Taking Aim: Hitting the mark on oil and gas methane targets

Environmental
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Attributions

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Executive Summary

Methane is a fundamental challenge for the global oil and gas industry because of how much industry emits and how intensely methane impacts warming. Methane is responsible for one quarter of the warming we experience today[1] and the oil and gas industry is one of its largest manmade sources. With proven, low-cost technology solutions, minimizing methane emissions is a strategic opportunity that industry and society cannot afford to miss.

Natural gas, or methane, has emerged as the potent paradox for the energy industry. Methane is a valuable source of energy when successfully delivered to the market as natural gas. But too often methane is vented, leaked or flared as pollution. In a decarbonizing and increasingly competitive energy landscape, the climate performance of natural gas becomes an important metric for decision makers.

Each year, over 75 million metric tons of methane is emitted from the global oil and gas supply chain[2], threatening our prospects of reaching a stable climate future[3] and causing unnecessary local air pollution.[4] As much as $34 billion of global gas supply is lost each year,[5] enough to electrify Africa two times over if the wasted gas were put to productive use.

Leading companies are stepping forward in a number of areas, including improving reporting, accelerating technologies, and implementing best management practices. Positive examples of industry-led collective action already underway include: the Oil and Gas Climate Initiative, the Oil and Gas Methane Partnership, a set of global methane principles signed in November 2017 by by eight leading operators, and One Future. Robust implementation of these early stage initiatives will be critical to ensure the solutions match the scope and magnitude of the problem.

[1] Radiative forcing metric used as a proxy for today's warming, with calculation as fraction of total positive radiative forcing from emitted species that is attributed to methane emissions. Data is from IPCC AR5 WGI 2013 Chapter 8 SM, Table 8.SM.6, and the calculation is corroborated by climate model simulations. There is new science since the IPCC report that finds that methane is even more potent (based on including its absorption of near-infrared radiation), and thus the 25 percent will likely be revised upwards; our internal analysis that includes this new data shows that methane accounts for 27 percent of today's warming.

[2] 2017 IEA World Energy Outlook (WEO) https://www.iea.org/weo2017/

[3] http://science.sciencemag.org/content/342/6164/1323

[4] https://pubs.acs.org/doi/abs/10.1021/es4053472

[5] EDF analysis based on IEA's 2017 WEO estimate of global oil and gas methane emissions and 2017 average natural gas prices from various regional markets as reported by Rystad Energy.

In the coming years, industry's actions will determine:

- what level of verifiable methane emission reductions are achieved
- how methane emissions affect the future of gas, and
- which companies will lead or lag on managing methane risk as a competitive issue

With such questions looming for industry's future, institutional investors are becoming increasingly vocal about the need for companies to set targets. According to State Street Global Advisors, establishing company-specific climate emissions targets is "one of the most important steps in managing climate risk." EDF analysis, however, suggests that just six companies that represent only three percent of global oil and gas production currently report quantitative methane emission targets.

A targeted commitment from industry to reduce oil and gas methane emissions is the next frontier of climate risk management. A well-crafted and executed target shows a tangible step by industry to slow the rate of warming now and can help companies mitigate regulatory risk.

EDF intends the white paper to help industry leaders establish strong methane targets and to inform institutional investors, policy makers, and civil society as they evaluate methane targets in the months and years to come. We focus primarily on upstream oil and gas operations, which, according to the International Energy Agency (IEA), account for more than three quarters of the industry's methane emissions. However, methane target setting can be a valuable tool across the supply chain, and many of the same considerations outlined here apply.

A targeted commitment from industry to reduce oil and gas methane emissions is the next frontier of climate risk management.

As oil and gas producers design and implement methane targets, EDF recommends:

Emissions from Oil Production – Not Just Gas Value Chain – Must be Targeted:

IEA estimates more than half of upstream methane emissions come from oil production. Targets encompassing upstream must include all emissions from oil and gas production, including both stranded and marketed associated gas. The oil and gas industry cannot credibly position natural gas as a climate solution while emitting large amounts of methane from oil-heavy fields.

Non-Operated Assets Are Key to Scale Impact:

With joint ventures permeating the global industry landscape, companies with worldwide presence that set targets should also work with their partners to reduce methane emissions in non-operated assets.

Absolute Targets Are Preferable – 75 Percent Emission Reductions are Feasible:

Companies should implement absolute targets to reduce methane emissions. IEA analysis and demonstrated industry experience suggest that corporate commitments to reduce methane emissions 75 percent by 2025 are feasible. A 75 percent emission reduction by 2025 is a milestone on the pathway toward virtually eliminating wasteful emissions of natural gas.

0.20 Percent Leakage Rate Feasible for Production:

Intensity targets will be assessed on whether they deliver strong environmental outcomes, even in industry growth scenarios. The reported experience of industry leaders suggests that it is feasible to achieve a 0.20 percent or lower methane intensity rate, calculated as total methane emissions from oil and gas production[6] divided by total natural gas production. Intensity targets lack certainty on environmental outcomes, and any intensity goal will need to address this issue.

Use and Report Rigorous Data and Analysis:

Rigorous emission measurement and statistical analysis should set the foundation for industry reporting on methane targets. Field measurement at site and basin levels is necessary to identify “fat tail” leaks and accurately assess progress on targets. Public disclosure of data and methods supports the credibility of a methane target program. Companies should engage qualified independent experts for valuable review and validation.

[6] Appendix discusses alternative intensity target metrics and how they can be compared

In governments, investment firms, and communities around the world, calls to reduce methane emissions are gaining remarkable momentum. How industry responds to these calls will inform each company's role in tomorrow's energy market. Companies that seize this opportunity can differentiate themselves to investors and others. In concert, leaders can mitigate the risk that unchecked emissions create backlash that harms the entire sector.

Now is the time to design and implement ambitious methane emission targets. We hope this white paper helps companies set methane targets with urgency and resolve.

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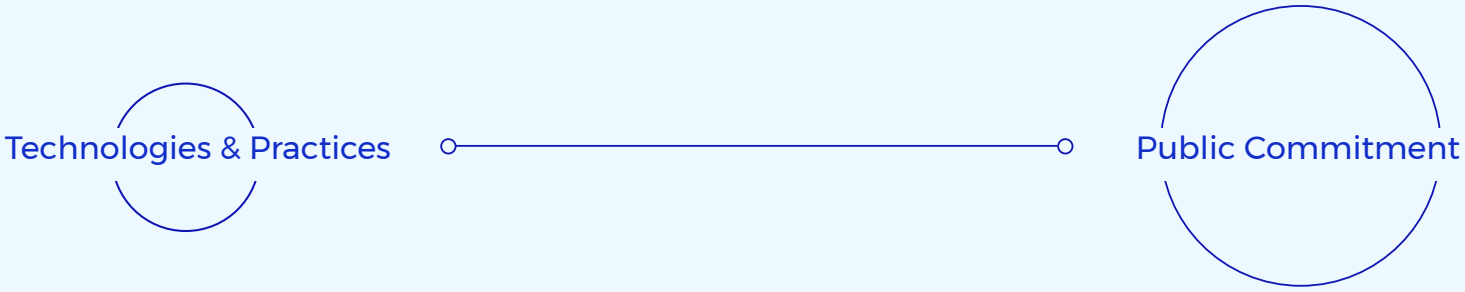
Introduction

As the International Energy Agency (IEA) found, "the role that natural gas can play in the future of global energy is inextricably linked to its ability to help address environmental problems." On one hand, natural gas has lower CO2 intensity than other fossil fuels when burned and can improve energy access in the developing world. On the other hand, methane and associated emissions from the global oil and gas industry accelerate climate change, damage air quality, waste a valuable natural resource, and threaten industry's license to operate.

Limiting methane emissions, including from oil and gas[7], is one of the critical steps toward achieving the global goal of limiting temperature rise over the next few decades and overall to 2C° or 1.5C°. Minimizing methane emissions can increase operational efficiencies, lessen the amount of energy wasted and improve the climate performance of natural gas in a changing energy system.

As demands for cleaner energy and climate action intensify, corporate leaders across a range of industries are setting performance targets for different measures of climate and environmental impact. The Task Force on Climate-related Financial Disclosures (TCFD) – a leading coalition that develops climate-related financial risk disclosures for use by companies in providing information to key stakeholders – emphasizes metrics and targets as one of the four core elements of its framework for corporate climate disclosure. TCFD calls on companies to "describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets."[8]

Many oil and gas industry leaders recognize the importance and benefits of taking action to reduce their methane emissions. Some companies have already instituted methane control technologies and practices in the field, such as leak detection and repair or low emitting valves. But very few companies have yet set quantitative targets to demonstrate commitment and earn stakeholder confidence. Public commitment to robust methane targets is a next frontier for climate risk management.



[7] Though EDF supports work to address methane emissions in other industries, this paper focuses on the oil and gas industry. The oil and gas industry is distinctive among methane emitting sectors in that the pollutant is a valuable product, which makes the economics of methane mitigation highly cost effective.

[8] "Recommendations of the Task Force on Climate-Related Financial Disclosures." Task Force on Climate-Related Financial Disclosures, Financial Stability Board, June 2017, www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf.

Well-crafted targets can demonstrate an industry commitment to being part of the climate solution, support and enhance engagement with investors and other key stakeholders, and guide operational initiatives to implement controls and monitor performance. Conversely, a failure to set methane targets – or poor target design or execution – risks missing valuable opportunities and undermining industry credibility.

The IEA has determined that a 75 percent reduction of global oil and gas methane is possible with today's technology, and that up to a 50 percent reduction can be achieved at no net cost. IEA's analysis shows that just these no-net cost reductions would have the same climate impact in 2100 as immediately closing all the coal plants in China. The opportunity for fast, low-cost, emission reductions is undeniable. Failure by the global oil and gas industry to drastically reduce its methane emissions when it is straightforward to do so only casts more doubt about whether natural gas has a contructive role to play in a low-carbon future. The goals of this white paper are to help industry leaders establish credible and strong methane targets and to inform institutional investors, policy makers, and civil society as they evaluate methane targets in the months and years to come.

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Scope

Comprehensive
Coverage Needed

Methane emissions from oil production are, quite literally, a natural gas problem.

The scope of an effective methane target must match the scope of the industry's methane problem. As oil and gas producers establish targets, full coverage of upstream production – including methane emissions associated with both oil and gas production – is essential for completeness and credibility. Moreover, because joint ventures are so prevalent in the global oil and gas industry structure, companies should extend emission reduction efforts beyond operated assets.

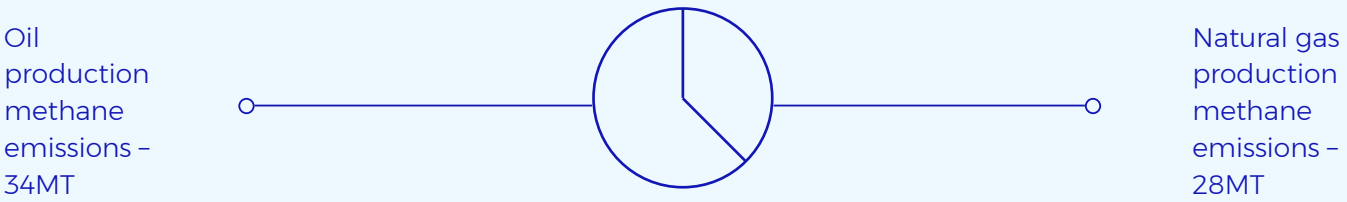
Oil and Gas

It is critical for upstream methane targets to include oil and gas production. Methane emissions from oil production are, quite literally, a natural gas problem. Industry cannot protect the future of gas without targeting substantial reductions from oilier wells.

The IEA estimates that in 2015, of the 4.4 trillion cubic feet of methane emitted to the atmosphere from the oil and gas sector, more than three quarters came from upstream operations alone[9]. This means that oil and gas producers have a unique opportunity – and obligation – to lead the charge in reducing emissions. Since the route to solving the global oil and gas methane problem runs through production, comprehensive coverage of emitting upstream facilities is essential to a serious industry response.

IEA analysis exposes that methane emissions from oil production is a very large contributor to overall methane emissions in the oil and gas sector. EDF analysis based on IEA data suggests that 34 million metric tons (MT) of methane emissions comes from oil production, meaning that more than half of global upstream emissions comes from oil production. To put this in perspective, EDF analysis based on IEA data suggests that the 34 MT of methane emissions from oil production have the short-term climate impact equivalent to the annual GHG emissions of 65 percent (611 million) of global passenger vehicles in 2015.[10] Multiple measurement studies similarly show that oil production sites tend to have more emissions than gas production sites.[11]

Oil production accounts for most upstream methane emissions



Source: EDF analysis of International Energy Agency World Energy Outlook data

[9] EDF analysis of global methane emissions from oil and gas operations as reported in IEA's 2017 World Energy Outlook (WEO). Analysis assumes 90% overall methane content in natural gas.
[10] EDF analysis based on the U.S. EPA's passenger vehicle CO2 emission factors (2017 GHGI). The 2015 passenger vehicle data were obtained from the International Organization of Motor Vehicle Manufacturers, http://www.oica.net/category/vehicles-in-use/
[11] https://pubs.acs.org/doi/abs/10.1021/acs.est.6b00705;https://www.elementascience.org/article/10.1525/elementa.284/; https://pubs.acs.org/doi/abs/10.1021/acs.est.7b03525

Methane emissions from oil production is not only a large problem; it is a solvable one. IEA's analysis indicates that with existing technologies, industry can reduce more than 60 percent of oil methane emissions at no net cost. For the upstream oil production sector, this is equivalent to 21 MT of no-net-cost methane reduction potential, about equal to the combined oil and gas methane emissions of Russia and the United States.[12] In some geographies, cooperation and investment will be required to establish natural gas infrastructure to avoid stranded gas, unlock economic value, and improve energy access.

Some industry voices have recently emphasized the case for reducing methane emissions from the natural gas value chain to ensure natural gas is a better fossil fuel alternative to coal. Including the natural gas value chain as one part of emission reduction efforts is a necessary and important step. However, limiting industry's methane commitments to the natural gas value chain would be incomplete and ineffective. Furthermore, the boundary between oil and gas production is arbitrary and fluid. Most reservoirs contain both hydrocarbons. The atmosphere does not distinguish between methane emissions from oil or gas production, and neither should companies.

Operated and non-operated assets

Just as addressing the full scope of upstream oil and gas emission sources is key to reducing global methane emissions, so too is a strategy that encompasses both operated and non-operated assets. We encourage companies setting targets to develop a strategy for engaging joint venture partners within one year of setting the target for operating assets.

[12] 2017 IEA World Energy Outlook (WEO) https://www.iea.org/weo2017/

Oil and gas companies are accountable for portfolios comprised of both operated and non-operated assets. In 2015, for instance, more than 45 percent of average annual production from the oil and gas majors came from non-operated joint ventures.[13] Therefore, including non-operated assets in methane emission reduction strategies is an essential step to manage methane risk across portfolios.

As an illustrative example, according to a leading IOC's annual report, the company produced approximately three million BOE/d in 2015. Meanwhile, it is estimated that 44 percent of the company's production in 2015 came from non-operated joint ventures.[14] In such instances, an "operated-asset only" methane reduction strategy would exempt nearly 1.3 million BOE/d, the equivalent of daily oil and gas production in Argentina.

Today, operator / non-operator engagement on Health, Safety & Environment is often limited to the standards outlined in Joint Operating Agreements – the contracts that commonly govern joint ventures. Many of these agreements were established years ago and are updated only at the terms' expiration, which in some instances extends well into this century. As a result, these agreements can inadequately reflect the reputational risk factors industry confronts today.

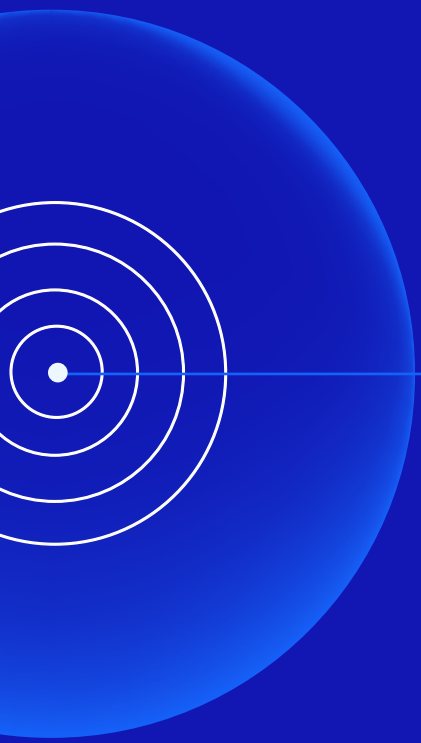
Emerging technology advances like satellite monitoring will increase global and local attention on emission levels across the globe. Companies jointly invested in assets share a reputational interest in addressing emissions regardless of whose boots are on the ground.

Helping key joint venture partners address methane may yield outsized value in the long term by supporting more efficient projects that are positioned for a lower carbon future. Within a year of setting a methane target, companies should define a strategy for engaging joint venture partners on methane mitigation at non-operated assets. The strategy may include elements such as:

- Proactively engaging joint venture partners to increase awareness of safety, operational, environmental and/or reputational benefits of addressing methane emissions
- Supporting technology transfers and trainings with joint venture partners to accelerate methane monitoring and mitigation
- Fostering knowledge transfer with joint venture partners to support the creation of their own methane reduction targets going forward

[13] Bamford, Jim. "The Importance of Joint Ventures – Three Snapshots". Water Street Partners, December 2017. https://www.waterstreet-partners.net/infographic/corporate-investments-the-importance-of-joint-ventures-at-the-company-industry-and-geographic-level

[14] Bamford, Jim. "The Importance of Joint Ventures – Three Snapshots". Water Street Partners, December 2017. https://www.waterstreet-partners.net/infographic/corporate-investments-the-importance-of-joint-ventures-at-the-company-industry-and-geographic-level



Form

Absolute Targets
Preferable to Intensity

Companies should set standalone, absolute targets to reduce their methane emissions.

Methane is a powerful short-lived climate pollutant that affects the atmosphere quite differently than carbon dioxide and presents appealing mitigation economics based on its value as a natural resource. Thus, methane merits its own standalone targets, rather than being absorbed into combined GHG targets that obscure important differences among pollutants.

The two leading forms for methane targets are absolute and intensity. Absolute targets set a limit for total emissions that is independent of production rates (or pipeline throughput for a midstream target). Absolute targets are likely to take the form of percentage reduction targets. A percentage reduction target starts with a "baseline" of estimated current emissions from best available data, then calculates the future level of allowable emissions by imposing a reduction relative to the baseline. In contrast, intensity targets set an emission rate expressed as a percentage of production (or throughput).

Absolute targets are preferable to intensity targets.

Critically, absolute targets provide certainty on environmental outcomes. The exact future level of allowable emissions is knowable in advance because it is defined or calculated relative to a specified emissions baseline. In contrast, intensity targets sow uncertainty on environmental outcomes because the allowable level of future emissions fluctuates with the unknowns of future production or throughput. Indeed, a company with expanding activity could claim credit for achieving an intensity target even though absolute emissions – the direct cause of climate change – increase or remain flat. Long-term stakeholders concerned about the total carbon footprint and reputation of natural gas cannot find guarantees around methane emissions in intensity targets.

Anticipated growth in production levels is not a valid reason to avoid taking an absolute commitment to reduce emissions. With ongoing innovation in facility design and equipment creating the prospect for very low or zero emission new sites, there is no reason growing operations should mean growing emissions. Furthermore, asset owners and other long-term stakeholders are trained to review narrative or supplemental information in addition to metrics when considering performance. A growing company can provide such information to contextualize performance against an absolute target.

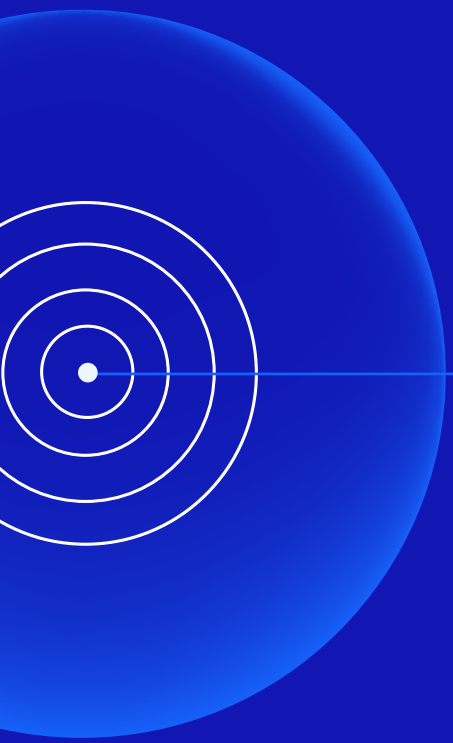
There is strong precedent for corporate sustainability leaders in a range of industries taking absolute reduction targets for their GHG emissions. Companies stating public commitments to absolute GHG reductions include Walmart, Pepsi, Smithfield, McDonald's, and Microsoft, among many others. As oil and gas industry leaders strive to position their companies as resilient in a decarbonizing world, the example of top companies in other industries is instructive.

Because absolute targets create environmental certainty, absolute targets are preferable. However, we recognize that some companies may choose intensity targets. To overcome the inherent challenges of intensity targets, stringency and transparency are essential. An appropriately calculated methane intensity target will provide insight on how efficient/inefficient the operator is at keeping out of the atmosphere methane that is produced – whether the methane is associated with marketed natural gas, stranded associated gas, natural gas liquids, or oil production. Though there are different ways to calculate an upstream oil and gas intensity target[15], generally we recommend:

> Total methane emissions from oil and gas production /
> Total natural gas production

This paper explores key considerations relevant to both target formats.

[15] See technical appendix for additional considerations regarding calculation of methane intensity rates



Stringency

75% Cuts or
0.20% Intensity are
Benchmarks

The stringency of methane emission targets must match the magnitude of both the challenge and the opportunity. It is well-known that cost effective technologies and practices can feasibly achieve large methane emission reductions. As the field of climate scenario planning continues to mature, investors and others will increasingly ask operators to explain how their targeted future methane emissions comport with a 2C° or 1.5C° world. More work is needed to define how companies can incorporate science-based targets for short-lived climate pollutants such as methane. However, with independent studies – and the examples of leading companies – supporting the feasibility of achieving 75 percent emission reduction or 0.20 percent methane emission intensity for upstream, the first round of stringent methane targets can and should be set today.

Absolute Target

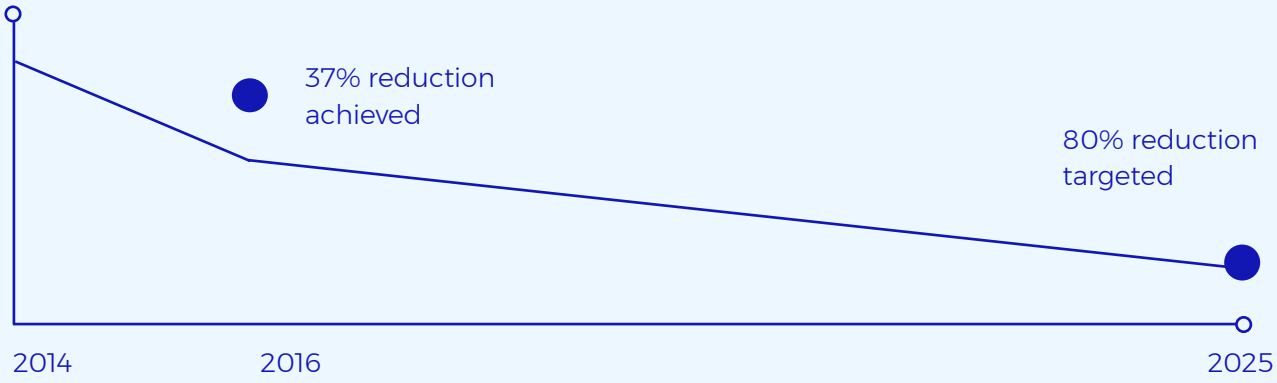
IEA analysis and corporate experience suggests that reducing emissions by 75 percent is feasible, drawing on a host of cost effective technologies and practices to reduce emissions.

A key benchmark for companies setting an absolute target is the World Energy Outlook analysis released in late 2017 by the IEA. IEA conducted a marginal abatement cost curve analysis of global opportunities to reduce methane emissions from the oil and gas industry. Notably, based on the conservative assessment of just what is possible with today's static set of technologies and practices, IEA concluded that a 75 percent emission reduction is feasible, with up to 50 percent having no net cost.

The IEA estimate of 75 percent reduction is an important reference point for companies setting targets. Achieving that level of emission reductions across industry would have the same short-term climate benefit as removing all the passenger vehicles in operation globally. But even at a 75 percent reduction, the remaining level of global oil and gas methane emissions would have the same short-term climate punch as a third of global passenger vehicles. So, while 75 percent is a worthwhile target, industry leaders should recognize it not as a final end point, but rather as a milestone on the continuous improvement process to virtually eliminate emissions.

Corporate precedent also supports the feasibility of a methane emission reduction commitment on the order of 75 percent. Italian supermajor ENI, the 18th largest oil and gas producer in the world, set an 80 percent reduction target for fugitive emissions from its oil and gas assets. ENI's 80% reduction target is set for 2025, relative to a 2014 baseline. To date, ENI's reporting suggests that the company is ahead of pace to achieve the target, as ENI reports a 37 percent reduction from 2014 to 2016. At that rate, ENI would be on pace to achieve an 80 percent reduction six years ahead of schedule. Apache Corporation, an American oil and gas producer, also reports achieving substantial emission reductions. Specifically, Apache's reporting reflects cutting its total methane emissions 51 percent in under five years, between 2012 and 2016.

ENI ahead of pace to achieve 80% reduction in fugitive emissions



Source: ENI online sustainability reporting
https://www.eni.com/en_IT/sustainability/climate-change-and-new-forms-of-energy/reducing-emissions.page

Intensity Target

Companies pursuing an intensity target must grapple with the stakeholder concern that intensity targets carry the risk of absolute emissions rising or remaining flat if production or throughput increases. For those who still move forward with an intensity target, injecting stringency is an important way to provide some measure of assurance that the target will likely still deliver low emissions, even if production or throughput increases. When considering equivalence with the 75 percent industry wide reduction, and the reported intensity of industry leaders, a strong aspiration for an upstream methane intensity target is no more than 0.20 percent oil and gas methane emissions over total natural gas production.

Italian supermajor ENI, the 18th largest oil and gas producer in the world, set an 80 percent reduction target for fugitive emissions from its oil and gas assets.

Intensity based targets should be evaluated on the likelihood that they will provide strong environmental outcomes even in a scenario where production rises. For comparison, based on best available emission estimates, the 75 percent emission reductions projected by IEA would achieve industry supply chain wide emissions of approximately 19 MT (including upstream oil and gas and the natural gas value chain). Using BP industry growth assumptions, we estimate that a 0.50 percent industry wide methane emission intensity in 2025 would result in 20MT of emissions, roughly equivalent to the 19MT from a 75 percent industry wide reduction. Because that 0.50 percent is a cumulative value chain intensity rate calculated by adding up intensity of methane loss in each segment of the value chain, intensity targets limited to one particular segment (e.g., upstream) must be much smaller than 0.50 percent. Additional work is needed to apportion allowable methane intensities across segment. However, at present, EDF views 0.20 percent or lower as a feasible target for oil and gas producers, recognizing that the top operators can and will aim lower.

Scientific studies support the feasibility of a 0.20 percent or less target. One science-based reference point for a producer setting an intensity target is the Robertson et al study, which used site-based measurements and found an average loss rates of 0.09 percent in the Fayetteville and 0.18 percent in the Wyoming Upper Green River.

More recent reference points include industry leaders who have been proactive in instituting methane controls. For example, Statoil has participated in measurement campaigns, the Oil and Gas Methane Partnership, and an onshore leak detection program in the United States featuring optical gas imaging cameras[16], and is the first producer to use automated, continuous methane monitoring through the Methane Detectors Challenge[17]. In its 2016 CDP response, Statoil reported a methane intensity of 0.02 percent for its oil and gas upstream operations.[18]

[16] "Eagle Ford." Where We Are, Statoil ASA, 2018, www.statoil.com/en/where-we-are/united-states/eagle-ford.html.
[17] Partnering to Pursue a Smaller Footprint. Statoil ASA, 2018, www.statoil.com/en/magazine/partnering-to-pursue-a-smaller-footprint.html.
[18] Statoil ASA 2017 CDP Oil and Gas Questionaire, CDP, www.cdp.net.

EDF views 0.20 percent or lower as a feasible target for oil and gas producers, recognizing that the top operators can and will aim lower.

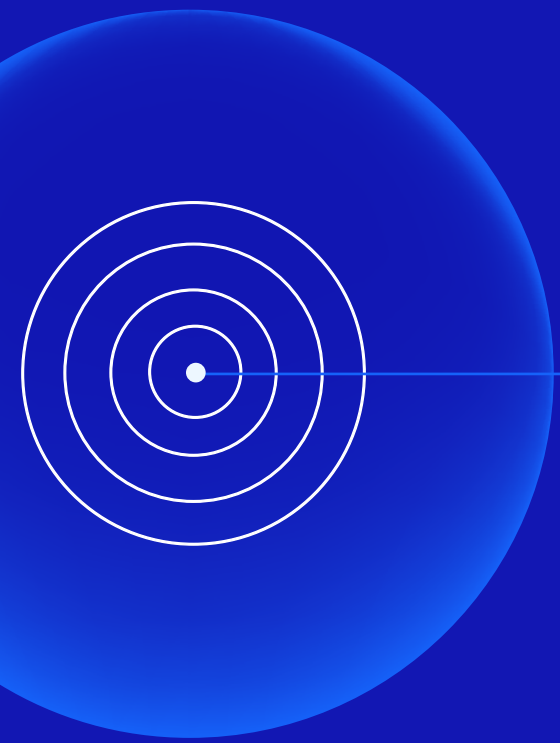
Another example is Southwestern Energy, long recognized by experts as a leader in methane emission management. Southwestern has participated in measurement campaigns, the EPA Natural Gas Star program, and One Future. Southwestern institutes a culture and system of methane management, including using multiple handheld technologies to monitor leaks, direct measurement to quantify leaks, and preventive measures including eliminating all high bleed pneumatic devices.[19] Southwestern ascribes to a methane intensity target of 0.36 percent adding emissions from production and gathering/boosting segments of the value chain. Southwestern already reports achieving a methane intensity of 0.18 percent for its oil and gas upstream operations, based on Greenhouse Gas Program Reporting Estimates.[20]

Other operators are taking action to reduce emissions, with results reflected in their reported methane intensity rates. Some leading operators are reporting upstream oil and gas methane intensity rates at or below 0.20 percent, although EDF does not have all the details on how these numbers were calculated.

OPERATOR	METHANE EMISSIONS/ GAS PRODUCED
ConocoPhillips[21]	0.10%
Hess[22]	0.17%
Noble Energy[23]	0.15%

Such examples demonstrate the feasibility of methane controls with today's technologies and practices and provide a benchmark for the amount of emissions that other companies should strive to meet or beat if they opt to develop an intensity target.

[19] "Air." Environment, Southwestern Energy, www.swncr.com/environment/air/index.html.
[20] Ibid.
[21] ConocoPhillips 2017 CDP Oil and Gas Questionaire, CDP, www.cdp.net.
[22] Hess Corporation 2017 CDP Oil and Gas Questionaire, CDP, www.cdp.net.
[23] Noble Energy 2017 CDP Oil and Gas Questionaire, CDP, www.cdp.net.



Timeline

Urgency
Needed

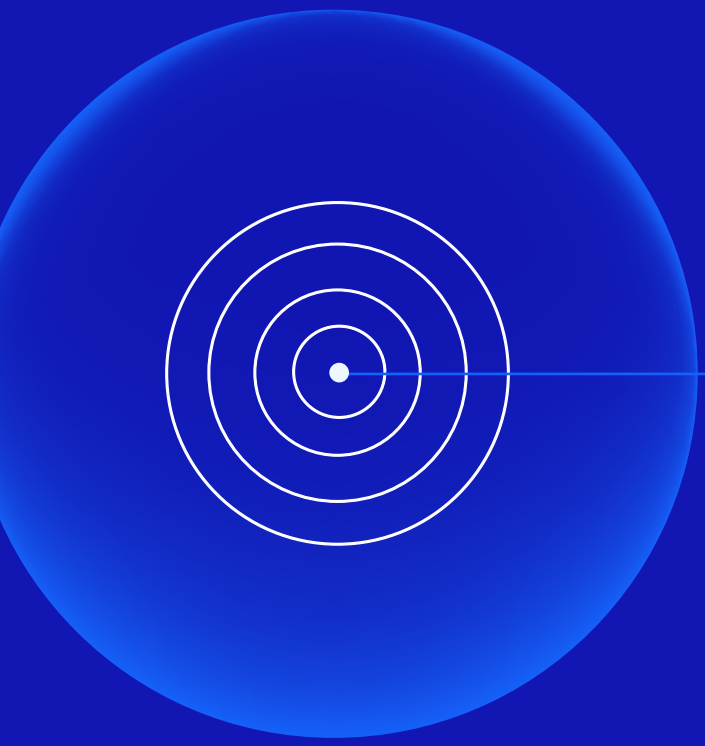
With the world striving to achieve emissions reductions consistent with 2C° or 1.5C° temperature rise, the environmental case for natural gas depends on fast action. By addressing oil and gas methane emissions swiftly and decisively, society can massively reduce the rate at which methane is emitted into the atmosphere. This will help provide a window in which the energy transition to a low carbon economy can take place before catastrophic climate change occurs.

Setting a time-bound target is critical for several reasons. A deadline is a measureable metric for success that allows internal and external stakeholders to assess progress. Additionally, a deadline signals management commitment and creates a public-facing framework for planning and implementation.

A holistic approach to target setting could include a medium-term target year combined with iterative annual targets set on a rolling basis to drive urgency, accountability, and learning.

Each annual target should be achievable with technologies and practices prevailing at the time. As companies harvest better data and improve operations while monitoring and mitigation technologies continue to evolve, annual targets can gain stringency. Furthermore, annual methane targets may offer useful visibility into progress across geographies. For global operators, portfolio-wide methane reduction targets will likely encompass numerous countries at different phases of maturity in methane management. Annual targets that include geographic sub-targets can create visibility into which countries are doing what and how these initiatives contribute to a single overall corporate target.

To operationalize targets rapidly, the C-suite should consider creating small, cross-functional teams responsible for reducing worldwide methane emissions from all operated and non-operated assets. Such teams should have the authority to establish targets for the company and its operating units and manage the company's emissions reduction program and outreach to non-operating partners. Year one establishment of this – or other organizationally appropriate implementation mechanisms – is a leading indicator of management resolve on methane targets.



Data & Transparency

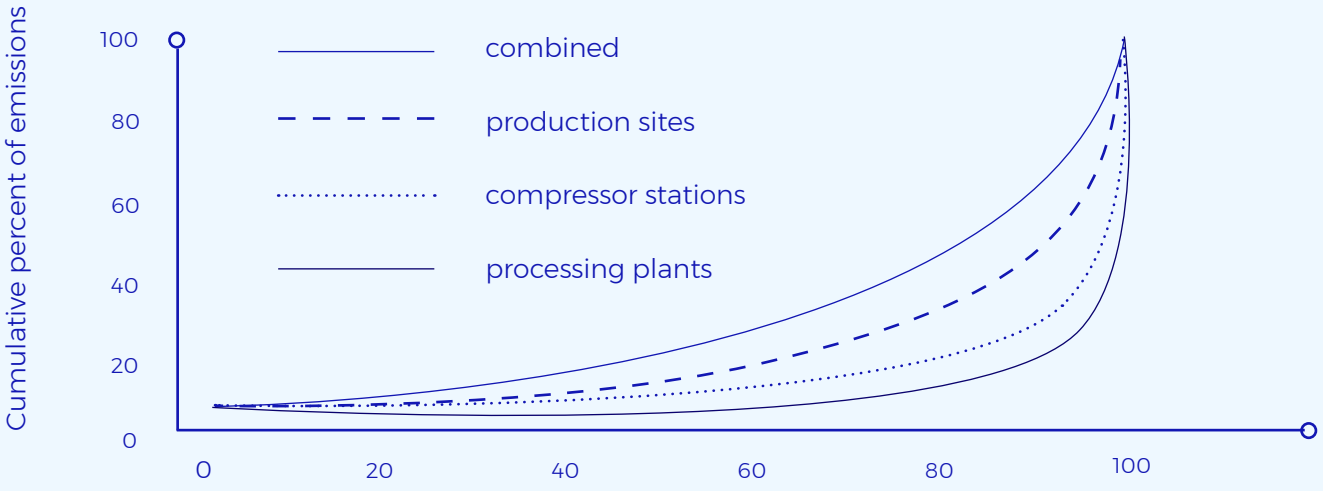
Robustness Essential

Robust data and transparency are linchpins of credible corporate target setting. The need for high quality, audited data and enhanced transparency is heightened for companies asserting progress in reducing emissions of an invisible gas. Emissions should be estimated using well-established effective methods informed by the latest science and sound statistics. Public disclosure of emissions data and the methods used to estimate emissions is needed to ensure confidence in the accuracy of reported performance.

First, transparency is crucial for establishing trust in the validity of reported emissions and reductions. Companies should publicly release data and methods, including assumptions used in analyses, with enough detail to allow independent verification. When using methane intensity targets, it is particularly important to clarify how intensities are calculated, including the exact definition of the numerators and denominators, so that targets can be understood in context of absolute emissions If some data are business-sensitive, companies can use data aggregation and anonymization techniques to maximize the release of useful information without creating competitive disadvantages.

Second, methane emission estimates should be based on empirical data from measurements made at different spatial scales. Numerous studies have found that oil and gas sources have a "fat-tail" distribution with the top five or ten percent highest emitting sites/sources accounting for a large portion of emissions.[24] Traditional inventory approaches that rely on emission factors – which often do not account for these highest emitting sources – have a tendency to underestimate emissions.

Measurement needed to capture high emitters in methane target programs



Source: https://agu.confex.com/agu/fm15/meetingapp.cgi/Paper/60025
http://www.pnas.org/content/112/51/15597

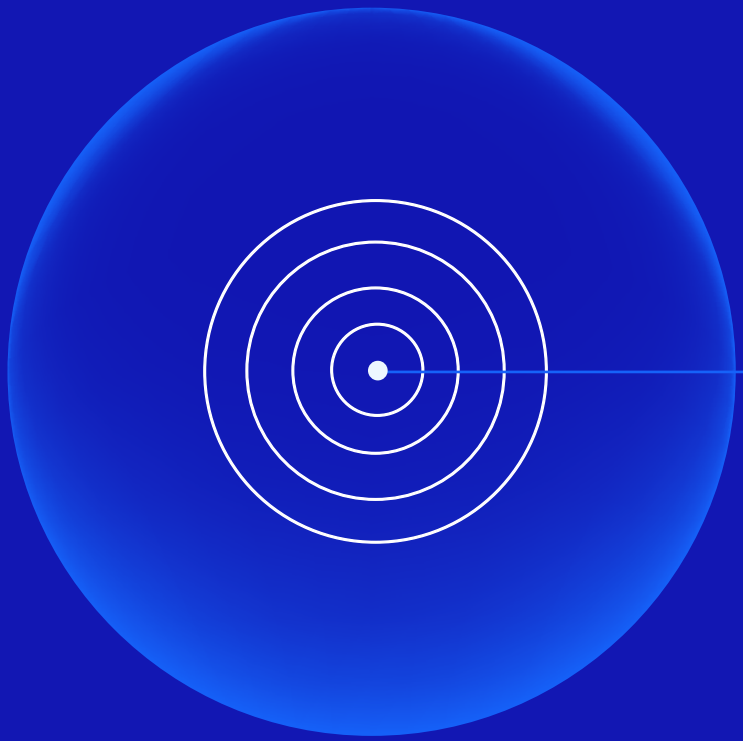
[24] https://pubs.acs.org/doi/abs/10.1021/acs.est.6b04303

By using site-level measurements, companies can verify or adjust emission inventories developed with traditional bottom-up equipment level approaches. This is important because site-level measurement approaches, such as downwind, vehicle-based quantification, often find higher emissions compared to the aggregate emissions of all emission sources found and measured on-site.[25] This discrepancy can be caused by some emission sources being unsafe or difficult to measure during equipment-level surveys. Basin-level approaches, such as aerial mass balance estimates, are an effective means of verifying inventories in areas where companies operate large, contiguous assets.

Third, emission inventories and associated measurements should use robust sampling approaches informed by statistics, as non-representative sampling can easily lead to spurious results. Approaches such as stratified random sampling, using knowledge of how geology or technology varies, can be used to develop an efficient sampling plan that is representative of diverse assets. Companies should transparently account for statistical uncertainty throughout the inventory process, including uncertainty associated with measurements and extrapolating emissions of non-measured assets.

Finally, independent review of assumptions, calculations and data can improve the quality and credibility of methane emissions data and thus targets. Companies should consider seeking the input of external experts including scientists, engineers, and statisticians throughout the process of developing and implementing systems to collect, analyze, and report data. Working collaboratively with subject matter experts can address potential sources of confusion or error, while helping companies take advantage of technical learnings and best practices. Further, subjecting emissions data to auditing by a qualified third party increases credibility for investors and other stakeholders.

[25] https://www.nature.com/articles/ncomms1-1012



Conclusion

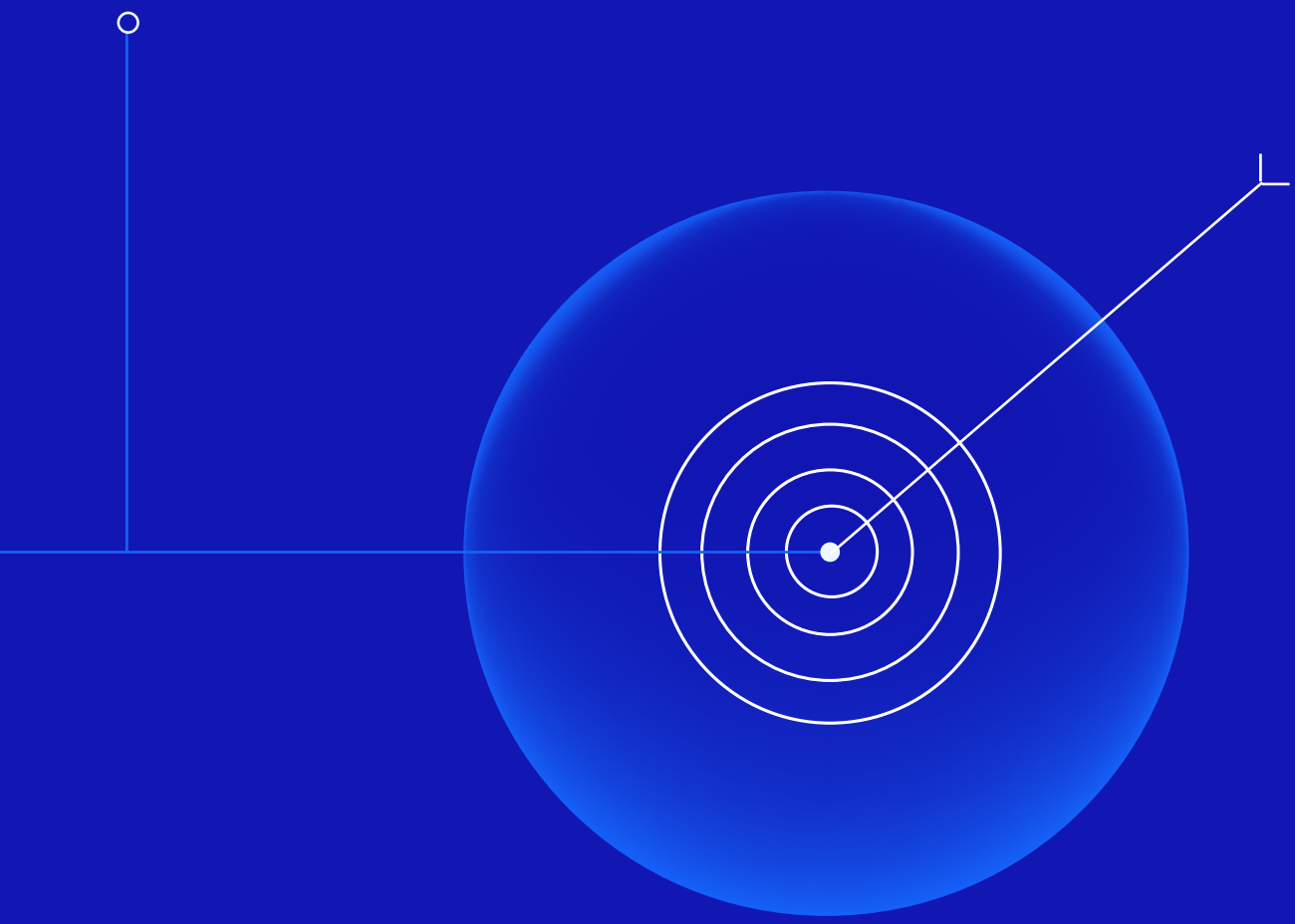
EDF calls on companies to set absolute targets to reduce methane emissions from oil and gas, such as a 75 percent reduction by 2025.

Producers that instead select an intensity target should aim for 0.20 percent leakage or lower.

With scrutiny of industry GHG management continually increasing, the stakes for methane targets are high. The case for natural gas as a credible contributor to the energy transition depends on fixing the weak link of methane emissions. Leading companies can show their commitment to being part of the climate solution by setting and implementing strong methane targets.

The most critical elements of an upstream methane target include coverage of oil and gas, stringency, urgency, and an implementation plan grounded in quality data and transparency. Companies that seize the opportunity through operated and non-operated assets can differentiate themselves to investors and other key stakeholders while doing their part to manage risk to industry writ large.

EDF calls on companies to set absolute targets to reduce methane emissions from oil and gas, such as a 75 percent reduction by 2025. Producers that instead select an intensity target should aim for 0.20 percent leakage or lower. In either case, a commitment to quality data and transparency is essential, and companies should consider using annual targets to hasten action and encourage continuous improvement. Moving forward, operators in other segments of the value chain can learn from upstream leadership and establish stringent targets of their own.



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Technical Appendix

Methane intensity targets typically are defined as emissions normalized to production or throughput. As there is wide variation in the metrics used in targets, it is critical that the numerators and denominators are clearly defined. The primary goal of targets should be the reduction of total emissions from the oil and gas industry. Any target that normalizes total emissions to a transparent, publically accessible metric such as gross gas production, marketed gas production, oil production, or gas throughput can be appropriate. However, uncertainty in the projection of these production/throughput metrics makes it difficult to convert methane intensity targets to future absolute emissions. As a best practice, companies that report a methane intensity target also should include their best estimate of how the denominator and total emissions will change over time.

As a secondary goal, methane intensity targets may be valuable for limiting the greenhouse gas intensity of products such as natural gas, condensate, and crude oil. In life cycle analyses, metrics normally are reported as the emissions associated with the entire life cycle of the product normalized to product quantity (e.g., grams CH4 / Mcf delivered gas). For the oil and gas industry, many emission sources are not clearly linked to a single product, such as fugitive emissions from a well pad that produces both oil and gas. If companies report product-specific methane intensity targets for life cycle analyses, then the definition, scope, and goal of the metric should be clearly defined so that the target does not obfuscate total emissions.

One option is to report conservatively high estimates of total emissions from all wells that produce a product normalized to the product quantity; in this case, some emissions may be double-counted between products. Another option is to use a transparent, consistent approach to allocate emissions among productions, such as by energy content[26]. There also may be situations in which it is appropriate for life cycle analyses to provide targets that exclude certain assets or focus on a specific region or industry segment. In these cases, companies should clarify which assets are included/excluded, the reasoning behind the decision, and the approximate fraction of emissions covered by the target.

[26] https://pubs.acs.org/doi/pdf/10.1021/sc500730x