a total network length of approx. 3,800 km and has an operating pressure of up to 70 bar. In order to distribute the gas in such a large area and between different network pressure levels, there are over 1,600 gas pressure regulating and/or metering stations with different capacities and operating pressures. These also include stations to upstream and downstream operators like transmission/transport grids (withdrawal stations) as well as stations for (light) industrial consumer supply and injection stations for biogas. EWE NETZ has been certified an energy management system according to DIN ISO 50001 since 2016 to systematically and sustainably reduce energy consumption. In addition, EWE NETZ demonstrates secure network operations and a high level of security of supply through the Technical Security Management (TSM). EWE NETZ has been repeatedly TSM-tested by the German Association of Gas and Water Professionals (DVGW) in the field of natural gas since 2002. EWE NETZ has set itself the goal of reducing operational and incident methane emissions in the distribution grid. Due to the in Germany applicable Set of Rules by the DVGW, 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 been 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 less than 0.1%. This proven strategy that led to fewer methane emissions will be continued.

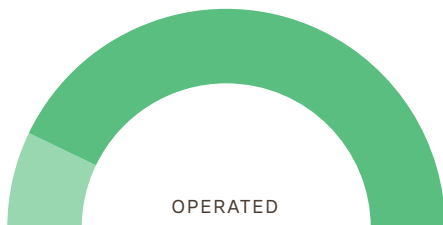
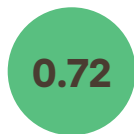
2025 TARGET (absolute reduction*)



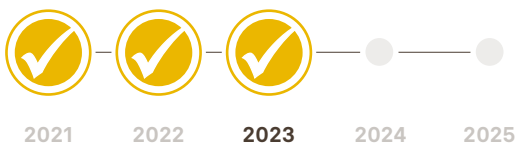
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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SEGMENT

DOWNSTREAM



FLUVIUS

Fluvius is the Flemish utility company responsible for building, managing and maintaining distribution grids for electricity, gas, sewerage, cable TV, district heating and public lighting.

Fluvius 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 and find and implement innovative solutions.

- The gas distribution assets consist of 58.000 km of gas distribution grid.
- The gas distribution grid connects about 2,35 million customers. The majority are residential customers connected to the low pressure grid.

During the past decades, Fluvius has taken several measures such as substituting grey cast iron with modern materials and reducing operational and incident methane emissions in the distribution grid.

As an ambitious OGMP member Fluvius strengthens its efforts to further reduce methane emissions and collect more data via specific measurements to reach a reporting Level 4/5 by 2024.

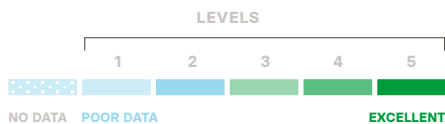
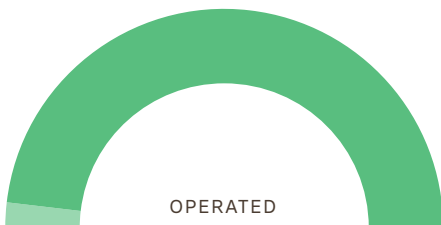
2025 TARGET (absolute reduction*)



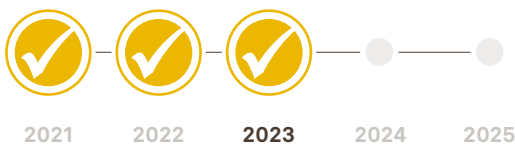
*percentage reduction of annual methane emissions by 2025 based on 2015 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



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SEGMENT

DOWNSTREAM



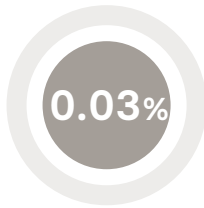
G.E.I. GESTIONE ENERGETICA IMPIANTI SPA

GEI Gestione Energetica Impianti SpA is an Italian gas distribution company (DSO) operating for 70 years in the north of Italy.

The company currently manages 150.000 point of delivery located in 3 Italian regions (Lombardy, Piedmont, and Veneto), 1.000 reducing and/or metering stations along 2.600 km of gas network.

We deliver up to 298 million standard cubic meters of gas natural to end users, with a strong focus on quality of our services, people's safety, and environmental sustainability. We work day-by-day to maintain a high level of efficiency and to reach this target we are constantly and strongly committed on our company's specific mission: deliver natural gas to people with maximum effectiveness and efficiency, making sustainable innovation our strategic pillar.

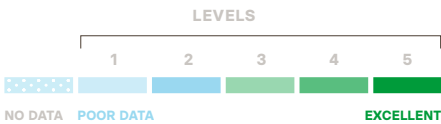
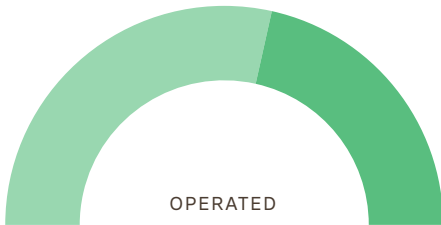
2025 TARGET (intensity*)



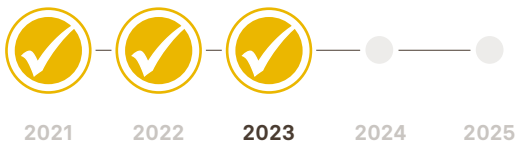
* kg emitted / Kg distributed

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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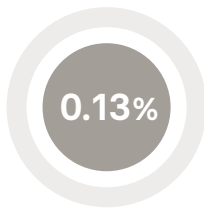
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SEGMENT

DOWNSTREAM



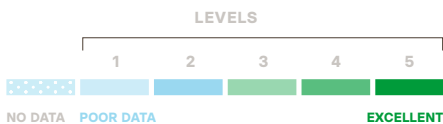
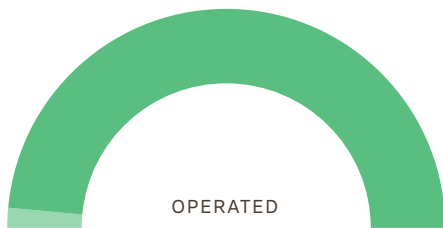
2025 TARGET (intensity*)



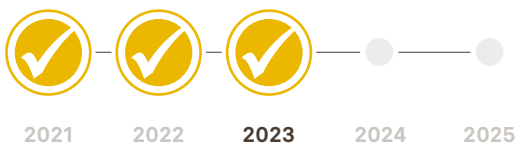
* Amount of gas distributed in GWh HCV

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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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 (205,800 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 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 gas network by 2050.

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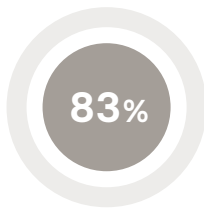
DOWNSTREAM

ITALGAS

Italgas is the leading gas distributor in Italy and Greece and the third in Europe: with its affiliates and the work of 4,281 people at the various offices across Italy and Greece, it manages 81,309 kilometers of gas distribution network, through which, in 2022, it distributed more than 8,500 million cubic meters of gas to almost 8 millions users.

Italgas firmly believes in pursuing technological and operational excellence and aims at inspiring other European and world gas DSO in entering a path of deep innovation and digitization and in supporting renewable gas development at the service of a just, fast and sustainable energy transition.

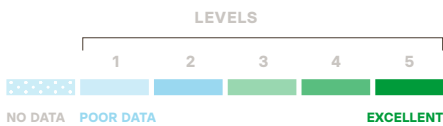
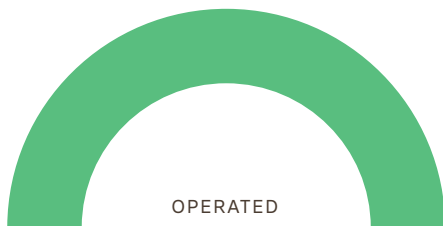
2025 TARGET (absolute reduction*)



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

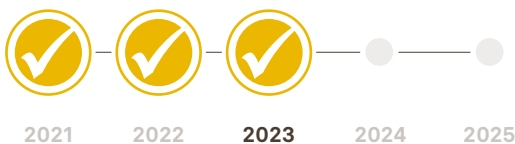
DATA QUALITY

2022 METHANE REPORTED (kt)



**dotted pattern = incomplete data

GOLD STANDARD



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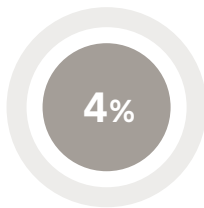
DOWNSTREAM



LIANDER

For over 100 years Liander or her predecessors have been active in gas and electricity distribution. In the Netherlands the gas distribution grid operator function has been separated from the energy supply side since the Dutch Gas Law in the year 2000. The grid distribution operations under the name of Continuon were separated from the NUON company and resulted in the Network company Alliander. In the Netherlands all grid operators (TSOs and DSOs) are regulated by the government. Within the incentive regulation the tariffs are yearly adjusted for each individual system operator by the regulator (ACM). Network operator Liander, which is an Alliander subsidiary, has been statutorily tasked with managing and further developing the gas and electricity network. The other Alliander units facilitate markets by providing products and services that help create a future-proof energy network. Alliander's shares are held by Dutch provinces and municipalities. Liander is responsible for the construction and operations of the electricity and gas distribution grids in a large part of the Netherlands (six Dutch regions Gelderland, Noord Holland, Friesland en Flevoland). Liander distributes gas to over 3,2 million private households and commercial businesses and operates over 42,000 km gas distribution grid. The operating pressure ranges from 30 mbar up to 8 bar in the gas distribution grid. Methane emission reduction goals at Liander are currently solely based on the replacement of cast iron pipes. Furthermore the main focus in reducing gas leaks is safety. By reducing gas leaks indirectly also methane emission is reduced at Liander. Alliander stands for an energy supply system where everyone has access to reliable, affordable and renewable energy on equal terms. This is the social mission we work to achieve every day. We make sure the lights are on, homes are heated in the winter and stay cool in the summer, and businesses can keep operating, not just today, but in a sustainable tomorrow too. Our strategy comprises four pillars, which stand firmly on a solid and future-proof foundation: a safe, cost-conscious, sustainable and inclusive organisation. These are: excellent network management, support for customers in making choices, investing in new open networks and digitalization. This combination of strategy and structure helps us to fulfil our social mission both now and in the future.

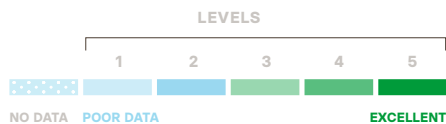
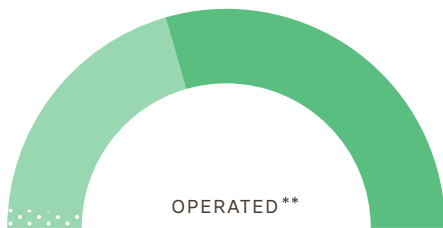
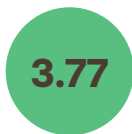
2025 TARGET (absolute reduction*)



*percentage reduction of annual methane emissions by 2025 based on 2023 estimates

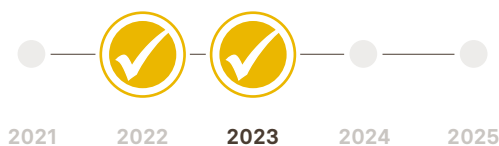
DATA QUALITY

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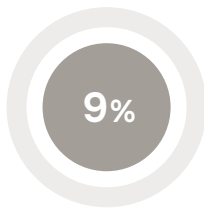
DOWNSTREAM



MADRILEÑA RED DE GAS, SAU

MRG is the first company in Spain to operate a distribution network in a completely independently manner from the rest of the businesses in the gas value chain. It is also the third largest gas distribution company in Spain by number of supply points. It currently has 900,911 natural gas supply points. It began its activity on May 1, 2010 in 38 municipalities of the Community of Madrid, currently distributing gas in 61 municipalities of the Autonomous Community, including the municipality of Madrid capital, where the activity is maintained in 5 districts. As part of the gas supply, MRG has operated in 2022 a total of 5 liquefied natural gas plants, all of them with vaporization boilers. Madrileña Red de Gas, is aware of the great contribution to global warming generated by greenhouse gases, including methane gas emissions from the oil and gas sector, for this reason, we have developed different initiatives, to determine the impact of our operations (distribution of natural gas) and thus be able to develop responsible actions with society and the environment. For Madrileña Red de Gas, as a company in the energy sector, our challenge is to satisfy the growing energy demand of a developing world, and furthermore, we must do so in an increasingly cleaner, safer and more reliable way; proactively betting on sustainability and the circular economy. We want to provide solutions and we join the transformation of current energy and production models. Madrileña red de Gas has joined the OGMP 2.0 this year according to our commitment with the methane emissions reduction in the oil and gas sector. Our interest in adhering to OGMP 2.0 is to be informed about future methane reductions commitments and also know the latest technologies to identify and measure fugitive leaks in order to apply it to reduce our emissions. Madrileña Red de Gas has set long-term objectives, aimed at improving efficiency in the management of its distribution assets, to mitigate fugitive natural gas emissions, with the consequent forecast of reducing methane gas emissions. We have announced a new target of reaching a methane intensity of 9% by 2025 in our operated assets. The reported values correspond to the L3 level.

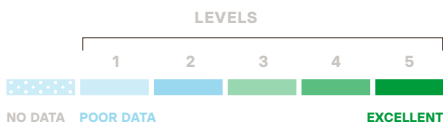
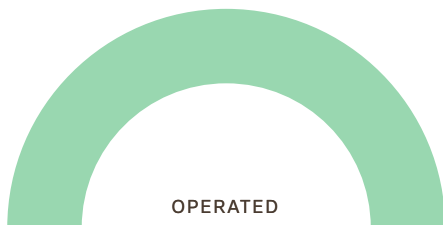
2025 TARGET (absolute reduction*)



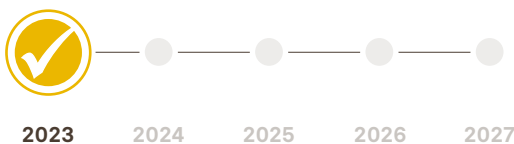
*percentage reduction of annual methane emissions by 2025 based on 2022 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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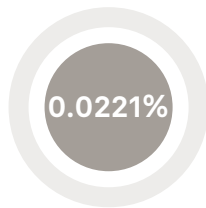
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SEGMENT

DOWNSTREAM

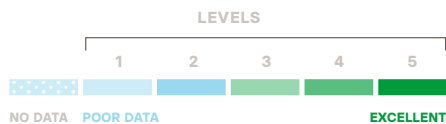
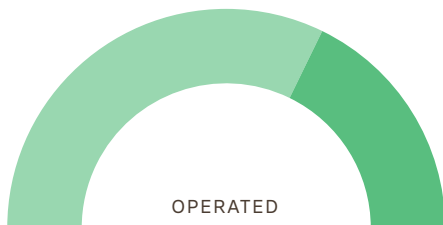
2025 TARGET (intensity*)



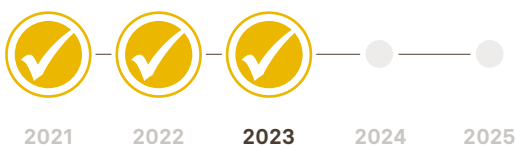
*Yearly conveyed methane along the grid
(Kg CH4 /year)

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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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 180 years, Nedgia is currently operating in 11 autonomous communities with around 6 million of supply points. Its main asset is almost 60,000 km 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. 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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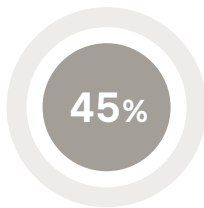
DOWNSTREAM

NETZE GESELLSCHAFT SÜDWEST

Netze-Gesellschaft Südwest mbH (Netze Südwest) and its predecessor companies can look back on a history of more than 30 years of natural gas supply in Baden-Württemberg. Netze Südwest is regulated by the state regulatory authority of Baden-Württemberg, where it is the largest gas network operator supervised by the authority.

Our core tasks include the reliable and secure supply of gas to network customers. This includes the construction, operation and maintenance of distribution networks, including network connections. However, our tasks as a network operator also include community support through concession management as well as regulatory and network access and energy data management as defined by the Energy Industry Act (EnWG). In addition, Netze Südwest ensures a reliable, economical and environmentally friendly supply to customers in its concession areas, as well as secure operation and continuous expansion of the network. In this context, the entry of renewable energies into the heating market is explicitly taken into account, thus laying the foundation for efficient energy use. In this way, Netze Südwest helps to ensure that the communities supplied remain attractive to households and industry and can grow, using natural gas as an efficient and sustainable energy source and integrating regional energy sources.

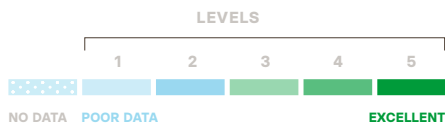
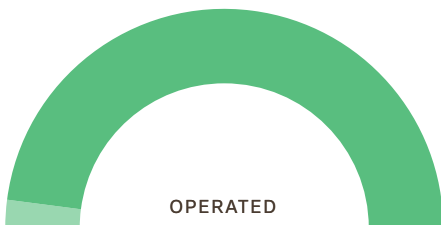
2025 TARGET (absolute reduction*)



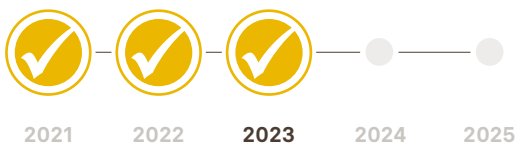
*percentage reduction of annual methane emissions by 2025 based on 2020 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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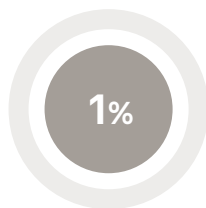
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SEGMENT

DOWNSTREAM



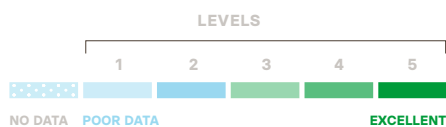
2025 TARGET (absolute reduction*)



*percentage reduction of annual methane emissions by 2025 based on 2022 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



**dotted pattern = incomplete data

GOLD STANDARD



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RENDONETBEHEER

N.V. RENDO is a local grid operator, responsible for an adequate distribution of gas and electricity in South Drenthe and North Overijssel. N.V. RENDO strives to continuously improve its current strong position as a grid operator. N.V. RENDO wants to be active as a grid operator in facilitating new developments in the field of sustainable use of energy and the transition to a sustainable energy supply.

Important company values are in addition to a safe, high-quality, reliable and affordable energy network: customer focus, flexibility and sustainable entrepreneurship. N.V. RENDO has three important stakeholders: customers/public, staff and the ultimate shareholders.

For customers/public, N.V. RENDO offers a safe, reliable and efficient energy network, good service at relatively low cost and attractive (sustainable) products and services for the free market.

For employees, N.V. RENDO is a good company for committed employees, which acts on the basis of respect and mutual responsibility and a company with a good working climate.

For the ultimate shareholders, N.V. RENDO is: a well-organized and transparent company and a company that always realizes positive value development in a broad sense.

N.V. RENDO distributes gas to over 100,000 private households and commercial businesses and operates over 3,500 kilometers gas distribution grid. Around 2,700 kilometer of the grid is known as a low pressure network with a pressure of 100 millibar. The other 800 kilometer is known as a high pressure network with pressures of 1, 4 and 8 bar.

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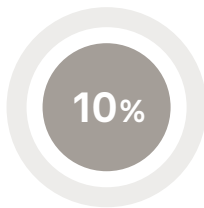
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SEGMENT

DOWNSTREAM

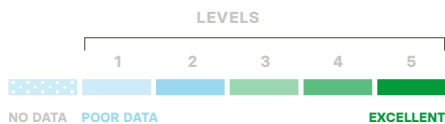
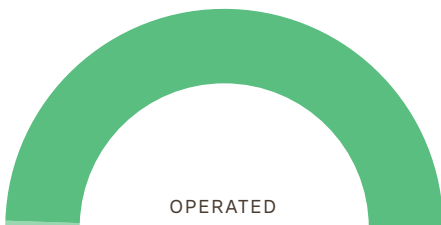
2025 TARGET (absolute reduction*)



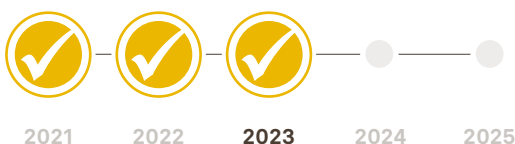
*percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

SCHWABEN NETZ

Schwaben netz GmbH is a gas distribution company operational in the south of Germany in western Bavaria. Schwaben netz is a 100 % subsidiary of erdgas schwaben GmbH and is part of the Thüga group, an alliance of 100 local and regional utility companies. The Thüga group wants to expand its expertise in the measurement, quantification and mitigation of methane emissions, therefore 3 gas distribution companies have joined OGMP 2.0 in October 2020.

Schwaben netz operates 7.000 km of gas grids in a 200 villages and smaller cities. The pressure levels range from low pressure up to 80 bar. Schwaben netz also operates 2 small emergency compressors, 5 gas conditioning plants and 8 CNG fuelling stations.

The weighted average age of the service lines is 18 years and of the main grid between 22 and 36 years. In the past 30 years all grey cast and ductile iron have been substituted with polyethylene pipes and steel with cathodic protection. In 2021 100 % of all steel pipes were equipped with cathodic protection. Every new steel pipe is insulated with polyethylene and has cathodic protection. Since joining the OGMP 2.0 schwaben netz has conducted several detailed measurements on leakages in the grids, pressure reduction stations and in 2022 several compressors. The quantification of methane emissions is becoming more detailed each year, new technologies for LDAR and top down measurements are tested.

Schwaben netz has implemented in 2016 voluntarily the ISO 14001 environmental management system and is audited regularly every 3 years.

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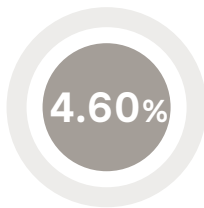
DATA QUALITY = Reporting levels 1 to 5, where increasing level corresponds to increased use of direct measurements

GOLD STANDARD has been awarded to companies who demonstrate an explicit and credible path to report all material assets at levels 4 and 5 within 3 years for operated ventures and within 5 years for non operated ventures. The Gold Standard is maintained by meeting the credible path and continuing to progress reporting to level 5 for the overwhelming majority of material assets.

SEGMENT

DOWNSTREAM

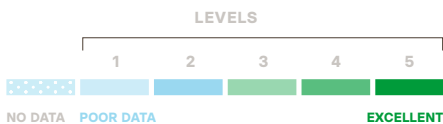
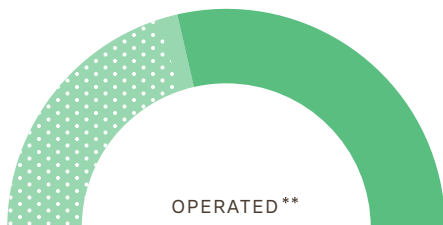
2025 TARGET (absolute reduction*)



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

DATA QUALITY

2022 METHANE REPORTED (kt)



**dotted pattern = incomplete data

GOLD STANDARD



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STEDIN

Stedin Group is a public organization whose shares are held by 44 municipalities. With our shareholders and other stakeholders, we work together to realize the energy transition. Stedin Group operates and is based in the Netherlands. As a grid operator we carry out regulated activities and as group some non-regulated activities with a strong relationship to the energy infrastructure. Our head office is located at Blaak 8, 3011 TA, Rotterdam.

As a grid operator for gas and electricity, we provide a vital infrastructure. With just under 5,000 colleagues, we are faced with the task of investing in the energy transition and maintaining the quality of our grids in the longer term. Stedin Group distributes gas to over 2.1 million gas customers (private households and commercial businesses) and operates over 28,160 km of gas distribution grid. The operating pressure ranges from 30 mbar up to 8 bar. Working together to create a living world full of new energy. That is our mission. We are convinced that we can make the energy transition possible by focusing on our core tasks for (future) grid management and by providing excellent services to our, in total, 2.3 million customers. We focus on our grids: building, utilize and managing our assets.

Stedin operates alongside five other regional grid operators in a regulated market. Every regional network operator is a monopolist within its service area. Regulation means that the tasks that the grid operators perform are laid down in the Dutch legislation and that the rates that they may ask for it, are determined by the Netherlands Authority for Consumers and Markets (ACM).

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SEGMENT

DOWNSTREAM



THÜGA ENERGIENETZE

Thüga Energiernetze 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 4.800 km in in a multitude of communities to 101.000 residential, commercial, industrial end-users 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. 72 % of the grid is made of polyethylene, 72 % 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 < 0,007 % we consider our target for 2025 as a challenging endeavour.

THEN is actively involved in the work of OGMP and explore new ways. In 2021 a first 600 km trial with vehicle-based LDAR was done. 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.

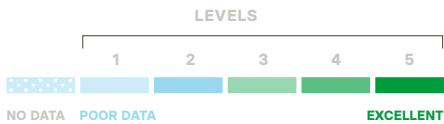
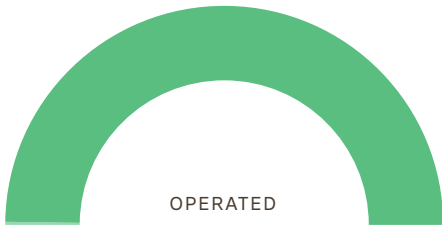
2025 TARGET (absolute reduction*)



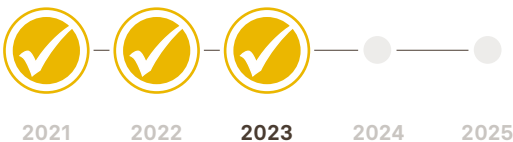
*percentage reduction of annual methane emissions by 2025

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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SEGMENT

DOWNSTREAM



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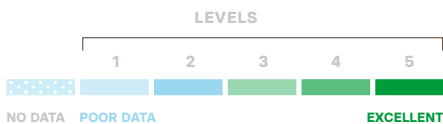
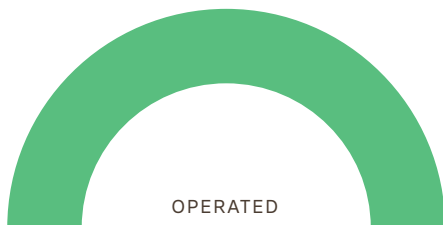
2025 TARGET (absolute reduction*)



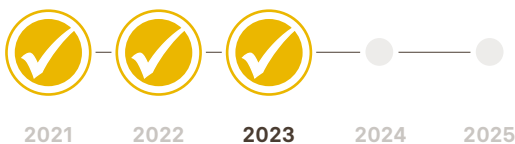
*percentage reduction of annual methane emissions by 2025 based on 2019 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



GOLD STANDARD



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UNARETI

UNARETI is involved in gas distribution in different regions in the north area of Italy. Conditions of networks are very different plant to plant. The company provides more than 480 million of smc each year to one million of users along more than 5.130 km of grids.

UNARETI moves towards both the improvements of the methodology to quantify emissions and the increase of inspection frequency along all plants grid served. In this perspective during 2022 more than 1.500 kms have been inspected using PICARRO® technology. Combining PICARRO® technology with other inspection methods UNARETI can ensure the inspection of more than 72% of its network annually.

Survey of both main grids and all other assets of distribution plants (buried and air branches or meters) has been intensified and improved. Different instruments capable of detecting very small volume of dispersed gas are used to detect any kind of leakages as early as it occurs.

The health of lines is continuously monitored since older and more fugitive sections have been substituted: methane emissions rate visibly reduced.

The reduction of methane emissions is a crucial point for UNARETI sustainability report. All the objectives, fixed in OGMP implementation plan, are coherent with all the activities carried out in the perspectives of methane emissions reduction and improvements of estimation methodology.

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SEGMENT

DOWNSTREAM

WESTLAND INFRA NETBEHEER

As a network company, including a grid operator, we work towards a livable and sustainable society for everyone. We believe in powering innovation and collaboration to achieve our goals and taking care of availability for energy, as well now as in the future. Transforming the current energy supply systems into a sustainable energy system in the coming decades is seen as our biggest challenge.

Specialized in transport of energy and related products and services, within the legal frameworks, we take the initiative by seeking connections with all stakeholders. By working together, we arrive at the best solutions. We see the transformation of the current energy supply into a sustainable, reliable and cost-efficient energy system as the greatest challenge for the coming decades.

For the inhabitants of the Westland and Midden-Delfland regions, for the greenhouse horticulture sector and for our customers in industry, business services and other sectors.

The goal is clearer and at the same time more challenging than ever. Global, European, Nationwide, Regional. And as N.V. Juva, we have one common goal: To reduce CO2 and methane emissions to virtually zero by 2050.

We are intrinsically motivated and have a strong intention of contributing to the climate objectives. It also applies to our organisation that there are still steps to be taken in business operations in order to realise our impact. This means that we must constantly adjust our choices and considerations.

N.V. Juva has three subsidiaries, each with its own specialization: Westland Infra Netbeheer B.V. (grid operator network management gas and electricity), Capturam B.V. (sustainable & innovative activities and (heat)projects) and Anexo B.V. (commercial medium and low voltage, measuring & data company).

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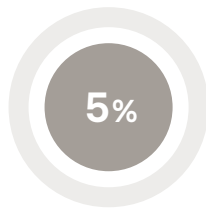
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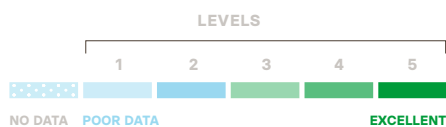
2025 TARGET (absolute reduction*)



*percentage reduction of annual methane emissions by 2025 based on 2022 estimates

DATA QUALITY

2022 METHANE REPORTED (kt)



** dotted pattern = incomplete data

GOLD STANDARD



Gold Standard has been achieved on the basis of a credible implementation plan

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