



PLUGGING THE LEAKS

# AN INVESTOR GUIDE TO OIL AND GAS METHANE RISK

**ESG BY EDF: ACTIONABLE INSIGHTS FOR A DECARBONIZING WORLD**

*ESG by EDF offers investor research with insights into transition issues in carbon-intensive sectors informed by EDF expertise in science, policy and business.*



**BUSINESS**



# HIGHLIGHTS

- 1. Methane emissions pose an urgent and material financial risk to oil and gas companies.** Amid rising awareness of the climate impact of methane and improving abilities of methane detection technologies, unabated methane emissions present a material risk to the oil and gas industry. Investors must urge firms to improve their efforts at methane emissions reduction, both rapidly and credibly. This report explains how.
- 2. Reducing oil and gas methane emissions is crucial – and practical – when it comes to limiting global temperature rise.** There is no plausible pathway to limit temperature rise to 1.5 °C without dramatic reductions in methane, a powerful greenhouse gas. Curbing methane emissions from the oil and gas sector is the fastest and most cost-effective path to slow the rate of near-term warming: around 75% of the industry’s methane emissions can be eliminated using technologies widely available today.
- 3. You can’t manage what you don’t measure and disclose.** Current industry standards for reporting methane emissions provide limited insights to both external stakeholders and operators, potentially underestimating emissions by a factor of 10 or more. To credibly demonstrate emissions reduction progress, companies must undertake real-world direct measurements and report through an independent and transparent disclosure framework – specifically by joining the Oil and Gas Methane Partnership 2.0.
- 4. Companies need to improve on methane measurement, abatement, and policy advocacy efforts in response to escalating investor, regulatory, and data pressures.** Investors have increased their calls for ambitious commitments and credible disclosures on methane, while the Global Methane Pledge has accelerated policy developments on methane measurement and abatement. Global pressure on oil and gas companies will continue to grow with improvements in data quality, as advanced instruments enable enhanced transparency and accountability.

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# EXECUTIVE SUMMARY

Methane emissions pose fundamental financial, regulatory, and reputational risks to oil and gas companies, with credible reductions becoming increasingly central to demonstrating long-term value to investors. Effective methane management not only reduces climate pollution, but also represents operational excellence among competitors: minimizing product loss and improving process safety, in accordance with emerging regulatory mandates and rising stakeholder expectations.

Oil and gas companies are under increasing scrutiny for their management of methane – a potent greenhouse gas responsible for 30% of the warming experienced today, and the primary component of natural gas. In addition to its harmful climate impacts, releases of methane cause health-damaging air pollution and waste a valuable energy source. Growing pressure from energy buyers, financial actors, regulators, and other stakeholders to reduce oil and gas industry methane emissions reflects the Intergovernmental Panel on Climate Change’s (IPCC) finding that there is no plausible pathway to limit temperature rise to 1.5 °C without deep reductions in methane emissions.

## The scale of oil and gas methane emissions poses material financial risks – but the mitigation opportunity is well within reach



## Credible disclosures empower companies to rapidly actualize methane reductions

Research and operator experience demonstrate that extensive reductions are possible: the International Energy Agency (IEA) estimates that 75% of oil and gas industry methane emissions can be avoided using technologies available today, with significantly more than half of those reductions at no net cost, depending on the value of captured gas. As such, a growing number of companies are planning and implementing robust methane management strategies, given the feasibility of both mitigating material business risk and delivering on corporate climate pledges.

However, poor data quality undermines the industry’s efforts at methane management as well as investor and stakeholder confidence in reported progress. Research by EDF and others finds that US methane emissions are over 60% higher than what is reported to the US Environmental Protection Agency. In certain oil and gas basins, studies have found methane emission rates to be more than 10 times higher than industry-disclosed figures.

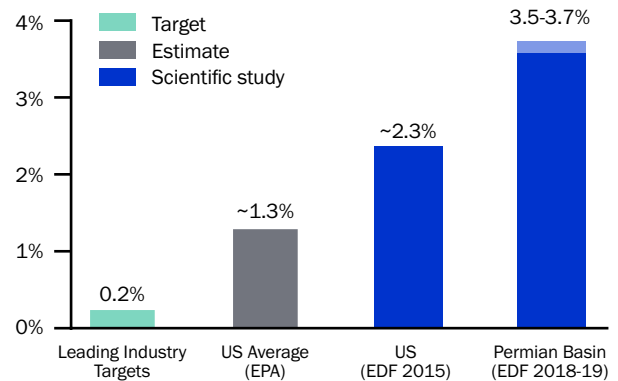
## Poor data quality undermines confidence

Most reported methane emissions are based on factor estimates, rather than direct measurement.

Multiple scientific studies have found that factors underestimate real-world emissions.

High-quality methane data and enhanced disclosure are critical to assessing oil and gas company performance and methane-related risk across the industry. In this report, we identify a series of key commitments and disclosures, discussed in greater detail in Chapter 4, necessary to clarify operator goals and provide transparency on progress towards achieving them.

## Methane Intensity (emissions/natural gas produced)



## Core Commitments

Set a 'near-zero' methane emissions intensity target	Join the <a href="#">Oil and Gas Methane Partnership</a> (OGMP 2.0)	Join the World Bank's <a href="#">Zero Routine Flaring by 2030</a> (ZRF30) Pledge	Distinguish and report emissions from NOJV assets*	Extend emissions targets to NOJV assets*	Support robust methane emissions policy and regulation
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## Core Disclosures

Methane emissions volume and intensity	% of emissions covered by OGMP reporting level	Flaring intensity and flared volume by situation	Equity emissions reporting, including for methane and flaring	Production and assets covered by emissions targets	Public statements and comments on methane policies and regulations
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## Global forces – including investors – are accelerating the industry's methane management efforts

As part of investment and lending processes, [major investors](#) and [members](#) of the financial sector have already begun to look more closely at company methane performance. In addition to its reflection of operational capacity, strong methane management provides an important starting point for broader decarbonization efforts and can demonstrate a company's preparedness to compete in the energy transition.

While the last few years have seen notable improvements among some oil and gas companies in their methane-related commitments and disclosures, global pressure continues to accelerate the demand for credible methane abatement. In an increasingly competitive and decarbonizing economy, companies must continue to improve the integrity of their methane targets and reporting.

\*NOJVs refer to assets that are operated by a partner (non-operated assets) and/or jointly owned (joint ventures), which are often governed quite differently than a company's fully-owned and fully-operated assets.

## Drivers for stronger methane management encompass policy, technology, and finance



Through the [Global Methane Pledge](#), 150 countries have committed to cut methane emissions by 30% by 2030, highlighted by strong policy developments in the United States and the European Union.



New imaging and measurement technologies, such as EDF's [MethaneSAT](#) platform, are rapidly improving access to transparent, credible, and actionable data, driving both accountability and emissions reductions.



Representing \$60trn in AUM, the Institutional Investors Group on Climate Change (IIGCC) has [called on](#) oil and gas companies to improve methane data quality and disclosure, specifically through the leading [Oil and Gas Methane Partnership](#) (OGMP 2.0) framework.

In this report, we discuss the science of methane management and its importance to the energy transition; provide background on methane emissions from the oil and gas supply chain; highlight the pressing data challenge; identify impactful technical solutions; review key global policy developments; and supply investors with critical asks for the industry.



# THE ASK: KEY COMMITMENTS AND DISCLOSURES FOR OIL AND GAS COMPANIES

As investors engage with companies about their climate and energy transition plans, methane emissions should be high on their list of priorities. Investors need a strong understanding of oil and gas companies' methane performance as part of material business risk evaluation, especially considering the escalating technical, regulatory, and financial pressures they face.

Below we recommend specific commitments and disclosures from companies operating in the sector and suggest questions to assess their performance. The 'Core Commitments and Disclosures' represent priority asks that all companies should seek to fulfil, while additional asks are classified by level of ambition in Table 1.

## Methane emissions commitments

Companies should set concrete commitments for methane emissions reduction, with near-term targets backed by empirical measurements. Time-bound targets are critical for internal and external stakeholders to assess progress.

Investors should seek the following **Core Commitments** from oil and gas companies:

### Set a 'near-zero' methane emissions intensity target

An ambitious methane target is central to driving methane reductions across all of a company's assets. Companies should target reaching near-zero (<0.2%) methane emissions intensity by 2025 or sooner, verified through actual emissions measurements. Intensity targets should be calculated as total methane emissions (volume in CH<sub>4</sub>) divided by volume of production.

### Join the Oil and Gas Methane Partnership (OGMP 2.0)

The [OGMP](#) offers an industry-leading reporting framework that enables companies to directly measure and report methane across all assets, accompanied by operational best practice guidance. Achieving the OGMP's 'Gold Standard' for methane measurement enables companies to better measure, manage, and mitigate their methane emissions.

### Join the World Bank's Zero Routine Flaring by 2030 (ZRF30) Pledge

Malfunctioning and unlit flares result in excess methane releases. Companies should endorse the [World Bank's ZRF30 Pledge](#), where they will report flaring volumes by defined situations. Many companies are well-placed to eliminate routine flaring even earlier and should seek to reduce total flared gas volume to 0.2% of gas produced, as per [research](#) from Rystad Energy.

### Distinguish and report emissions from non-operated assets and joint ventures (NOJVs)

Currently, most environmental reporting is limited to assets owned and operated by the company in question, and do not extend to production that is operated by a partner (non-operated assets) and/or jointly owned (joint ventures). It is critical that emissions reporting - of carbon dioxide-equivalents, methane, and flaring - cover all assets in which a company holds economic interests.

### Extend emissions targets to NOJV assets

Similarly, most corporate climate and methane targets do not include NOJV assets within their scope - obscuring emissions-related risk, disclosure, and mitigation efforts. Incorporating NOJV assets within company targets will not only improve management and disclosure of associated emissions, but will also influence partners towards achieving credible reductions.

### Support robust methane emissions policy and regulation

Oil and gas companies should publicly support robust methane emissions regulations. Voluntary action on methane will not produce industry-wide emission reductions at the scale needed to avoid the most severe climate consequences. Providing productive input on critical rules will not only improve policy effectiveness but will also raise the 'floor' for the entire industry, reinforcing the competitive edge for first movers.

## Methane emissions disclosures

Commitments to manage and reduce methane emissions should be accompanied by disclosures that allow investors and other stakeholders to assess a company's performance or compare one company's activity to another. While many publicly traded oil and gas companies have set net-zero targets and disclose some form of methane emissions data, data gaps and inconsistency across the industry limit investors' ability to assess performance.

Companies should also explain changes in emissions to distinguish between different sources of change. Reporting should distinguish between, for example, emissions reductions stemming from changes to operations, reporting methodologies, and asset acquisition or divestment.

Investors should seek the following **Core Disclosures** from oil and gas companies:

### Methane emissions volume and intensity

Companies should disclose the quantity of methane emitted in tons of methane released, its CO<sub>2</sub> equivalence, and the total production basis on which methane emissions occurred. Methane intensity should be disclosed as volume of methane emitted divided by volume of production.

### Percentage of emissions covered by OGMP reporting level

Companies should disclose the percentage breakdown of emissions covered by the different reporting levels, in a manner consistent with the OGMP methodology. Companies should aim to report on this indicator across both operated and NOJV assets.

### Flaring intensity and flared volume by situation

Companies should disclose the volume of gas flared, its CO<sub>2</sub> equivalence, and the total production basis on which flaring took place, to provide an accurate measure of flaring intensity. Companies should also break out volume of gas flared by situation, in a manner consistent with the World Bank's ZRF30 methodology.

### Equity emissions reporting, including for methane and flaring

Companies should disclose methane and flaring emissions on an equity basis (i.e., weighted to reflect the company's ownership stake) for all non-operated and joint venture assets. Companies should also report total GHG emissions (CO<sub>2</sub>e) on an equity basis.

### Production and assets covered by emissions targets

Companies should disclose the scope of production and assets explicitly covered by each emissions target, including for methane and flaring. Companies should aspire to set targets on an equity basis, in order to include the weighted share of emissions from all non-operated and joint venture assets.

### Public statements and comments on methane policies and regulations

Companies should disclose their statements on methane rulemakings. This should include individually filed input, statements published or submitted by associated trade groups, and other public comments voiced on methane regulations.

Companies that implement these core commitments are better positioned to manage methane emissions-related risk. For companies that already meet one or more of the above core commitments, next step commitments and disclosures are presented in Table 1.



TABLE 1

## Commitments and Disclosures to Evaluate Oil and Gas Company Performance

What should investors be asking from oil and gas companies on addressing the risk from methane emissions? The table below lays out a series of ‘Core’ asks (fundamental, basic expectations from investors) and ‘Leadership’ asks (additional opportunities for companies to demonstrate best-in-class performance).

For more detail, see [Chapter 4: Priority Actions for Companies](#)

Category	Levels	Commitments	Disclosures
Measuring and Abating Methane	Core	Set near-zero methane emissions intensity target by 2025 or sooner	Methane volume emitted / volume of production
			Absolute methane volume
		Join the Oil and Gas Methane Partnership 2.0 (OGMP)	OGMP membership
			IMEO Gold Standard plan approval
		% Emissions covered by different reporting levels	
	Leadership	Set near-term target for reducing absolute methane emissions	Absolute methane volume
Provide detailed disclosure of progress on direct measurement efforts and methane abatement initiatives		% Reduction in absolute volume emitted	
Reducing Flaring Impacts	Core	Join the World Bank’s Zero Routine Flaring by 2030 (ZRF30) Pledge	ZRF30 Endorser
			Flared gas volume / volume of produced gas
			Flared gas volume by situation
	Leadership	Set near-zero flaring intensity target (to eliminate all non-emergency flaring) by 2030 or sooner	Non-emergency flaring volume
			Flared gas volume / volume of produced gas
			Rate of gas captured
	Set target for zero unlit and malfunctioning flares	Rate of flares malfunctioning/unlit	
		Combusted gas volume / flared gas volume	
Addressing Risk from Non-Operated Assets and Joint Ventures	Core	Distinguish and report emissions from NOJV assets, including by breaking out methane and flaring	Equity emissions reporting (carbon dioxide-equivalents)
			Total emissions from assets with meaningful equity stake (e.g., >5%)
			Methane and flaring emissions volumes, on an equity basis
		Extend emissions targets, including for methane and flaring, to cover both operated and NOJV assets	Production and assets covered by emissions targets
	Leadership	Require emissions mitigation plans at NOJV assets	Support emissions reduction efforts at partners’ other assets
			Evidence of NOJV partners developing climate and methane plans for other assets
Advocating for Robust Policy	Core	Publicly support robust methane and flaring policy and regulation	All public statements on applicable regulations
	Leadership	Report spending on climate lobbying	Evidence of company input to trade association positions, statements, and comments
		Influence trade associations to support stronger regulations	

## Key questions to ask management about methane emissions

The following questions can help investors better understand companies' methane management strategies:

### Measuring and Abating Methane

- How do you currently estimate and report methane emissions from your operations? What methane reduction approaches does your company take?
- Have you undertaken or referenced direct measurement studies, such as those from continuous monitoring devices or ground-based, aerial or satellite sensors?
- If you are not yet a member of the OGMP, what obstacles are preventing you from joining and how can those be overcome? If you are an OGMP member but have not achieved the Gold Standard pathway, what is preventing you from achieving the Gold Standard?
- What challenges do you foresee to providing specific quantitative disclosures?
- What are your emissions targets with regards to methane reduction? What obstacles stand in the way of deeper cuts to methane emissions?

### Reducing Flaring Impacts

- If you have not joined the ZRF30 Pledge, what obstacles are preventing you from joining and how can those be overcome?
- What operational practices are you using or planning to use to mitigate flaring?

- How do you define routine flaring versus emergency flaring? How do you calculate flaring volumes and flaring efficiency?
- What are your flaring reduction targets?

### Addressing Risk from Non-Operated Assets and Joint Ventures

- How do you engage with non-operated joint venture (NOJV) partners on climate risk and greenhouse gas emissions?
- Do you report your methane and overall emissions on an equity basis? If not, what are the barriers preventing you from disclosing this information?
- Do you plan to extend your current emissions targets to cover NOJVs?

### Advocating for Robust Policy

- What state, national, and/or international public policies or initiatives do you promote or support to improve methane management?
- What concerns do you have with current methane and flaring regulations in jurisdictions critical to your operations?
- What progress have you made with trade associations and industry groups on advocating for strong methane and flaring policies?

## Why methane matters to investors

Methane emissions present financial risks and opportunities for the oil & gas industry and investors in the sector.

**Proxy for current operational performance:** High methane leakage rates are evidence of lagging corporate and asset performance. Companies unable to prevent methane emissions from their operations are wasting a key energy product and missing out on potential revenues. With technical solutions often paying for themselves, companies with low (measured) methane intensities can demonstrate operational excellence and process optimization – meriting the continued flow of finance from investors.

**Signal for future preparedness and value creation:** Meaningful action on methane emissions is a leading indicator of a company's preparedness for rising expectations around the energy transition. In a decarbonizing policy and business environment, operators with best-in-class methane management stand to gain competitively, through greater access to key markets considering emissions in regulating energy imports. With increasing focus on the global energy transition, methane reduction offers a proving ground for companies to build their credibility on tackling challenging decarbonization issues.

**Role in meeting investor climate targets:** As investors continue to track the carbon intensity and climate targets of their far-reaching portfolios, companies with a better track record on methane management can better find space within a portfolio carbon budget. Investors can meet their climate goals by directing investment towards companies that deliver both financial and climate performance.

# METHANE EMISSIONS 101

Methane is the main component of natural gas and is 82 times more powerful than carbon dioxide at trapping heat over its first 20 years in the atmosphere. As the most plentiful and longest-lasting greenhouse gas in the atmosphere, carbon dioxide will determine the long-term increase in warming, while methane sets the pace for warming in the near term.

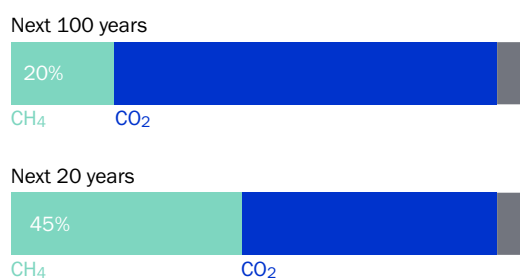
Atmospheric methane levels are now higher than at any time in at least 800,000 years. They increased by a record 17 parts per billion (ppb) in 2021 and are 162% greater than pre-industrial levels.

Around 30% of the global warming experienced today is driven by methane - an invisible, odorless, and highly flammable gas - from human activities. Therefore, reducing methane emissions quickly can slow the unprecedented rate of warming that is driving current climate phenomena such as stronger storms, hotter fire seasons, and rapidly melting Arctic Sea ice.

**Methane emitted in 2020 accounts for 20% of warming over the next 100 years - but 45% of warming over the next 20 years, since methane is more potent in the short-term.**

FIGURE 1A

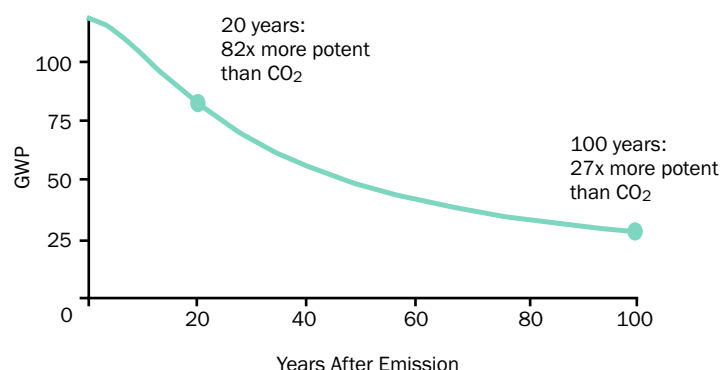
## Methane emitted in 2020



Source: JRC GECO 2020.  
GHG emissions considered are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O.

FIGURE 1B

## Methane's warming potency over time



Source: IPCC AR6, Chapter 7.

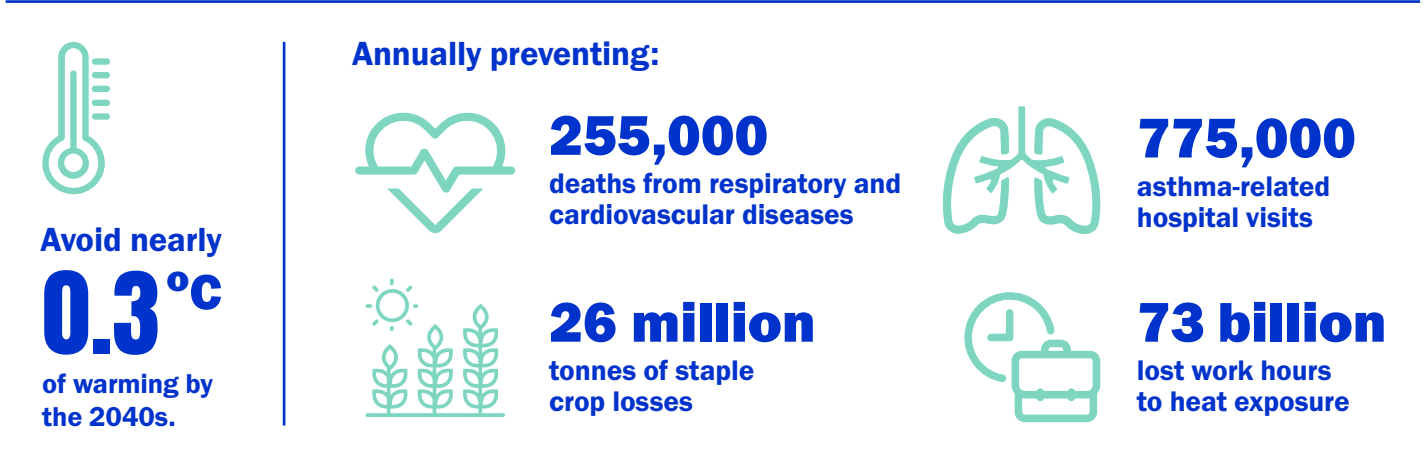
The Sixth Assessment Report from the United Nations Intergovernmental Panel on Climate Change (IPCC), published in 2021, is the most dire warning yet that we must rapidly and drastically slash climate emissions and that reducing methane emissions is critical. As is the case with carbon dioxide, methane concentrations have been rising rapidly over the course of the past 150 years. Importantly, the analysis warns there is no plausible pathway to limit temperature rise to 1.5°C without dramatic reductions in both methane emissions and carbon dioxide. A recent study shows that a rapid, full-scale effort to reduce global methane emissions from the oil and gas industry, large-scale agriculture and other human sources could slow the worldwide rate of warming by as much as 30%.

In addition to the climate benefits of cutting methane emissions, the IPCC report also cites robust evidence that doing so will also improve air quality and reduce the incidence and severity of pollution-related health conditions, such as asthma. Alongside methane, the oil and gas industry also emits significant amounts of volatile organic compounds (VOCs), including

known carcinogens, as well as nitrogen oxides (NOx). These emissions directly contribute to formation of particulate matter and ground-level ozone – another air pollutant that harms human health and causes considerable damage to plants and crops around the world. Methane itself is responsible for around half of the growth in ground-level ozone formation, directly impacting air quality.

FIGURE 2

## Reducing methane emissions by 45% by 2030 would unlock global health benefits



Source: Global Methane Assessment 2021

Reducing harmful and preventable methane releases can improve health outcomes for vulnerable populations, as a key step towards ensuring emission reductions occur equitably and justly. Studies show that marginalized communities are disproportionately burdened by exposure to air pollution and toxins from fossil fuels, with one study finding that proximate communities with higher non-White makeup are associated with higher methane exposure. In a gradually decarbonizing global economy, methane reduction is a key first step to address near-term threats to at-risk communities, while creating momentum to address deeper decarbonization challenges.



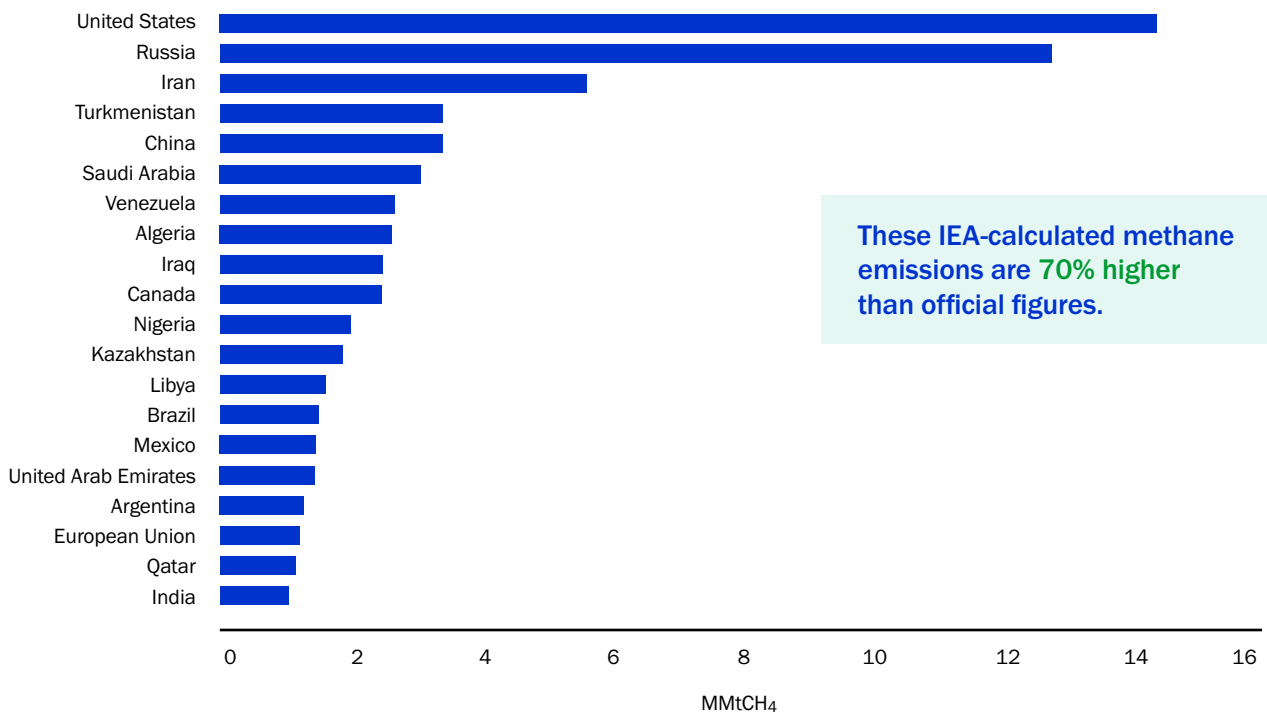


## The oil & gas sector in focus

In 2022, the global energy sector (oil, natural gas, coal, and bioenergy) produced around **38%** of total methane emissions from human activity. More than 82 million tons were from the oil and gas industry, making it the second largest anthropogenic source among all industries (after agriculture).

FIGURE 3

### The world's top emitters of methane from the oil and gas sector



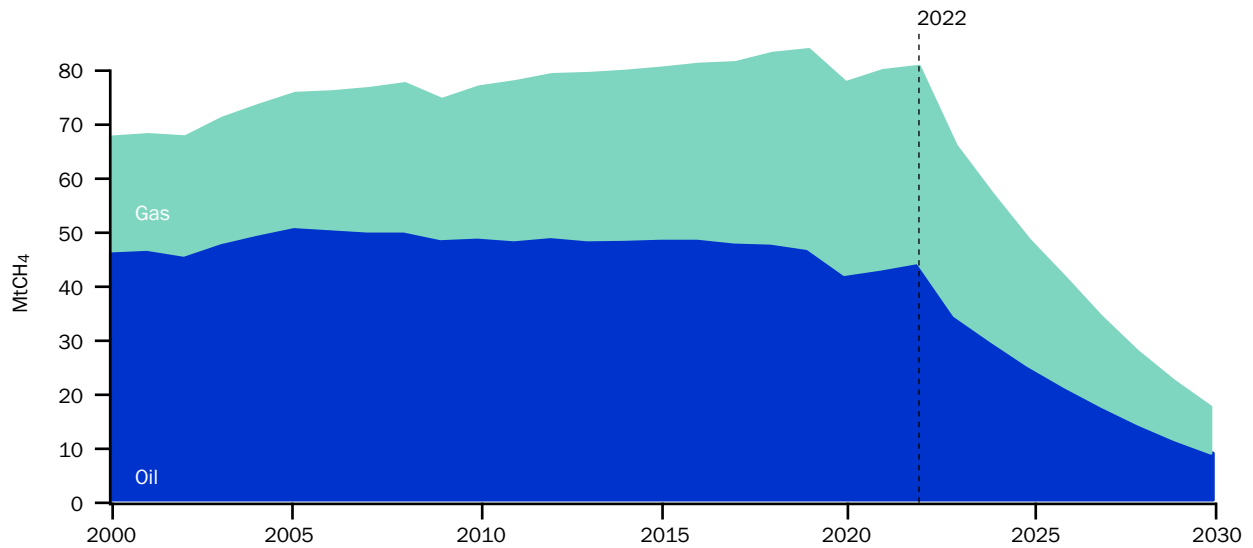
Source: IEA Global Methane Tracker 2023.

There is considerable uncertainty around the level of oil and gas methane emissions around the world. The International Energy Agency publishes annual estimates in its Methane Tracker, but these are based on estimated emission intensities scaled by using country-level factors. As measurement-based methods and data become more prevalent, our understanding of real-world will markedly improve. More information on the IEA methodology can be found [here](#).

Methane emission from oil and gas slightly rose since the year before and could remain excessive in the absence of concerted action. The IEA estimates that methane emissions from fossil fuel operations would need to fall by more than 75% from current levels by 2030 to reach the organization's Net Zero by 2050 Scenario.

FIGURE 4

### Oil and gas methane emissions must decline drastically under the IEA NZE2050 pathway

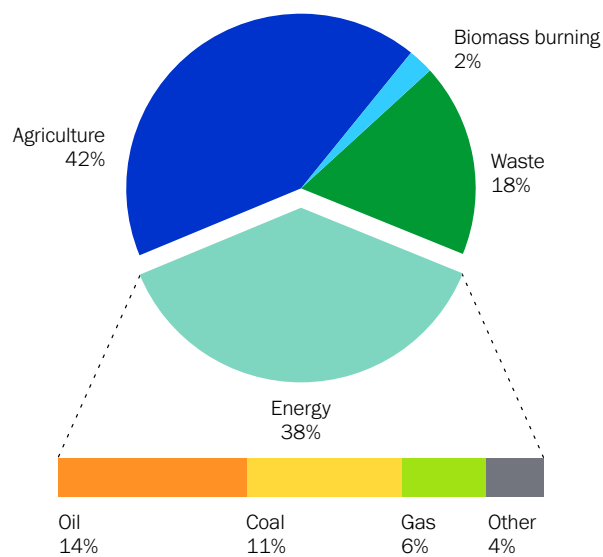


Source: IEA Net Zero by 2050 Scenario, 2021.

**Along with a drastic reduction in fossil fuel consumption, the global emissions intensity of oil and gas must fall by more than 70%, as per the IEA’s Net Zero by 2050 Scenario.**

FIGURE 5

### Sources of Anthropogenic Methane Emissions



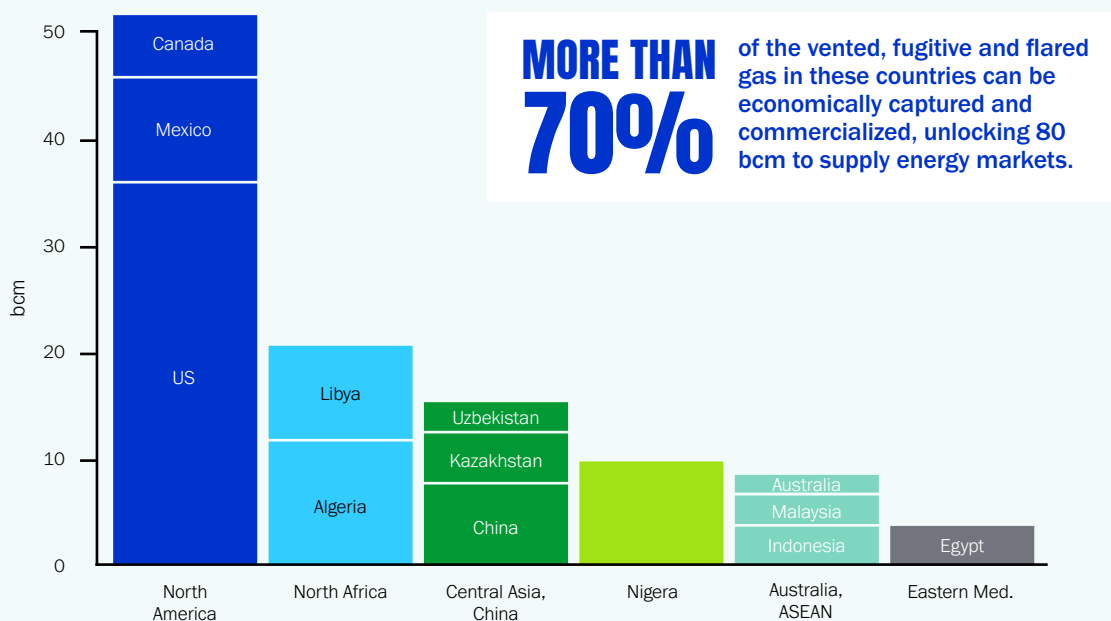
Source: EPA Non-CO<sub>2</sub> Greenhouse Gas Emission Projections & Mitigation, 2019.

## Reducing methane emissions can support global energy security

The Russian invasion of Ukraine upended global energy markets as buyers pivoted away from Russian fossil fuel exports. The conflict highlights the importance of national security considerations in the energy transition.

FIGURE 6

### By preventing methane losses, key global exporters can unlock 80 bcm to supply energy markets



Source: S&P Levers for capturing methane emissions to improve gas availability, 2022.

S&P Global developed country-level estimates of vented, fugitive, and flared gas, obtaining data from the IEA Methane Tracker, SkyTruth flaring data, and S&P Global's infrastructure and field-level data. Then, IEA's abatement cost curve data was paired with S&P Global's updated gas price forecast to determine the extent of economically feasible methane reductions. More information can be found [here](#).

Methane that is currently being lost or flared from oil and gas operations can be captured, sold, and supplied to stabilize international commodity markets. This approach would be cost-effective and avoid locking in carbon-intensive infrastructure for the long term.

Reducing methane and flaring emissions presents a uniquely feasible solution to address energy security concerns and meet global energy demand, while reducing climate-warming impacts. Analysis from S&P and EDF finds that **70%** of methane emitted from oil and gas producers in six major regions could be captured and sold today at net savings.

Reducing preventable emissions could profitably bring over 80 bcm of gas to market, which is nearly 60% of Europe's annual pre-war imports from Russia - without locking in carbon-intensive infrastructure for the long term. The report identifies that 45 bcm of gas can be brought to market in just 2-3 years using existing or under-construction export capacity, while averting emissions associated with new oil and gas production.

## Oil and gas emission sources: leaks, flares, and venting

Oil and gas development comprises a series of steps that bring oil and gas from underground reservoirs to the surface and converts them into useful products for end users around the world. **Methane is emitted from every part of this supply chain in three key ways.**

**Leaks (fugitive emissions):** Unintentional leaks of natural gas from equipment such as wells, flanges, valves, seals, pipelines, storage facilities, or other equipment are called fugitive emissions. By volume, fugitive emissions are one of the largest emission sources and make up most of the industry's methane emissions. Fugitives can be addressed by leak-detection and repair (LDAR) programs to find and fix leaks across company operations.

**Venting:** The intentional release of methane directly to the atmosphere is called venting. This can take place on a planned basis, i.e., to perform maintenance, or on an unplanned basis, in response to system pressure or safety requirements. Bottlenecks in capacity further along the supply chain can trigger venting and flaring from producers, typically occurring when infrastructure is lacking to capture and utilize natural gas for sale or use.

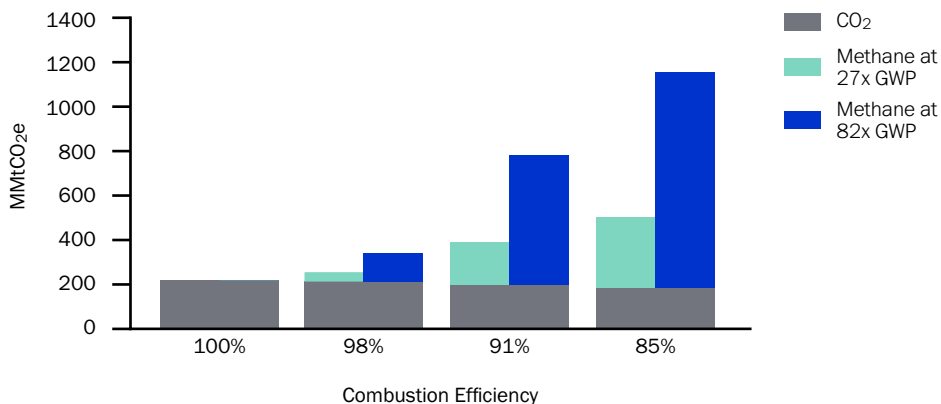
**Flaring:** Flaring is the intentional burning of natural gas, often as a byproduct of oil extraction when there is insufficient infrastructure in place to transport the gas to market. Flaring is a long-standing industry practice and is either routine (100% of gas is flared due to a lack of infrastructure access), event-driven (a significant percentage of gas is flared due to a temporary lack of infrastructure capacity), or safety-related (gas is flared in limited emergency safety-related situations).

The process of burning methane creates carbon dioxide that is released into the atmosphere; this is preferable from a climate perspective to venting uncombusted methane, since methane is 82 times more potent than CO<sub>2</sub> as a near-term driver of warming. However, flaring tends to result in only partial combustion, leading to some vented emissions of unburned methane. In optimal conditions, it is assumed that 98% of flared gas is combusted and 2% is vented but there is strong evidence that combustion efficiency and equipment quality of flaring in real-world conditions is significantly lower – potentially increasing climate impact by a factor of five times or more.

FIGURE 7

### Reduced combustion efficiency results in far greater warming impact

Under different assumptions for combustion and methane warming potential



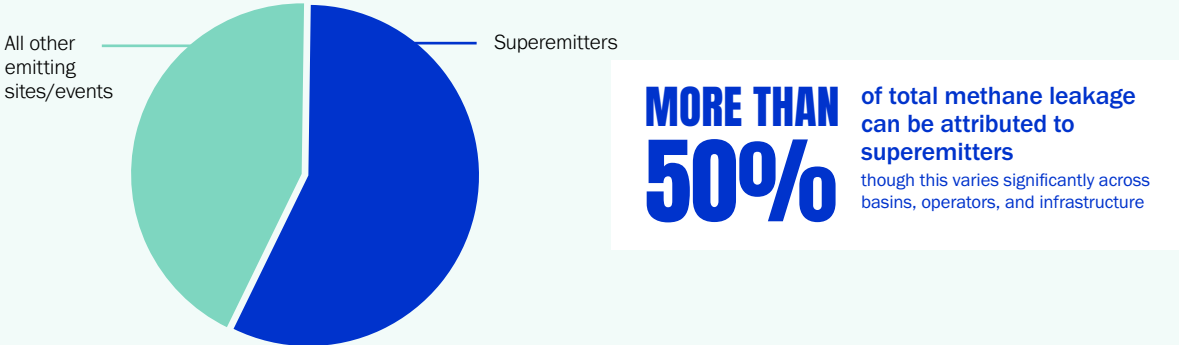
Source: EDF 2022



## Super-emitters

Super-emitters are sites that produce a disproportionate amount of methane pollution, with super-emitting events referring to sporadic events that are far more polluting than average. Field studies have found that a significant portion of methane emissions come from hard-to-predict super-emitting events, sometimes due to mechanical failure, operator error, or some other unforeseen reason.

FIGURE 8  
**Superemitters disproportionately contribute to methane leakage**



Source: Brandt et. al., "Methane Leaks from Natural Gas Systems Follow Extreme Distributions", 2016.

The top five or ten percent of highest emitting sources accounting for a disproportionately large portion of emissions. EDF's PermianMAP project found that 30 facilities – making up less than .001% of the Permian Basin's oil and gas infrastructure – produced the same near-term climate pollution as about half a million passenger vehicles. Repairing leaks at just these 30 facilities could immediately reduce 100,000 metric tons of methane every year and avoid \$26 million in wasted gas annually.

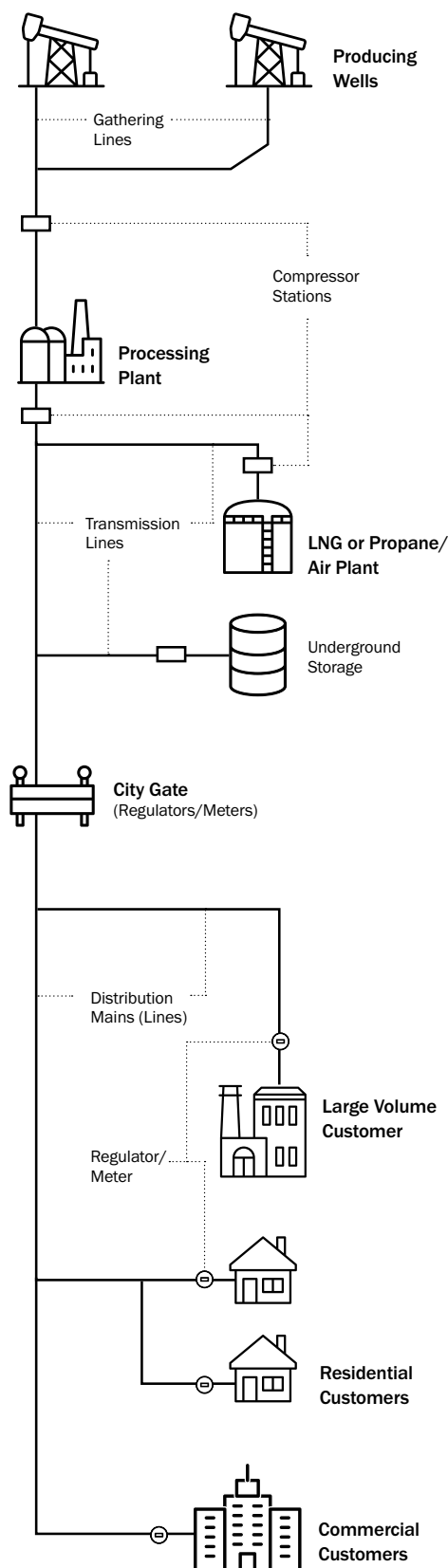
Data from the PermianMAP project conclusively show that while super emitters account for a small number of unique sites, they have an outsized contribution to the region's emissions. The prevalence and impact of these intermittent super emitter events mean that regular monitoring across assets and basins is critical to detect and quickly mitigate emissions, with a special focus on older sites with more leak-prone equipment.

## The oil and gas supply chain

A series of 16 studies sponsored by EDF found that methane is emitted from all stages of production and all parts of the oil and gas supply chain\*, including production, gathering and boosting, processing, transmission and storage, and distribution.

\*Note: Although the oil and gas supply chain is often described as made up of three segments (upstream, midstream and downstream), framing the supply chain by function is more helpful for understanding methane risk.

FIGURE 9



Source: EPA 2022.

### Production

The supply chain begins from the raw extraction of crude oil and natural gas from onshore or offshore basins. When oil and gas are being extracted from wells, methane that is trapped underground escapes to the surface, and to the atmosphere, without adequate measures in place.

### Potential Methane Releases

Production is frequently identified as the highest methane-emitting segment of the value chain. With oil more valuable and easier to store, some producers refrain from building the necessary equipment and takeaway capacity for capturing gas that escapes – opting to vent or flare methane. If there is faulty equipment or insufficient infrastructure to capture gas, further flaring, venting, or fugitive methane releases are possible.

### Gathering and Boosting

The gathering and boosting node of the supply chain refers to equipment that collects crude fossil products and transports them to processing facilities.

### Potential Methane Releases

Methane can escape to the atmosphere during this collection and transportation process, and a lack of takeaway capacity in this node may trigger flaring or venting at the production site.

EDF-supported peer review research concluded that methane emissions from Permian natural gas gathering pipelines was at least **14 times** greater than EPA estimates, after observing recurring large emission events.

### Processing

At processing facilities, extracted oil and gas is appropriately transformed to be ready for sale and use. Depending on the final product, this involves a range of chemical procedures to refine crude oil into gasoline, diesel, or other petroleum-based products. Natural gas is processed to remove impurities, to stabilize its energy and chemical content, as well as for liquefaction and regasification (associated with liquefied natural gas, or LNG).

### Potential Methane Releases

Fugitive methane releases are possible from faulty equipment used throughout the different processing functions.

### Transmission and Storage

Finished oil and gas products are then transported in bulk quantities across vast pipeline networks, where they are stored as needed.

### Potential Methane Releases

Faulty pipeline equipment can allow methane to escape, especially when leaks are possible anywhere across thousands of miles of pipeline infrastructure. As such, pipelines must be well-maintained and well-managed to avoid methane leaks.

### Distribution

Distribution is the final step of the oil and gas value chain, where finished products are transported to their final destination for consumption. This means delivering oil and gas to the final residential, commercial, and industrial customers.

### Potential Methane Releases

Downstream methane emissions are often a combination of uncombusted flaring, venting, and fugitive leaks linked to faulty equipment and operational processes.

Researchers estimate that gas distribution pipelines alone have about **630,000 leaks** emitting 690,000 tons of methane annually – **five times higher** than estimated in the U.S. EPA greenhouse gas inventory..

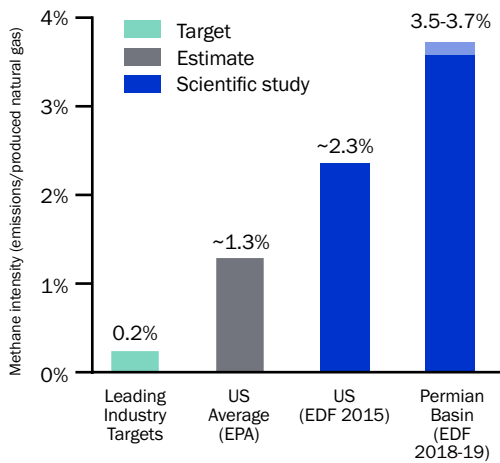
# MEASUREMENT AND DATA FOR BETTER METHANE MANAGEMENT

Methane emissions mitigation starts with reliable data. However, current oil and gas industry estimates of methane emissions by and large underestimate the scale of emissions and mischaracterize their sources.

Almost all industry emissions data today is derived not from contemporary measurements, but from emission factor-based estimates – desktop calculations that theorize what emission levels should be. These estimates are based on engineering specifications of the types and number of individual parts within a facility under normal operating conditions, but do not adequately account for malfunctions or variations from ideal conditions observed in the field. Research has revealed that these calculated estimates consistently underestimate actual, real-world emissions.

FIGURE 10

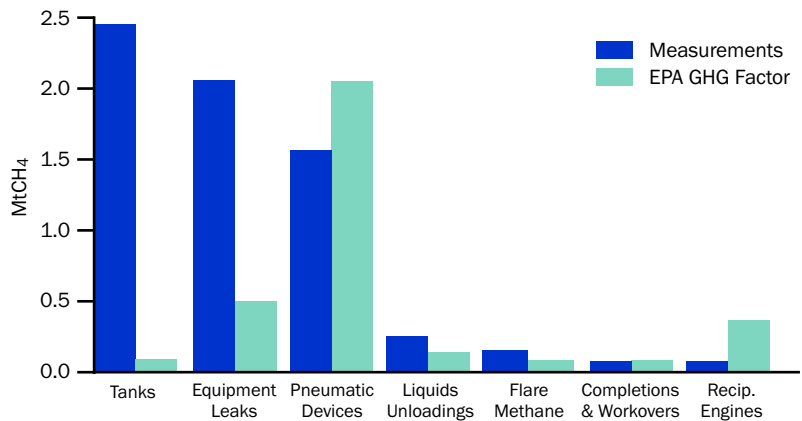
### Poor data quality undermines confidence



Source: OGCI 2019 Annual Report, EPA US GHG Emissions and Sinks Inventory 2018, Alvarez et. al. 2018 (“Assessment of methane emissions from the U.S. oil and gas supply chain”, Science), Zhang et. al. 2020 (“Quantifying methane emissions from the largest oil-producing basin in the United States from space”, Science), EDF PermianMAP 2019.

FIGURE 11

### Misleading emission factors can misallocate resources



Source: Rutherford et. al., “Closing the methane gap in US oil and natural gas production emissions inventories”, 2021.

In a U.S.-wide study, emission factor-based estimates were found to underestimate emissions by 60%. In certain basins, studies found real-world emission rates to be up to 10x higher than calculated estimates. The IEA has similarly found that real-world methane emissions from the global energy sector are about 70% greater than emissions factor estimates submitted by national governments.

This methane emissions data problem also hampers operators’ ability to accurately understand and characterize emissions from their own assets. Without high quality methane data to inform their mitigation strategy, companies may misallocate capital to less impactful and less cost-effective mitigation opportunities.

## The Oil and Gas Methane Partnership 2.0

Managed by the United Nations Environment Programme (UNEP) and supported by EDF, the Oil and Gas Methane Partnership (OGMP 2.0) is the only comprehensive, measurement-based reporting framework for oil and gas industry that improves the accuracy and transparency of methane emissions data.

The OGMP stands out as the key practical, industry-focused solution to rapidly improving methane data and management, enabling companies to be better positioned as credible participants in the energy transition.

In comparison to other initiatives, the OGMP framework offers:





-  Comprehensive, **measurement-based** reporting standards
-  Disclosure of all material emissions, including from **NOJV assets**
-  Rigorous science-based protocol with **best practice guidance**
-  Global and standardized, with **support from leaders** in industry, finance, and policy

TABLE 2

### The OGMP enables companies to achieve best-in-class reporting

OGMP signatories are expected to achieve the **'Gold Standard'** in methane measurement, which represents the highest reporting level under OGMP, within 3 years for operated assets and 5 years for non-operated assets. Participating companies are thus able to comprehensively demonstrate their ambition and ability to measure, manage, and report their methane emissions in a rigorous, standardized method that builds investor confidence.

<b>Level 1</b>	<b>Venture or Asset Reporting</b>	Single, consolidated reported emissions number	Based on generic emissions factors
<b>Level 2</b>	<b>Emissions Category</b>	Emissions reported based on IOGP and Marcogas defined emissions categories	Based on generic emissions factors
<b>Level 3</b>	<b>Generic Emission Source Level</b>	Emissions reported by detailed source type	Based on generic emissions factors
<b>Level 4</b>	<b>Company Specific Emissions Source Level</b>	Emissions reported by detailed source type (at the equipment or component level) using company-specific emissions and activity factors	Based on direct measurement methodologies
<b>Level 5</b>	<b>Site Level</b>	Emissions reported at a site or facility level, typically through the use of sensors mounted on a mobile platform	Based on direct measurement methodologies
<b>Gold Standard</b>	<b>Level 4 and 5 Reconciliation</b>	"Bottom-up" source-level (Level 4) reporting is reconciled with "top-down: site level emissions measurements (Level 5)	Based on direct measurement methodologies

### Today, there are around 100 corporate members to the OGMP, powering action on methane measurement and abatement.

As it stands, these leading companies represent 35% of global oil and gas production, 25% of gas transmission and distribution pipelines, and 70% of LNG flows.

#### Supporters



#### Global Oil and Gas Asset Coverage





## EDF's PermianMAP

EDF's Permian Methane Analysis Project (PermianMAP) is a methane monitoring and research project aiming to provide transparent and accessible methane emissions data from one of the world's largest oil fields. Starting in early 2020, EDF's PermianMAP team has been conducting advanced emissions monitoring in high producing areas of the Permian Basin using tower-based monitors, frequent aircraft and helicopter surveys, as well as ground-based measurements.

The PermianMAP project has been central to generating new scientific insights into the methane performance of the United States' largest oil and gas basin, contributing to key findings:

- Aircraft measurements have revealed Permian emissions are 2-3 times higher than what the EPA estimates in their inventory of greenhouse gas emissions.
- The amount of gas lost in the Permian – 3.5% of what companies produce – is 15 times greater than the loss rates many companies have pledged to achieve.
- Approximately 10% of flares are malfunctioning or entirely unlit, driving a significant portion of methane emissions from the Permian Basin.
- On average, marginal wells (production <15 barrels of oil equivalent a day) are losing approximately 10% of their gas – several times more than their high-volume counterparts.
- Methane emissions from natural gas gathering pipelines in the Permian Basin are at least 14 times greater than the EPA's national inventory estimates.

These observations are valuable for understanding the root causes of emissions and informing actions to permanently reduce them. PermianMAP has been a transformative project towards improving methane measurement practices, revealing the real extent of methane pollution, and highlighting the need to drive action on methane emissions both in the Permian as well as in less studied oil and gas basins around the world.

## How can different technologies be used to measure oil and gas methane?

Direct measurement technologies can allow both operators and regulators to better understand emissions sources and prioritize mitigation strategies. However, robust methane emissions quantification programs require a combination of bottom-up, source-level and top-down, site-level measurements that are reconciled to give an accurate overall picture of emissions. As such, detection and measurement technologies should be deployed across different spatial and temporal scales.

**Component-level** or “bottom-up” assessments begin by using handheld devices, such as an infrared Optical Gas Imaging (OGI) camera, to identify individual equipment-level leaks or emission sources. Once detected, these leaks are then quantified in an additional step, most commonly applying emission factors which take into account the flow rate and methane concentration at the leak.







**Facility-level** measurements identify and quantify total emissions from a facility, which usually contains multiple structures and components, helping contextualize component- or basin-level measurements. Sensors for detecting and quantifying emissions can be deployed on aircraft, drones, or terrestrial vehicles. Continuous ground-based sensors can also be used for remote detection of super-emitting leaks.

**Basin-level** measurements are a form of “top-down” readings that provide a snapshot of emissions over a whole region. These aerial or satellite surveys can be used to quantify total emissions, estimate an emission rate for a basin, and verify other bottom-up estimates.

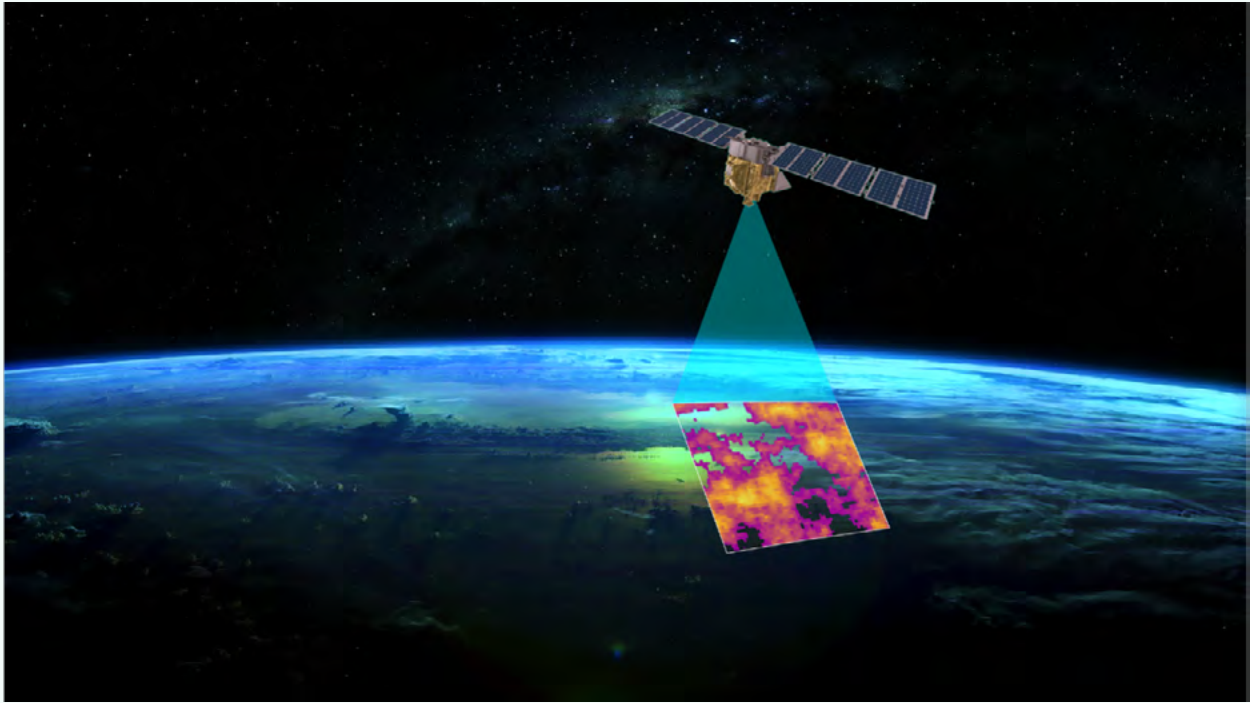
Other developments also highlight that improved technical abilities are on the horizon: enhanced precision in aerial, drone, and satellite measurements, faster quantification and detection through artificial intelligence integration, and continuous measurement through vast sensor networks.

TABLE 3

### A variety of technologies are needed to meet methane measurement needs

	Deployment platforms					
	Close-range			Screening		
						
	Handheld	Continuous Sensors	Mobile Ground Labs (MGLs)	Drones	Aircraft	Satellites
Characteristics	Small, portable devices that can be used in the field at high frequencies, from daily to monthly or quarterly, often used as part of LDAR programs.	Methane sensors (stationary, can be tower-based) that provide continuous, real-time readings (typically used at high-risk facilities).	Consisting of a vehicle with a GPS and a methane sensor, MGLs generate a map of methane concentrations along the vehicle's path or at a specific location.	Methane sensors mounted to drones or unmanned aerial vehicles (UAV) that are flown in patterns that enclose a facility. Several flights per day are possible, and they can reach dangerous or inaccessible places.	Various sensor types can be mounted on small aircrafts, covering long distances over long periods, often flying at different elevations or frequencies.	Remote sensing technology and advanced flight paths and targeting. Detects large plumes (super-emitters) and total emissions of a region or company portfolio.
Identify sources or estimate sub-facility emissions	●	●	◐	◐	◐	◐
Identify super-emitters	●	●	●	●	●	●
Estimate emissions at facility-level	○	○	◐	●	●	●
Estimate emissions at basin-level	○	○	○	○	●	●

As per EDF's scientific expertise, this table represents a sound understanding of how different technologies can broadly meet the needs of an effective methane measurement program. However, the ability of these measurement options to meet the standards of a particular measurement program vary significantly by the specific makeup of the facility/program and the qualities/capabilities of the technologies deployed.



## MethaneSAT

A new generation of satellites is paving the way for vast improvements in methane emission detection and quantification on a global scale, ushering in a new level of transparency into methane emissions through regular, frequent data accessible to companies, regulators, investors, and – for some satellites – the public.

MethaneSAT, a satellite mission and wholly-owned subsidiary of Environmental Defense Fund, will measure methane pollution from the oil and gas sector globally, and make that information easily accessible and free for the public. Once in orbit, it will provide regular monitoring of methane emissions in regions accounting for more than 80% of global oil and gas production, quantifying methane emission rates and identifying where those emissions are coming from and how they are changing over time.

With a wide field of view and a high level of precision and spatial resolution, MethaneSAT will find and measure small amounts of excess methane across the globe, quantifying emissions on a regional level and tracing larger emissions back to their point sources. The satellite's raw readings will be translated into actionable data for users within days, versus calculations that currently take weeks to months.

Some satellites have broad global coverage but with limited spatial resolution to identify point sources, while others can quantify emissions from high-emitting point sources but are restricted in their geographic scale. MethaneSAT combines the best of these existing capabilities by providing the necessary scope and granularity of global methane emissions.

# METHANE REDUCTION SOLUTIONS

Reducing methane emissions from oil and gas industry remains the fastest way to slow the rate of near-term warming – it is a key sector where the majority of emissions can be cost-effectively avoided with technologies that exist today.

# 75%

of the industry's methane emissions can be avoided with existing technology

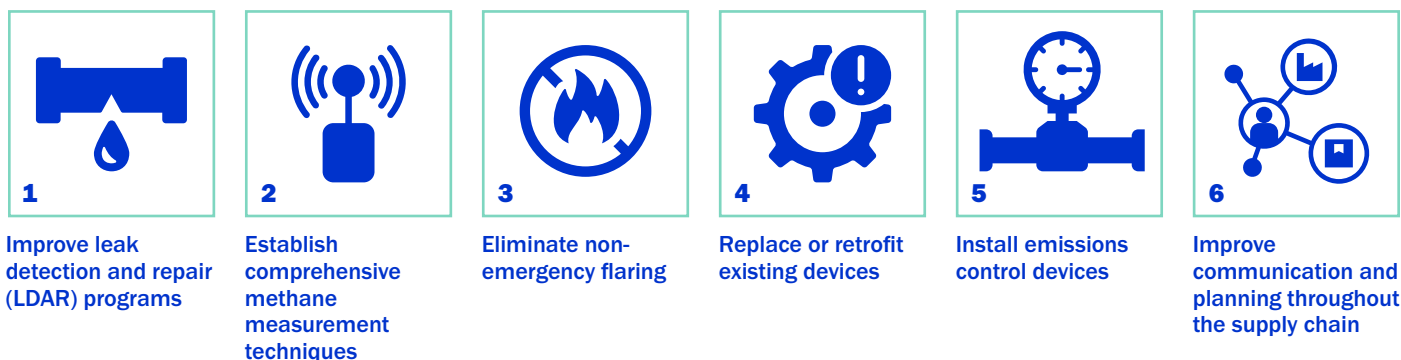
# MORE THAN 40%

of the total emissions can be mitigated at no net cost

There are a range of tested tools and strategies to reduce or avoid oil and gas methane emissions. Committed companies can take the following technical steps to rapidly cut methane emissions across their operations:

FIGURE 12

## Technical measures to prevent oil and gas methane emissions



### 1 – Improve leak detection and repair programs

Leak detection and repair (LDAR) programs is a principal strategy to mitigate methane emissions across the energy supply chain. Leaks are unpredictable and widespread across various operational touchpoints, so LDAR programs are systematically developed to detect and repair leaks. While most companies and facilities do conduct LDAR programs in line with legal requirements, they often lack the necessary rigor to effectively address leaks.

High-quality LDAR programs are those that:

1. Ensure that the initiative is meaningfully implemented across all assets, with a specific focus on high-risk equipment at each facility.
2. Undertake detection at specific, regular intervals – a quarterly/monthly inspection frequency is recommended, though this varies with the size of the facility.
3. Require leaks to be repaired or otherwise addressed within a short, specified time frame – EPA recommends between 5 to 15 days, though even faster repair times will minimize the effects of a leak.
4. Utilize proven detection tools that can spot small leaks, such as handheld optical gas imaging (OGI) cameras, continuous monitoring sensors, and drone/aerial surveys.
5. Employ personnel that have been sufficiently trained to detect and repair leaks.
6. Optimize all LDAR processes to best suit the type of leak expected, using appropriate tools to encapsulate detection sensitivity, geographic scope, and temporal variations.
7. Regularly use third-party audits to ensure that execution of the LDAR program meets a high threshold for performance against a high stated corporate policy.





## 2 – Establish comprehensive methane measurement techniques

A robust approach to methane measurement is central to any credible mitigation effort. Current emission factor-based methods do not provide a clear profile of methane emissions, since they rely on estimates that are inaccurate and vary widely between facilities and specific sources. Through the Oil and Gas Methane Partnership (OGMP), companies can develop the precise measurement and reporting capabilities to effectively allocate capital to address high-emitting sources. OGMP participation also enables accurate reconciliation of data collected from diverse measurement techniques – such as handheld cameras, drones, aircraft, satellites, and continuous sensors – providing visibility into both site-wide and source-level methane performance.



## 3 – Eliminate non-emergency flaring

There are multiple avenues to address flaring, which takes place when gas is burned as a waste product. In most cases, the ideal solution would be to connect production facilities to gas gathering and distribution pipelines. By developing sufficient offtake capacity, the industry can ensure that otherwise wasted/flared gas reaches the market. Natural gas can also be processed to produce compressed natural gas (CNG) or liquified natural gas (LNG), which may enable more economically feasible offtake in certain conditions. Gas can also be used productively on-site, which is preferable to the polluting effects of flaring. Reinjecting gas into reservoirs can enhance oil production, while using gas-powered turbines for local electricity generation can help reduce overall energy usage.

Refer to EDF's The Burning Question report for more on flaring mitigation.



## 4 – Replace or retrofit existing devices

Another major source of methane emissions is pneumatic devices, which are mostly made up of controllers that manage conditions (temperature, pressure, etc.) and pumps that inject chemicals into wells and pipelines. During their standard functioning, natural gas-powered pneumatic devices vent methane from the device. The IEA estimates that 15% of global methane emissions from oil and gas operations can be eliminated by implementing best practice mitigation measures for pneumatic devices; particularly through their replacement with electrical or mechanical controllers and instrument air systems. Other key devices with similar associated leakage that can be replaced or retrofitted include compressor seals or rods, dehydrators, and storage systems.



## 5 – Install emissions control devices

A range of equipment can be deployed to reduce fugitive methane emissions during operational processes. Vapor recovery units can be installed to efficiently capture gas that would otherwise escape from storage tanks. To avoid emissions from blowdowns (when gas is vented from a pipeline to relieve pressure during maintenance or testing activities), installing an ejector can transfer gas from an inoperative compressor to a functioning one without venting. Plunger lifts can enable liquids production from wells without releasing gas that is closer to the surface.



## 6 – Improve communication and planning throughout the supply chain

Venting and flaring is often driven by a breakdown in communication across the oil and gas supply chain. For example, temporary shutdowns or maintenance of midstream gathering and boosting facilities may trigger upstream producers to flare or vent gas that can no longer be transported cost-effectively. Companies should improve communication, planning, and coordination with adjacent nodes of the supply chain, so that all parties are well-informed and well-prepared to avoid additional methane releases. Producers and midstream partners should also collaborate to ensure that sufficient gas capture and takeaway infrastructure is optimally built to avoid routine flaring and venting.

# PRIORITY ACTIONS FOR COMPANIES

This section provides key context on the Core and Leadership investor asks for companies. Core asks refer to fundamental expectations from investors, with companies failing to meet these asks seen as laggards. Leadership asks refer to additional opportunities for companies to demonstrate best-in-class methane risk performance.

## Measuring and Abating Methane

### Key EDF Resource:

[The Investor Guide to OGMP 2.0](#)

### CORE: Set near-zero methane emissions intensity target by 2025 or sooner

Setting a methane intensity target is a key first step to driving action across any company and is an early indicator of ambition, if backed by direct measurement. ‘Near-zero’ methane intensity targets (0.2% or lower) can scale emissions to production volumes and offer a comparable metric across operators. Companies should report frequently on their progress against their methane intensity target, which should be disclosed as total methane emissions (volume in CH<sub>4</sub>) divided by volume of production.

### CORE: Join the Oil and Gas Methane Partnership 2.0 (OGMP)

The **Oil and Gas Methane Partnership (OGMP 2.0)**, managed by the United Nations Environment Programme (UNEP) and supported by EDF, provides a first of its kind reporting framework for oil and gas companies to accurately measure and credibly disclose their methane emissions. By creating a comprehensive and transparent standard for measuring and reporting oil and gas industry methane emissions, OGMP aims to not only improve the quality of methane emissions data but to realize deep reductions in global oil and gas methane emissions over the next decade. Today, around 100 companies – making up more than 35% of global oil and gas production – are reporting under the standardized, industry-leading OGMP framework.

FIGURE 13

### Timeline of OGMP Membership



FIGURE 14

### OGMP Signatories by ‘Gold Standard Pathway’ Status in 2022



Source: IMEO Eye on Methane 2022.

OGMP signatories are expected to achieve the 'Gold Standard' in methane measurement for operated assets within three years of joining and within five years for non-operated assets. The Gold Standard refers to when direct measurements from source-level (Level 4) and site-level (level 5) are reconciled, the highest assurance of data integrity. 60 companies are already on track to achieve the Gold Standard.

OGMP signatories report the share of emissions covered by the different reporting levels, which more companies should use and disclose as a key indicator to track progress on direct measurement efforts.

### **LEADERSHIP: Set near-term target for reducing absolute methane emissions**

Setting an absolute target ensures reductions in total methane volumes allows for certainty on environmental outcomes. Companies may find it challenging to estimate baselines for an absolute reduction target, since current estimates of methane emissions are inaccurate, but should

seek to provide absolute methane emissions volumes. An absolute methane target can play an important role in guiding the overall direction of a company's methane mitigation program.

### **LEADERSHIP: Provide detailed disclosure of progress on direct measurement efforts and methane abatement initiatives**

Leading companies should strive to provide additional detail on their methane measurement and abatement efforts, which can provide guidance to industry peers and support investor confidence.

Additional details and data could include:

- LDAR description and performance
- % Relevant equipment replaced/retrofitted
- Pilot measurement and technology projects
- Marginal abatement cost curve development
- Future methane management plans

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## **Reducing Flaring Impacts**

### **Key EDF Resource:**

[The Burning Question: How to Fix Flaring](#)

### **CORE: Join the World Bank's Zero Routine Flaring by 2030 (ZRF30) Pledge**

More than 30 governments and over 50 global oil and gas companies have committed to the [World Bank's Zero Routine Flaring by 2030 \(ZRF30\) Pledge](#), where endorsers commit to eliminating routine flaring.

As part of reporting to the World Bank, companies disclose their routine flaring volumes – but the excessive variation highlights that the industry lacks a clear definition on what situations constitute 'routine' flaring. Therefore, companies should provide clear definition of each situation (due to lack of infrastructure access, lack of takeaway capacity, or safety-related), alongside their disclosed their flared gas volumes by situation.

In addition to meeting ZRF30 reporting requirements, companies should provide the full breakdown of flaring intensity – volume of gas flared over the specified production basis – to transparently communicate progress towards reducing all non-emergency flaring.

### **LEADERSHIP: Set near-zero flaring intensity target (to eliminate all non-emergency flaring) by 2030 or sooner**

In order to prevent flaring volumes from being higher than necessary, companies should set a near-zero flaring intensity target, which accounts for all types of flaring situations. When flaring in purely emergency situations, research from Rystad Energy indicates that flaring intensity can be limited to 0.2% of gas produced. Industry leaders have already committed to achieving zero routine flaring across their global operations by 2025, with some companies pursuing even more aggressive timelines for key assets and regions.

### **LEADERSHIP: Set target for zero unlit and malfunctioning flares**

When flares fail to combust gas, this results in greater methane and near-term warming. EDF research – covering over 3,000 flares in the Permian Basin – found that 10% of flares were consistently malfunctioning, or completely unlit, thereby venting methane directly into the atmosphere. Companies should ensure optimal flare performance, through frequent monitoring of flares as well as better design, installation, and maintenance. Disclosing their measured flaring efficiency can help companies provide an improved assessment of their methane performance.

## Addressing Risk from Non-Operated Assets and Joint Ventures

### Key EDF Resource:

[Joint Action: Catalyzing Methane Emission Reduction at Oil and Gas Joint Ventures](#)

### CORE: Distinguish and report emissions from NOJV assets, including by breaking out methane and flaring

The portfolios of the world's largest oil and gas companies are comprised of two types of assets: operated and non-operated. Operated assets are those in which a company's employees and directly managed contractors use the company's standards for processes, tools, and systems. Non-operated assets, in contrast, are assets in which another oil and gas company assumes the role of asset operator, overseeing all decision-making and standards, including environmental, health and safety protocols. Joint ventures refer to assets created by two or more parties, generally characterized by shared ownership, shared returns and risks, and shared governance.

While the companies typically continue to generate and report revenue from their non-operated assets, the associated emissions are often not reported. This leaves large portions of company production emissions unaccounted for in carbon footprint management, providing an inaccurate picture of a company's climate performance and potentially obscuring risks that could damage company profitability.

To provide stakeholders with information on emissions risk from NOJVs, a growing number of companies use equity GHG emissions reporting, where companies report the share of emissions from each of their assets equivalent to their ownership stake. Alternatively, companies can report emissions from all assets in which they hold a significant equity stake (for example, >5%).

Companies should also provide additional material information to stakeholders by separately breaking out reported volumes of methane and flared gas from NOJV assets. For example, it is a requirement under the OGMP Gold Standard goal to report methane emissions from NOJVs within five years of joining the framework.

### CORE: Extend emissions targets to cover both operated and non-operated assets

To adequately address climate risk, emissions targets must extend to NOJVs, since they make up a significant portion of a company's production portfolio, revenues, and emissions. Including NOJVs under the scope of climate targets will highlight the shared responsibilities of partners to mitigate risk, manage emissions and commits companies to working collaboratively with joint venture partners to their support methane mitigation efforts.

To date, almost all of the industry's methane reduction commitments have only been for companies' operated assets. This means in some cases up to 65% of a company's production is exempt from its reduction target. Few companies have extended their emissions reduction targets or are requiring their operating partners or NOJV assets to meet concrete emissions targets. But with more seeking to influence emissions management at NOJVs, the industry must rapidly strengthen NOJV climate governance to mitigate otherwise obscured risks.

### LEADERSHIP: Require emissions mitigation plans at NOJV assets

A key aspect of reducing emissions at NOJV assets is through development and implementation of asset-specific emissions mitigation plans. Jointly developed plans can enable collaboration between partners, while supporting both parties' decarbonization efforts. Companies should work with their NOJV partners to ensure that all assets – operated and non-operated – are pursuing all feasible emissions reduction initiatives, including where necessary by providing operating partners with the technical and financial resources to address this challenge.

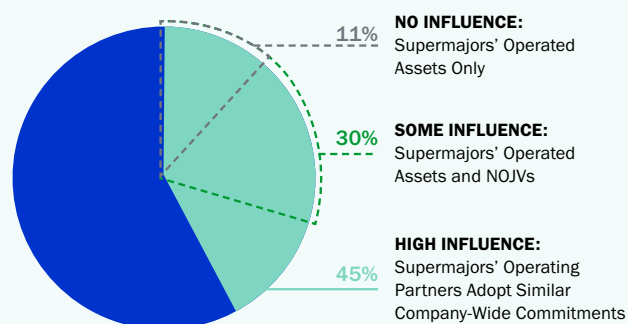
### LEADERSHIP: Support emissions reduction efforts at joint venture partners' other assets

Engaging with partners on emissions management at NOJV assets is a key pathway to influencing other oil and gas companies across the globe to pursue credible emissions reductions. EDF analysis finds that the global production covered by methane reduction targets can rapidly increase by leveraging supermajor influence over their NOJV assets and operating partners.

FIGURE 15

### Influencing the NOJV partners of the supermajors can rapidly increase the extent of global production covered by methane targets and disclosure practices

(% of global production covered, in different situations of NOJV influence)



Source: EDF 2022 analysis. More information can be found [here](#).

## Advocating for Robust Policy

### Key EDF Resource:

[The AAA Framework for Climate Policy Leadership](#)

### CORE: Publicly support robust methane and flaring policies and regulations

Companies should advocate for government policies consistent with a significant reduction in methane and broader Scope 1 emissions (including flaring). If responsible operators already acting on methane emissions do not take advantage of policy opportunities, industry's worst actors will continue to bring down the reputation of the whole. Supportive, detailed comments from industry leaders can counter input from those aiming to undermine action and can be critical to the quality of the resulting policy.

### LEADERSHIP: Report spending on climate lobbying

The oil and gas industry has a poor track record on positively influencing the broader climate change conversation, posing material reputational risks to the industry's social license to operate. It is crucial that the industry transparently discloses its climate lobbying funding activities, in order to demonstrate credibility and accountability when it comes to public policy advocacy.

### LEADERSHIP: Influence trade associations to support stronger policies

Companies should clearly evidence their efforts of seeking to influence the position of trade associations, who carry significant political influence and but often tend to advocate for weaker regulation than many of their individual members. Companies can push trade associations from within to improve their stances on climate and methane regulations, while being willing to publicly diverge from weaker trade group positions. Companies should leave trade groups that do not make sufficient progress.



# CONCLUSION: ACCELERATING EFFORTS TO ADDRESS METHANE RISK

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In an environment of growing stakeholder expectations, poor methane management undermines a company's ability to compete and operate effectively. Investors are increasingly evaluating methane performance as part of assessing the oil and gas industry's exposure to material financial risks. With the emergence of robust regulation and supercharged technological improvements, companies must demonstrate credible efforts to mitigate methane – or risk being left behind.

Despite the technical feasibility and cost-effectiveness of methane reduction efforts, companies lag on implementing credible mitigation strategies. Current industry practice of using inaccurate emissions factors to estimate methane emissions impede abatement initiatives, as the extent of emissions is unclear and limited remediation resources are potentially misallocated. Poor data quality additionally impairs stakeholder efforts for transparency and accountability, opening the door to potential greenwashing.

However, industry leaders are showing the path to credible methane mitigation, by improving data quality, implementing best operational practices, covering all material assets, and supporting strong regulation. By joining the Oil and Gas Methane Partnership (OGMP 2.0), companies are committing to the standardized, transparent reporting framework, which is based on direct measurement. Companies are pledging to eliminate the harmful and wasteful practice of routine flaring, in partnership with the World Bank. Industry leaders are measuring, reporting, and managing emissions from all their assets – including non-operated assets and joint ventures, which are material contributors to company bottom lines but are often unaccounted for in corporate climate initiatives. Finally, more companies are advocating for strong methane regulations, which raise the floor industry-wide.

Developments in finance, policy, and technology have spurred global pressure on mitigating methane, dramatically accelerating the industry's performance in recent years. Investors, companies, and other stakeholders are increasingly seeing methane risk materialize – impacting the return of financial portfolios, the nature of global decarbonization, and the health of the environment. Strong methane management today sets up investors and companies to lead in the global energy transition tomorrow. This is the methane moment.



# APPENDICES



# REGULATION AND VOLUNTARY ACTION

While companies should continue to pursue voluntary methane reductions, they will also be subject to an increasingly broad scope of methane regulation. Jurisdictions around the world are responding to the dangers of methane by proposing and enacting smart and robust methane regulations.

Effective methane regulation serves several roles:

- **Drives uniform reductions** by creating enforceable requirements for companies to reduce their emissions
- **Sets common standards** for methane mitigation reporting
- **Encourages worldwide reductions** by leveraging interplay between global markets and international partnerships
- **Protects communities** that are close to oil and gas emissions sources

## THE GLOBAL METHANE PLEDGE (GMP)

### Background

Around 150 countries – representing half of global methane emissions and three-fourths of the global economy – have pledged to cut methane emissions by 30% by 2030 (vs 2020 levels). This alone could eliminate over 0.2°C of warming by 2050.

### Timeline

The GMP was launched at the 2021 UN Climate Change Conference (COP26), driving planning and implementation across a range of international and national initiatives. COP27 saw the United States, Canada, Mexico, Colombia, Ecuador, Nigeria, and Malaysia all highlight their significant progress on domestic methane and flaring regulation for the oil and gas sector.

### Key Initiatives – Continued Implementation

- **Accelerated national methane planning:** Over 50 countries have methane action plans or are in the process of developing one and more than 70 countries now include “targeted methane reduction measures” in their nationally determined contributions (NDCs).
- **The Joint Declaration from Energy Importers and Exporters:** The pact aims to create a global market for low methane-intensity natural gas by publicly supporting efforts to integrate improved emissions data into concrete policies, commercial agreements, and emission mitigation plans.
- **Methane Alert and Response System (MARS):** The International Methane Emissions Observatory, a core partner to the GMP and the OGMP 2.0, launched MARS to scale up detection of major emission events, notify relevant stakeholders, and support and track mitigation progress.

### Takeaways

COP27 highlighted real progress inspired by the GMP in the fight to reduce methane. More countries are issuing stronger regulations, more companies are taking voluntary actions, and more funds are being raised to support methane abatement efforts.

**Read more here:**

- [Details, Details: Quiet Action at COP 27 Tees Up a Big Year for Methane](#)



# ENVIRONMENTAL PROTECTION AGENCY (EPA)

## Background

The EPA's proposed methane regulations cover new and existing equipment and processes at oil and gas production, processing, transmission, and storage facilities in the United States. The proposed standards could eliminate over 46 million tons of methane emissions between 2023-2035, with the EPA estimating around \$3.2bn in net climate benefits annually.

## Timeline

At COP27, President Biden announced the EPA's supplemental regulatory proposal, which strengthens the agency's initial proposal released in November 2021. The comment period for the supplemental rule closed on February 13, 2023. EPA can be expected to issue a final rule sometime in 2023, potentially in August.

## Key Elements – Proposed

- **Expanded monitoring and repairing of leaks:** All well sites, regardless of size, will be required to be routinely monitored for leaks, with heightened requirements for sites with leak-prone equipment.
- **Flexibility in methane detection technology:** Owners and operators will have the flexibility to choose one or more advanced monitoring technologies that best suit methane detection at their facilities, as long as these techniques are approved by the EPA to achieve equal or greater reductions
- **Zero-emissions standard for all pneumatics:** All new and existing pneumatic controllers and pneumatic pumps will be required to transition to zero methane and VOC emissions.
- **Limiting flaring and venting:** EPA has proposed significant limits on the flaring and venting of associated gas from oil wells, but should go further before the rules are final to require it (in uncertified cases) to be either captured and sold, productively used as fuel, or reinjected.
- **Preventing leaks from abandoned and unplugged wells:** Monitoring must continue at well sites “until all wells have been plugged and equipment has been removed”, with owners required to submit a well closure plan and conduct a final survey to ensure that the well site is not leaking.
- **A new Super-Emitter Response Program:** In order to leverage independent monitoring detecting large emission events, EPA will now allow certified parties with approved remote methane detection technology to notify owners and operators of super-emitting events.

## Takeaways

The supplemental proposed rule is significantly more protective than the initial proposal, with marked improvement on monitoring small, leak-prone wells. Current provisions should be maintained in the final language, along with strengthening requirements to end routine flaring. Further, effective implementation of EPA regulations hinges on using industry and investor support to develop strong corresponding implementation plans.

### Read more here:

- [As oil and gas industry gathers in Houston, companies show historic levels of support for EPA methane rules](#)
- [Widespread public support, new analysis signal urgent need for strong EPA methane protections](#)
- [EPA methane proposal makes critical progress, but work remains to quickly finalize protective standards](#)
- [Investor Guide to Company Comments on EPA Proposed Standards for Oil and Gas Methane Emissions](#)
- [Investor Guidance on EPA Proposed Standards for Oil and Natural Gas Methane Emissions](#)



THE UNITED STATES

## INFLATION REDUCTION ACT (IRA)

### Background

The nearly \$369 billion in climate and clean energy provisions in the Inflation Reduction Act (IRA) include grants and tax credits towards reducing US greenhouse gas emissions by 40% below 2005 levels by 2030. The IRA includes two key provisions on channeling methane reductions from the oil and gas industry.

### Timeline

Enacted in 2022, implementation dates vary.

### Key Elements – Enacted

- **Methane Emissions Reduction Program (MERP):** Certain oil and natural gas facilities are required to pay a fee on excessive emissions of \$900 per metric ton of methane in 2024, rising to \$1,200 in 2025, and increasing to \$1,500 for 2026 and subsequent years. Companies can choose to reduce their emissions below industry-set thresholds instead of paying the fee.
- **Methane reduction funding:** The IRA provides \$850 million to EPA to provide grants for methane reduction, and an additional \$700 million for the same purposes at marginal conventional wells.

### Takeaways

MERP, through its appropriations and waste emissions charge, will help to further drive down methane emissions, complementing and reinforcing the EPA's methane regulations. Funding will further reduce the costs of cutting methane, while the waste charge acts as a strong incentive for operators to reduce emissions.

### Read more here:

- [The Inflation Reduction Act is a game-changer on methane. Here's why.](#)

## BUREAU OF LAND MANAGEMENT (BLM)

### Background

Through increased venting and flaring on public lands, the last decade saw wasted gas volume four times that of what was lost in 1990-2000. In response, the Department of the Interior announced a [proposed Bureau of Land Management \(BLM\) rule](#) to address methane releases from oil and gas production on federal and tribal lands.

### Timeline

The rule was issued in November 2022, with the first comment period closing on January 30, 2023. A final BLM rule can be expected in fall 2023.

### Key Elements – Proposed

- **Royalties:** BLM plans to place time and volume limit on royalty-free flaring, projecting to raise an estimated \$40 million in royalty payments from flaring beyond authorized limits.
- **Equipment upgrades:** When economically feasible, operators must use low-bleed pneumatic equipment and install vapor recovery units for storage tanks.
- **Protocols:** Operators must submit waste minimization plans – on which basis BLM may delay or deny drilling permits – as well as maintain a leak detection and repair (LDAR) program.

### Takeaways

While an important first step, the BLM rule must be further strengthened to enable deeper methane waste reductions. As it stands, the rule falls short of best practice standards that end routine flaring, as exemplified by New Mexico and Colorado. Higher royalty fees are also required, since many oil and gas companies operating on federal and Tribal lands have simply accepted current royalty payments as part of the cost of doing business.

### Read more here:

- [BLM Draft Waste Prevention Rule Important First Step, Must Be Further Strengthened to Eliminate Waste Caused by Venting and Flaring and Protect American Taxpayers and Communities](#)
- [New Study Quantifies Natural Gas Wasted on U.S. Public and Tribal Lands](#)

# PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION (PHMSA)

## Background

The agency oversees 3 million miles of oil and gas pipelines, with analysis suggesting that PHMSA could help deliver an annual reduction of up to 20 million metric tons of CO<sub>2</sub>e in methane emissions. The PIPES Act of 2020 manufactured new ambition for PHMSA to develop and finalize new policies to control methane emissions from pipelines, storage facilities, and associated infrastructure.

## Timeline

PHMSA has finalized several key rules during the Biden administration, including expanding oversight of gas gathering pipelines in November 2021 and mandating automatic shut-off valves in March 2022. PHMSA is expected to soon issue a proposed rule to facilitate deployment of advanced technologies to find and fix more methane leaks on gathering, transmission, and distribution pipelines.

## Key Elements – Enacted

- **Gathering lines:** The 2021 rule, part of which takes effect in 2023, establishes basic safety standards for an additional 90,000 miles of gathering lines, and for the first time, requires annual reporting on all 425,000+ miles of gathering lines.
- **Automatic shut-off valves:** The installation of high-performance, automatic shut-off valves will be required for new and replaced onshore gas and liquid pipelines.

## Takeaways

It is critical that PHMSA establish comprehensive advanced leak detection (ALD) standards for gas pipelines to set clear guidelines for technical performance, require strong public reporting of methane leakage and abatement progress, and cover the full scope of distribution, transmission, and gathering pipelines. PHMSA's role in controlling methane leakage has previously been under-recognized, so recent regulatory efforts are key to driving nationwide reductions, especially for the midstream sector.

### Read more here:

- Federal pipeline agency has essential opportunity to reduce methane emissions
- Research shows gathering pipelines in the Permian Basin leaking 14 times more methane than officials estimate

# THE EUROPEAN UNION (EU)

## Background

As part of the European Green Deal strategies and initiatives, the European Commission published its [EU Methane Strategy](#) in October 2020. A key facet of the overarching strategy is to propose and finalize legislation to [mitigate methane emissions across the energy supply chain](#).

## Timeline

[Proposed legislation](#) was published in December 2021 and negotiations to amend and agree a final text are taking place. The Council of the European Union adopted its general approach (i.e. its negotiating position) in December 2022. In October 2022, the Parliament submitted more than 1,000 amendments to the proposed legislation and will reach its negotiation position in the first quarter of 2023. Negotiations between the European Parliament and the Council of the European Union will start straight after, suggesting a potential final agreement sometime in 2023.

## Key Initiatives – Proposed

- **Compulsory measurement, reporting and verification (MRV):** Building on the methodology of the OGMP 2.0, the legislation requires operators to report on direct measurement efforts of methane emissions at both operated sources and non-operated assets, using source-level and site-level measurements.
- **Mandatory leak detection and repair (LDAR) programs:** All fossil gas infrastructure or other infrastructure that produces, transports, or uses natural gas will require an LDAR program. Timelines for operators to repair or replace components as soon as methane emissions are detected, along with surveying for further leakages, are set.
- **Limiting venting and flaring:** Venting and flaring should be limited.
- **Importer information disclosure requirements:** EU Member States will annually report information provided by companies exporting oil and gas to the Member State, regarding their methane measurement and abatement efforts.
- **Inactive wells efforts.** EU Member States will be expected to publish a yearly list of and install methane measuring equipment at all inactive wells.

## Takeaways

Given its vast potential as the first continental legislation regulating methane emissions from the energy sector, the EU regulation should have strong internal requirements. The legislation must do more to enable, at a minimum, alignment with OGMP 2.0 best practices, by bringing forward the MRV timeframes, increasing LDAR frequency, and prohibiting all non-emergency flaring and venting. Leveraging its role as major gas buyer, the EU should consider stronger rules, so that it can set higher climate standards on future gas imports.

### Read more here:

- [EU Methane Policy Recommendations](#)

# PARTIAL LIST OF ORGANIZATIONS WORKING ON METHANE EMISSIONS

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[International Energy Agency \(IEA\)](#) – Made up principally of 31 OECD member countries, the IEA is a leading global resource on authoritative data analysis and policy recommendations to support the clean energy transition. In addition to its research capabilities, the IEA serves as a key voice on understanding energy trends, in addition to supporting a range of international partnerships. On methane, the IEA uses its regularly updated Global Methane Tracker to provide the latest insight on methane emissions and abatement. The IEA is also often cited for its Net Zero by 2050 (NZE2050) scenario, which projects how energy and emissions need to change to align with the Paris Agreement.

[International Methane Emissions Observatory \(IMEO\)](#) – Launched at COP26 in 2021, IMEO is a data-driven, global initiative to accelerate the transparency and credibility of methane reporting. Supported by the United Nations Environment Programme (UNEP) and the European Commission (EC), IMEO intends to monitor the national commitments made under the Global Methane Pledge, by initially tracking methane emissions from the fossil fuel sector (before expanding to others). IMEO is generating a granular, public dataset of global methane emissions, by collecting data from OGMP 2.0 reporting, oil and gas company disclosures, and other direct measurement data (including that from satellites, scientific studies, etc.).

[Methane Guiding Principles \(MGP\)](#) – Established in 2017, the MGP is a voluntary coalition of industry, international institutions, non-governmental organizations and academics focused on areas of action to reduce methane emissions from the natural gas supply chain. The five Guiding Principles are (1) Continually reduce methane emissions; (2) Advance strong performance across the gas supply chain; (3) Improve accuracy of methane emissions data; (4) Advocate sound policy and regulations on methane emissions; and (5) Increase transparency.

[Oil and Gas Climate Initiative \(OGCI\)](#) – Launched in 2014, the OGCI is a CEO-led initiative that aims to accelerate the industry response to climate change. Made up of 12 of the world's largest oil and gas companies, the OGCI updated their target of reducing the collective average methane intensity of their members' aggregated oil and gas production operations to 0.2% by 2025. In March 2022, members announced they will strive to reach near-zero methane emissions from operated assets by 2030 and encourage their partners to do the same. In addition, the OGCI has a \$1bn+ fund (OGCI Climate Investments) that invests in technologies and projects that accelerate decarbonization in the industry.

[Oil and Gas Methane Partnership \(OGMP\) 2.0](#) – Co-developed by UNEP, EDF and the European Commission, the OGMP 2.0 framework provides a reporting framework for oil and gas companies to accurately measure and report their methane emissions. The framework offers a transparent and standardized reporting protocol, allowing stakeholders to credibly differentiate industry leaders and laggards. The goal is to enable the oil and gas industry to realize deep reductions in methane emissions over the next decade in a way that is transparent to civil society, governments, and their investors. As of February 2023, around 100 companies have committed to achieving the 'Gold Standard' in methane measurement across both their operated and non-operated assets.

[World Bank](#) – The international financial institution leads a range of initiatives to address global poverty, including its Zero Routine Flaring by 2030 Pledge (ZRF30). Launched in 2015 with the support of UNEP, ZRF30 voluntarily commits governments and companies to end routine flaring this decade and annually report on their progress. Companies are required to disclose their overall and routine flaring levels to the World Bank and are expected to avoid routine flaring for new production developments. As of February 2023, 34 governments, 54 companies, and 15 development institutions have adopted the ZRF30 Pledge.

# ADDITIONAL RESOURCES

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## EDF Resources

### Measurement

- [An Investor's Guide to the Oil and Gas Methane Partnership 2.0](#)
- [PermianMAP Final Report](#)
- [MethaneSAT Website](#)

### Flaring

- [The Burning Question: How to Fix Flaring](#)
- [Flaring Flatline: Commitments on natural gas flaring outpace progress](#)

### NOJVs

- [Joint Action: Catalyzing Methane Emission Reduction at Oil and Gas Joint Ventures](#)
- [Emission Omission: A Shareholder Engagement Guide to Uncovering Climate Risks from Non-Operated Assets in the Oil and Gas Industry](#)
- [The Next Frontier: Managing Methane Risk from Non-Operated Assets](#)

### Policy

- [The AAA Framework for Climate Policy Leadership: A Guide for Companies](#)
- [Investor Guide to Company Comments on EPA Proposed Standards for Oil and Gas Methane Emissions](#)
- [Investor Guidance on EPA Proposed Standards for Oil and Natural Gas Methane Emissions](#)
- [EU Methane Policy Recommendations](#)

### Transferred Emissions

- [Climate Principles for Oil and Gas Mergers and Acquisitions](#)
- [Transferred Emissions: How Risks in Oil and Gas M&A Could Hamper the Energy Transition](#)

## Other Key Resources

- [S&P – Levers for capturing methane emissions to improve gas availability](#)
- [Carbon Limits – Methane action at National Oil Companies](#)
- [IEA – Global Methane Tracker 2023](#)
- [IEA – Curtailing Methane Emissions from Fossil Fuel Operations](#)
- [IEA – The energy security case for tackling gas flaring and methane leaks](#)
- [World Bank – 2022 Global Gas Flaring Tracker](#)
- [IIGCC – Net-Zero Oil and Gas Standard](#)
- [Rystad Energy – Japan's opportunities concerning global methane emissions](#)
- [IMEO – An Eye on Methane 2022](#)
- [MGP – Best Practice Guides](#)